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# Automation in Stock-Brokerage Firms

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One of our brokerage clients recently completed a study of the possible use of electronic data-processing equipment. In connection with this study the outline of a plan for processing purchases and sales of securities and for handling customers' accounts and the stock record was developed. The firm has given me permission to describe this outline for you.

The plan embodies the thoughts of many people, principally the operations and procedures people of the firm. In addition, representatives of three manufacturers of electronic equipment, IBM, Radio Corporation of America, and Remington Rand, contributed freely of their own ideas, based on studies of the firm's operations.

Early study indicated that the use of electronic equipment might be considerably simplified by certain changes in processing which might, however, provide less satisfactory service to customers. One change considered, for example, was the preparation of customers' statements on a cycle basis, such as is commonly done by department stores. Under this plan about 1/20th of the customers would receive their statements as of the close of the first business day of each month, another twentieth on the second of each month, and so on throughout the month. It was promptly decided that consideration would be given only to changes which would increase customer service, not those which might decrease customer service.

It was also realized that after more careful study many changes in routine would be necessary to provide better information to management and to branches. In order to avoid prolonging the study, however, the firm decided to stay as close to present procedures as possible unless the electronic equipment offered some obvious improvement not practical with present equipment.

The plan I shall describe was developed for large-scale equipment. Only a few firms can afford equipment of this size. This same plan, however, with only minor modifications, could be used for smaller-scale equipment, provided that magnetic tape is used. The princi-

pal difference between large-scale and smaller-scale systems is in their speed — and their price.

And of course there are many firms which will not be able to afford any electronic data-processing system — of their own, that is. But there are two alternatives which would warrant investigation. One is the possibility of pooled equipment, to be used in a manner similar to that now being done in some instances with punched-card equipment. The other alternative is the use of a data-processing service bureau, such as those operated by Remington Rand and IBM.

Before I begin the description, let me repeat that this is only one way in which the job might be done. It is probable that many changes will be made before the system is installed. And other firms, organized in another way or doing a different type of business, might make other changes. This description is presented to give you an idea of what electronic equipment can do in one phase of the operations of a brokerage house. It is not intended to portray the ideal method.

Before I go into more detail, I should like to summarize the basic jobs which it is planned that the electronic system will do initially:

1. It will figure the trades, and prepare teletype tape for transmission of confirmations to branches.
2. It will perform the internal and external balancing, including the preparation of cards for the clearing houses.
3. It will prepare blotters and contract sheets.
4. It will prepare the daily business sheet.
5. It will prepare the stock take-off and the dividend take-off.
6. It will prepare a printed stock record at least once a week.  
On days when no record is printed, there will be a cumulative record of transactions since the last printing.
7. It will compute margin calls to be made and give notification as to overdue cash trades.
8. It will provide daily a printed record of the balances and positions of every account.
9. It will prepare monthly customers' statements.
10. It will prepare various statistical and earnings reports.

To make it possible for you to follow my outline, I have prepared a series of ten charts. In these charts I have not covered all the details, but I shall try to answer any questions you may have after you have seen them.

It is not difficult to describe the electronic system which is con-

templated in the charts. The heart is what might be called the computer or the central processing unit. Before each of the jobs is run, the instructions for that job are entered into the central processing unit and stored internally. There might be as many as two or three thousand instructions for one job. Then the information to be processed is entered. One transaction or group of transactions is entered at a time, processed, and the results recorded. Required information for one run, as you will see, may come from several different files. All of this accumulated data continues to be stored within the central processing unit. Instructions and information are entered into this unit from reels of magnetic tape. Results of processing are recorded on magnetic tape.

In addition to the tape units and the central processing unit, this plan requires some converters:

1. A punched card to magnetic-tape converter,
2. A magnetic tape to punched-card converter,
3. A punched card to teletype-tape converter.

And of course we need a line printer or tabulator.

Now I should like to show you the charts.\*

Chart 1 shows one way of processing trades. On the basis of order-room reports, cards are pulled from a prepunched security-title tub file. The customer's account number, number of shares, price, origin code, and transaction symbol (purchase or sale), are key-punched. The cards are then converted to tape. Following a program previously stored internally, the electronic data-processing machine sorts the trade data to account number sequence and extends them. The extended trades are recorded on two tapes.

The trades which are to be confirmed by branches are converted to teletype tape (by way of punched cards) and transmitted to the branches. Names and addresses will be added by the branches, using address plates.

Confirmations for New York are prepared completely, including names and addresses, on a line printer. The system takes the names and addresses from an input tape and records them with the trades on an output tape. The line printer then converts the tape into confirmations.

I do not intend to mention all possible alternatives, but one will be obvious to all of you. When the branches are advised by teletype of the execution of trades, a perforated tape may be produced as a by-product. This tape may be converted to magnetic tape (directly or by

\*See appended charts.

way of punched cards) to serve as input to the system. This procedure would eliminate the tub file and punching operation for most trades.

In Chart 2 we see the extended trades put into a pending file and the trades settling today removed from the pending file and recorded for posting to the customers' accounts and to the stock record. At the same time three other jobs are done:

1. Using a tape file of customers' names and addresses, security receive and deliver notices are prepared for those customers who have established this arrangement for the receipt and delivery of cash trades.
2. From a code recorded at the time of the trade, notices are prepared to transfer the securities to the customer's name.
3. On cash trades, if securities are to be in street name, an automatic segregation notice is prepared for the cage.

Chart 3 shows the preparation of security blotters. The extended trades are sorted to blotter sequence and tapes for printing blotters are prepared. The round lots are recorded on a tape for internal and external balancing.

Chart 4 shows the internal-balancing procedure. The floor reports are recorded on magnetic tape by pulling prepunched security cards from a tub file, key punching the number of shares, the price, and the other broker's code, and then converting the cards to tape. These items are sorted to security and price sequence, and then compared with the items from the customer's side. Any differences are recorded on tape and listed. New York Stock Exchange sells, and all American Stock Exchange trades are recorded on tape and then converted to cards. The cards are sent to the clearing houses. The contract sheets are prepared from tapes written in this run.

The tape prepared from the floor reports is used on the succeeding day for the external balancing, shown in Chart 5. The cards received from the clearing houses — buys for the New York Stock Exchange — are converted to tape, and the items on the two tapes are compared. Any differences are listed for investigation.

The bookkeeping-margin runs are of course the most complex. The required processing might be done in one run, but it is shown here as two runs. Chart 6 shows what might be considered as a preliminary run. This run combines information from various sources and prepares one tape to be used in the next run for posting the customers' ledgers, which are maintained on tape. A second tape produced in this run is

used to list the daily business sheet. Into this run goes any transaction affecting customers' money balances or positions. Trades have already been recorded on tape, and are entered on the settlement date. Cards are punched for receipts or deliveries of securities, and for collections or payments of money. Cards are also punched for various miscellaneous entries. These cards are converted to tape and then sorted to customer-account-number sequence. The tape for security transactions is also used later in the stock-record run. Dividends to be posted to the customers' accounts are on tape, as I shall explain later. If the dividends have been paid to the customer, both the credit and the charge will be posted from this tape. All of these transactions are merged into the output tape in proper order.

The actual posting of the tape ledger is indicated on Chart 7. The ledger contains not only settled transactions, but executed trades not yet settled. These latter, which are needed for margining, are earmarked so that they will not appear on the monthly statements. Only settled trades were entered in the preceding run — today's trades are entered in this run. Before the run is started, the closing prices for the day are stored in the "memory" of the system. Each customer's account is read into the central processing unit in turn, transactions are posted, and the up-dated ledger is written on a new tape. Before it is written out, the balances and positions of every account that had transactions during the day are recorded on a tape which is later used to print a record. Also recorded for printing are the details of any accounts which are undermargined. This file of account balances and positions is intended only for reference purposes. Since some accounts are printed each day, a reference list is needed. This list is cumulative for the month, and shows the date of the last activity for each account having activity during the month. Since monthly statements are prepared, and copies retained, this list starts afresh each month.

As each account is processed, a computation is made to determine if it is adequately margined. If a call is required, the account number and amount of the call are to be listed for the margin department. As I indicated a moment ago, details of the account are also listed for reference. Also to be listed are those accounts on which previous calls have not been answered. And on cash accounts the central processing unit checks to see that securities bought are paid for and that sales are covered by securities received from the customer. Any overdues are listed for follow-up by the margin department.

The central processing unit also computes segregation requirements, and records on tape those securities to be put into or taken out of segregation. This tape is used in the stock-record run.

Chart 8 shows the daily up-dating of the stock-record tape. In order to keep the amount of printing to a minimum, without making references inconvenient, the complete stock record is printed only once each week, on the week-end. On Mondays, the take-off of course shows the changes in positions. On Tuesday nights, Wednesday nights, and Thursday nights, a list is prepared showing the cumulative changes since the preceding Friday. Thus reference on any day need be made to a maximum of two records. The cumulative changes are kept on tape from one day to the next.

The input to this run includes, in addition to the stock record, all transactions affecting positions. Those which also affect customers accounts were used in the bookkeeping run and are already on tape. The trades settling today were also used in the bookkeeping run. Segregation changes required were recorded on tape in the margin run. These are posted and are designated with a special symbol on the take-off so that the cage may make the necessary changes.

Other entries affecting the stock record, such as movements of securities in and out of street positions, are recorded on tape by way of punched cards. On a dividend record-date, a card is punched with the dividend rate. If it is practical, the stock record will indicate whether the securities are in street anme, and the dividend take-off will list only those dividends for which an accounting is required. These dividends are recorded on tape for processing as indicated in Chart 9.

The dividends are recorded in a pending file until the payment date. This tape is processed each day and on the payable date the dividends are recorded on a tape to be used as input to the bookkeeping run, as we saw a moment ago. At the same time, checks are prepared for any customers who want their dividends paid over to them on the payment date. For this purpose a file of the names and addresses of these customers is processed. All dividends, whether paid to the customer or not, are recorded on the bookkeeping tape for posting to the customers' ledger. Automatic dividends paid are indicated on this tape, so that the customer is both credited and charged.

In the final chart, number 10, I have indicated how the monthly statements are to be prepared. The statements will show the money

balance at the beginning of the month, all transactions during the month, and the money balance and positions at the end of the month. A tape showing the beginning balance is available from the preceding month's statement run. The final balances and positions are available from the bookkeeping run. And the daily transactions tapes have been retained. In order to reduce the number of tape units required, the daily tapes will be merged into two or three tapes before the statement run. A name and address file is required for addressing the statements; the other files carry only the account number.

In this description I have omitted some things for the sake of keeping it from becoming unnecessarily complicated. For example, I have not shown how name-and-address files are kept up-to-date. If you have any questions about some of the things I have left out, I shall be glad to try to answer them during the discussion period.

I should like to repeat that this represents one way of doing the job; it is not the only way. And while this plan was designed for a large-scale electronic system, it could be used without much change by a smaller firm with a smaller-scale machine. It could also readily be used by a group of firms using a pooled system.



CHART I

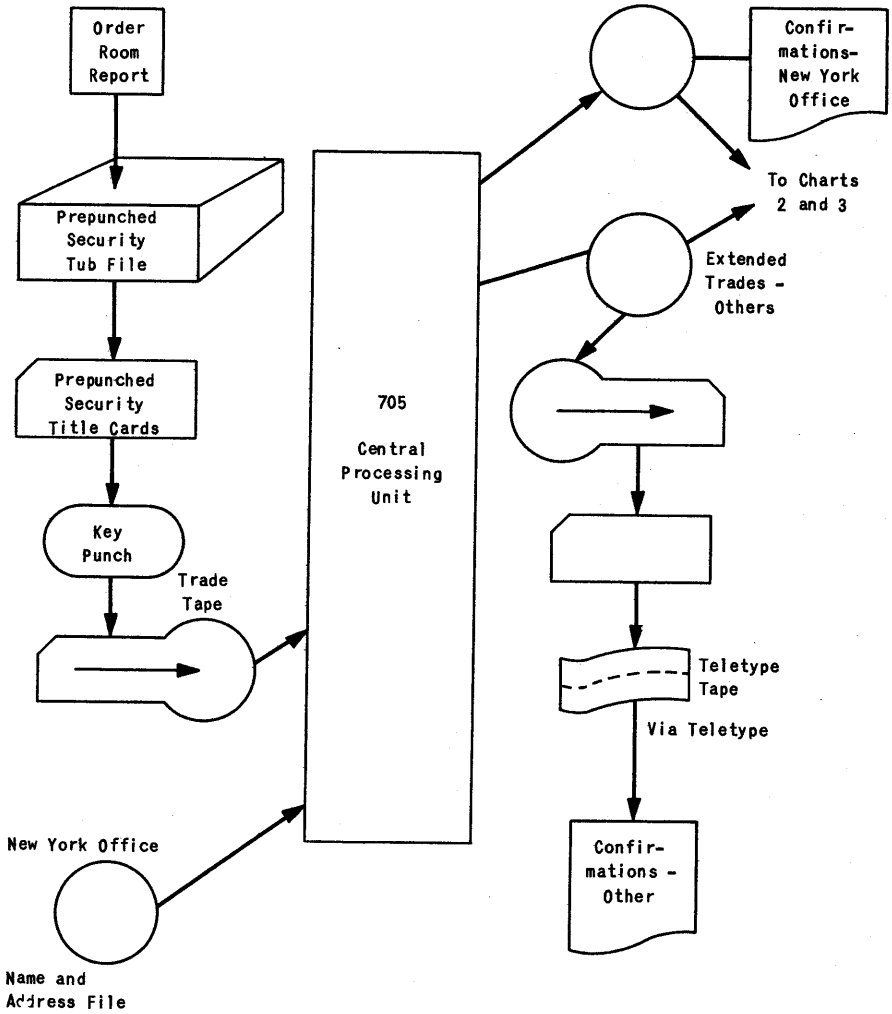


CHART 2

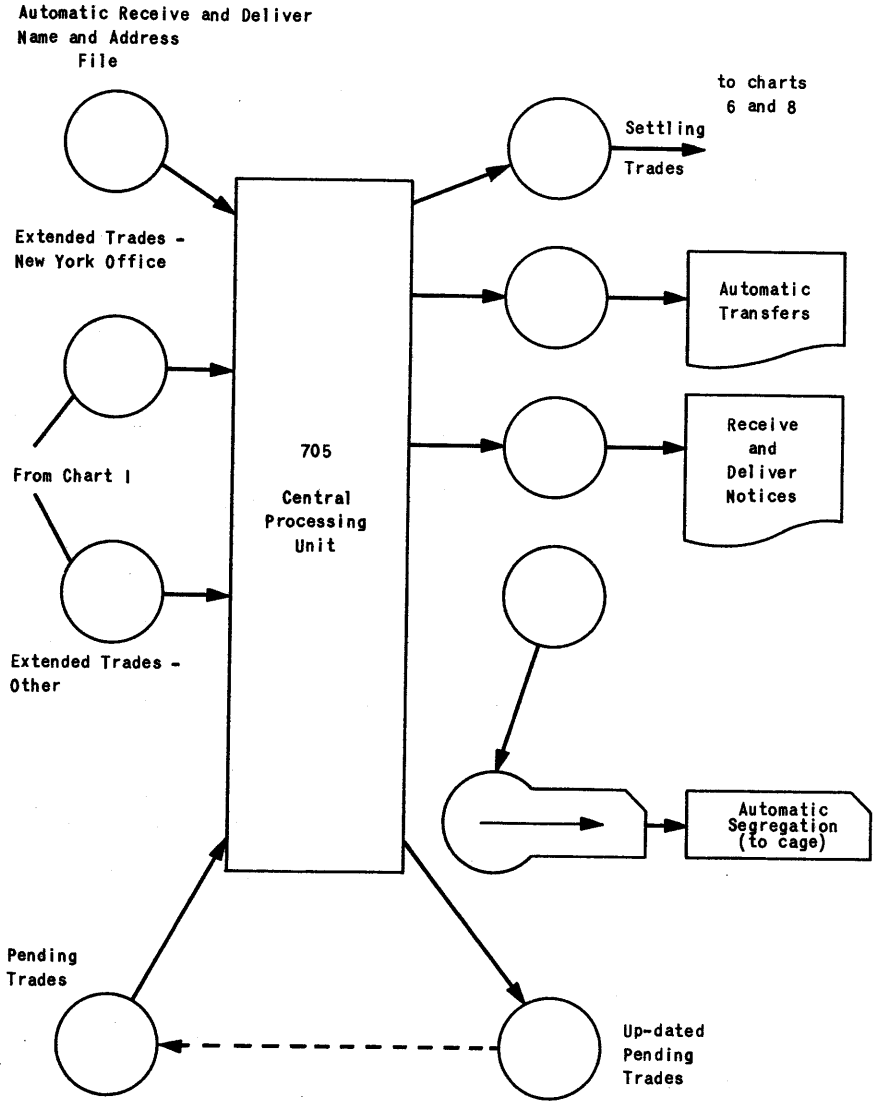


CHART 3

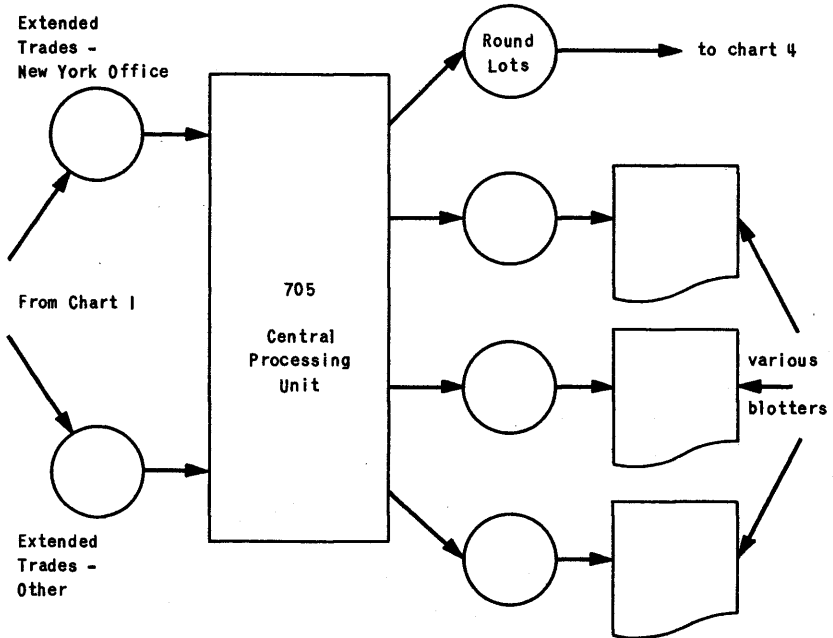


CHART 4

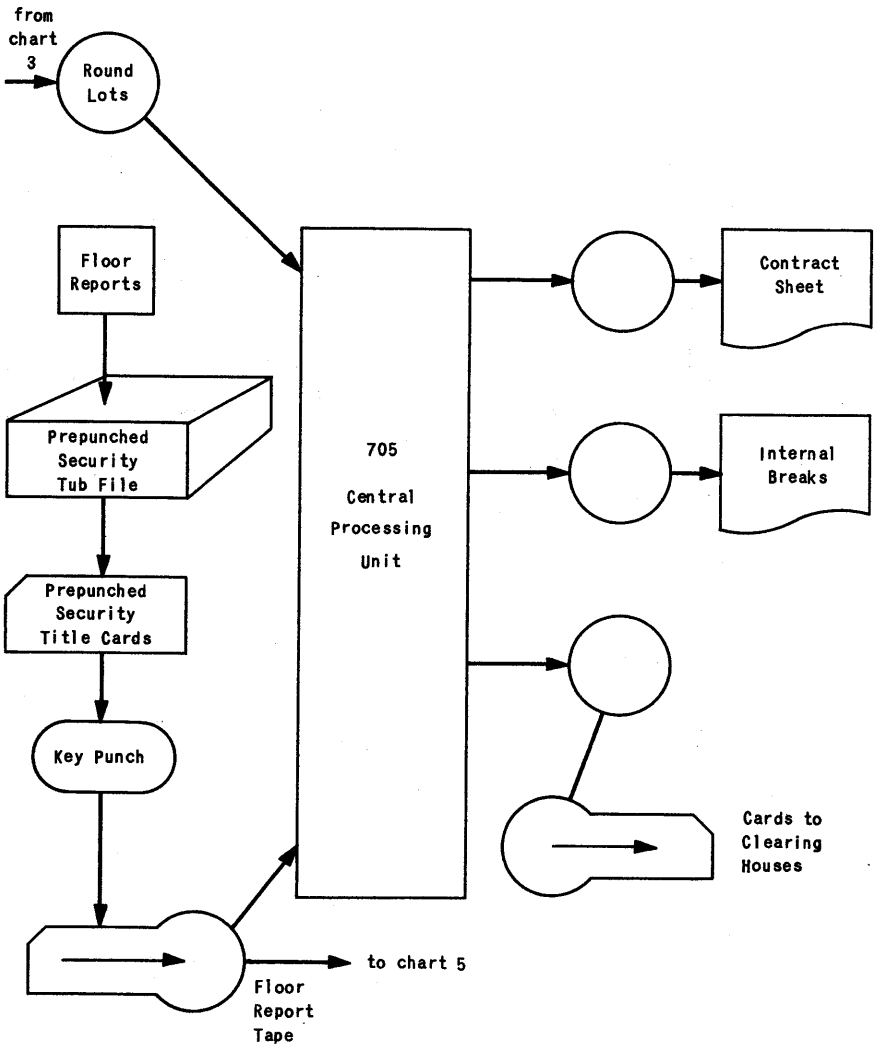


CHART 5

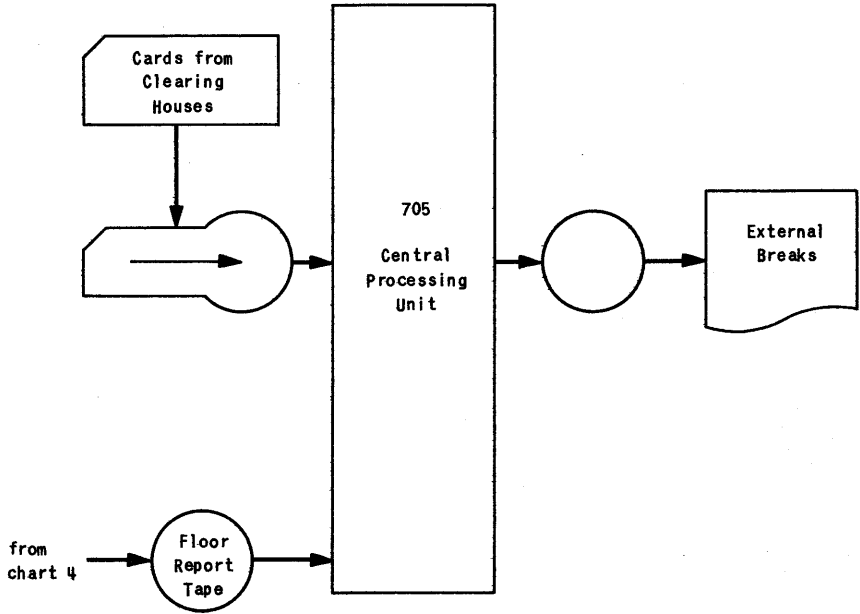
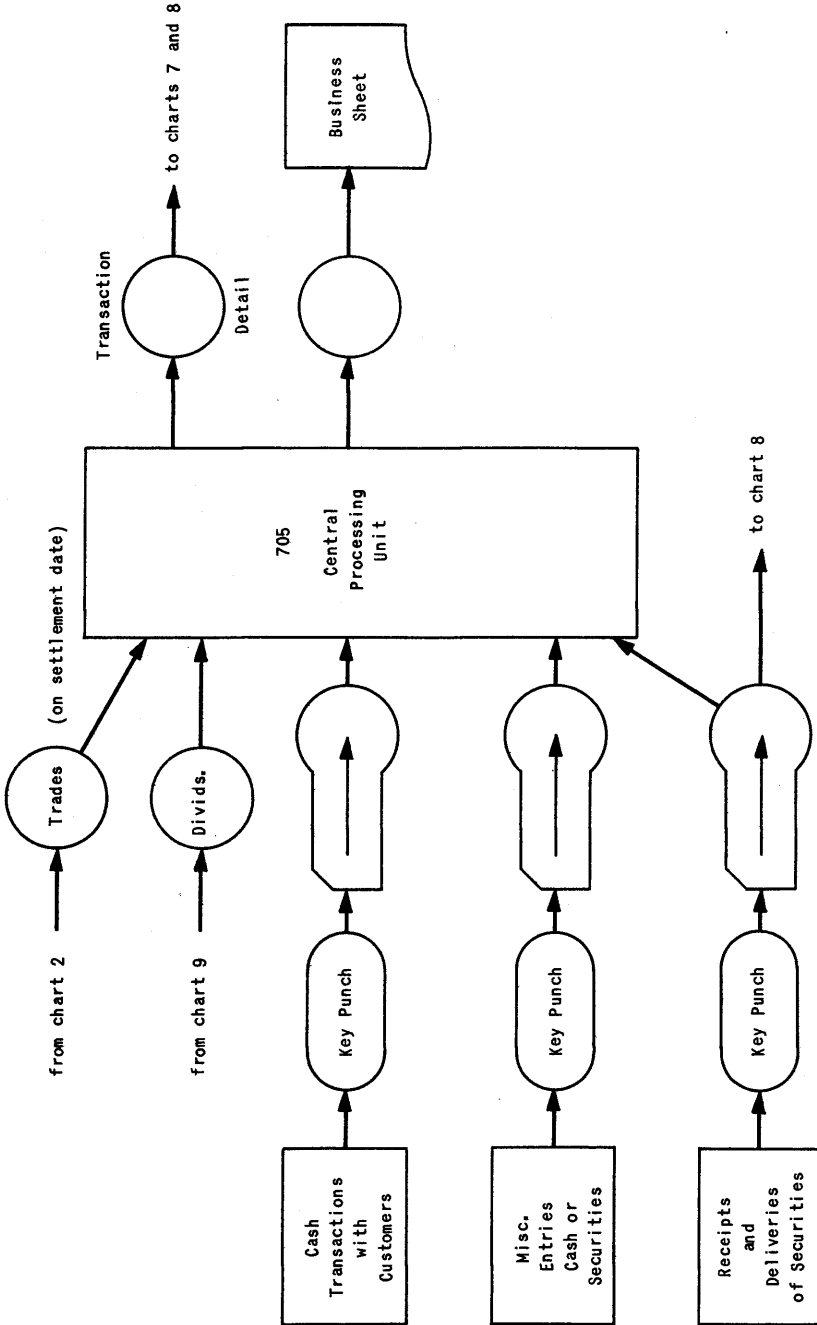
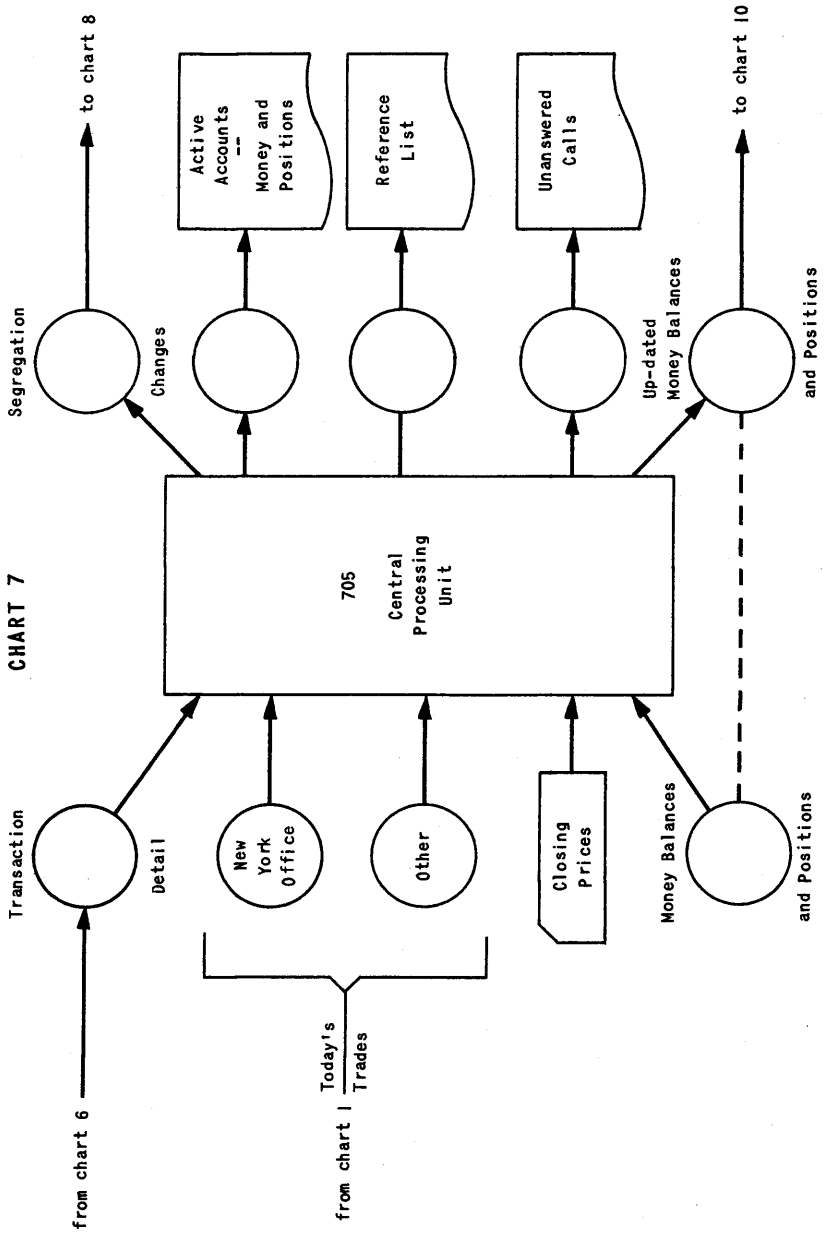
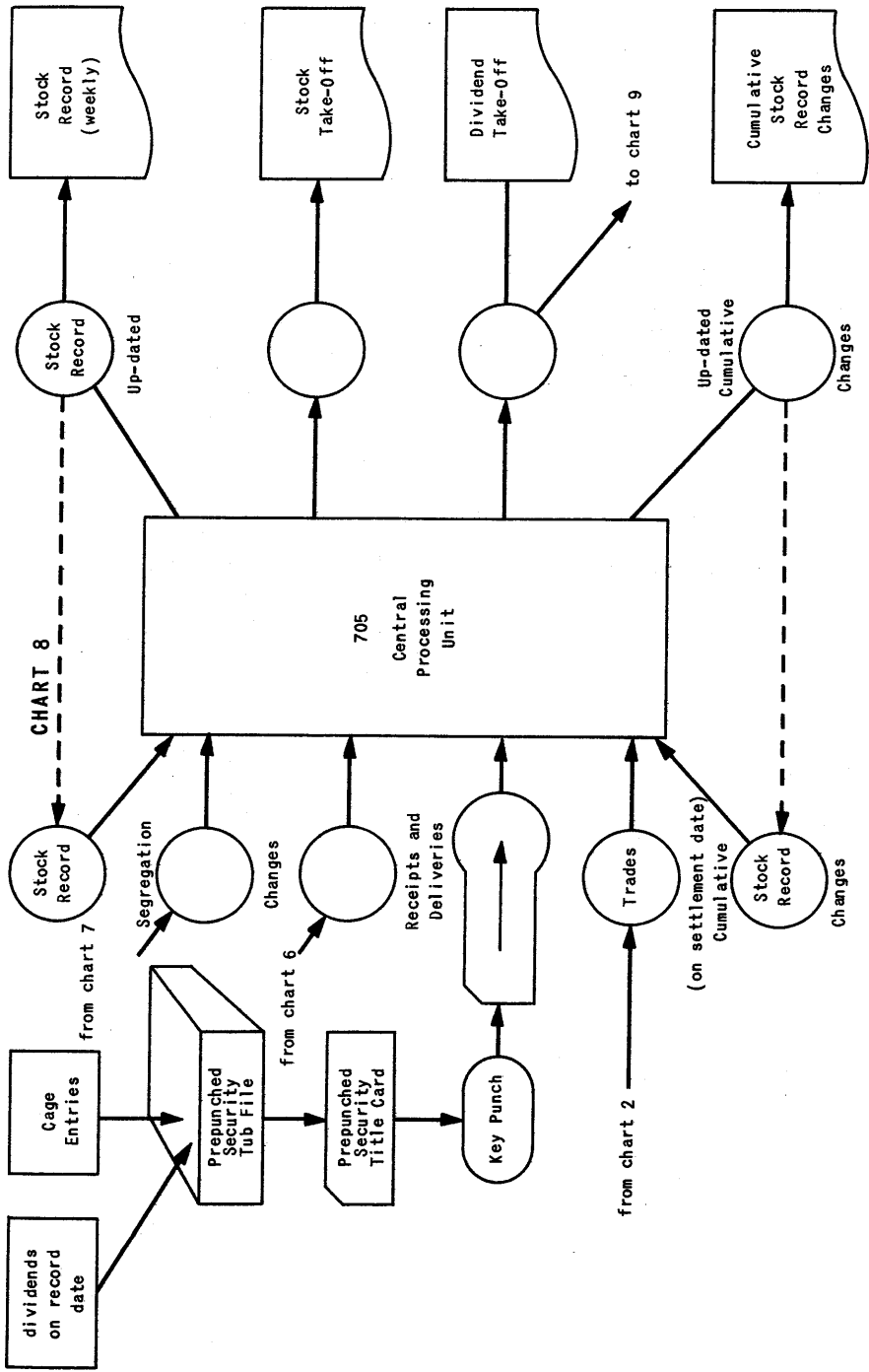


CHART 6

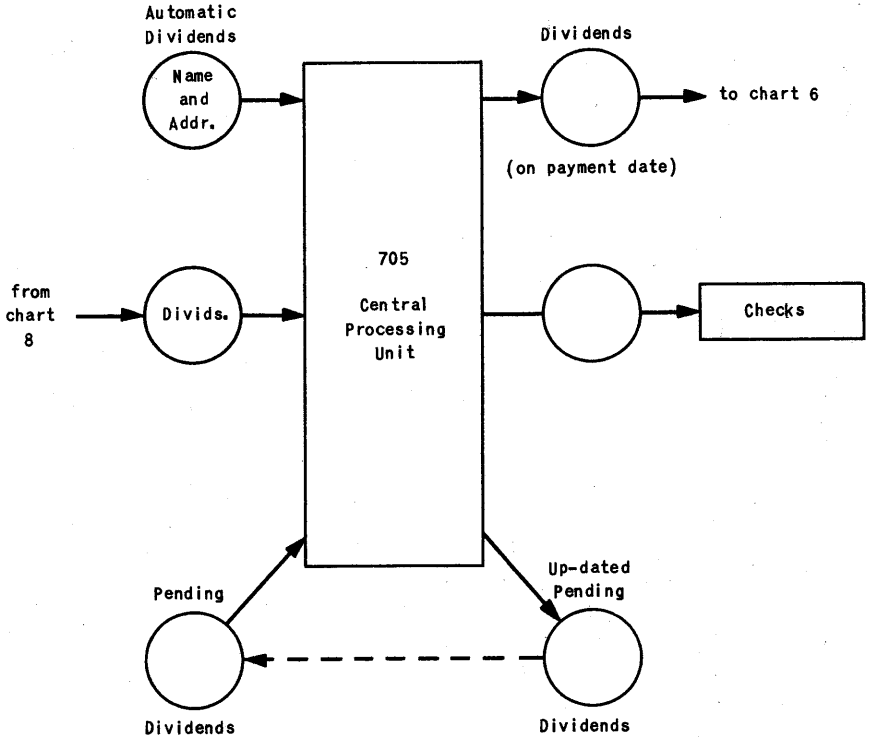








# CHART 9



# CHART 10

