TROUBLE TICKET AND SUMMARY COMMUNITY DIAL OFFICES

CONTENTS PAGE

1. GENERAL

1.01 This section describes Form E-4319, Trouble Ticket CDO or PBX, and Form E-4321, Summary of Found and Not Found Trouble CDO and PBX.

1.02 This section is issued to introduce procedures for recording, classifying, analyzing, and summarizing trouble data for all types of community dial offices.

2. FORMS

2.01 Form E-4319, Trouble Ticket CDO or PBX is printed on McBee Keysort cards, 3-5/16 in. by 7-1/2 in. (Fig. 1). The outer edges of the form are perforated with small holes, 3/32 in. in diameter. Keysort (Trademark Registered U.S. Pat. Off.) is a sorting system. This system uses marginally punched card records for sorting, analysis, etc. The holes around the edges of the Keysort card are coded by notching away the portion of the card between the hole and the edge with a punch (Fig. 3). When a sorting needle is inserted in one of the holes of a group of cards, the notched cards fall from the group while the unnotched cards remain on the sorting needle. By associating certain information with individual holes, it is possible to sort specific cards desired, or make analyses by observing the number and location of notches on a group of cards. Form E-4319 is designed to facilitate recording, classifying, analyzing, and summarizing reports from all sources, on all types of CDO's.

2.02 Form E-4321, Summary of Found and Not Found Trouble CDO and PBX is printed on white paper and is 11 in. by 17 in. (Fig. 11). This form is designed to show trouble "expectancies" and the number of trouble reports encountered each month for Found and Not Found Trouble.

3. DEFINITIONS

3.01 ***"T", "R", and "I" Troubles:*** Troubles are classified as "T", "R", or "I", as covered in the following paragraphs, to show the source of found and not found trouble as the result of the maintenance activities which evolve from reports and alarms, scheduled routine effort, and work not periodically scheduled. The following definitions of "T", "R", and "I" apply:

(a) A "T" trouble is one located within the community dial office as the result of a report from a subscriber, an employee, another department or office, or indicated by any alarm signal.

(b) An "R" trouble is one located within the community dial office equipment as the result of the performance of routines,

classified or reclassified as insurance or productive. The work involved may be mechanical or electrical tests or inspections.

(c) An "I" trouble is one located within the community dial office equipment, and includes all troubles other than those defined as "T" or "R", such as troubles disclosed as the result of sampling inspections, observations and special or as required routines and routine tests not periodically scheduled.

3.02 ***Expectancies:*** The found trouble portion of the expectancy column of Form E-4321 represents the number of troubles which may be anticipated on a particular item of equipment in one month when that item of equipment is giving satisfactory service as indicated in the exchange maintenance results, local dial central office index, Traffic Department reports, etc. In a similar manner the no trouble found portion represents the number of not found trouble indications expected in the categories provided.

(a) Expectancy figures that meet the above classification will usually require considerable time and effort to develop. In order that a figure may be developed for use in the expectancy column it is necessary to accumulate trouble performance history on each classification shown on Form E-4321. The trouble history is added for one year and divided by 12 to establish a separate monthly average for particular classifications. Should this average be less than 1, no expectancy need be developed. In the case of new installations of equipment, a reference can be developed by adding trouble performance and averaging out for the number of months involved. For short periods of time, however, a trouble history is likely to be unstable. When a year's results have been accumulated, the average monthly performance becomes a reference point by which each succeeding month can be quickly compared to determine trouble trends. (Seasonal fluctuations and unpredictable events or incidents producing high trouble performance should not be calculated in expectancy development.) The trouble history record so developed becomes an actual expectancy figure when all other measurable performance items are satisfactory.

(b) Trouble reports coded (T), provide the primary source of data for establishing found trouble expectancy figures. In addition, it may be desirable to develop separate (R) trouble expectancies to provide the guide post for common equipment, such as, trunks, repeaters, out trunk switches, power, etc. This type of equipment in many cases would not be well indicated by (T) trouble reports.

(c) Trouble reports classified as no trouble found in one of the categories provided, are intended as the source of the not found expectancy. This is essentially a guide post for comparing the actual volume of no trouble found reports in the various categories with the expected volume.

3.03 There are five main groups (contact, adjustment, defective, wiring, and no trouble found) which classify the general nature of trouble data. The trouble shall be charged against the classification which was judged to be the primary cause of the trouble. These five main groups are defined as follows:

3.04 ***Contact:*** Classify as "Contact" all "T", "R", or "I" troubles which are caused by a failure of:

(a) Contacts to complete a circuit after the relay or switch has operated or released, when the reason for the failure is the presence of a nonconducting material between the contacts. Includes all troubles where cleaning the contact completes the circuit regardless of the fact that there may be very little contact follow and an adjustment is made to correct this condition.

(b) Contacts which are missing or eroded to a point where they no longer touch when the relay or switch is operated or released if it is judged that the circuit would otherwise be completed by the contacts, if they were not eroded or missing.

(c) Wipers to complete a circuit after the wiper has reached the proper bank terminal, when the reason for the failure is the presence of a nonconducting material between the wiper tip and the bank contact. Includes all troubles where cleaning the wiper tip and/or bank contact completes the circuit regardless of the fact that there may be very little wiper follow or tension, and an adjustment is made to correct this condition.

Classify as "R" or "I" those contacts replaced by welding, or cleaned, on a preventive maintenance basis. Contacts cleaned by compressed air or bank contacts cleaned on regular maintenance should not be classified.

3.05 ***Adjustment:*** Classify as "Adjustment" all "T", "R", or "I" troubles which are caused by faulty electrical or mechanical adjustment of apparatus. Does not include adjustments made on apparatus coincident with clearing a "T", "R", or "I" trouble of another classification. For example, if a found trouble is primarily due to a dirty, eroded, or missing contact in accordance with the "contact" definitions, any electrical or mechanical adjustment to the apparatus necessary either before or after the contacts have been cleaned or aligned, would not be recorded.

3.06 ***Defective:*** Includes all cases where it is necessary to replace the apparatus (except contacts), and all cases where the spring assembly is crossed or grounded in the spring pile-up due to filings, defective insulators, etc; regardless of whether the apparatus is replaced or not. Does not include crosses and grounds due to solder splashes or wire clippings which are included under "wiring" trouble.

3.07 ***Wiring:*** Includes ordinary wiring troubles such as loose connections, opens, crosses or low insulation resistance, either in the wiring or between terminals on connecting blocks and, in addition, all cases where a foreign substance affects the electrical operation of a circuit (other than contact trouble), e.g., a foreign piece of wire or solder which causes a cross or short circuit shall be included in the proper subdivision of "wiring" trouble. Includes missing or incorrectly wired cross connections on distributing frames. Troubles in cable wiring between the cable butt and the apparatus terminals on the frame shall be classified as part of the frame with which it is associated.

3.08 ***No Trouble Found Analysis:*** Includes all not found trouble that can be charged to a CDO. Under this heading record those instances in which an inspection has been made due to an alarm, a routine, or a reported trouble and no trouble has been found.

3.09 Even an unsuccessful attempt to find trouble frequently produces information of value in analysis. In order to benefit by the time and effort spent, each case may be coded into one of the following categories on the trouble ticket Form E-4319:

ORIG.

ORIGINATING: Trouble reports concerned with the origination of calls. Reports shall be coded to NDT or OTHER.

NDT

NO DIAL TONE: Trouble reports of no dial tone, can't call out, dead, etc.

OTHER

Any trouble indication from the start of dialing through to ringing and answer. Trouble reports of no audible ring, gets wrong number, etc.

CONV.

CONVERSATION: Trouble indications occurring from start to end of conversation. Trouble reports of noisy, poor transmission, etc.

CFR

CIRCUIT FAILS TO RESTORE: Trouble reports on equipment that is found off normal and trouble can not be determined.

TERMINATING: Trouble reports concerned with the receipt of calls. Such as bells don't ring, bells ring no answer, receives calls for wrong numbers, etc.

COIN BOX
PBX
MISC.

Trouble reports on equipment having greater circuit complexities than average business or residential service.

NTF

NO TROUBLE FOUND: A direct code hole for rapidly sorting out all NTF cards so that they may be assembled for broad visual analysis by observing the notches along the edge of the cards.

4. ISSUANCE OF FORM E-4319

4.01 Qualitative maintenance is the corrective action applied where, when, and to what extent needed as determined by the integration and analytic evaluation of records, routine test results, sampling inspections, and experience. To attain optimum results in any CDO, it is

essential that complete and accurate records be kept of all reports, routine test results, sampling inspections, etc, to permit continuing analysis.

4.02 A Form E-4319 shall be issued for each "T" trouble indicated by a subscriber report, employee report, alarm, or report from another department or office.

4.03 A Form E-4319 shall also be issued for each "R" or "I" trouble indicated on insurance or productive routine, sampling inspection, observation, special or as required routine, and routine test not periodically scheduled. If a large number of identical troubles, such as worn wiper tips, are indicated, the essential details may be recorded on one Form E-4319.

5. PREPARATION OF FORMS E-4319 and E-4321

5.01 The front of Form E-4319 has spaces provided for entering trouble report, trouble found, work done, referral information, date,

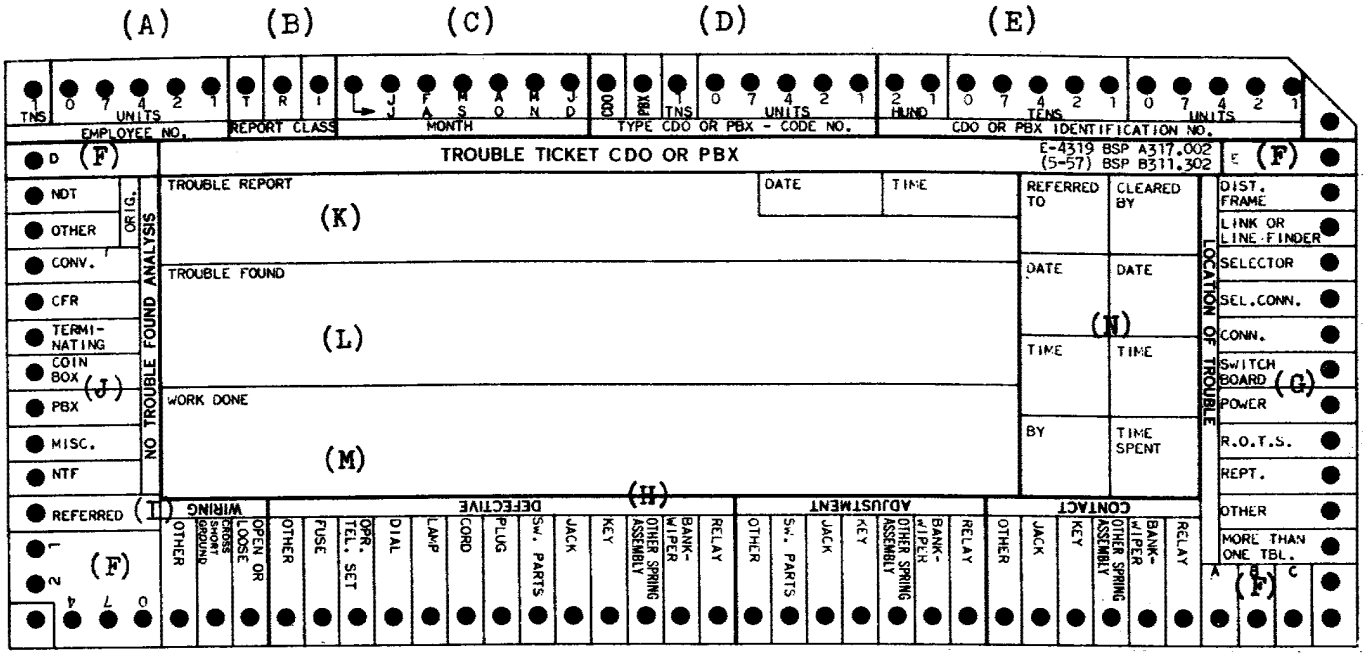


Fig. 1 — Front of Form E-4319

Notes	Explanation
A.	Number assigned to employee 00 to 19.
B.	Proper report classification. Par. 3.01.
C.	Month in which trouble report was closed. Use hole on the left side of code field along with the hole for the month for the last half of the year.
D.	Code number assigned to a ***type*** of CDO.
E.	Code number assigned to a ***specific*** CDO.
G.	Major equipment groups for found trouble.
H.	Trouble found and apparatus involved.
I.	Trouble referred to distant office or other employee.
J.	No trouble found. Par. 3.08.
K.	Trouble reported. (Additional detail on back if needed. May be used along with the back of Form E-4319 or in lieu of.)
L.	Details of trouble found.
M.	Details of work done.
N.	Referral or clearing data.

time, etc. The outside edge of the card has specific information associated with small holes. Trouble is classified by notching the holes associated with major equipment groups, (Dist. Frame, Selector, Conn., etc), and apparatus involved (Relay, Bank-Wiper, etc).

5.02 The back of the Trouble Ticket CDO or PBX, Form E-4319, provides spaces for entering the trouble report detail and important associated information such as date, time, calling number, panel, jack, etc.

5.03 Figs. 1 and 2 through notes explain in detail the preparation of Form E-4319.

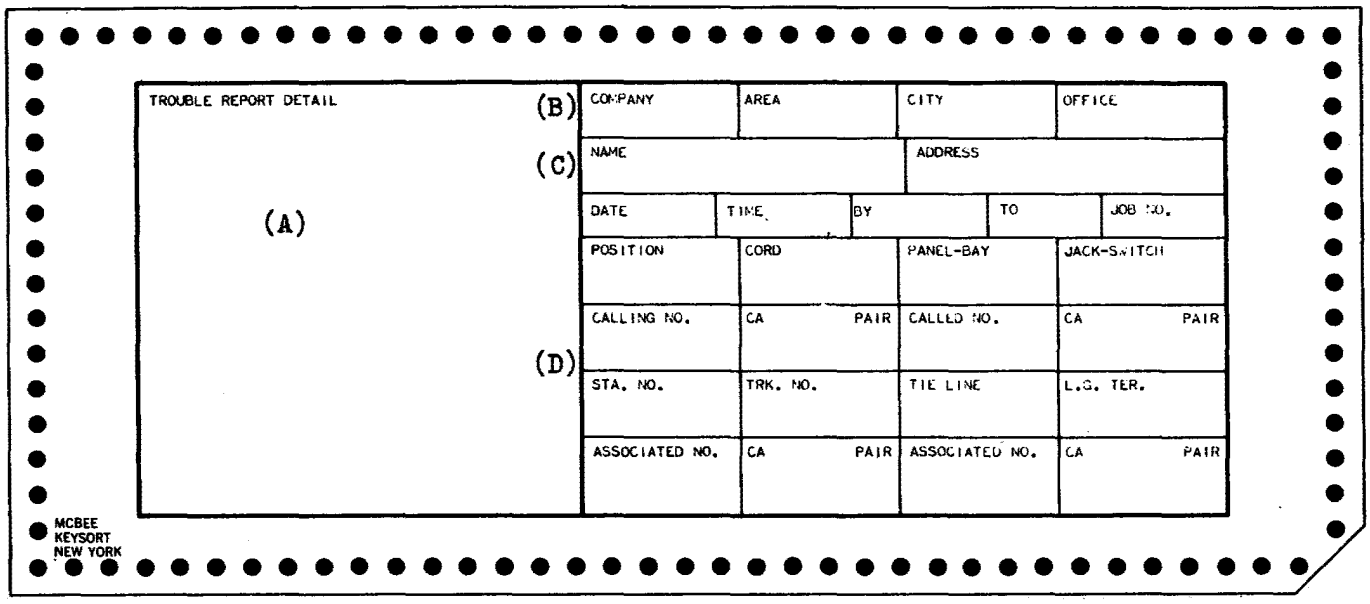
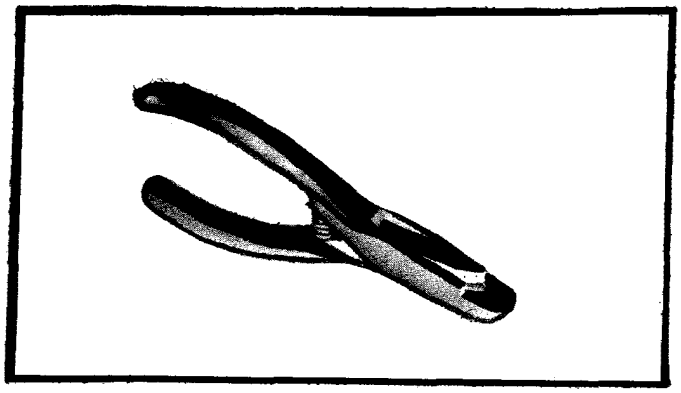


Fig. 2 — Back of Form E-4319

Notes	Explanation
A.	Enter complete details of trouble reported.
B.	Enter Company information as required.
C.	Enter Name and Address of the CDO.
D.	Enter details of the report.

5.04 ***Coding:*** The holes around the sides of Form E-4319 are coded by notching away that portion of the card between the hole and the edge with a punch. See Fig. 3.



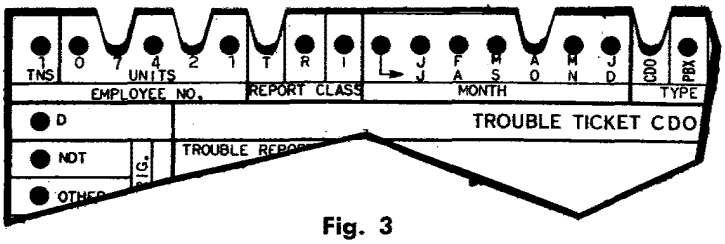


Fig. 3

The holes are identified as Code Position, Code Field, or Code Section.

(a) A Code Position is a single hole which is identified by a number, letter, word, or phrase. See Fig. 4.

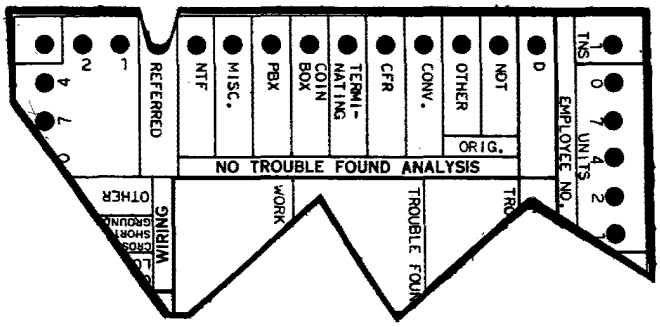


Fig. 4

(b) A Code Field contains one or more code positions relating to a single subject or classification. See Fig. 5.

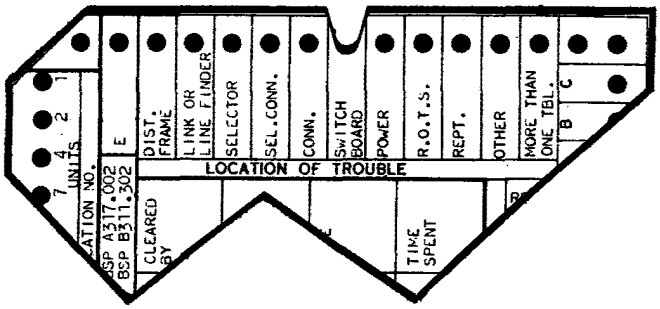


Fig. 5

(c) A Code Section contains one or more code fields relating to the same subject. See Fig. 6.

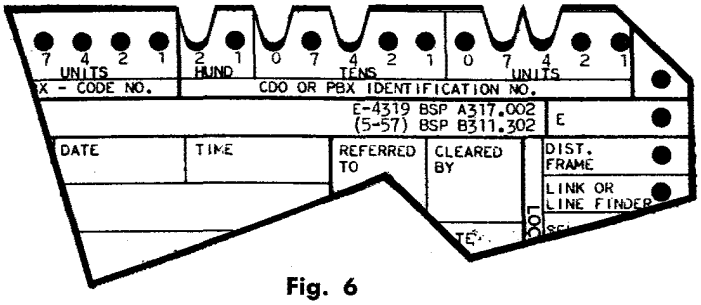


Fig. 6

5.05 A Direct Code is a specific classification assigned to a hole. All direct codes can be easily read and sorted since the sorting position is named. See Fig. 7.

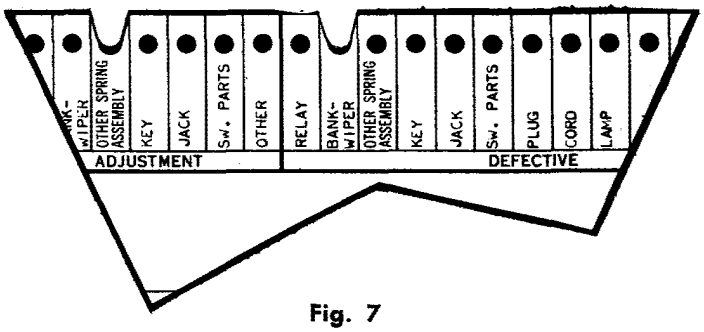


Fig. 7

5.06 A Selective Code is a special numerical code to permit a specific number to be selective sorted. Fig. 8 illustrates the numerical code used on Form E-4319.

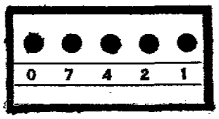


Fig. 8

Fig. 9 — Illustrates the Use of the Numerical Code to Designate Digits 0-9.

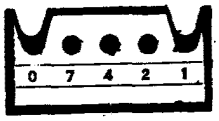
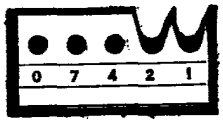
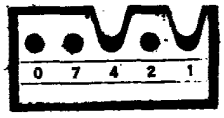
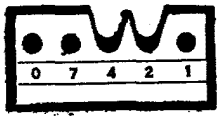
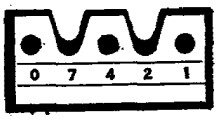
Number	Punch	
0	7 & 4	
1	0 & 1	
2	0 & 2	
3	2 & 1	
4	0 & 4	
5	4 & 1	
6	4 & 2	
7	0 & 7	
8	7 & 1	
9	7 & 2	

Fig. 9

Note: The "0" combination (7 and 4) is the only one which is not additive.

5.07 It is recommended that the actual preparation of Form E-4319 be handled in whatever manner is determined to be the most efficient and economical for the locality involved. Some possibilities are as follows:

(a) Each repairman doing maintenance work in a CDO may be equipped with a blank supply of Forms E-4319, and a handpunch. When he prepares a Form E-4319, he would notch out the required data. Completed forms would be forwarded daily to the personnel performing the analyses.

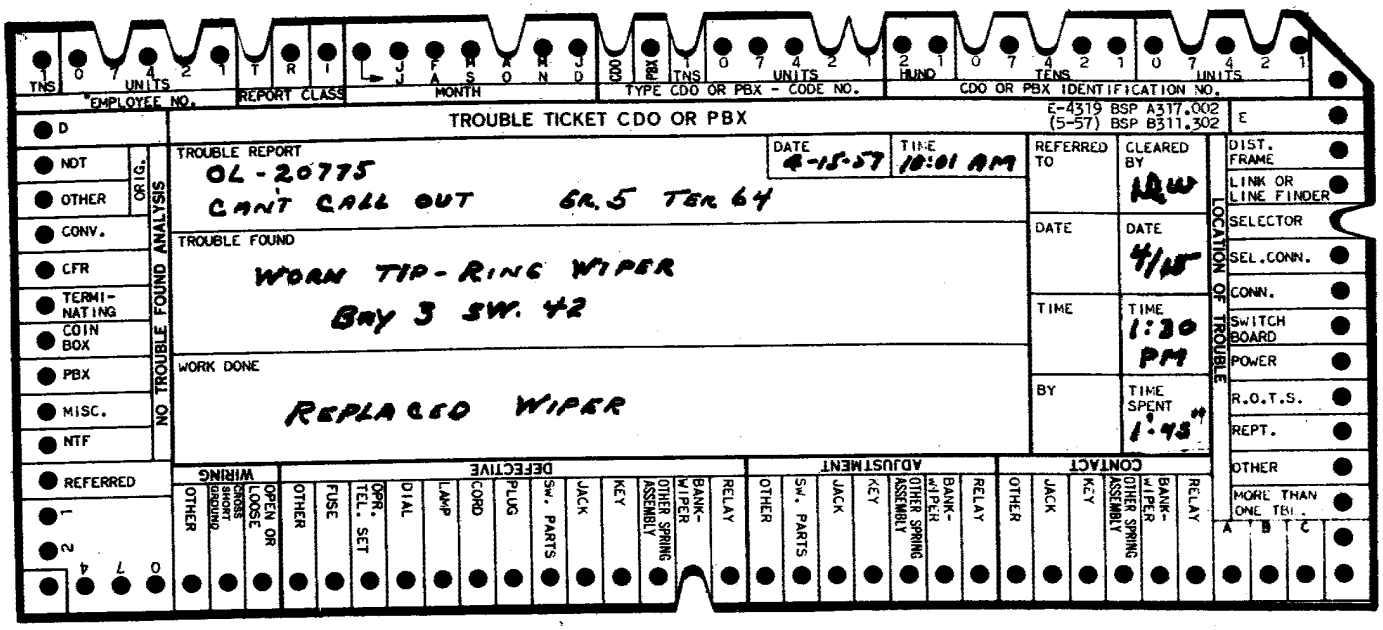
(b) Each repairman may be equipped with a blank supply of Forms E-4319. When he has occasion to prepare a Form E-4319, he would indicate the locations to be notched with a pencil mark. These forms could later be notched at a centralized location and then forwarded to the personnel performing the analyses.

(c) The identification data for all CDO's being maintained could be prenotched and a supply of partially prepared Forms E-4319 could be left at each location for the repairman to complete when the maintenance work is performed.

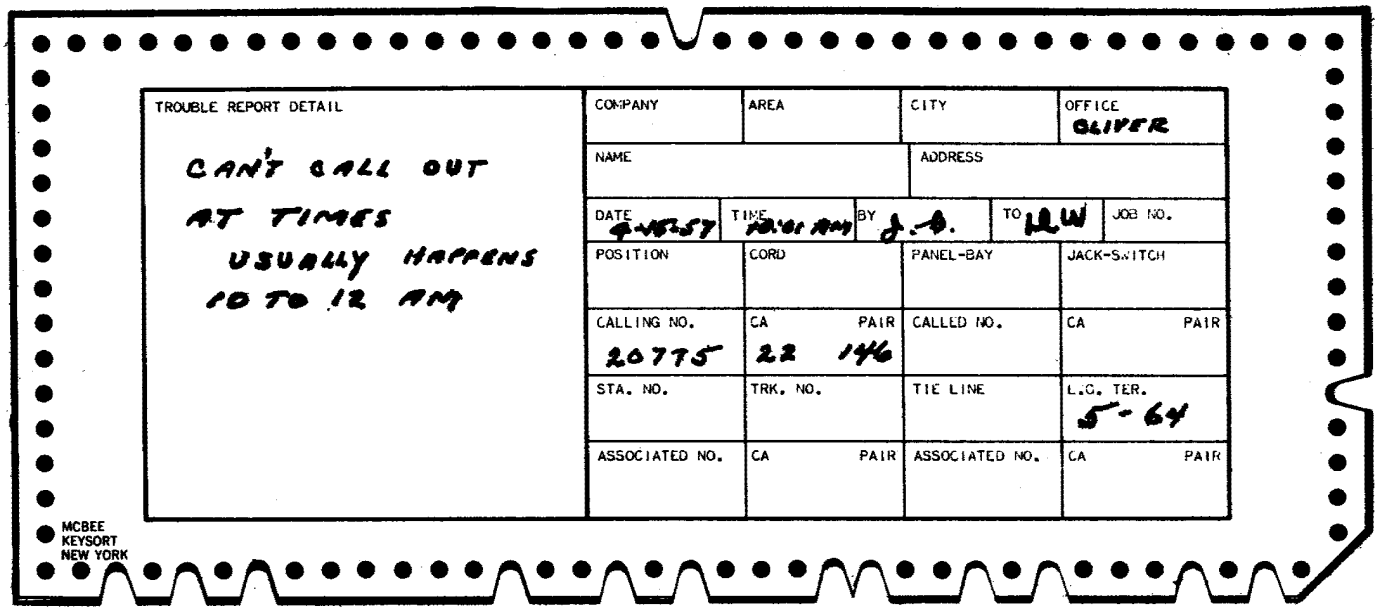
5.08 To preclude the necessity of filing completed Forms E-4319 in any certain order, or by individual CDO, and to facilitate subsequent analyses, each CDO being maintained should be assigned an identification number. This will permit all troubles, occurring on a specific CDO, to be selected when desired. Form E-4319 is designed to accommodate up to 299 CDO's. When less than one hundred identification numbers are required it is recommended that all be assigned two digits, for example, 01, 02, 03, etc. This coding will facilitate sorting for a specific CDO.

5.09 To aid in sorting all troubles, or certain troubles, that have occurred on a specific ***type*** of CDO, a direct code hole is provided for either CDO. Code numbers may be assigned to 19 different types of CDO's. Each completed Form E-4319 should be notched to indicate this information.

5.10 Fig. 10 illustrates completed Form E-4319.



Form E-4319 (Front)



Form E-4319 (Back)

Fig. 10 — Trouble Ticket CDO or PBX

5.11 Summary of Found and Not Found Trouble CDO and PBX; Form E-4321 is used as a summary of trouble ticket Form E-4319. The summary form provides space for a continuing history of "T", "R", and "I" troubles. Local experience will indicate the frequency best suited for posting of trouble performance to the summary. In order to benefit by comparing present performance with past performance, as indicated by the expectancy figures, like periods of time should be used for the respective figures.

5.12 Fig. 11 through notes, explains the preparation of Form E-4321 Summary of Found and Not Found Trouble CDO and PBX.

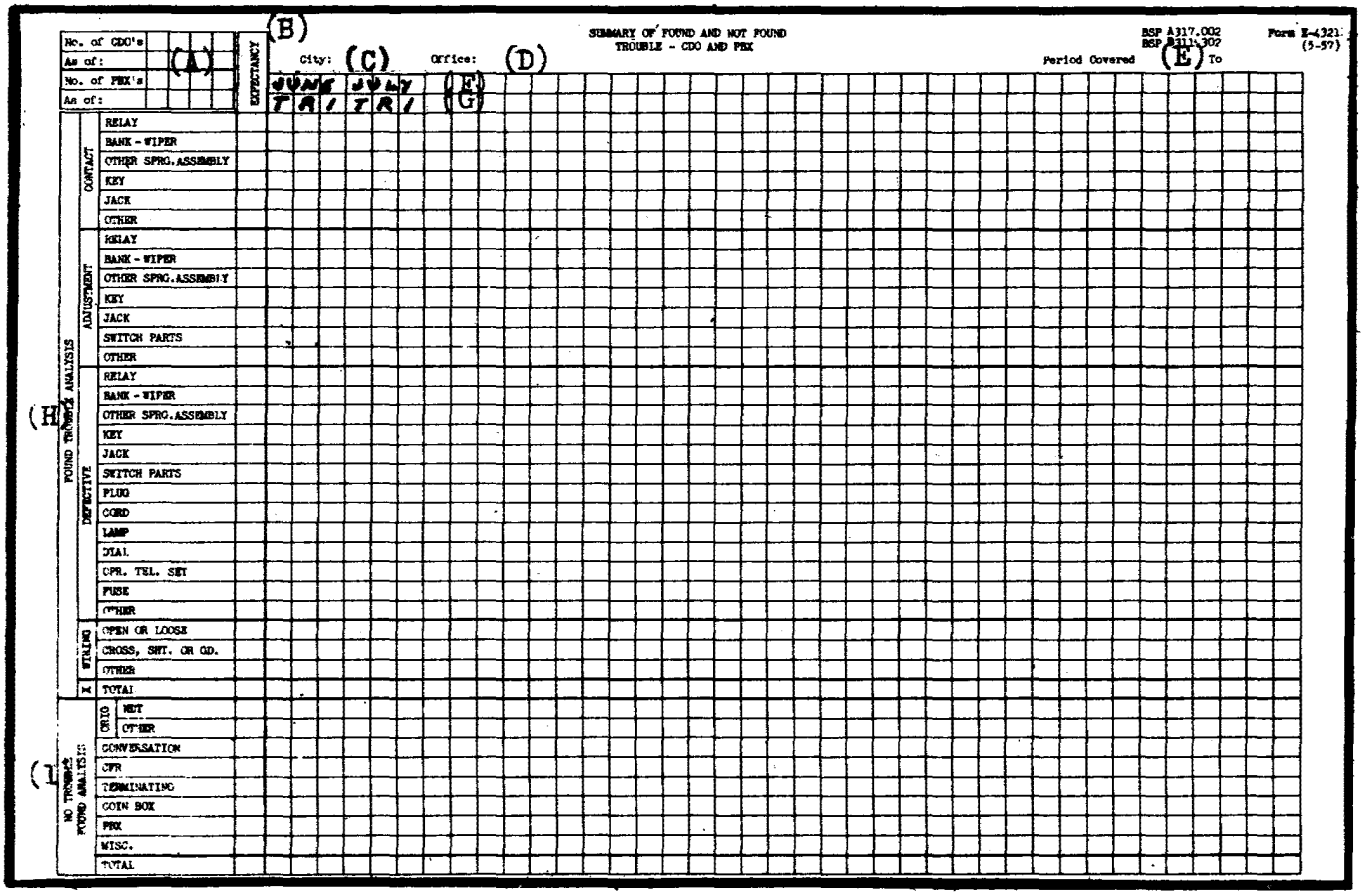


Fig. 11 — Form E-4321

Notes	Explanation
A.	Enter the number of CDO's being summarized on this form.
B.	Enter the expectancy figure for each type of found trouble and each category of not found trouble. Par. 3.02.
C.	Enter the city from which the CDO's are maintained.
D.	Enter the office, if practicable, from which the CDO's are maintained.
E.	Enter period covered.
F.	Enter the month or week on which the form is prepared.
G.	Enter trouble report by class "T", "R", or "I". Par. 3.01.
H.	Enter the total of each type of found trouble recorded on Form E-4319.
I.	Enter the total of each type of not found trouble recorded on Form E-4319.

6. SORTING

6.01 The equipment required to sort, and maintain, a group of Forms E-4319 is:

(a) KEYSORTER — The Keysorter is a steel needle set in a plastic handle. It is made with a screw collet which permits adjusting the length of the needle. The length of the needle should be adjusted to provide the greatest ease and speed in sorting.

(b) ALIGNMENT BLOCK — The Alignment Block increases the speed and ease of sorting. The drop front guide fits flush against the front edge of a desk. The vertical side guide on the right is used for aligning the cards. See Fig. 12.

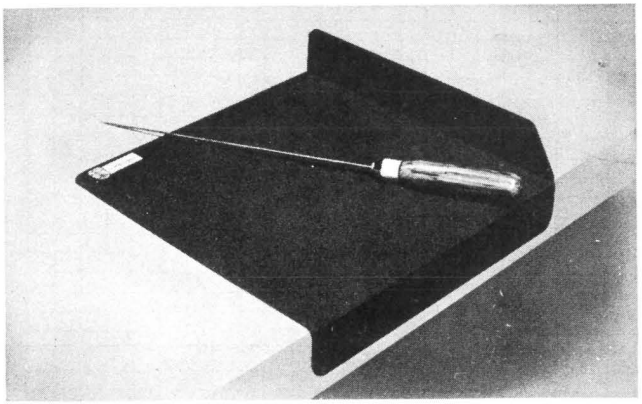


Fig. 12 — Alignment Block and Keysorter

(c) CARD SAVERS — Card Savers are gummed stickers which are used to correct a punching error or to eliminate the making of a new card if a classification is changed. Sheets of Card Savers are perforated into sections of three holes and bound in book form. To apply, simply tear out a Card Saver and moisten the gummed side. Place one-half of it on the back of the card with the center hole of the Card Saver centered on the notch to be corrected. Fold the other half over the edge of the card and press down. The card will then be ready for repunching. See Fig. 13.

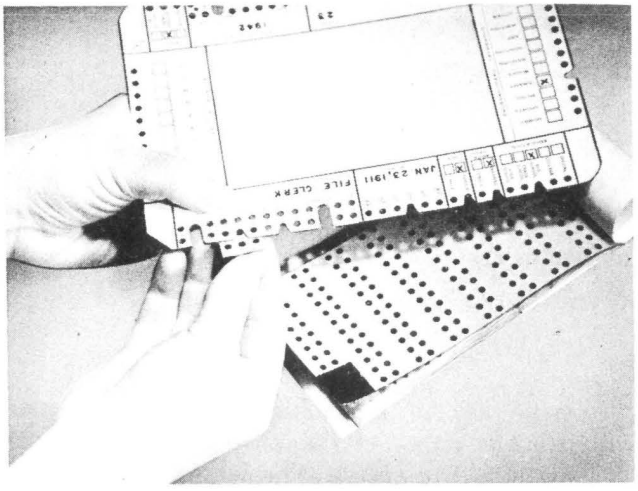


Fig. 13 — Illustrating the Use of Card Savers

6.02 A high degree of sorting efficiency can quickly be attained by following certain basic principles and techniques.

(a) ***Sorting the Long Side:***

(1) Place a convenient handful of cards (approximately one inch or slightly larger) on the Alignment Block with the front of the cards facing the operator and the side to be sorted at the top.

(2) Holding the cards loosely with the left hand, jog them against the guide of the Alignment Block. See Fig. 14.

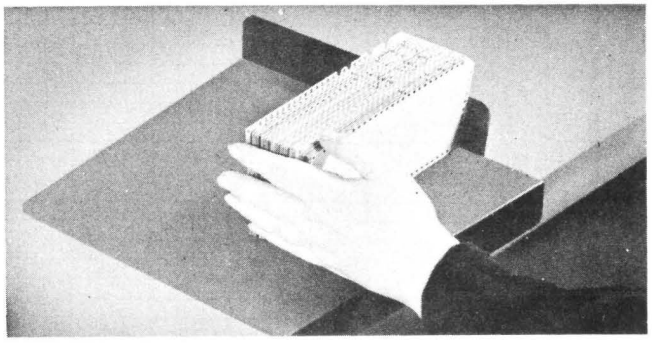


Fig. 14

(3) Grasp the cards close to the position to be sorted.

(4) Hold the handle of the Keysorter firmly with the right hand. ***Keep the fingers away from the needle at all times.***

(5) Insert the needle in the position to be sorted until the front card is approximately one inch from the handle. See Fig. 15.

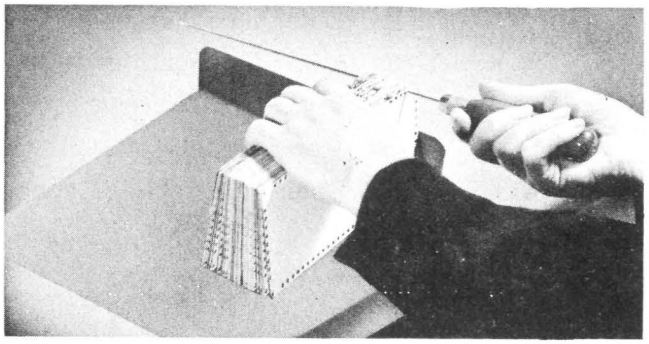


Fig. 15

(6) Slide the left hand to the left side of the cards. Hold them lightly with only slight pressure of the thumb and fingers against the cards. See Fig. 16.

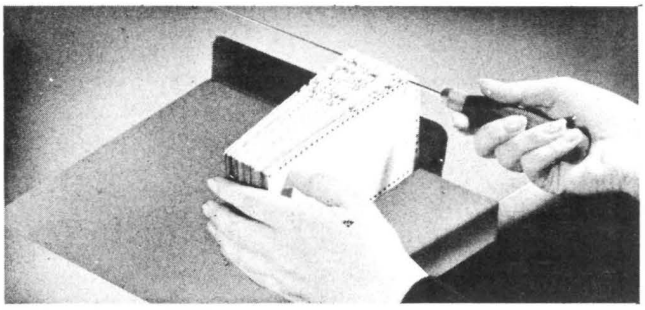


Fig. 16

(7) Move the handle of the Keysorter to the left and at the same time move the cards to the center of the Alignment Block. Hold the cards with the left hand. Exert pressure with thumb in the lower left corner. See Fig. 17.

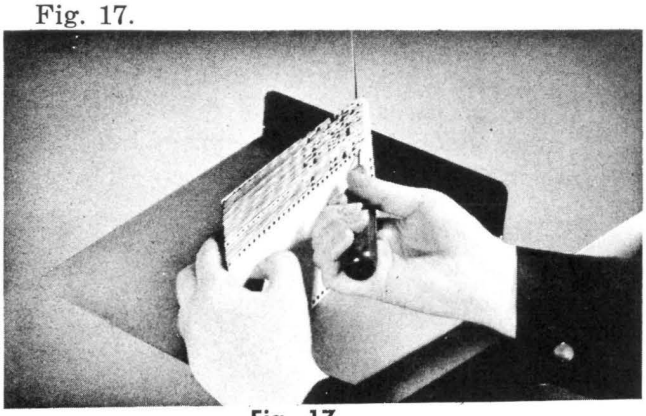


Fig. 17

(8) The inside of the fingers should be flush against the beveled edge of the cards. See Fig. 18.

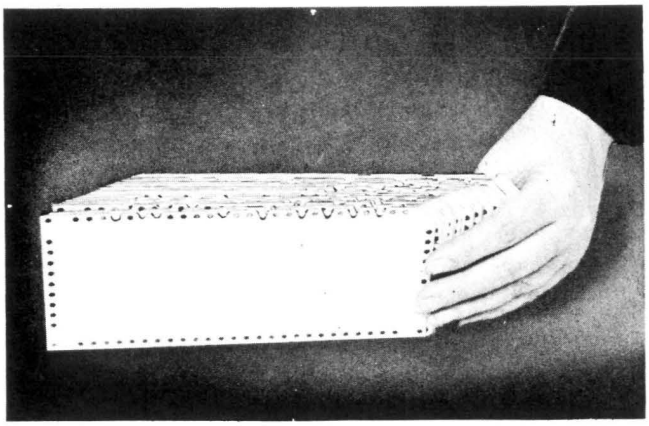


Fig. 18

(9) Swing the Keysorter to the right until resistance is felt. This will cause the cards to spread out on the needle. See Fig. 19.

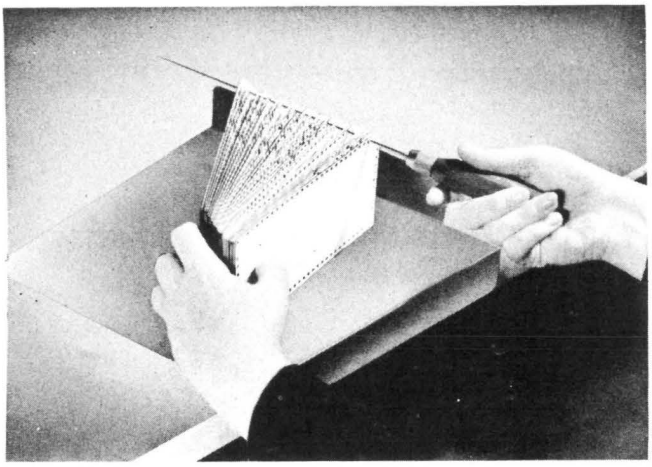


Fig. 19

(10) Release the pressure of the left hand. Spread the fingers to balance the cards that will fall.

a. Holding the cards firmly, raise both hands about two inches above the floor of the alignment block. See Fig. 20.

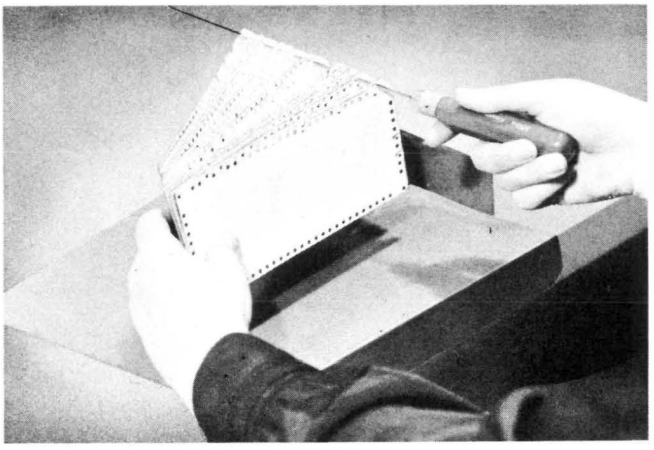


Fig. 20

b. Strike the cards squarely on the Alignment Block, releasing the pressure of the left hand as the cards strike the block. Quickly raise the Keysorter slightly to sep-

arate the punched cards from those remaining on the needle. Rest the side of the left hand on the block, spreading the fingers to balance the cards that are falling. See Fig. 21.

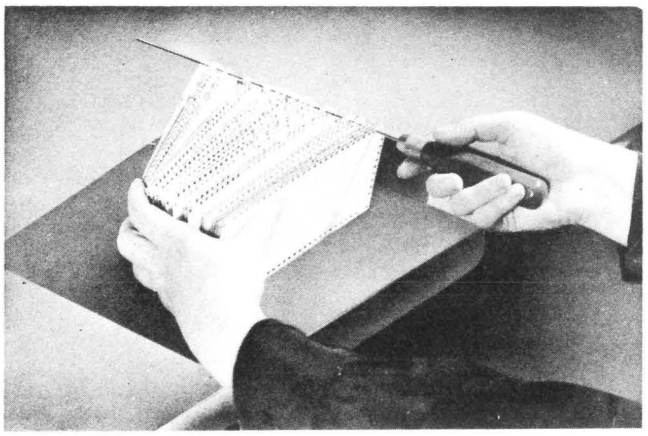


Fig. 21

(11) Strike the cards several times against the guide of the Alignment Block, at the same time gently raising the Keysorter away from the cards that are falling. See Fig. 22.

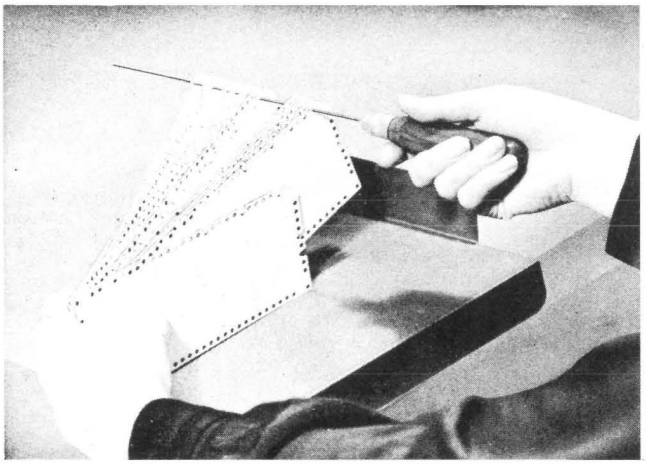


Fig. 22

(12) If some cards stick and do not fall, grasp all the cards, placing the thumb and fingers in the lower left-hand corner of the cards that are still on the needle. Move the cards toward the center of the Alignment Block. See Fig. 23.

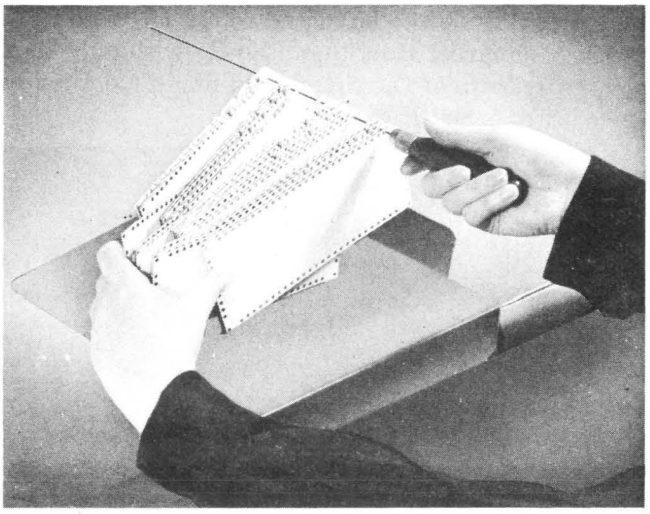


Fig. 23

Release the pressure of the left hand and strike the cards again to break loose those that did not fall in the first operation.

(13) Lift the Keysorter to the right over the guide. With the left hand open, slide the cards that have fallen against the right guide of the Alignment Block. See Fig. 24.

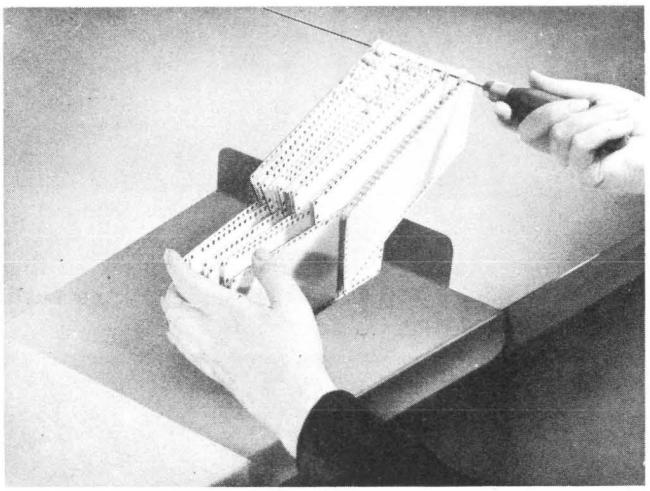


Fig. 24

Never pull out the cards that are falling, but rather lift out the cards that are on the needle. Always keep the Keysorter parallel with the top of the desk; if tilted down, the cards will fall off the end, and if tilted up, the cards will bind together and the notched cards will not fall. The steps of Basic Tech-

nique are now completed. Disposal of the cards that drop depends on the final sorting method.

(b) ***Sorting the Short Side:*** To sort the short side of a card the technique is slightly different from that described for the long side of the card.

(1) to (5) Follow the same procedure as described for the long side of the card.

(6) Slide the left hand to the bottom of the cards. Hold them lightly with only slight pressure of the thumb and fingers against the cards. Move the cards about one inch to the left away from the guide of the Alignment Block. See Fig. 25.

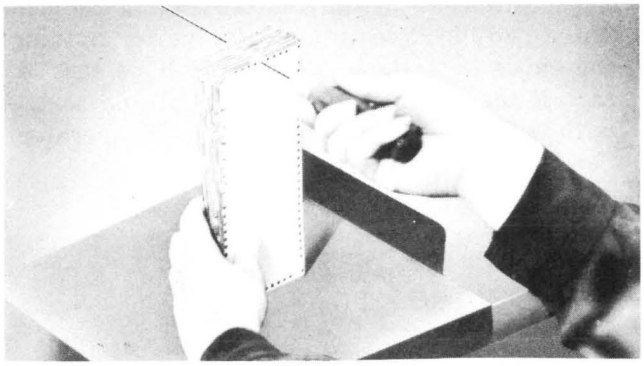


Fig. 25

(7) Lower the handle of the Keysorter and at the same time raise the batch of cards slightly off the floor of the Alignment Block so that the front cards are resting on the little finger of the left hand. Hold the cards with the left hand. Exert pressure with thumb in the lower left corner. See Fig. 26.

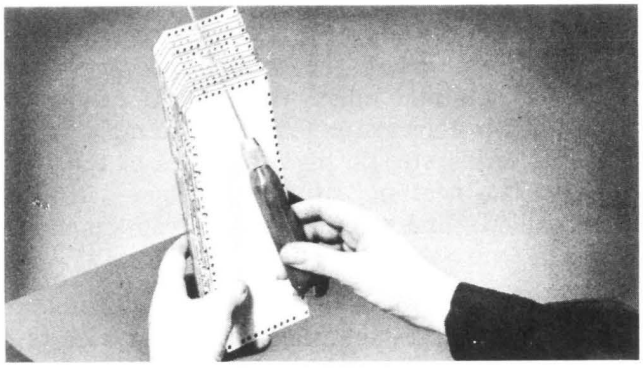


Fig. 26

(8) The inside of the other three fingers should be flush against the beveled edge of the cards. See Fig. 27.

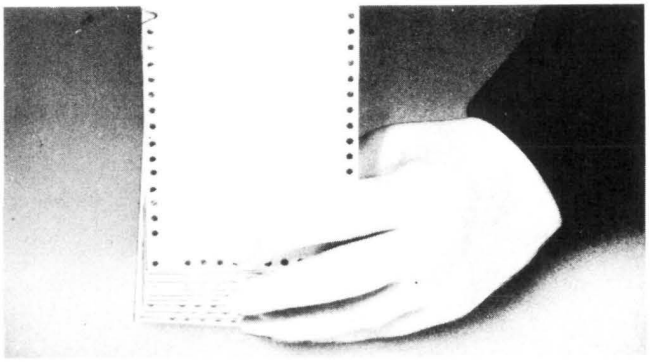


Fig. 27

(9) Raise the handle of the Keysorter until it is parallel to the top of the desk and resistance is felt. This will cause the cards to spread out on the needle. See Fig. 28.

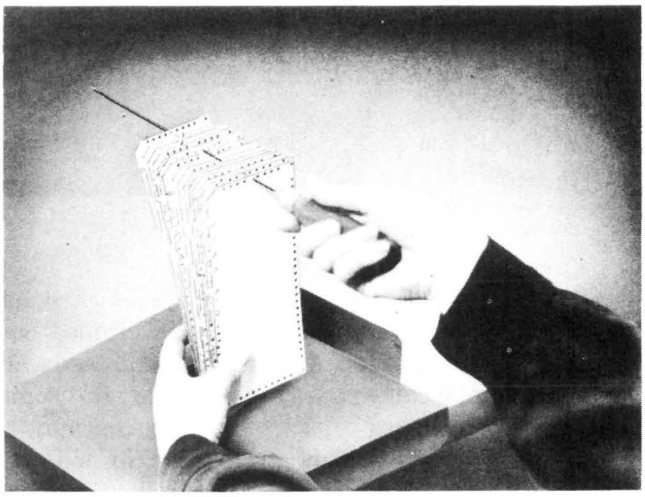


Fig. 28

(10) Release the pressure of the left hand. Tap the lower left corner of the cards several times on the Alignment Block, shaking gently two or three times. See Fig. 29.

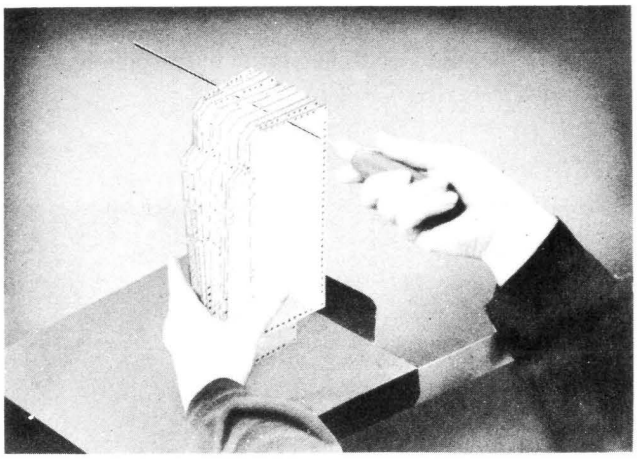


Fig. 29

Lift the cards that are on the needle to the right over the guide. See Fig. 30.

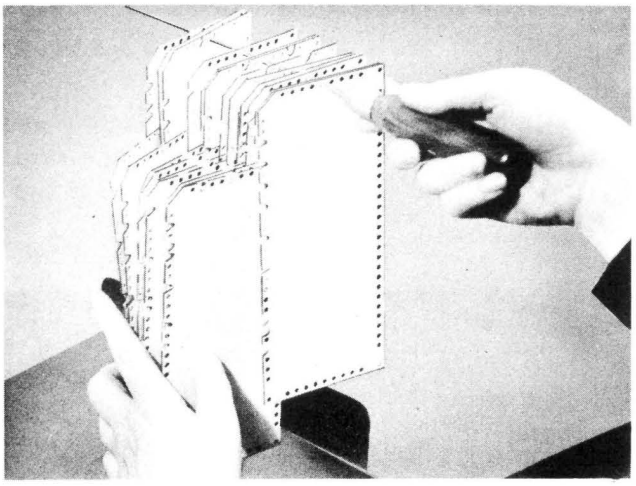


Fig. 30

(c) ***Corner Sorting:*** Every Keysort card has three square corners and one clipped corner. When the clipped corners of all cards are together, the same codes are together. But sometimes the corners of a group of cards may be mixed up. Some cards may be right side up, some upside down, some face back and right side up, and some face back and upside down. To corner sort a mixed up group of cards, sort in the top right corner hole. Place the cards that drop in a stack. In the same manner, sort the remainder of the cards in two more corners. The clipped corners of the cards that drop after each sort will be together and the batch may then be reassembled for sorting. See Fig. 31.

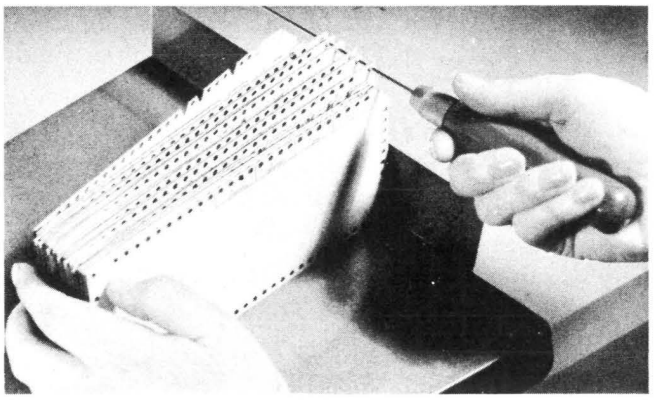


Fig. 31

(d) ***Left of Center Sorting:*** When sorting in positions which are to the left of the center, it is difficult to obtain leverage for fanning the cards. But these positions will be easy to sort if the group is turned around and sorted with the back of the cards facing the operator. See Fig. 32.

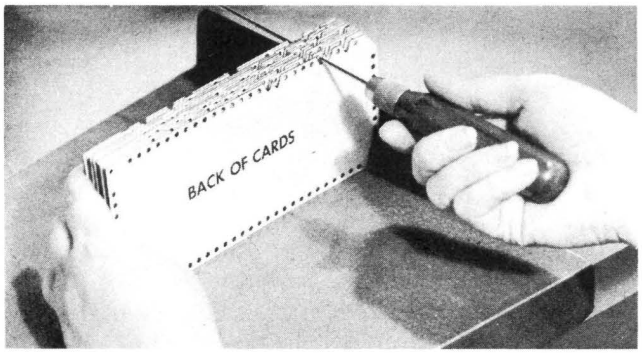


Fig. 32

6.03 ***Different Types of Sorting Procedure.***

(a) ***Direct Sorting:*** To sort in direct code positions, insert the sorting needle in the proper hole and follow the basic technique as outlined in Paragraph 6.02. For example, if the needle is inserted in the "R" space of the "Report Classification," all "R" troubles will drop and all "T" and "I" troubles will remain on the needle.

(b) ***Selective Sorting:*** When it is desirable to select all trouble tickets bearing a certain identification code, or employee number, selection can be performed with the Keysorter by

eliminating unwanted cards. For example, assume that it is desirable to sort out all troubles occurring on CDO No. 06. In the tens field sort "7" and "4"; and in the units field sort "4" and "2." In each case discard the cards remaining on the needle. The cards that fall from the sorting needle on the last sort will be all Forms E-4319 designated as CDO No. 06.

7. ANALYSIS OF FORM E-4319

7.01 The objective of the trouble analysis is to discover a pattern composed of a group of found and/or not found troubles that have a common relationship by type and/or location. Patterns indicate the need for further examination of administrative, analysis and performance records and subsequent evaluation of sampling inspections and routine tests to determine the required corrective action.

7.02 Form E-4319, when completed properly, facilitates the analysis of found and not found trouble. Broad analyses can be made by observing the edges of a group of cards. The notches form patterns which are easily discernible.

7.03 After observing a pattern which is common to a certain type of CDO, a specific CDO, a major group of equipment or a type of trouble, etc, the sorting needle is used to sort these troubles from the other cards.

7.04 By eliminating unwanted cards, an existing or potential trouble condition may be detected. Cards associated with the pattern are analyzed for further detail and decision regarding specific sampling inspections or routine tests required to evaluate the pattern. Subsequent analysis of the cards may disclose some common factor that can be identified with the faulty condition, such as geographical location of the equipment, time of day reports were received, identity of workmen, performed routine tests or inspections, etc. Disclosure of a common factor will permit application of effective corrective action.

7.05 In making this examination, reference and comparison to past trouble results is invaluable for correct evaluation of the pattern. This can not be a precise comparison because of the random distribution of trouble and the wide fluctuations encountered over a short period of time.

7.06 Consideration should be given to the relationship between "T", "R", and "I" troubles. Experience with analytical procedures should develop skill in evaluating these sources of trouble indications so that administration and direction of maintenance effort may achieve their proper balance.

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

7.08 It is extremely important to keep analyses unbiased and to avoid shaping them to support preconceived conclusions.

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

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

8. METHOD OF ORDERING FORMS

8.01 The materials described in this practice are ordered in the following manner:

PACKAGING INFORMATION:

Form E-4319 — Trouble Ticket CDO or PBX - 2500 forms per package.
Form E-4321 — Summary of Found and Not Found Trouble CDO and PBX - 25 forms per package.
Savers, Card — 2500 per package.

ORDERING INFORMATION:

Requisitions for these forms in multiples of the standard package units should be worded as follows:

(Quantity) Form E-4319
(Quantity) Form E-4321
(Quantity) Savers, Card, Lot, McBee (K5S)
(Quantity) Needle, Keysorter, McBee (5003)
(Quantity) Block, Alignment, Right-Handed McBee (5301)
(Quantity) Block, Alignment, Left Handed McBee (5302)
(Quantity) Punch, Hand, Single Row, McBee (5201)