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AUTOMATED DATA PROCESSING

The author begins a series of articles designed to take the reader from manual book-keeping through the necessary steps for conversion to a data processing system.

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Manual data processing is being replaced in many businesses with machines that reduce the cost and speed up the processing of data. The professional accountant is undoubtedly aware that he will eventually become obsolete professionally if he does not continue his education in this area. The real problem is where to start. Much of what is written assumes the reader has a good background in data processing, mathematics, and statistics and leaves the mature accountant bewildered. This series of articles is designed to instruct that accountant who knows little about automated data processing, but wants to know more. For those familiar with automated data processing it will be elementary.

Niswonger and Fess state, "Automated data processing (ADP) is the general term applied to the processing of data by mechanical or electronic equipment (sometimes referred to as "hardware") that operates with a minimum of manual intervention."¹ In these articles, automated data processing is developed, first in terms of mechanical equipment with only punched cards for input; and second, in terms of electronic equipment with the whole array of input—cards, tape, and disk.

Description of Mechanical Equipment

Mechanical or unit record equipment refers to punch card machines that are mechanical or electro-mechanical rather than electronic as are computers. The punched card is the only input medium; usually each record is trans-

cribed on a separate card. Although the punched card dates back to around the end of the American Revolution, punched card methods have been in widespread business use only since the 1930's.² The IBM card is the heart of any integrated data processing system. It consists of 80 columns and 12 rows. Holes may be punched into any of the 960 punching positions (80 x 12). Punctures in each column of the card represent one numeric, alphabetic, or special character.

The numbers 0 through 9 are represented by the 0 through 9 punch. Two holes are needed for a letter. The hole above the 0 is referred to as an X or 11 punch and the hole above that as the Y or 12 punch. To represent the letter A, the 12 and 1 punch are used. The key punch machine is devised so that depression of the A will give the needed two holes and, if it is the proper model key punch, also print the A along the top edge of the card immediately above the holes. All letters require two holes, and the special characters require from two to six punches in the same column.

According to Niswonger and Fess, "An installation of punched card equipment is composed of a series of machines, each of which performs a specific operation."³ The series of machines most frequently used are the key punch, key verifier, reproducer, sorter, collator, interpreter, calculator, and tabulator.

Key punch: This machine looks somewhat like a typewriter. Every time a given key is

¹C. Rollin Niswonger and Philip E. Fess, *Accounting Principles* (10th Edition; Cincinnati, Ohio: South-Western Publishing Company, 1969), p. 328.

²Donald H. Sanders, *Computers in Business: An Introduction* (New York, New York: McGraw-Hill Book Company, 1968), p. 18.

³Niswonger and Fess, *Accounting Principles*, p. 331.



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depressed, it punches a hole or holes in the card. The letters are arranged in the same order as on a typewriter, but the numbers are arranged so that the operator only uses her right hand to punch them.

Key verifier: This machine is similar to the key punch, except that its main function is to check rather than to punch data into a card. The operator rekeys the same information that was supposed to be put in the card by the key punch operator. If the holes are not where they should be, an error is indicated by a notch on the top of each incorrectly punched column.

Reproducer: This machine can duplicate large numbers of cards much faster than the key punch. A deck of cards in one hopper may be duplicated at high speed into blank cards placed in the other hopper. The reproducer can be programmed (wired) to duplicate only selected data from one card into columns of a blank card. These columns need not be the same; this is useful in cases where the cards being punched do not have the same design as those from which the data are read.

Sorter: This machine rearranges cards in a given sequence. The operator must set the lever to select one of the 80 columns. An entire field can be sorted by first sorting on the right-most column, then the second right-most column, etc. Since each letter has two holes in each column, it takes two passes to sort each alphabetic column.

Collator: This machine collates two decks of cards in a given order. It can also merge, match, select, and sequence check at high speed.

Interpreter: If the model of key punch will not print above the punches, the interpreter is needed to convert punched card holes into human language. It is also used with cards which have been punched on the reproducer.

Calculator: This machine performs multiplication, division, addition, and subtraction upon numbers punched in the cards and punches the results into a different part of the same card or into a subsequent card as directed.

Tabulator: The 402 accounting machine,

sometimes called a tabulator, can be instructed to print invoices, statements, checks, purchase orders, and various types of reports under the direction of a control panel. The data punched in cards can be read, compared, selected, added, subtracted, and printed at speeds up to 100 lines per minute. If the IBM 519 summary punch is coupled with the 402, summary cards for future analysis can be punched while the accounting machine is preparing reports. Summary punching facilitates a chain of analysis and prepares future input.

The operation of the accounting machine and many other pieces of the unit record equipment is controlled by a control panel. These control panels are plastic with aluminum frames and come in various sizes to fit the different machines. The control panel must be wired to tell the machine what to do. This is the program for unit record equipment.

A mechanical system includes a series of these individual pieces of equipment, each of which processes the same punched card (or a summarized form of that card) in a different way. Certain equipment sorts; other equipment collates, calculates, or prints. Human intervention is required in preparing the punched cards, instructing the equipment, and transferring the cards from one machine to the other. The punched card is the primary unit record or input for all tab or unit record equipment. It is the communication link among the various machines. Instructing the equipment consists of setting dials or wiring control panels to achieve the proper flow and summarization of data. The output is continuous paper forms or, if the accounting machine is directly connected to the reproducer, punched cards.

Punched card machines are practical whenever there is a considerable amount of data to be processed on a continuous basis. Some of the more common applications are accounts receivable, accounts payable, inventory control, and payroll. The next issue will trace the conversion of a very simple accounts receivable application from manual to a punched card operation.

(To be continued)

MANDATORY CONTINUING EDUCATION FOR CPAs IN PUBLIC PRACTICE

Those people registered in practice in the State of Iowa will be informed as of January 1, 1969, that three years later, January 1, 1972, to register their certificate in practice they will have to give evidence—and this will be a self-assessment sort of a proposition—that they have attended at least 15 days of continuing education programs within the previous three-year period.

From "Mandatory Continuing Education for CPAs
As a Condition for Continued Licensure"

Richard G. Peebler

PROCEEDINGS OF THE 1968 ANNUAL MEETING,
NATIONAL ASSOCIATION OF STATE BOARDS OF ACCOUNTANCY