

# OPERATING AND SERVICE RECORDS

FOR  
AUTOMATIC TELEPHONE PLANTS

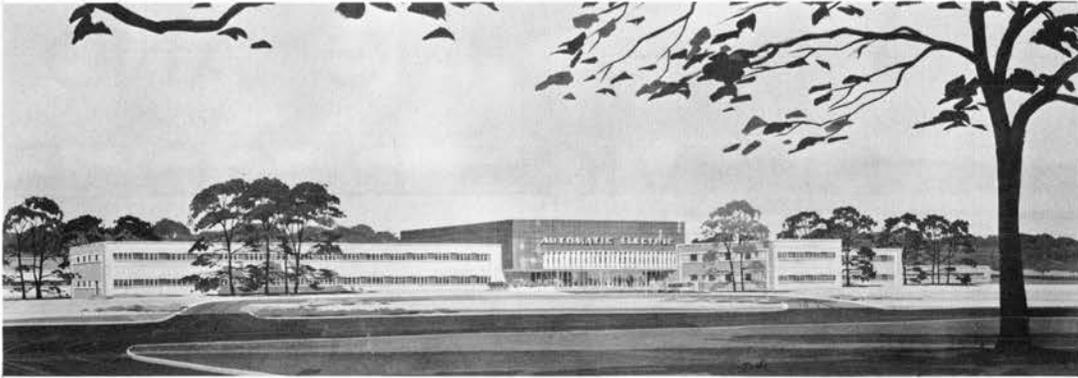
Technical  
bulletin **500**

***AUTOMATIC ELECTRIC***



Subsidiary of

**GENERAL TELEPHONE & ELECTRONICS**



*Factory, development laboratories, and general office at Northlake, Illinois, U.S.A.*

**AUTOMATIC ELECTRIC COMPANY** is an organization of designing, engineering, and manufacturing specialists in the fields of communication, electrical control, and allied arts. For more than sixty years the company has been known throughout the world as the originator and parent manufacturer of the Strowger Automatic Telephone System. Today Strowger-type equipment serves over 75% of the world's automatic telephones. The same experience and technique that have grown out of the work of Automatic Electric engineers in the field of telephone communication are also being successfully applied on an ever-increasing scale to the solution of electrical control problems in business and industry.

## PRINCIPAL PRODUCTS

**Strowger Automatic Telephone Systems**—Complete automatic central-office equipment for exchange areas of any size, from small towns to the largest metropolitan networks.

**Community Automatic Exchanges**—Unattended automatic units for small rural or suburban areas, with facilities for switching into attended exchanges.

**Automatic Toll Boards**—An adaptation of Strowger principles to toll switching, resulting in simplification of operators' equipment and greater economy of operating and toll-circuit time.

**Private Automatic Exchanges**—Available in various capacities, with or without central-office

connections, and with facilities for special control services to meet the needs of the user.

**P.B.X. Switchboards**—A complete range of cordless and cord types for the modern business.

**Telephone Instruments**—Modern designs for automatic or manual exchanges, including the Monophone—the world's most attractive and efficient handset telephone.

**Exchange Accessory Equipment**—Auxiliary exchange and substation equipment, including manual desks, testing apparatus, transmission equipment, and all accessories needed for the operation and maintenance of the modern telephone exchange.

Makers also of electrical control apparatus for industrial, engineering, and public utility companies, telephone apparatus for railroads and pipe-line companies, private telephone systems of all types, electrical and communication devices for aircraft and airways control, and special communication apparatus for military and naval departments.

# CONTENTS

	Page
1. RECORDING AND CLASSIFICATION OF COMPLAINTS AND THEIR ASSOCIATED FAULTS . . . . .	1
1.1 General . . . . .	1
1.2 Subscribers' Reports of Plant Service Reactions . . . . .	1
1.3 Subscribers' Record Cards . . . . .	2
1.4 Identifying Subscribers' Reports . . . . .	2
1.5 Equipment Classifications . . . . .	3
2. COMPLAINT AND REPORTED FAULT RECORDS . . . . .	3
2.1 General . . . . .	3
2.2 Complaint & Fault Record . . . . .	4
2.3 Complaint Check Sheet . . . . .	7
2.4 Stroke Sheet Classification of Complaints & Faults . . . . .	9
2.5 Monthly Record of Complaints & Classified Faults . . . . .	10
2.6 Monthly Summary of Complaints & Classified Faults . . . . .	10
2.7 Detail Study of Class Faults . . . . .	17
2.8 Daily Record of Repairmen . . . . .	17
3. ROUTINE AND DETECTED FAULT RECORDS . . . . .	21
3.1 Routine Assignment Record . . . . .	21
3.2 Routine Schedule & Time Study . . . . .	23
3.3 Routine Progress Report . . . . .	25
3.4 Routine Fault Record . . . . .	27
3.5 Daily Routine Fault Summary for Equipment Supervisor . . . . .	27
3.6 Monthly Summary of Routines & Faults . . . . .	29
3.7 Switch Room Complaint Record . . . . .	31
4. SIMPLIFIED RECORDS FOR SMALL AUTOMATIC TELEPHONE PLANTS . . . . .	31
4.1 General . . . . .	31
4.2 Subscribers' Report . . . . .	32
4.3 Subscribers' Record Cards . . . . .	32
4.4 Complaint Memorandum . . . . .	32
4.5 Complaint Record & Fault Summary . . . . .	32
4.6 Switch Room Record . . . . .	37



# OPERATING AND SERVICE RECORDS FOR AUTOMATIC TELEPHONE PLANTS

## 1. RECORDING AND CLASSIFICATION OF COMPLAINTS AND THEIR ASSOCIATED FAULTS

### 1.1 General

In order to operate and maintain a telephone plant efficiently, it is necessary that exact information on the performance of the equipment be available at all times. The system of records described in this bulletin is flexible and provides a definite means for determining at any time whether all service activities of the company are functioning properly.

The forms illustrated in this bulletin are for reference only. Telephone companies may copy the examples herein or use them as a basic format for outlining their own forms.

Since the results being obtained in the operation of a telephone exchange are indicated directly by the volume and nature of subscribers' reactions in the form of complaints, an accurate system of complaint and associated fault records is of utmost importance in the operation and maintenance of telephone exchanges. In summarizing these complaint records, and the faults which are responsible for them, accurate information is obtained which should be used as a guide in directing preventive measures hereinafter referred to as maintenance routines.

A standard system of maintenance routines should be prepared and established immediately after an exchange is cut into service to forestall interruptions in telephone service because of nonstandard conditions which may develop from time to time. These maintenance routines are in the form of periodic tests to determine whether the equipment is functioning properly and consist of service routines and inspection routines.

The first group, service routines, consists of those that are designed to detect actual faults that may cause service interruptions and are usually performed more frequently than others. They should be performed daily for a short period after the equipment has been placed in service, gradually reducing the frequency of performance until satisfactory service is provided with a minimum amount of maintenance. Thereafter, the frequency for performing these routines should be governed by the amount of faults detected by them and by the subscriber's comparative reaction.

The second group, inspection routines, consists of those routines which are designed to keep the equipment in good operating condition and are less frequently performed. The frequency of performing inspection routines is not always the same, but is governed by conditions revealed by the service routines, subscribers' reactions, general atmospheric conditions, traffic, etc. By carefully observing the operation and general condition of the equipment while performing their regular duties and analyzing the monthly trouble report summary, the maintenance force can determine for themselves when to perform each routine.

Complete description of routines for automatic telephone exchanges will be found in Automatic Electric Company's operating Technical Bulletin 543.

The purpose of this bulletin is to describe the application of a system of service records to an automatic telephone exchange. It is obvious that the volume of complaints received will determine in a large measure the number and type of records to be maintained. It has been found advisable to segregate the complaints or subscribers' reports and faults into equipment classifications and determine which classification is responsible for any abnormal amount of faults.

### 1.2 Subscribers' Reports of Plant Service Reactions

#### 1.2.1 Initial reports.

This classification comprises first reports, i.e., the initial or original report from a subscriber about a plant service reaction. When these are handled expeditiously and to the satisfaction of the subscriber there should be a minimum of subsequent reports.

#### 1.2.2 Subsequent reports.

This classification comprises all reports about plant service reactions which cannot be classified as initial reports. If a subscriber who has already made an initial report calls again about the same service reaction, it is classified as a subsequent report. Reports are also to be considered subsequent when another member of the family reports a plant service reaction with the information that it has been previously reported. All reports received from P-B-X subscribers or P-B-X operators shall be considered subsequent when

the same trunk line, extension station, or switchboard equipment has previously been reported regardless of whether the latter reports are made by the same person or different persons. This report must indicate that the party making the report has knowledge of a previous report. A call by a subscriber in answer to a postal notice of "no access," advising when access can be had, should be considered as information, and should not be counted as a subscriber's report.

### 1.3 Subscribers' Record Cards

Various types of subscribers' record cards are in use, the majority of which furnish the desired information relative to a subscriber's line and station equipment.

If an accurate record of line conditions is desired, it is recommended that a subscriber's line card be used with spaces provided for the following information.

- a. Date - for recording the date each complaint is received.
- b. Time - for recording the time of day the complaint is received.
- c. Complaint - for recording the nature of the complaint.
- d. Test - for recording the result of a test board test.
- e. Fault Found - for recording the actual fault.
- f. Date - for recording the date on which the fault was cleared or the complaint handled.
- g. Time - for recording the time of day the fault was cleared or the complaint handled.
- h. Repairman - for recording the initials of the repairman clearing the fault.
- i. Test Man - for recording the initials of the test man handling the complaint.

### 1.4 Identifying Subscribers' Reports

Since the identification of the class of subscribers' reports is now required for their separation into two divisions, it is necessary that a uniform plan be prepared for counting and identifying subscribers' reports.

#### 1.4.1 Recording subscribers' reports and other reports.

The repair clerk recording a subscriber's report on a subscriber's line card shall

indicate by the use of the symbol S under Report that the entry is a subscriber's report.

Reports of nonstandard conditions discovered by telephone employees will be indicated by the use of the symbol T on the memorandum or list. If later a subscribers' report is received on a report previously originating from telephone employees, the repair clerk will add the symbol S on the subscriber's line card to indicate that a subscriber's report was received.

#### 1.4.2 P-B-X line, station or position cards and subscribers' line cards of multiple service.

P-B-X operators or subscribers, and subscribers to multiple service having two or more main lines terminating in the same office or building, may report several trunk lines, several stations, and possibly some P-B-X equipment troubles in one group report.

The subscribers' line cards, all station cards, and the position of the switchboard will be posted with the necessary report information, one card only bearing the symbol S, to indicate a subscriber's report. On all the other cards involved in the group report, the symbol G will be used to identify the report as having been made by the subscriber. Only one subscriber's report shall be counted for each group report.

#### 1.4.3 Removal cards.

Removal cards should be provided and placed in the line card file whenever a subscriber's line card is removed. These removal cards should be of various colors or have tabs indicating the day of the week. The repair clerk, receiving a subscriber's report and referring to the subscriber's line card file, may find the card is out on a previous subscriber's report. The removal card will indicate the day of the week the card was removed. These cards will also indicate at a glance the number of subscriber's reports which are not clear within a certain number of days.

#### 1.4.4 Complaint memorandum.

When a subscriber's report is received and the particular line card is not on file, a complaint memorandum is used (figure 1).

These reports will be classified as Initial or Subsequent and passed by the repair clerk to the test desk. At this point, the memorandum will be associated with the subscriber's line card which applies to the line to be adjusted.

CARD OUT	COMPLAINT MEMORANDUM		REPORTED BY
INITIAL	EXCH. _____	TEL. NO. _____	DATE _____
SUBSEQUENT	NAME _____ ADDRESS _____		
SPEC. ATT.	NATURE OF COMPLAINT _____		
DISPOSITION OF COMPLAINT _____			
TIME REPORTED _____ A.M. P.M.	TIME CLEARED _____ A.M. P.M.		
REC'D. BY _____	O.K.'D BY _____		REMARKS ON REAR

Figure 1.

When the report on a party line station indicates that the trouble is probably of a minor station nature and the card involved is out because of trouble on another station on this line, then the memorandum ticket should be passed to the test desk and associated with the card. When P-B-X operators who have previously reported other troubles on the same board, report additional P-B-X board troubles, the memorandum should be passed to the test desk to be attached to the card affected. Any subsequent report on the same case of trouble by the same subscriber, is equivalent to an expression of dissatisfaction with the activities of the Repair Department. On all tickets the date and time of day shall be shown so that the report may be classified by the trouble clerk.

As final adjustments are made on subscriber's reports, the information as to the cause is entered on the cards which are passed to the trouble clerk or repair clerk charged with the responsibility of posting trouble records. Attached to these cards are the complaint memorandums referred to the test desk. At this time, the initial and subsequent subscribers' reports will be entered on the stroke record sheet and final entries made on the subscriber's line card. If the original entry on the card indicates that the first report was received from other employees as indicated by the symbol T and the associated memoranda represent subscribers' reports received later, the symbol S shall be added on the card to indicate the trouble was later reported by the subscriber.

When several parties on a line complain, a card record is made of these complaints as follows: The report of the first party complaining, is disposed of by recording the code of the fault found, opposite the report on the line card.

### 1.5 Equipment Classifications

The following equipment classifications shown in Table A are used on many of the record forms.

TABLE A

No.	Class
Outside Line Equipment	
1.1	Cable Prs. U.G. (Ex. Term.)
1.2	Cable Prs. Aerial (Ex. Term.)
1.3	Terminal
2	Line Wire
3	Drop Wire
Substation Equipment	
4	Station Protection
5	Station Wiring
6	Telephone (L.B.)
7.1	Telephone (C.B.)
7.2	Paystation
8	Dial
9	Ringer
10	P-B-X, P-A-X, I-B-X
O.K. Classes	
11	Tested O.K. Test Desk
12	Found O.K. Outside
13	Found O.K. Inside
Central Office Equipment	
14	M.D.F. & Office Protection
15	Line & Cut-Off Relays (Finder System Only)
16	Plunger Switch, Bank & Wiring
17	Master Switch, Bank & Wiring
18	Rotary Switch, Bank & Wiring
19	Strowger Switch Relays & Springs
20	Strowger Switch - Mechanism
21	Strowger Switch - Wipers & Cords
22	Strowger Switch - Wiring & Misc.
23	Strowger Switch - Bank, Bank Wiring & Term.
24	Minor Switch, Bank & Wiring
25	Repeaters
26	Signal Equipment
27.1	Lamps & Jacks )
27.2	Relays & Springs ) Manual
27.3	Keys, Cords & Plugs ) Equip.
27.4	Other Equipment )
28	Power
29	Intermediate & Equipment Frames

## 2. COMPLAINT AND REPORTED FAULT RECORDS

### 2.1 General

The forms suggested for tabulating subscribers' reports and their associated faults are shown in figures 2 and 3. These forms provide for either a tally mark system of recording or the recording of the actual complaints as received. Many telephone

companies have used the complaint recording system in the operation of their manual exchanges and prefer to retain their former practice after the conversion to automatic operation. In either case, the separate complaint and fault record can be used as a weekly or daily sheet depending on the amount of complaints received and recorded.

When either of these forms are used as a weekly complaint and fault record, there will only be four or five sheets to total at the end of the month and these totals can be recorded directly on the Monthly Summary of Complaints & Classified Faults (figure 5). When used as a daily complaint and fault record, a running sheet (figure 4) is provided for recording the summary of each daily record to avoid confusion and inaccuracy. At the end of the month, these daily results are then totaled and recorded on the Monthly Summary of Complaints & Classified Faults.

When an abnormal number of faults are charged to a certain classification, a detail study of the equipment involved is advisable to determine the exact cause. A form (Detail Study of Class Faults, figure 6) is provided for detail studies on all equipment classifications.

In the investigation of complaints and the clearing of faults on the outside plant equipment, there are certain facts which nearly all large organizations endeavor to record and compile such as time spent on each case by repairmen, clearing time, elapsed time, etc. A form (Daily Record of Repairmen, figure 8) has been provided for this purpose and is arranged to meet all the requirements of small or large organizations. It is recommended that either all or part of this record be maintained. A time chart (figure 7) is provided for use with the form mentioned above for the purpose of eliminating the necessity of figuring clearing or elapsed time. This particular chart is arranged for working hours of 7 A.M. to 5 P.M.

2.2 Complaint & Fault Record (Figure 2A)

This form which is interchangeable with the Classification of Complaints & Faults form

TABLE B

Column	Information
1	Time complaint is received.
2	Number of the calling station.
4	Number of the called station.
8	"X" if an initial complaint.
9	"X" if a subsequent report.
10	Record of the actual complaint.

in this system, is designed for recording the complaints as they are received.

2.2.1 Recording of complaints.

Space is provided in Columns 1, 2, 4, 8, 9, and 10 (Table B) on each complaint.

After tests have been made to ascertain whether the complaint (Table C) was the result of nonstandard operation of outside plant equipment, or inside switchboard equipment, a repairman or switchboard maintenance employee is assigned to investigate and clear the trouble. When the report is received on the clearance, the following information is recorded in Columns 3, 5, 6, 7, 11, 12, 13, and 14 respectively.

TABLE C

Column	Information
3	Equipment classification number if fault was found on equipment associated with calling line or station.
5	Equipment classification number if fault was found on equipment associated with calling line or station. This column is also used when faults are found on common equipment. In this case, the common equipment classification is recorded in Column 5 with a circle drawn around it to indicate, at a glance, a common equipment fault.
6	When detail study is being made on a particular classification, the detail code for the trouble found will be entered in Column 6 in addition to the equipment classification record in Column 5.
7	Office area in which fault was found if more than one office in the network.
11	Time of day fault was cleared.
12	Elapsed time (from time report was received until time fault was cleared).
13	Actual trouble found which caused complaint.
14	Initials of repairman or maintenance employee who cleared fault.





### 2.2.2 Summary of complaints and classified faults.

At the bottom of this form (figure 5), provisions have been made for summarizing the results recorded on these forms for a certain period such as daily or weekly. The top horizontal row of equipment classifications are associated with manual exchanges. The second horizontal row of equipment classifications are associated with automatic exchanges for which this bulletin is written. Letters A, B, C, D, E, F, and I, in these rows represent totals of certain classification codes (see figure 3).

Space is provided under these classifications for recording total reported faults on all classifications and detected faults on outside equipment and O.K. on Test classifications. Since faults detected on inside switchboard equipment are recorded on the routine system records, no record is made of them on this form.

Provision is also made for a record of special reports such as reports to manager, letter reports, and reports to other employees not designated as service reports. The total of these reports is recorded as Item L.

The following miscellaneous items are recorded at the bottom of the form in order that the sheet will present a complete service analysis of each day or week.

- a. Item G - The grand total of subscribers' initial reports.
- b. Item H - The grand total of subscribers' subsequent reports.
- c. Item I - The total subscribers' reports indicated in the Satisfied by Operator's record.
- d. Item J - Total of G, H, and I indicating the total reports received daily.
- e. Item K - When the repair clerk trunks are metered, daily readings are made and recorded in this space, indicating the number of attempts to reach the repair clerk.

Data for Items M to R inclusive may be obtained from the form shown in figure 8, opposite "T," in the columns as specified.

- f. Item M - Number of cases handled by the trouble men on business and on residence stations. Also the combined total of both business and residence cases (see column entitled Number of Cases, figure 8).
- g. Item N - Actual time on cases referred to in Item M (see figure 8, column entitled Actual Time on Cases).

- h. Item O - Total clearing time on cases referred to in Item M (see figure 8, column entitled Clearing Time on Cases).
- i. Item P - Total elapsed time on cases referred to in Item M (see figure 8, column entitled Elapsed Time on Cases).
- j. Item Q - Total number of cases (Business) which were cleared within 2 hours (see figure 8, column entitled Cases Cleared within 2 Hours).
- k. Item R - Total number of cases (Residence) which were cleared within 4 hours (see figure 8, column entitled Cases Cleared within 4 Hours).
- l. Items S1 and S2 - Total number of cases on which the total elapsed time is over 24 hours (S1) and over 48 hours (S2).
- m. Item T - General weather conditions for the day.

### 2.3 Complaint Check Sheet (Figure 2B)

The purpose of this form (figure 2B) is to provide a means for checking complaints, as they are received, to determine whether they are duplicates of previous complaints. It also provides a means for indicating nonstandard conditions in a particular hundred group when an abnormal number of complaints appears in any one space.

When complaints are received, the last two digits of the calling station number (or the last three digits of a party line station number when the ringing frequency is selected by dialing) can be entered in the column associated with the hundred group in which the particular line is located. For instance, station 4632 calling 6496. The station number 32 would be entered in line 46.

As subsequent complaints are received, a quick glance at the lines in which the station numbers would ordinarily be recorded, will determine whether previous complaints have been received from these stations. When duplicate complaints are received, the subscriber is advised that the trouble has already been reported.

When a complaint has been cleared out, the line number record on this form will be cancelled by a line being drawn through it. This provides a means for determining at a glance the complaints which have not been cleared. Those station numbers which have not been cancelled by the end of the day will be entered on the form for the following day in RED to indicate that they were not cleared out the same day they were received. A color

## STROKE SHEET CLASSIFICATION OF COMPLAINTS & FAULTS

DATE		FROM		TO		OFFICE		
CLASS CODES	CLASSES	NUMBER OF SUBSCRIBERS REPORTS				NUMBER OF FAULTS FOUND ON SUBSCRIBERS REPORTS		
		INITIAL		SUBSEQUENT				
OUTSIDE PLANT	1.1	CABLE PRS. U.G. (EX TERM.)						
	1.2	CABLE PRS AERIAL (EX TERM.)						
	1.3	TERMINAL						
	2	LINE WIRE						
SUBSTATION EQUIPMENT	3	DROP WIRE						
	A	TOTAL						
	4	STATION PROTECTION						
	5	STATION WIRING						
	6	TELEPHONE (L.B.)						
	7.1	TELEPHONE (C.B.)						
	7.2	PAVSTATION						
	8	DIAL						
	9	RINGER						
	10	P.B.X., P.A.X., I.B.X.						
CENTRAL OFFICE EQUIPMENT	B	TOTAL						
	14	M.D.F. & OFFICE PROTECTION						
	15	LINE & CUT-OFF RELAYS (FINDER SYSTEM ONLY)						
	16	PLUNGER SWITCH BANK & WIRING						
	17	MASTER SWITCH BANK & WIRING						
	18	ROTARY SWITCH, BANK & WIRING						
	19	STROWGER SWITCH RELAYS & SPRINGS						
	20	STROWGER SWITCH MECHANISM						
	21	STROWGER SWITCH WIPERS & CORDS						
	22	STROWGER SWITCH WIRING & MISCL.						
	23	STROWGER SWITCH BANK, BANK WIRING & TERM.						
	24	MINOR SWITCH BANK & WIRING						
	25	REPEATERS						
	26	SIGNAL EQUIPMENT						
	27.1	LAMPS & JACKS						
	27.2	RELAYS & SPRINGS						
	27.3	KEYS, CORDS & PLUGS						
	27.4	OTHER EQUIPMENT						
	28	POWER						
	29	INTERMEDIATE & EQUIPMENT FRAMES						
C	TOTAL							
D	A, B & C TOTAL							
E	TOTAL REPORTS O.K.'D CLASSES 11, 12 & 13							
F	D & E GRAND TOTAL							
DET. CODE	DETAIL OF O.K. CLASSES	11 TESTED O.K. TEST DESK INITIAL	SUBS'QT	12 FOUND O.K. OUTSIDE INITIAL	SUBS'QT	13 FOUND O.K. INSIDE INITIAL	SUBS'QT	SATISFIED BY OPERATORS
70	RECEIVER OFF HOOK							
309	NOT AT HOME							
310	SUBSCRIBER'S ERRORS							
311	INTERFERENCE BY WORKMAN							
312	TROUBLE CAME CLEAR							
313	SUB MADE NO COMPLAINT							
314	ANNOYANCE CASE							
315	NO FAULT FOUND							
316	NO WANTED BUSY (TALKING)							
318	ALL TRUNKS BUSY							
319	PTY LINE INTERFERENCE							
320	REFERRED TO OTHER DEPTS.							
322	SUB CALLING WRONG NO.							
323	NUMBER CHANGED							
324	TELEPHONE TAKEN OUT							
327	REACH PTY ON 2 <sup>ND</sup> ATTEMPT							
330	L.D. HOLDING SUB. LINE							
332	TEMPORARY DISCONNECT							
334	OPERATORS IRREGULARITIES							
30	FOREIGN EQUIP. OR WORKMEN							
TOTAL								
SPECIAL REPORTS		INITIAL COMP. DISP. OF G		BUS	RESID	TOTAL	CASES CLEARED WITHIN 2 HRS (BUS) Q	
		SUBS'QT. COMP. DISP. OF H	NUMBER OF CASES M				CASES CLEARED WITHIN 4 HRS (RESID) R	
		SATISFIED BY OPERATORS I	ACTUAL TIME ON CASE N				CASES WITH ELAPSED TIME 24 TO 48 HRS S	
		TOTAL J	TOTAL CLEARING TIME O				" " " " OVER 48 HRS T	
			TOTAL ELAPSED TIME P					
L		METER COUNT OF COMPLAINTS K					WEATHER - T	

Figure 3.

scheme may be adopted, if required, whereby those which are two, three, and four days old may be indicated as they are carried over.

#### 2.4 Stroke Sheet Classification of Complaints & Faults

The upper portion of this form (figure 3) is primarily arranged for recording two major items: one, the stroke record of subscribers' reports and the other, the stroke record of faults found.

Recording these two categories is necessary because the method of counting faults is different from the method of counting subscribers' reports.

There are three main trouble classifications: Outside Plant, Substation Equipment, and Central Office Equipment.

The lower portion of the form is arranged for recording Details of O.K. Classes, etc., and for listing miscellaneous information relating to the disposition of complaints, time required for clearance, etc.

The stroke record of subscribers' reports is divided between initial and subsequent. Space is provided in Columns 4 and 6 for recording the Initial and Subsequent reports opposite each classification by the use of tally marks (strokes), and for class totals, division totals, and grand totals in Columns 5 and 7 opposite each class and spaces A, B, C, E, and F. The total in Column E which is recorded in the initial report division is the combined total of the initial report stroke record under the O.K. divisions. The total to be recorded as "E" in the subsequent division is the combined total of the subsequent report stroke record under the O.K. divisions.

The subscribers' reports resulting in Tested or Found O.K. are subdivided into three classifications: Test O.K. Test Desk, Found O.K. Outside, and Found O.K. Inside. For the purpose of analyzing complaints disposed of in this manner, a set of detail classifications is provided which is used for all three major classes.

This separation will indicate where efforts should be concentrated to obtain improvement of the condition that is responsible for the report.

The stroke record part of the form for recording faults is arranged to take the count of faults chargeable to the Outside Plant, Substation Equipment, and Central Office Equipment classifications.

Space is provided in Column 9 for recording the total faults found as indicated by the stroke record opposite each classification and for division and grand totals opposite spaces A, B, C, and D.

Space is provided for a stroke record of those subscribers' reports which are handled satisfactorily by the repair clerk or operators designated to receive such reports, and do not reach the test desk. An analysis of these reports will also indicate where efforts should be made to obtain improvements in the service.

Provision is also made for a stroke record of special reports such as reports to manager, letter reports, and reports to other employees not designated as service reports. The total of these reports is recorded as Item L.

The following miscellaneous items are recorded at the bottom of the form in order that the stroke sheet will present a complete service analysis of each day.

- a. Item G - The grand total of subscribers' initial reports recorded opposite F.
- b. Item H - The grand total of subscribers' subsequent reports recorded opposite F.
- c. Item I - The total subscribers' reports indicated in the Satisfied by Operators stroke record.
- d. Item J - Total of G, H, and I indicating the total reports received daily.
- e. Item K - When the repair clerk trunks are metered, daily readings are made and recorded in this space indicating the number of attempts to reach the repair clerk.

Data for Items M to R inclusive may be copied from the form shown in figure 8, opposite "T" Items, in the column specified below.

- f. Item M - Number of cases handled by the trouble men on business and on residence stations and the combined total of both (see figure 8, column entitled Number of Cases).
- g. Item N - Actual time on cases referred to in Item M (see figure 8, column entitled Actual Time on Cases).
- h. Item O - Total clearing time on cases referred to in Item M (see figure 8, column entitled Clearing Time on Cases).
- i. Item P - Total elapsed time on cases referred to in Item M (see figure 8, column entitled Elapsed Time on Cases).

- j. Item Q - Total number of cases (Business) which were cleared within 2 hours (see figure 8, column entitled Cases Cleared within 2 Hours).
- k. Item R - Total number of cases (Residence) which were cleared within 4 hours (see figure 8, column entitled Cases Cleared within 4 Hours).
- l. Items S1 and S2 - Total number of cases on which the total elapsed time is over 24 hours (S1) and over 48 hours (S2).
- m. Item T - General weather conditions for the day.

## 2.5 Monthly Record of Complaints & Classified Faults

This form (figure 4) is arranged as a running sheet for recording the results of the daily stroke-sheet analysis (figure 3).

The classifications and totals are the same as on the form shown in figure 3, except that the arrangement is changed so that the results of the stroke analysis can be recorded daily in vertical Columns 1 to 31, opposite the items they are associated with. One vertical column is provided for each day of the month, and at the end of the month these figures are added horizontally and the totals recorded in the column provided.

The column entitled Total All Offices provides space for recording the grand total of all offices in a multioffice network for each item.

The figure to be recorded opposite Classifications 11, 12, and 13 are obtained from the totals of the stroke record of the O.K.'d initial report division at the lower part of the form.

## 2.6 Monthly Summary of Complaints & Classified Faults

This form (figure 5) is arranged to provide a complete summary of the complaints and faults handled during the operation of a telephone plant for the period of one month. Space is provided above the equipment classification column for recording the following line and station data.

Opposite Lines Installed, record the total number of lines of automatic and manual switchboard equipment installed, under Automatic and Manual, respectively.

In a similar manner, opposite Lines in Service record the number of automatic and manual lines in service. P-A-X and P-B-X Trunks, as recorded in lower right-hand corner of form, are included in these figures.

Opposite Stations in Service, record the number of automatic and manual stations in service under Automatic and Manual, respectively. P-A-X and P-B-X Stations, as recorded in lower right-hand corner of form, are included in these figures.

Opposite Extensions, record the number of automatic and manual extension telephones in service as above. P-A-X and P-B-X Extensions, as recorded in lower right-hand corner of form, are included in these figures.

Record P-A-X lines, stations, and extensions in the Automatic column.

Record P-B-X lines, stations, and extensions in the Manual column.

When automatic and manual equipment is installed in the same office, it is desirable to know the number of lines and stations connected to each.

### 2.6.1 Transferring monthly totals.

Each month, the totals from the Monthly Record of Complaints & Classified Faults should be transferred to the Monthly Summary of Complaints & Classified Faults. The classifications, Items 1 through 29, A through J, and M3, N, O, and P are arranged in the same manner in both forms (figures 4 and 5). The figures to be recorded opposite these items in Column A, entitled Number of Faults (figure 5), are transferred from the Total column of the monthly record form when a single-office system is involved or from the Total All Offices column when a multioffice system is involved.

The spaces for recording the figures associated with Items K, L, M1, M2, M3, Q, R, S1, and S2 are arranged in the lower right-hand corner of the monthly summary form. These totals are also transferred from the Total column of the monthly record form, as explained in the preceding paragraph.

These results, when properly recorded, are subject to an analysis which determines whether the subscriber's reaction to the service, the actual causes for subscriber's reaction, indicated by the number of faults charged to the various classifications, and the efficiency of the trouble department are above or below the standards set up in the normal expectancy columns.

### 2.6.2 Method of analyzing monthly summary.

The explanation of the method of analyzing the monthly summary is divided into five parts: Actual faults found (due to subscribers' reports), complaints O.K.'d through the



MONTHLY SUMMARY OF COMPLAINTS & CLASSIFIED FAULTS														
COMPANY			CITY STATE		OFFICE MONTH									
LINES INSTALLED		AUTOMATIC	MANUAL	FAULTS FOUND ON SUBSCRIBERS REPORTS							FAULTS FOUND BY ROUTINES			
LINES IN SERVICE	STATIONS IN SERVICE			NUMBER OF FAULTS A	NO. OF UNITS IN SERVICE B	FAULTS PER UNIT A ÷ B C	NORMAL EXPECTANCY IN FAULTS PER UNIT D	NORMAL FAULT EXPECTANCY B × D E	FAULT INDEX E ÷ A F	PERCENT OF TOTAL G	FAULTS PER LINE H	FAULTS PER STATION I	NUMBER OF FAULTS	PERCENT OF TOTAL
EXTENSIONS														
OUTSIDE PLANT	1.1	CABLE U.G. PRS. (EX. TERM.)												
	1.2	CABLE AERIAL PRS. (EX. TERM.)												
	1.3	TERMINAL												
	2	LINE WIRE												
	3	DROP WIRE												
A	TOTAL													
SUBSTATION EQUIPMENT	4	STATION PROTECTION												
	5	STATION WIRING												
	6	TELEPHONE (L. B.)												
	7.1	TELEPHONE (C. B.)												
	7.2	PAYSTATION												
	8	DIAL												
	9	RINGER												
	10	P. B. X. P. A. X. I. B. X.												
	B	TOTAL												
	CENTRAL OFFICE EQUIPMENT	14	M. D. F. & OFFICE PROTECTION											
15		LINE & CUTOFF RELAYS (FINDER SYSTEM ONLY)												
16		PLUNGER SWITCH, BANK & WIRING												
17		MASTER SWITCH, BANK & WIRING												
18		ROTARY SWITCH, BANK & WIRING												
19		STROWGER SWITCH RELAYS & SPRINGS												
20		STROWGER SWITCH MECHANISM												
21		STROWGER SWITCH WIPERS & CORDS												
22		STROWGER SWITCH WIRING & MISC'L.												
23		STROWGER SWITCH BK. BANK WIRING & TERM.												
24		MINOR SWITCH BANK & WIRING												
25		REPEATERS												
26		SIGNAL EQUIPMENT												
27.1		LAMPS & JACKS												
27.2		RELAYS & SPRINGS												
27.3	KEYS, CORDS & PLUGS													
27.4	OTHER EQUIPMENT													
28	POWER													
29	INTERMEDIATE & EQUIPMENT FRAMES													
C	TOTAL													
D	A. B. & C TOTAL									100 %				
O. K. FAULTS	11	TESTED O.K. TEST DESK											K	METER COUNT OF COMPLAINTS
	12	FOUND O.K. OUTSIDE											L	SPECIAL REPORTS
	13	FOUND O.K. INSIDE											M1	NUMBER OF CASES
	E	TOTAL REPORTS O.K.'D CLASSES 11, 12 & 13											M2	NUMBER OF CASES
F	D & E GRAND TOTAL									100 %				
WIRE CHIEF'S SUBSCRIBER'S REACTION REPORT	TOTAL			DAILY AVERAGE	NORMAL EXPECTANCY	COMPLAINT INDEX	PERCENT OF TOTAL	COMPLAINTS PER LINE	COMPLAINTS PER STATION	M3	TOTAL NUMBER OF CASES			
	G	INITIAL COMPL'S. DISP. OF								Q	CASES CLEARED WITHIN 2 HRS.		B	US
	H	SUBSQ.T. COMPLTS. DISP. OF								R	CASES CLEARED WITHIN 4 HRS.		R	ES
	I	SATISFIED BY OPERATORS								S1	CASES WITH ELAPSED TIME 24 TO 48 HRS.			
	J	TOTAL								S2	CASES WITH ELAPSED TIME OVER 48 HRS.			
	M3	NUMBER OF CASES									TOTAL	TRKS	STATIONS	EXTENSIONS
	N	TOTAL TIME ON CASES (HRS)									NUMBER OF P.A.X.'S			
	O	TOTAL CLEARING TIME (HRS)									NUMBER OF P.B.X.'S			
	P	TOTAL ELAPSED TIME (HRS)								WEATHER	T			

Figure 5.

test desk, subscribers' reaction, wire chief's report, and private branch exchange record.

a. Actual fault found (due to subscribers' report). All faults found through investigations resulting from subscriber's complaints are recorded in the upper portion of this form. This section is headed by the caption Faults Found on Subscribers' Reports and the columns below are identified by letters A to I, inclusive. The total number of actual faults charged to each class of equipment is recorded in Column A.

In Column B the Number of Units in Service will be recorded and the amounts changed, only if necessary, once every six months or a year unless a large amount of equipment has been added or removed. These unit figures are prepared from the notations which follow each description of faults to be charged to a classification, for instance, there are 1000 plunger lineswitches in an office. A unit consists of 100 plunger lineswitches. Therefore, 1000 switches equals 10 units. This figure (10) would be recorded in Column B, directly opposite classification 16, Plunger Switch Bank & Wiring. Record unit figures, regardless of whether faults are charged to a class or not.

The figures to be recorded in Column C are prepared by dividing the number of faults charged to a classification in Column A by the number of units in service recorded opposite the same classification in Column B. This result is identified as the Faults Per Unit.

Normal Expectancy in Faults Per Unit represents the number of faults which have arbitrarily been set as an amount of reported faults which each unit of the classifications can produce and still render good commercial service at a reasonably low cost of maintenance.

In Column E, entitled Normal Fault Expectancy, record results which are obtained by multiplying each classification figure in Column B by the figure in Column D. The resulting amounts indicate the number of reported faults which may be allowed on all the equipment covered by each classification in a particular office and still provide good commercial service. Figures in this column will remain the same from month to month unless changes are made in the Units in Service figures associated with them in Column B. The results of actual operation however (see Column A) should produce figures which are lower than those in Column E at reasonably low

maintenance costs. A figure which will provide a picture of the situation at a glance may be obtained by dividing the Normal Fault Expectancy figure in Column E by the corresponding actual faults figure in Column A.

The result should be recorded in Column F, entitled Fault Index. Whenever it is less than "1" it is an indication that the Actual faults are greater than the normally Expected faults (the permissible amount) and therefore corrective measures must be taken to remedy the situation.

The results of each month's plant operation will therefore be reflected in Column F.

Classification A, B, C, and D totals are only recorded in Columns A, E, and F. If there is no requirement for the information called for below, recording in Columns G, H, and I, may be ignored.

Using the total faults, D, in Column A as 100 percent, compile the percentages which the number of faults charged to each classification and to totals A, B, and C, in Column A, represent, of the total faults, D. Record these percentages in Column G, entitled Percent of Total.

In the beginning of this description, the method of recording lines installed, lines in service, and stations in service was explained.

The figures to be recorded in Column H, entitled Faults Per Line is obtained by dividing the number of faults charged to classifications 1 to 3 of the Outside Plant division and which totals A, and classifications 14 to 29 of the Central Office Equipment division which totals C, by the total number of lines in service recorded at the top of the form.

Figures to be recorded in Column I are obtained in a similar manner except that the total Stations in Service figure recorded at the top of the form is used, instead of Lines in Service. These figures are only obtained for classifications 4 to 10 and they total "B."

The columns entitled Number of Faults and Percent of Total are for recording the results being obtained each month on maintenance routines.

At the end of each month, the faults found by routines on each classification, as well as on classification Totals A, B, C, and D, are recorded in the next to last column.

Consider the total faults, D, in Column 13 as 100 percent. Compile the percentages which the number of faults charged to each classification and Totals A, B, and C in Column 13 represent of the total faults, D. Record these percentages in Column 14.

Faults Found by Routines appears on this summary to show the connection that exists between the results of routine maintenance and the reported faults. If a classification shows an abnormal number of reported faults, (in Column A) it is obvious that the routine maintenance is failing in its functions. The logical method of rectifying this condition, is to analyze the routines and their performance on the equipment involved, in an effort to determine why these faults are not detected by the routines. Even after this has been done, and a perceptible decrease is noticed in the reported faults due to their detection by routines, the routine faults should be studied, segregated, and efforts made to eliminate them entirely or to reduce them to a minimum.

On exchanges where no specific routines are performed on the outside plant equipment there will be no figures recorded in the last two columns opposite Outside Plant or Substation Equipment.

Full details of the manner in which routine work should be conducted appear in Section 3 of this bulletin.

- b. Complaints O.K.'d through test desk. Since an analysis of complaints which are O.K.'d through the test desk is made daily on the stroke sheet, the only summarizing to be done on the Monthly Summary of Complaints & Classified Faults (figure 5), is the compiling of percentages called for in Column G, in the O.K. Faults division.

Consider the total complaints "F," as 100 percent. Determine what percentage of this total is charged to Class 11, 12, 13, and Total E. Record the results in Column G.

- c. Subscribers' reaction. The summary of the complaints recorded in the division entitled Subscribers' Reaction is made along the same lines as the reported fault summary.

The number of complaints which are recorded in Column A opposite each Item G, H, I, and J are reduced to daily averages (using the full number of days in the month) and these averages recorded in Column B entitled Daily Averages.

The lowest daily average figures on complaints received and charged to Items G, H, I, and J will be recorded in Column B entitled Normal Expectancy.

These figures will not change from month to month unless the figures opposite one of the items in Column B for a particular month indicate that a lower daily average has been reached. The Normal Expectancy figures in Column C should then be changed to correspond to the new low figure for that item.

In order to provide a figure of comparison such as used in the reported fault analysis, Column D entitled Complaint Index is provided. The figures to be entered in this column are obtained by dividing the Normal Expectancy figures in Column C by the actual daily average figures in Column B. The result will either be above or below the figure 1. If, for example, this complaint index figure is .93, it indicates that the actual daily average for that item for the current month is .07 above the lowest average experienced on that item heretofore. If the complaint index figure is 1.8, the actual daily average for the item is .8 below the previous daily average.

Calculate what percent of the total number of complaints "J" in Column A, is represented by totals G, H, and I, and record them in Column E.

In Column F entitled Complaints Per Line, record the results obtained by dividing the number of complaints charged to each Item G, H, I, and J by the number of lines in service shown at the top of the form.

In Column G entitled Complaints Per Station, record the results obtained by dividing number of complaints charged to each Item G, H, I, and J by the number of stations in service shown at the top of the form.

- d. Wire Chief's Report. The totals of the results of the Wire Chief's Report recorded in Column A, differ to the extent that Item M3 represents cases, and Items N, O, and P represent "hours."

The figure for Item M3 to be recorded in the Daily Average, Column B, is obtained by dividing the total cases for the month in Column A by the actual number of days in the month.

The figures to be recorded in the Daily Average, Column B opposite Items N, O, and P are obtained by dividing each of the total hour figures in Column A by the actual number of days in the month.



The figures which will appear in Columns C and D of this division are calculated in the same manner as the figures for Columns C and D in the Subscribers' Reaction division.

The Average Time Per Case to be recorded in Column E opposite Items N, O, and P is obtained by dividing each hour figure in Column A by the total cases opposite Item M3 in Column A.

Space is provided in the lower right-hand section of the form for a detail analysis (if desired) of the cases handled by the test desk.

In the space opposite "K," record the total complaints received over the complaint trunks as recorded by meters, if these trunks are equipped with meters. To arrive at the approximate number of complaints handled by the complaint operator, subtract the Initial and Subsequent complaints from the total recorded on the meters.

In the space marked "L" record the total special complaints received by letter or in any other special manner.

In spaces marked M1, M2, and M3, record the total number of complaints from Business Stations, Residence Stations, and from both Business and Residence Stations handled during the month.

In the space marked "Q," record the number of Business cases cleared within two hours. Directly under this figure record what percent it is of the Total M1.

In the space marked "R," record the number of Residence cases cleared within four hours. Directly under this figure, record what percent it is of the Total M2.

In the spaces marked S1 and S2, record the number of cases on which the elapsed time is over 24 hours and over 48 hours.

- e. Private branch exchange record. In order that an intelligent study may be made of this summary on substation equipment, space is provided for Private Branch Exchange information. This data is recorded separately for P-A-X's and P-B-X's, and consists of the total number of these exchanges, the total number of trunks to Main Exchange, total number of stations served by them, and the total number of extension telephones associated with them.

Space is also provided for recording the average weather conditions for the month.

## 2.7 Detail Study of Class Faults

When the number of faults charged to a classification is excessive, a detail study of these faults may be necessary to determine the cause of this condition. The form shown on figure 6 may be used for this purpose.

This form provides space for six separate classification detail studies.

Record the code number of the classification whose faults are to be analyzed in detail, in the small square at the top of a column entitled Faults. A description of each of the faults which applies to the classification being analyzed should then be recorded in this column, for example: open relay coil, line short, dirty contacts, and other common faults. The description of a type of fault should be entered only once. When a certain fault has been recorded once and a tally mark recorded opposite it in the third column, successive faults of the same nature will be recorded by additional tally marks in the same space.

Code numbers have been designated for each different detail description. The same code number will appear under any classification with which this fault may be associated.

The second column of this form is provided for the recording of the detail code numbers.

A study will usually indicate that a certain detail fault is responsible for the abnormal amount of faults charged to a major classification, and will determine where the maintenance force must concentrate their efforts to decrease this amount or eliminate it entirely.

## 2.8 Daily Record of Repairmen

This form (figure 8) is arranged for recording the data and time figures associated with the complaints handled by repairmen through the test desk.

The main portion of the form is divided into eight horizontal divisions. One of these divisions is ordinarily assigned to a repairman for one day in large networks. In small offices where only one or two repairmen handle all trouble, one of these forms may be used for several days or a week.

Record the name of the repairman in the blank triangular space at the left of each division.

### 2.8.1 Vertical columns.

Vertical columns numbered "1 to 12" are for recording the information on each case of trouble assigned to a repairman, as follows:

EXPLANATION

WHEN COMPUTING EITHER ELAPSED OR CLEARING TIME, FIRST DETERMINE THE NUMBER OF HOURS AND THEN THE ADDITIONAL MINUTES. THE HORIZONTAL SPACES OF THE LARGE CHART ARE NUMBERED IN COLUMN "A" TO CORRESPOND TO A PERIOD OF 24 HOURS AND ARE ASSOCIATED WITH THE TIME THE COMPLAINTS ARE RECEIVED.

THE VERTICAL SPACES ARE NUMBERED IN THE SAME MANNER AND ARE ASSOCIATED WITH THE TIME THE COMPLAINTS ARE CLEARED. LOCATE THE HOUR THE COMPLAINT WAS RECEIVED IN THE "A" COLUMN AND MOVE ACROSS THE HORIZONTAL SPACE TO THE VERTICAL COLUMN ASSOCIATED WITH THE HOUR THE COMPLAINT WAS CLEARED. THE SQUARE AT THE INTERSECTION OF THESE TWO SPACES CONTAINS THE CLEARING TIME AND THE ELAPSED TIME IN HOURS.\*

THE MINUTES WHICH ARE ASSOCIATED WITH THIS TIME ARE COMPUTED ON THE SMALL CHART. IN THE CASE OF A COMPLAINT RECEIVED AT 9:45 AND CLEARED AT 3:30 P.M. LOCATE HORIZONTAL SPACE IN COLUMN "A" ASSOCIATED WITH 45 MINUTES AND MOVE ACROSS TO THE RIGHT TO VERTICAL COLUMN ASSOCIATED WITH 30 MINUTES. THIS SQUARE CONTAINS THE NUMBER OF MINUTES TO BE ADDED TO THE CLEARING TIME AND ELAPSED TIME HOURS.

SUBTRACT 1 HR. FROM THE TIME THE FAULT WAS CLEARED, BEFORE USING TABLE, WHEN THE MINUTES ASSOCIATED WITH THE CLEARING TIME ARE LESS THAN THE MINUTES ASSOCIATED WITH THE RECEIVING TIME.

- \* UPPER FIGURES. (CLEARING TIME)
- LOWER FIGURES. (ELAPSED TIME)

		MINUTES OF CLEARING TIME													
		A	B	0	5	10	15	20	25	30	35	40	45	50	55
MINUTES OF RECEIVING TIME	A	0	0	5	10	15	20	25	30	35	40	45	50	55	
	B	0	55	0	5	10	15	20	25	30	35	40	45	50	
	5	50	55	0	5	10	15	20	25	30	35	40	45		
	10	45	50	55	0	5	10	15	20	25	30	35	40		
	15	40	45	50	55	0	5	10	15	20	25	30	35		
	20	35	40	45	50	55	0	5	10	15	20	25	30		
	25	30	35	40	45	50	55	0	5	10	15	20	25		
	30	25	30	35	40	45	50	55	0	5	10	15	20		
	35	20	25	30	35	40	45	50	55	0	5	10	15		
	40	15	20	25	30	35	40	45	50	55	0	5	10		
	45	10	15	20	25	30	35	40	45	50	55	0	5		
	50	5	10	15	20	25	30	35	40	45	50	55	0		
55	0	5	10	15	20	25	30	35	40	45	50	55			

CHART ARRANGED FOR COMPUTING CLEARING & ELAPSED TIME HOURS  
CLEARING TIME (BLACK) & ELAPSED TIME (RED)

		A.M.												P.M.															
		B	A	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
COMPLAINT RECEIVING TIME HOURS	A.M.	12	9	9	9	9	9	9	9	9	9	9	1	2	3	4	5	5	6	7	8	9	9	9	9	9	9	9	9
		1	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
		2	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
		3	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
		4	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
		5	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
		6	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
		7	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
		8	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
		9	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
		10	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
		11	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13		
P.M.	12	4	4	4	4	4	4	4	4	4	4	5	6	7	8	9	9	1	2	3	4	4	4	4	4	4	4		
	1	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11			
	2	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10			
	3	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9			
	4	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8			
	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7			
	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6			
	7	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5			
	8	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4			
	9	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3			
	10	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2			
	11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1			
12	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				

Figure 7.





- a. Number of telephone associated with case of trouble.
- b. Cross out either BUS (Business) or RES (Residence), whichever does NOT apply.
- c. Time started: The time of day that the case was given to the repairman or the time of day the repairman signed off on one case and started on a new one. It is generally conceded that the time for traveling from the old case of trouble to the new one shall be charged to the new case.
- d. Code: The classification code to which the fault which caused the trouble is to be charged.
- e. Time on Case: The period between the time the repairman started on the case and the time he signed off.
- f. Clearing Time: The period between the time the complaint is received and the time the repairman signs off of the case, excluding the nonworking hours of the repairman.
- c. The total clearing time (T) and average clearing time (A) charged to all business cases, residence cases, and grand total and average of both.
- d. The total elapsed time (T) and average elapsed time (A) charged to all business cases, residence cases, and grand total and average of both.
- e. The total number of business cases cleared within two hours after being reported and the percent of the total (T) this figure represents.
- f. The total number of residence cases cleared within four hours after being reported and the percent of the total (T) this figure represents.
- g. The total number with elapsed time over 48 hours.

When trouble is received and cleared by repairmen during nonworking hours, no entry will be made in this space.

- g. Elapsed Time: All the time which elapsed between the moment the complaint is received and the time the repairman signs off of the case.

### 2.8.2 Code number.

The lower section of this form is arranged for compiling a summary of the results recorded in the upper section.

Space is provided for recording the code number of the faults which seem to predominate and the total number of these faults which were recorded in the upper section. This is done to bring them to the attention of the wire chief.

Below the predominating code divisions, a record is made of the number of cases each repairman disposed of each day, also the average time spent on each case by the repairman.

At the lower right of the form, a division is provided for the following information:

- a. The total number of cases: business, residence, and the grand total of both.
- b. The total actual time (T) and average time (A) spent on all business cases, residence cases, and grand total and average of both.

## 3. ROUTINE AND DETECTED FAULT RECORDS

### 3.1 Routine Assignment Record

The purpose of this form (figure 9) is to provide a record of the code number and title of all routines, or portions of them, that are assigned for performance by individuals in the central office. A routine or the equipment involved in a routine, may be divided into several parts, thus making it possible to assign certain groups of switches or equipment to different individuals. Two or three of these forms should be sufficient to list all routines applicable to the equipment.

The third vertical column entitled Total Equipment should show the total units of equipment involved in each routine covered.

The fourth column entitled Unit Time should show the approximate time required for performing each routine on one equipment unit.

The fifth column entitled Man Hours is for recording the time in man hours apportioned to the performance of each routine.

The sixth column entitled Assigned To should indicate by letter or number, the shift to which the routine is assigned. It should be borne in mind that routines should not be assigned to fit any arrangement of men the local company may have available, but assignments should be made to correspond to the number of employees recommended for the task. It is advisable to enter assignments with pencil to facilitate rearrangements, if necessary.



The next to last column entitled Days to Complete should show the number of days allotted for the completion of a routine; or in case part of a routine is assigned to each day, week, etc., the amount assigned for each period will be shown, such as 10-per-day, meaning 10 switches are to be done each working day, etc. The purpose of this allotment is to insure that the elapsed time between consecutive performances of a routine will always be approximately the same. Therefore, when a certain number of days is required to complete a routine, this should be shown on the form as a guide to the maintenance men in the performance of their work.

The last column entitled When to Assign should show whether the routine is to be performed daily, weekly, monthly, quarterly, biannually, or annually.

In the last three periods just cited, the exact months of the year in which the routines should be performed can be recorded when the equipment units are not divided over several months.

It has been found that when a large number of units are involved on routines which are not performed daily, it is practical to assign a certain number of units per day, per week, or per month, so as to distribute the routine work evenly over the whole year. For instance, R-240 and R-245 covering relay and switch adjustment inspection. If these routines are to be completed yearly, and there are 500 switches involved, determine the number of switches per week, which, if adjusted, would complete the routines in one year.

In the above example, the amount would be 9.6; therefore, 10 switches would be assigned per week in the column entitled Days to Complete, and the time which it would take to inspect 10 switches for adjustment would be entered on the same line under Man Hours. This particular routine would be assigned to a day of the week which does not already have enough routine time allotted according to the time study (figure 10) made up for the shift to which this routine is assigned. This can be done with most any routine; weekly, monthly, annually, etc.

This method, as covered in the description of Routine Schedule (figure 10), will balance the routine so that a definite amount will be done per day, and at no time of the year will more routine hours be necessary than in other periods.

After the exchange has been in operation for a sufficient period of time, so that the records indicate the true results which are being obtained; a study may be made to determine the proper frequency of performing the routines.

If the results obtained from the performance of a routine shows a low number of detected faults, it indicates that the routine may be performed less frequently. On cutting down the frequency, the results should be studied carefully to determine if there is an increase in reported faults or faults detected by routine. If advisable, the frequency may then be changed again until results indicate the most suitable interval. In this manner, maintenance costs and unnecessary wear on equipment are kept at a minimum.

The frequency of certain routines will always remain the same regardless of the results obtained with respect to detected faults. These are routines which check the operation or condition of equipment which is so important that it is necessary to perform them at stated periods, even if no faults are detected.

### 3.2 Routine Schedule & Time Study

The Routine Schedule & Time Study form (figure 10) may be used for various purposes. It provides a means of making time studies of routine shifts which will indicate the time necessary for performing the routine work. It may be used in the layout of routine work for new central offices, and it provides a means of allocating time to routines and other miscellaneous work which can be scheduled periodically.

In laying out the routine work for a new central office, the Routine Schedule & Time Study form (figure 10) should be used in conjunction with the Routine Assignment Record (figure 9).

The routines are arranged into shifts according to the comparative skill and training required, and the proper amount of time is allotted each day to perform each routine. A shift is the amount of routine work which can be performed by an employee with the ability to perform the routine under consideration, in the total working period (of the day) allotted to it.

The proper procedure is to assign the simplest routines to those who have the least training (to apprentices) and the more complicated routines to the more skilled employees.

Maintenance costs are in this manner held to a minimum.

In preparing the Routine Test Schedule, a separate sheet is used for each routine shift.

At the top of the Routine Schedule & Time Study form (figure 10) record in the respective spaces provided, the office name, date, shift, number of days a week on which routines can be assigned, number of working hours per day, and number of hours available for routines.



When filling in the data, turn the form so that the bottom becomes the left side. Five vertical columns will then be seen at the left which are for recording the routine numbers, the frequency in which the routines will be performed, the total number of equipment units involved, the number of units assigned (such as ten switches per day), and the total number of unit tests to be made during the month. This last figure is obtained by multiplying the total units involved by the number of times the routine is to be performed that month.

The portion of the form at the right of these five columns, is also divided into vertical columns, each headed by a letter representing a day of the week. Slightly heavier vertical lines divide the days into weekly groups. The blank spaces above the letters representing the days of the week, are provided for entering the calendar dates of the month for which the form is prepared.

Record the estimated time required each day to perform the work assigned to each routine, on the line opposite the routine, under the proper date. If work on a routine is not assigned daily, then the estimated time will be recorded on those days only on which work is assigned. This should be done on all routines assigned to the shift being considered, except those routines on which work is not assigned every month but which appear on the schedule sheet each month. Work to be performed on these routines is indicated when the schedule sheet is made up for the particular month during which work on the routine is to be performed. The first four vertical columns at the left of the form will be filled in the same way for each month.

The estimated time for all routines on each day will then be added to determine the amount of time which is necessary to perform the work assigned each day.

If it is found that an insufficient amount of routine work has been assigned to a shift, add more routines until the figures approximate the time appropriated for routine work. If the time schedules indicate that the shift is too heavily loaded, reduce the number of routines assigned to this shift until the figures total the time desired.

Should the time figures indicate that certain days seem to be too heavily loaded, the time figures can be shifted until each day seems to be about even with respect to routine work.

It is advisable not to load a shift up to its full working hour capacity, because the employees generally have miscellaneous work to perform. Routines which occur every two, three, and six months are taken care of in the

unassigned hours of the days. Routines which are to be performed less often than daily can be handled by assigning a certain number of units daily, weekly, or monthly, if desired. This will balance the work, and allow the same amount of work to be accomplished every day of the year and still permit the work to be completed in the specified time.

### 3.3 Routine Progress Report

Routine Progress Report, figure 11, provides means of analyzing the routine work of an exchange while routines are being performed, and provides a record of the actual progress of the work.

If the form is to be used for recording the progress of one routine only, fill in spaces provided for the office name, the date, and the routine number. If it is desired to record the progress of more than one routine, sufficient horizontal spaces should be allowed between each routine to record the progress of each for the period of time desired.

- a. In Column 1, record the number of the routine or routines on which a progress report is to be made.
- b. In Column 2, record the dates on which work was performed on the routine.
- c. In Columns 3 and 4 respectively, record the bay or board and the switch number on which routine work was started.
- d. In Columns 5 and 6 respectively, record the bay or board and the switch number where work stopped.
- e. In Column 7, record the number of equipment units completed during the work period being recorded.
- f. In Column 8, record the total remaining equipment units on which this is to be performed.
- g. In Column 9, record the percentage of the units completed (see Column 7) to the total units involved.
- h. In Column 10, record the number of faults detected during the period of work.
- i. In Column 11, record the number of faults detected per 100 units routined.
- j. In Columns 12 and 13, record the time spent on the routine during each work period.
- k. In Column 14, place the initials or badge number of the routiner.



- l. In Columns 15 and 16, show the time consumed in clearing the faults detected by the routining.
- m. In Column 17, place the initials or badge number of the switchman who cleared the faults.
- n. In Columns 18 and 19, record the time consumed both in routining and clearing faults.
- o. Column 20 is used to record a request for a change in the frequency of the routine, when the results as recorded in another column on this form indicate the advisability of doing so.
- p. In the left-hand margin of this form, place the title of the routine or routines or any instructions pertinent to the routines in progress.

### 3.4 Routine Fault Record

The form shown in figure 12 provides a record of faults detected in the central office equipment by routines.

In some instances, more than one sheet may be required for recording the faults detected by the associated routine. In such cases, the sheet number is placed in the upper right-hand corner of the form.

Likewise, spaces are provided at the top of the form for recording the office name, the month for which the record is to be kept, and the number of the individual routine, or the method employed for detecting the faults when this form is used as an inspection report.

In the first vertical column entitled Routine Number, record the number of the routine on which the fault is detected. This column is used only when the form is used for more than one routine.

The second column entitled Date, provides space for entering the date on which the fault is detected.

In the third and fourth columns respectively, record the bay or board number and the switch or unit number on which the fault was located.

In the fifth column, place the initials or badge number of the employee who detected the fault.

A horizontal space is provided for each fault. This space is divided vertically into two sections, designated "C" and "D." In the space opposite "D" (detected), a description of the detected fault should be written. No attempt

should be made by the routiner to assign the detected fault to a class code.

All the other entries on this form should be made by the switchman clearing the fault after the work has been performed.

In the lower horizontal "C" space, the switchman should place a mark "X" in the vertical column under the proper class code (15 to 29), to indicate the nature of the fault, provided the fault is located in the central office equipment.

In case no trouble is located, a check should be placed in the vertical column, entitled O.K. Test - Class 13. If the fault is on outside plant equipment, it should be referred to the test desk and an "X" recorded in the column provided for this type of fault.

If the fault is traced to another office in the network, the initial of the office will be recorded in the column provided and the switchman in the other office will pick it up on a routine fault record form assigned to a "special" routine which covers this condition.

In the three columns at the right of the form, entitled Faults Cleared, By, Date, and Time, respectively, the initials or badge number of the switchman who cleared the fault, the date fault was cleared, and the time consumed in clearing fault are to be recorded. These entries need not be repeated for each fault when the same switchman is working continuously clearing faults. In such cases, the time work started should be recorded opposite the first fault cleared and the time work was finished should be written opposite the last fault cleared. A vertical line should be drawn between these two time entries to indicate that all faults between these entries have been cleared in the interval.

Horizontal spaces have been provided for totals brought forward from preceding sheet (above) and totals carried forward to succeeding sheet (below). Horizontal spaces are also provided at the bottom of the form for Grand Totals of Faults Charged to Each Class. These totals are necessary for preparing an accurate summary of routines at the close of each month.

### 3.5 Daily Routine Fault Summary for Equipment Supervisor

Some telephone companies check the routine records each morning, and the total faults cleared the previous day on each routine are recorded on a separate sheet (figure 12). In this case, a separate horizontal space is used for each routine, which is recorded in Column 1. The total faults detected on each routine, for the day, are distributed according



to the class code of the equipment on which the fault was cleared.

The faults under each class code are then totaled.

All faults detected other than by routine, the same day as those above, are transferred from the special record sheet (figure 12) and are entered in separate horizontal spaces and distributed according to the class code in a manner similar to that described for routine faults.

Reported faults from the test desk may also be listed as a separate item in a similar manner.

The totals obtained from this form are recorded by the service chief on the form shown in figure 4 for his reference, and this form is then forwarded to the supervisor of maintenance.

### 3.6 Monthly Summary of Routines & Faults

The Monthly Summary of Routines & Faults form (figure 13) is employed to summarize the results of each routine which has been performed during the month. The relationship between the number of faults detected by routines and the combined total faults (reported, plus those detected by routines) should govern the period of performance of all routines.

In applying a routine system to a Strowger automatic office, the period of performance for each routine is taken from the table of routines in Technical Bulletin 543, Maintenance Routines.

Space is provided at the top of the form for the name of the city, state, office, and the month which the summary covers.

- a. In the first column, the routine numbers should be recorded as listed on the Routine Assignment form (figure 9).
- b. In the second column, record the actual total number of unit tests made during the month. This is obtained by totaling the figures recorded in Column 7 (figure 11) for the month, on each routine.
- c. In the third column, record the actual time spent (in minutes) on each routine during the month. This is obtained by totaling the figures recorded in Columns 12 and 13, for the month, on each routine.
- d. The caption, Fault Classes Covering Central Office Equipment (C.O.E.) appears over Columns 14 to 29 inclusive. In these columns, the total faults detected on each routine during the month should be distributed according to the classes of equipment on which they are found. These totals are obtained from Routine Fault Record.
- e. In the column entitled Total C.O.E. Faults, Classes 14 to 29, the total number of central office equipment faults detected on each routine should be recorded. This is obtained by adding horizontally the figures recorded opposite each routine in the columns headed by numbers 14 to 29, inclusive.
- f. In the column entitled Faults Per 100-Unit-Tests, the number of faults detected for every hundred unit-tests, made on each routine should be recorded. This is obtained by dividing the number of unit-tests in the second column by 100 and then dividing the total C.O.E. faults by the result.
- g. In the column entitled Faults Allowed Per 100-Unit-Tests, the number of faults that is normal per 100 unit-tests should be recorded. This figure will aid in determining whether the routine is being performed too often or not often enough.
- h. For example: .01 of a fault per unit, or one case to a hundred units, is a permissible amount to be found on a Strowger switch routine. Therefore, this figure for such routines represents a standard which should be maintained. If less than one fault is found per 100-unit-tests, the frequency of performance of the routine should be reconsidered. As previously explained, however, this method of estimating frequency of routines is not applicable to all cases, because some routines (for example, those performed on important trunks) should be performed frequently as an assurance of service, regardless of the number of faults found. Nevertheless, a standard figure is applicable to a certain degree on most routines.
- i. In the column entitled O.K.'d to Test Desk, Class 13, the number of cases found upon test to be clear (charged to each routine), is recorded. Duplicates will also appear on this column.
- j. In the next to last column entitled Tested Outside Referred to Test Desk, record the number of cases which are traced outside of the office and referred to the test desk.
- k. In the last column, the time spent clearing faults on each routine is recorded. By making an analysis of faults and routine summaries for the month, as shown on



figures 5 and 13, an accurate perspective may be obtained of the type of service being rendered by the present maintenance methods and personnel. Also, the identity of the class of equipment responsible for a nonstandard condition, may be ascertained.

Time and faults are recorded in the same manner as on regular routines previously described for the Routine Fault Record form (figure 12). At the end of the month, these routines are recorded on the Monthly Summary of Routines & Faults form (figure 13). The summary figures of the regular routine is brought forward to this sheet.

A summary of the figures in the horizontal spaces at the bottom of form will then show a complete analysis of central office maintenance trouble and maintenance man hours.

### 3.7 Switch Room Complaint Record

The purpose of this form (figure 14) is to provide a switch room record of those complaints which are referred to the switch room and a summary of the faults which are found.

The routine number should be recorded in the upper right-hand corner of the form.

Space is provided at the top of the form for the office name and date.

- a. In Column 1, record the date on which the complaints are received only when one form is used for several days, a week, or a month.
- b. In the second column, record the time of day that the complaint was received at the switch room.
- c. In the third column, record the name of the switch room attendant receiving the complaint.
- d. In the fourth column, record the clearing time associated with the complaint, or the actual working time spent in disposing of the complaint and clearing the fault, if one is found.
- e. In the fifth column, record the elapsed time or the time occupied from the moment the complaint was received in the switch room until its disposition is reported back to the test desk.
- f. In the sixth column, record the telephone number or numbers which accompany the complaint; the number of the calling party opposite No. 1, and the number of the telephone called opposite No. 2.

- g. The main section below the caption **Fault Classes Covering Central Office Equipment** and the various class descriptions, is arranged so that the complaint may be recorded on one line and the fault found may be charged to one of the Classes 14 to 29, inclusive and recorded in the applicable square, below the complaint.
- h. In the column entitled O.K.'d to Test Desk, record and "X" if no fault was found or if the trouble was traced to outside equipment. The complaint is then referred back to the test desk.
- i. When the trouble is traced to another office, record the initial of that office in the column entitled Traced to Other Offices.
- j. In the last three columns, record the initial of the employee who cleared the trouble or disposed of the complaint, the date the fault was cleared, or the complaint disposed of, and the time which was spent on this complaint by the switch room employees.
- k. Horizontal spaces have been provided for totals brought forward from preceding sheet (above) and totals carried forward to succeeding sheet (below).
- l. Horizontal spaces are also provided at the bottom of the form for Grand Total of Faults Charged to Each Class.

These totals are necessary for preparing an accurate summary of routines at the close of each month.

The total faults charged to each class should not be included in the routine summary totals when these totals are transferred to the next to last column of Monthly Summary of Complaints & Classified Faults (figure 5) because they are included in the reported fault totals in Column 4.

## 4. SIMPLIFIED RECORDS FOR SMALL AUTOMATIC TELEPHONE PLANTS

### 4.1 General

In order to operate a small telephone plant efficiently, it is necessary that exact information is available concerning the performance of the plant equipment. The system of records for small exchanges described in this bulletin, is both simple and flexible, providing a definite means of determining at any time whether all service activities of the company are functioning properly.

It is obvious that the volume of complaints has a direct bearing on the number and type of records to be maintained.

Offices which have less than 100 complaints a month, will have only a few each day. These complaints may be recorded for the whole month on one sheet (see form on figure 15A).

The summary of faults at the end of a month may indicate either a small amount or a general distribution of trouble, but each fault may have been responsible for several complaints. Considering this possibility, each fault is important, and its nature should be recorded. When trouble is experienced on small offices, each fault is generally found in a different part of the equipment, and a detail study will not disclose any further information after the period of its occurrence has passed. The condition may occur again and give considerable difficulty before it is taken care of, and perhaps no intelligent action can be taken because it appears in the summary a week or two after it has happened.

In order to eliminate these faults entirely when they appear, and to eliminate the handling cost which is higher per case than in larger exchanges, a means of recording the complaints is provided so that the type and number of complaints associated with each fault found, and the description of the condition which caused the complaints, is available on the monthly summary sheet (see form on figure 15A), at the end of the month.

#### 4.2 Subscribers' Reports

Subscribers' reports should be received and recorded in a simple and efficient manner, convenient both to the subscriber and to the telephone company. Also, the facts concerning each report should be so recorded that the data may be constantly used as a guide for maintenance and service activities; thus supervision and labor may be supplied where it is most needed, and the detrimental effect of repeated reports from the same cause may be reduced to a minimum. (It is extremely important that complete information concerning the nature of the complaint be obtained by the operator at the time a subscriber's report is received.) The cause of the fault should then be remedied within the shortest possible time.

#### 4.3 Subscribers' Record Cards

Various types of subscribers' record cards are in use, the majority of which furnish the desired information relative to a subscriber's line and station equipment.

If an accurate record of line conditions is desired, it is recommended that a subscriber's

line card be used, with spaces provided for the following information. This type of card eliminates the necessity of other plant records.

- a. Date - for recording the date each complaint is received.
- b. Time - for recording the time of day the complaint is received.
- c. Complaint - for recording the nature of the complaint.
- d. Test - for recording the result of a test board test.
- e. Fault Found - for recording the actual fault.
- f. Date - for recording the date on which the fault was cleared or the complaint handled.
- g. Time - for recording the time of day the fault was cleared or the complaint handled.
- h. Repairman - for recording the initials of the repairman clearing the fault.
- i. Test Man - for recording the initials of the test man handling the complaint.

#### 4.4 Complaint Memorandum

This form (figure 1) was designed as a memorandum for the use of repair clerks for passing subscribers' complaints to the test desk when the subscribers' card file is kept by the test man; also when the subscribers' card file is kept by the repair clerk and the subscriber's card has been passed to the test man on a previous complaint.

It will also be used by other employees of the telephone company who desire to pass a complaint (received by them) to the repair clerk or test man.

#### 4.5 Complaint Record & Fault Summary

The Monthly Summary of Complaints & Classified Faults form (figure 15A) is for the purpose of recording subscribers' reports and their disposition by the maintenance force. It also provides for a summary of faults which were found as a result of subscribers' reports or by routine tests and inspection.

Disposition should be made of each report, regardless of its nature. For this purpose, the equipment is class-numbered 1 to 29 as shown in figure 15A. Sufficient codes are provided so that no matter what the disposition of the report may be, it can be charged to one of these classes with but very little analyzing.

MONTHLY SUMMARY OF COMPLAINTS & CLASSIFIED FAULTS												
COMPANY			CITY STATE			OFFICE MONTH						
LINES INSTALLED		MANUAL	FAULT SUMMARY			RECORD OF SUBSCRIBERS REPORTS			TYPE OF COMPLAINT CLASS AND CODE			
LINES IN SERVICE			NUMBER OF REPORTED FAULTS	DETECTED BY ROUTINES	REPORT NUMBER	DATE OF REPORT & DATE OF CLEARING	OFFICE VISIT 'X'	FIRST RECORD SUBSCRIBERS REPORT THEN RECORD DETAIL DESCRIPTION OF THE TROUBLE AND THE FAULT WHICH CAUSED IT				
STATIONS IN SERVICE												
CLASS CODES		CLASSES										
OUTSIDE PLANT	1.1	CABLE U.G. PRS. (EX. TERM.)										
	1.2	CABLE AERIAL PRS. (EX. TERM.)										
	1.3	TERMINAL										
	2	LINE WIRE										
	3	DROP WIRE										
	A	TOTAL										
SUBSTATION EQUIPMENT	4	STATION PROTECTION										
	5	STATION WIRING										
	6	TELEPHONE (L.B.)										
	7.1	TELEPHONE (C.B.)										
	7.2	PAYSTATION										
	8	DIAL										
	9	RINGER										
	10	P.B.X. P.A.X. I.B.X.										
	B	TOTAL										
	CENTRAL OFFICE EQUIPMENT	14	M.D.F. & OFFICE PROTECTION									
15		LINE & CUT OFF RLYS. (FINDER SYSTEM ONLY)										
16		PLUNGER SWITCH BANK & WIRING										
17		MASTER SWITCH BANK & WIRING										
18		ROTARY SWITCH BANK & WIRING										
19		STROWGER SWITCH RELAYS & SPRINGS										
20		STROWGER SWITCH MECHANISM										
21		STROWGER SWITCH WIPERS & CORDS										
22		STROWGER SWITCH WIRING & MISC'L.										
23		STROWGER SWITCH BK. BANK WIRING & TERM.										
24		MINOR SWITCH BANK WIRING										
25		REPEATERS										
26		SIGNAL EQUIPMENT										
27.1		LAMPS & JACKS	MANUAL									
27.2	RELAYS & SPRINGS											
27.3	KEYS, CORDS, & PLUGS											
27.4	OTHER EQUIPMENT											
28	POWER											
29	INTERMEDIATE & EQUIPMENT FRAMES											
C	TOTAL											
O.K. FAULTS	D	A, B, & C TOTAL										
	11	TESTED O.K. TEST DESK										
	12	FOUND O.K. OUTSIDE										
	13	FOUND O.K. INSIDE										
	E	TOTAL REPORTS O.K.'D CLASSES 11, 12, & 13										
F	D & E GRAND TOTAL											
			TOTAL	DAILY AVERAGE	TOTAL TIME IN HOURS			MONTHLY COST OF REPAIR PARTS				
SUBSCRIBER'S REACTION	G	INITIAL COMPL'S. DISP OF			AT EXCHANGE	CLEARING SUB'S FAULTS	MAINTENANCE TIME					
	H	SUBSQ'T. COMPL'S. DISP OF										
	I	SATISFIED BY OPERATORS			OFFICE VISITS DUE TO							
WIRE CHIEF'S REPORT	J	TOTAL			OUTSIDE EQUIPMENT TROUBLE	CENTRAL OFFICE EQUIPMENT TROUBLE	INSPECTION ONLY	MONTHLY RENT	MONTHLY POWER BILL	NUMBER OF CASES		
	M3	NUMBER OF CASES	TOTAL	AVERAGE DAILY								
	N	TOTAL TIME ON CASES		PER CASE								
	O	TOTAL CLEARING TIME			ATTENDED		DISTANCE FROM ATTENDANTS W'D'Q'TS.		WEATHER:--			
	P	TOTAL ELAPSED TIME			NONATTENDED		MILES					

Figure 15A.



#### 4.5.1 Complaint record.

Each report is recorded in Column 9 by the complaint operator or the test man. This may be coded if desired.

The following codes are suggested, but may be altered or supplemented to meet the telephone company's individual requirements.

TABLE D

Code	Description
B.B.	Base Broken
B.D.R.	Bells Don't Ring
C.D.N.	Can't Dial Numbers
C.G.O.	Can't Get Operator
C.H.	Can't Hear
X.	Crossed With
C.O.	Cuts Out
D.S.	Dial Sticks
D.C.	Disconnected
D.A.	Don't Answer
H.B.	Handset Broken
N.D.T.	No Dial Tone
N.	Noisy
O.D.	Out of Order
P.T.	Poor Transmission
W.H.C.	Worn Handset Cord
W.M.C.	Worn Main Cord

In Columns 6, 7, and 10 opposite each report, record the serial number of the report for that month, the date it was received, and the type of the report, (I for initial, S for subsequent, and O for reports satisfied by operator receiving report).

Leave one space vacant after each report for recording the actual cause of the report.

After the maintenance force has cleared the fault, completed their switch room record, and reported their findings back to the complaint operator, the record should be completed as follows.

In the vacant space below each report in Column 9, record the exact cause of the fault

and the report, or the disposition of the report if no fault was found. Also record in Column 7 the date the report was disposed of or cleared, in Column 10 the class code to which this report should be charged, and in Column 8 an 'X' if a visit to the office was necessary, when the record is being kept on a nonattended office. This information should accompany the report of the maintenance force back to the complaint operator.

A record of this type will provide practically any information needed on small-size plants, and will enable one to provide data on operating conditions which have occurred during the current month or for any past periods. This is important to the telephone company.

Space for additional subscribers' reports is provided on the back of the Monthly Summary of Complaints & Classified Faults form as shown in figure 15B.

#### 4.5.2 Fault summary.

This part of the form, Columns 4 and 5, is used for summarizing the reported and detected faults, and the complaints on which no faults were found during the period of one month. From these figures, an analysis can be made of the condition of the equipment and the grade of service rendered.

The classification of faults at the left of this form is divided vertically into groups in order to show readily the totals of outside plant faults, substation equipment faults, and central office equipment faults, and also subdivisions of these general groups. These totals are obtained by adding the units of each column shown opposite the classes in the group. For example: to obtain the total number of outside line equipment faults, the figure opposite Classes 1.1, 1.2, 1.3, 2, and 3, in vertical Column 4, are added together and the total is shown in horizontal space "A." The total for each column should be shown for each group in the spaces provided for that purpose.

Columns 2 and 3 indicate the class number and the description of the equipment associated with the class number for the various kinds of faults.

Columns 4 and 5 are in section entitled Fault Summary.

In Column 4, entitled Number of Faults, the total number of reports cleared under each class code for the period of one month should be recorded. These figures are obtained from the record of subscribers' reports for the month or recorded in the form of tally marks each time a report is disposed of during the month.



Spaces are provided at the top of the form for:

- a. Number of lines of equipment installed (automatic and manual).
- b. Number of lines in service (automatic and manual).
- c. Number of stations in service (automatic and manual).

Spaces are provided opposite the title Subscriber's Reaction at the bottom of the form for the following general information.

- d. Total initial complaints (G) disposed of for the month.
- e. Total subsequent complaints (H) disposed of for the month.
- f. Total complaints (I) satisfied by operator receiving complaints (without the assistance of the test desk maintenance or trouble men).

The daily average is also recorded opposite these items.

There are additional spaces on the bottom of the form, the object of which may be readily determined by referring to the title or caption for the space involved.

#### 4.6 Switch Room Record

This form (shown in figure 16) is used for recording equipment faults detected either by routine tests or by subscribers' complaints.

It provides a record of the labor utilized and the equipment faults revealed by the service and equipment routine tests, by which their frequency of performance and the value of their application may be calculated.

Space is provided at the bottom of this form for recording the total number of routine and complaint faults charged to each central office equipment classification and the grand totals under "C." Provision is also made for recording the total number of routine and complaint O.K.'d tests charged to classification numbers 11, 12, and 13 (figure 15A) and the grand total under "E."

The reported fault figures are not transferred to the Monthly Summary, as these reported figures are compiled from the Complaint Record but the routine faults are transferred to Column 5 on the Monthly Summary of Complaints & Classified Faults (figure 15A).

Divisions are provided on this form for entering the following data:

TABLE E

Column	Information
1	Date the routine or subscriber's complaint is worked on.
2	Number of the routine performed.
3	Code "X" opposite reported faults.
4	Number of the equipment bay, rack, shelf, or position in which the fault is located.
5	Number of the line equipment, switch, or circuit unit in which the fault is located.
6	Condition detected by the routine or reported by a service complaint.
7	Actual condition causing the faulty operation of the equipment.
8	Fault code number.
9	Date the fault is cleared.
10	Initials of the person who clears the fault.
11	The time (in minutes) occupied in performing routines and clearing the faults detected. Enter time of performing routines even though no faults are encountered. When the faults are not cleared at the time the routine is performed, two, time entries should be made in this column. One, by the person performing the routine, in the top half of the space; and one, by the person clearing the faults, in the bottom half of the space.
12	The time (in minutes) occupied in running the complaint down and clearing the faulty condition. When faulty condition, exposed by the complaint, cannot be fixed immediately or is left for someone else to clear, two, time entries should be made in this column. One, in the top half of the space, for the time occupied in finding the fault and busying out the faulty equipment; and one, in the bottom half of the space, for the time occupied in repairing the faulty condition.





# **AUTOMATIC ELECTRIC**



Subsidiary of

## **GENERAL TELEPHONE & ELECTRONICS**

*Makers of Telephone, Signaling, and Communication Apparatus . . . Electrical Engineers, Designers, and Consultants*

Factory and General Offices: Northlake, Illinois, U.S.A.

### **ASSOCIATED RESEARCH AND MANUFACTURING COMPANIES**

Automatic Electric Laboratories, Incorporated - - - - - Northlake, Illinois, U. S. A.  
Automatic Electric (Canada) Limited - - - - - Brockville, Ontario, Canada  
Automatique Electrique, S.A. - - - - - Antwerp, Belgium  
Automatic Electric, S.A.T.A.P. - - - - - Milan, Italy

### **DISTRIBUTOR IN U.S. AND POSSESSIONS**

#### **AUTOMATIC ELECTRIC SALES CORPORATION**

Northlake, Illinois, U.S.A.  
*Sales Offices in All Principal Cities*

### **GENERAL EXPORT DISTRIBUTOR**

#### **AUTOMATIC ELECTRIC INTERNATIONAL**

INCORPORATED  
Northlake, Illinois, U.S.A.

### **REGIONAL DISTRIBUTING COMPANIES AND REPRESENTATIVES**

#### **ARGENTINA, URUGUAY, PARAGUAY, CHILE, AND BOLIVIA**

L. Pitigliani  
Caixa Postal 9212  
Sao Paulo, Brazil

#### **BELGIUM AND LUXEMBOURG AND NETHERLANDS**

Automatique Electrique, S. A.  
22 Rue du Verger  
Antwerp, Belgium

#### **BRAZIL**

Automatic Electric do Brasil, S.A.  
Caixa Postal 9212  
Sao Paulo, Brazil

#### **CANADA**

Automatic Electric Sales (Canada) Limited  
185 Bartley Drive  
Toronto 16, Ontario, Canada

#### **CENTRAL AMERICA**

R. R. Sanders  
Apartado 313  
San Salvador, El Salvador

#### **COLOMBIA**

Automatic Electric de Colombia, S.A.  
Apartado Aereo 3968  
Bogota, Colombia

#### **EUROPE, NORTH AFRICA, AND NEAR EAST**

Automatic Electric International, Inc.  
40 Rue Du Rhone  
Geneva, Switzerland

#### **FAR EAST**

T. A. Logan  
c/o General Telephone & Electronics International  
1103 Central Building  
Hong Kong, B. C. C.

#### **ITALY**

Automatic Electric S.A.T.A.P.  
Via Bernina 12  
Milan, Italy

#### **MEXICO**

Automatic Electric de Mexico, S.A.  
Apartado Postal 20642  
Mexico 6, D.F., Mexico

#### **PERU AND ECUADOR**

J. P. Maclaren  
Apartado Aereo 3968  
Bogota, Colombia

#### **VENEZUELA**

Automatic Electric de Venezuela, C.A.  
Apartado 9361, Caracas, Venezuela

*Other Sales Representatives and Agents Throughout the World*