AUTOMATION IN THE MARKETPLACE

AUTOMATION IN THE MARKETPLACE

YOU are probably already familiar with some uses of automation* by businesses and banks. Your bank statements, credit cards bills, and department store bills may be prepared by computers. Computers process your airline and hotel reservations. Computers have been used for recordkeeping, customer billing, and check processing for many years because computers process information quickly and accurately.

Then, too, you may have used automatic machines such as toll collectors and gasoline pumps that are activated when money or credit cards are inserted.

You will soon see new uses of automation in the market-place: automated cash registers and bank teller machines. These automated registers and tellers are computer terminals— devices that communicate with computers. The terminals send information about a transaction to a computer and receive instructions from the computer as to how to proceed with that transaction. The computer is often located far from the terminals. The terminals can also be linked to other devices that read codes and label information.

Businesses and banks are using computers to:

- speed up customer transactions,

- help prevent mistakes, and

- collect useful informa- tion for both consumer and business records.

To help you better un- derstand some of the recent changes in the marketplace, this booklet describes new uses of computers and automation by the grocery, retail, and banking communities.

*[Automation means the automatic operation of a process or a machine.]

SOME grocery stores are using computers to assist at the grocery checkout counter. The computerized checkout system generally consists of a laser scanner (reading device using a laser beam) and an electronic cash register that are connected to a computer.

The automated checkout operation eliminates the need to ring up manually the price of each grocery product. Instead, a scanner reads a special marking on the product and a computer looks up the product's price, which is then automatically recorded on the cash register.

Universal Product Code

You have probably noticed the vertical bars that appear on canned and packaged products in grocery stores. This marking represents the Universal Product Code (UPC)—a standard system of marking for labels, adopted by the major supermarkets, food manufacturers, processors, and distributors. The UPC identifies the

grocery item and is printed on the label by the manufacturer at the time of food packaging.

The bars and spaces of the UPC represent ten digits that identify the manufacturer or the brand and the particular product, its flavor, and size. The UPC does not contain the price of the item. A briefer six-digit code appears on some items such as chewing gum—a special adaptation designed for small packages.

The bar code can be used on products other than food:

Nonprescription Drugs. The National Drug Code assigned by the Food and Drug Administration can be printed on labels and used as the UPC.

Medical Products. The code assigned to other medical products such as bandages (National Health Related Items Code) can also be used as the UPC.

Other Non-Food Items. Additional items such as alcoholic beverages, books, magazines, stationery and business supplies, and electrical supplies have been assigned compatible codes.
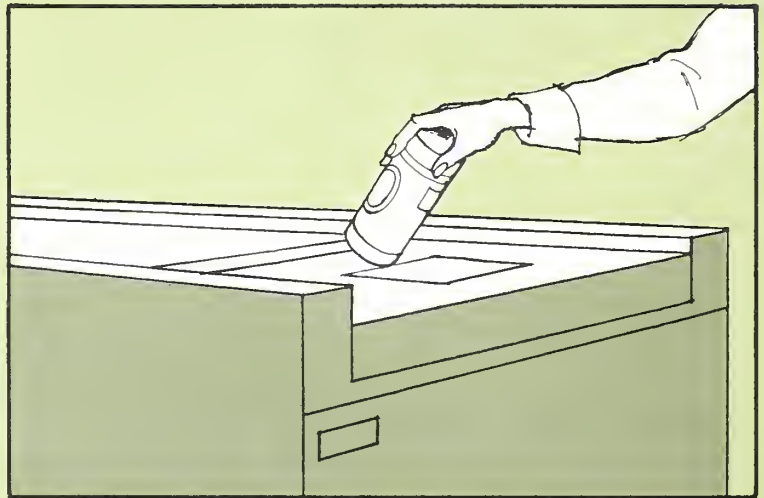
Laser Scanner

The UPC is read by a scanning device containing a low-energy laser installed at the end of the checkout counter. The UPC marking is designed so that it can be read sideways, upside down, or from any direction, as long as the bar code is facing the scanner. As the checker slides the item across the scanner, the laser scanner reads the UPC and transmits the data to the
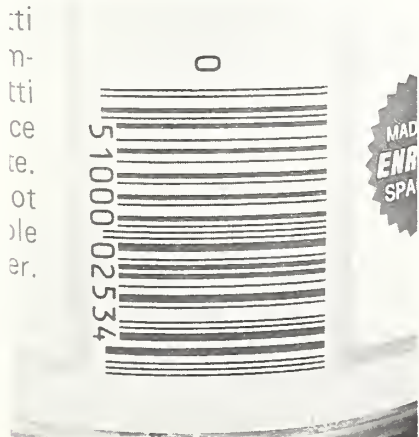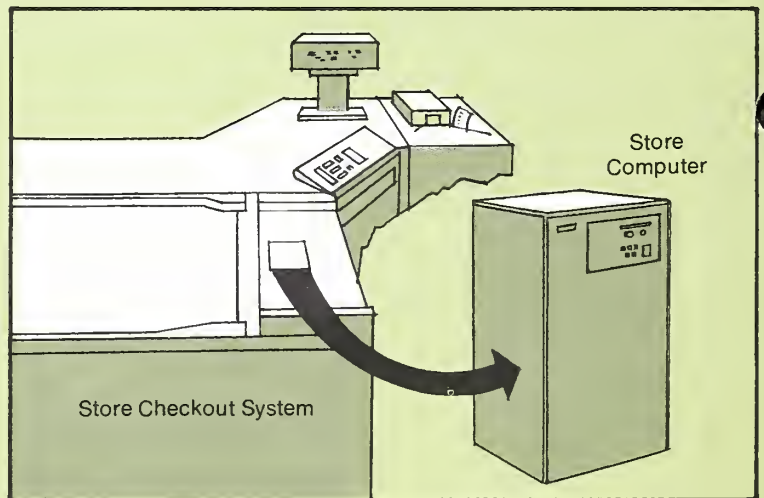
THE GROCERY CHECKOUT SYSTEM

As the checker moves the UPC marked item across the scanner, the product information is read.

The information is transmitted to the computer which looks up the price.

Store Computer

Store Checkout System

Then the price is flashed back to the checkout terminal where it is displayed on the viewer and printed on the receipt tape.

Store Computer

Store Checkout System
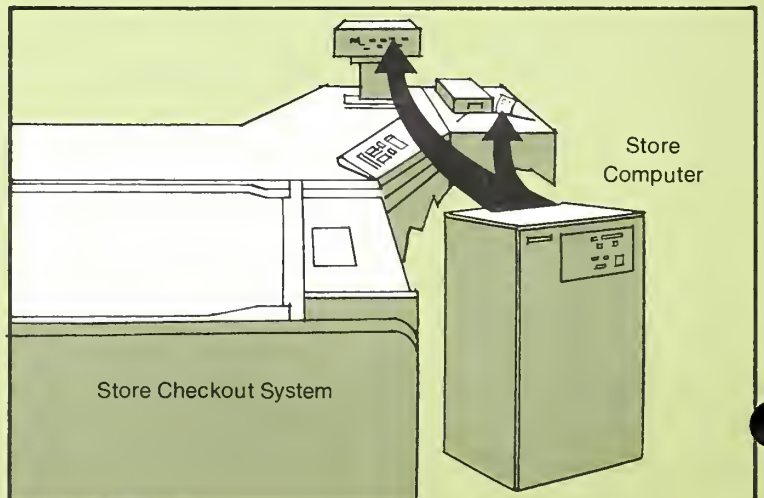
computer. Laser scanners used in grocery checkout operations have been tested and approved as safe for both checker and consumer.

Computer

The computer receives the product information from the laser scanner and finds the item in the computer file. The computer looks up the price and other information about the product; for example: Is the item taxable? Is it eligible for food stamp redemption? Is there a bottle deposit? This information is immediately flashed back to the cash register.

The computer which stores the product and price information can serve about 50 terminals and may be located in the grocery store or in a remote location such as the grocery company's headquarters office.

Electronic Cash Register

In some systems product identification and price information are displayed for the consumer on an electronic viewer at the checkout counter. At the same time this information is printed on a receipt tape and a "beep" is sounded by the cash register to indicate that the price has registered.

Handling of Uncoded Items

Items not marked with the UPC can be rung up manually on the cash register by the checker. Almost all packaged items will be marked with the UPC within the next few years.

Most fresh meats and fish packaged in the store are not marked with the UPC. However, grocery stores can buy equipment to apply UPC labels to these items so that they can be scanned and automatically rung up. Unpackaged items such as fresh fruits and vegetables are usually not coded. Electronic produce weighing-computing scales can be incorporated into the computerized checkout systems.

Electronic Sales

Loose produce can be weighed on an electronic scale that is linked to the computer and the cash register. The store assigns a commodity code to each item of produce. The checker places the item on the scale and enters the code into the terminal. The item is weighed and its price is computed automatically. Both weight and price are flashed on the display and printed on the receipt tape.

Another way of handling produce is with an electronic scale not connected to the computer. Here the checker enters the price per pound into the scale. The scale computes the total price and the checker manually rings up that price on the register.

Weights and Measures Enforcement

"Weights and measures" enforcement officials* are responsible for testing scales for accuracy and checking labels on products for correctness. Weights and measures

regulations are established and enforced at the local and state levels of government. These state and local officials are also responsible for enforcing requirements for specific information on the new computerized receipt tapes. This consumer protection service helps to assure equity and fairness in market-type transactions to protect both buyer and seller.

Special Features of Computer Checkout Systems

Computerized checkouts offer some new convenience features and potential opportunities for better service for consumers:

• *Computerized checkout reduces errors and makes calculations easier.* Since most prices will be rung up on the cash register automatically, there will be fewer errors caused by the checker entering the wrong price.

Taxes, totals from items eligible for food stamp redemption, merchandise and bottle refunds, coupon redemption, trading stamps, and change also can be computed automatically.

If the consumer does not want an item that has been scanned, the checker can push a button on the cash register and rescan the item. The

COMPUTER-ASSISTED CHECKOUT: SAMPLE SALES RECEIPT

ABC FOOD — AMERICAN CITY ← Store Location

D/H CAKE MIX	.83	← Item Description
WALNUTS CAN	.59	
JELLO PUDDNG	.30	← First Item of 3/89¢
1 GREEN PEPPER	.34	
1 CUCUMBERS	.34	
Weight → 1.18lb @.89/lb ROMAIN	1.05	
CHRRY TOMATO	.79	
PASCL CELERY	.49	
DELICATESSEN	1.35	
1 SPRING ONION	.34	
JELLO PUDDNG	.30	← Second Item of 3/89¢
2.19lb @.49/lb BROCCO	1.07	
JELLO PUDDNG	.29	← Third Item of 3/89¢
NEST MORSELS	1.09	
SR DO CLB RL	.79	
SEAFOOD	2.96	
SEAFOOD	3.10	
GREETNG CARD	.60 T	← Taxable Item
DRUG	4.49 T	
TAX DUE	.26	← Total Tax
TOTAL	21.37	← Total of Order
CSH TEND	22.00	← Amount of Cash Presented
CHG DUE	.63	← Change Due

Date, Time → 2/25/79 16:02 0150/ 3 ← Store Number, Checkout Lane

THANK YOU — COUNT ON US

amount of the item will be deducted from the total.

• *"Two-for" and "Three-for" items do not have to be grouped together.* Even when these items are scattered and not checked out together, the computer automatically keeps track of them. In the case of three items for 29 cents, for example, the customer will be charged 10 cents for the first item passed over the scanner, 10 cents will be rung for the second item, and, even if many other items are scanned in between, only 9 cents will be charged for the third item.

• *Computerized checkout can provide more detailed receipt tapes.* The name of the product and its price as well as the price per pound for produce and meats are usually printed on the tape.

In addition to the total price, sales tax, and change due, most computerized receipt tapes give the date and time of purchase, identity of the store, and the checkout counter where purchase took place. These receipt tapes can be used for comparison shopping, budget planning, and recordkeeping.

• *Check cashing can be speeded up.* Stores can keep check cashing information for its customers in the computer for fast check verification.

• *Inventory control can be improved.* The computer can keep current and up-to-date inventory records. It also can supply managers with timely information about how quickly items move, what community preferences are, and when to order additional stock.

Consumer Issues

Computerized checkouts have also created some concerns among consumers. The most controversial aspect has been the possible elimination of individually marked prices by some grocery firms as a way of saving labor costs. According to these firms, with product and price information stored in the computer, the checker does not need to refer to a price stamped on each item. Instead, item prices can be posted on shelf labels. Grocery firms using computerized checkouts are testing consumer reaction to the continuation or elimination of individually stamped prices.

Consumer groups support the continuation of marked prices. They say that shelf labels can be misplaced and may be difficult to read. Marked prices on products make it easier to compare the costs of different brands, to check the price charged at the cash register with the marked one, and to compare the cost of a newly purchased item with one at home.

A recent study conducted for the supermarket industry compared consumer price awareness in computerized checkout stores using only shelf prices with price awareness in conventional stores using shelf and individual item pricing. Some reduction in consumer price awareness occurred when item pricing was removed. As a result of that study, the supermarket industry has recommended that stores continue the practice of price marking individual items while alternative methods of disseminating price information are discussed with consumer and labor groups.

In the meantime, legislation has been introduced in Congress and in several states requiring individually marked prices. At least 6 states and 18 cities already have laws with this requirement.

Some other issues raised by consumer groups are:

• Computerized records of customers' check cashing histories could create a threat to the privacy of the consumers who pay by check.

• The high cost of computerized equipment may be passed on to the consumer in the form of higher prices.

• Incorrect prices may be coded into the computer.

The Future

Supermarket firms will probably change over to computerized checkout systems in new and remodeled stores. Consumer reactions to computer-assisted checkout and specific preferences for price marking will be important factors in determining how that changeover takes place.

RETAIL STORES

POINT-OF-SALE (POS) terminals that are linked to computer systems are replacing conventional cash registers in department stores and other large retail establishments. The POS terminals assist in the checkout operation and help managers operate more efficiently by providing more timely inventory information.

The POS terminal—an electronic cash register—at the checkout counter collects information about the sales transactions and records it in a form that can be transmitted to a computer. At the present time, some checkers are manually ringing up merchandise information in the cash registers. However, many of these terminals soon will be equipped with a hand-held scanner or "wand" to read merchandise labels automatically.

National Merchandise Code

The National Retail Merchants Association, with the technical assistance of the National Bureau of Standards, has adopted a voluntary standard system for marking merchandise. This system is based on agreements reached among retailers, merchandise manufacturers, and business equipment suppliers.

The merchandise marking system uses a specially designed set of numbers and letters that can be read by automatic reading devices and by the consumer. The type style looks very much like the letters of the alphabet and the Arabic numerals in everyday use.

Reading Wand

The hand-held scanner or "wand" is linked to the POS terminal and reads the specially printed characters on the merchandise label. The label can be scanned from left to right, or from right to left, and does not have to be removed from the merchandise.

Price and merchandise information is transmitted by the wand to the POS terminal.

Point-of-Sale Terminal Systems

The terminal receives the price and item information. In some systems the terminal stores the information for later transmission to a computer for processing. In systems that are directly connected with a computer, the terminal sends the information to the computer for immediate updating of inventory records.

The terminal totals the customer's bill and computes the tax. The operator is guided through the transaction by a series of messages that light up on the terminal.

Price calculations—multiplying and discounting—can be done automatically to reduce arithmetic errors. The terminal, when linked to the computer, can be used to verify the customer's credit and to authorize checks.

The electronic terminal prepares a detailed receipt for the consumer showing item purchased, the sales department, any credits allowed, taxes, method of payment, and amount of change. POS terminals linked directly to the computer can also send information about credit transactions.

Special Features

- *Easier checkout.* The automatic reading of merchandise labels can make the collection of information about sales faster and easier.

- *Better inventory control.* Retailers hope that with better inventory control they will be able to keep their shelves well stocked with popular items. They also hope to better control their store's cash flow and credit operations to improve customer service.

- *Extra services.* Terminals connected to computers can be used to provide special customer services such as asking the computer about the availability of an item in another store or in the warehouse.

BANKS are using computers to exchange funds instantly without paperwork. These paperless transactions are called electronic funds transfers (EFT's). EFT's involve the exchange of money by means of computer generated and processed electronic records rather than by checks or cash.

Electronic banking can help banks reduce the costly processing of more than 26 billion checks a year, costs borne indirectly by the consumer. Electronic banking can also mean conveniences such as neighborhood bank teller machines and automatic payroll depositing.

The technology for a shift from checks and cash to electronic banking exists today. However, there are many unresolved societal, legal, and regulatory issues. How will individual privacy be safeguarded? How will fraud and errors be prevented? Will small banks be able to compete?

The National Commission on Electronic Funds Transfer was established to study the impact of electronic banking and to report its recommendations for legislation and regulation. Full scale implementation of electronic banking will be delayed until the regulatory agencies and the legislatures can consider the Commission's recommendations.

Current Forms of Electronic Banking

Banks have used computers and automated equipment for many years to process the millions of checks that are

The computer terminal permits bank transactions 24 hours a day. The customer can withdraw cash, make deposits, and transfer funds between accounts.

written every day. At present, some banks offer electronic banking services to their customers including: pre-authorized deposits and payments, automated teller machines, and other automated services.

Preauthorized Deposits

The direct deposit of an employee's pay into his/her checking account can be done by an electronic funds transfer or by the deposit of one check covering many employees, reducing check preparation and mailing costs. Some welfare and Social Security checks are deposited this way.

Direct deposit arrangements can help consumers by:

● saving time in cashing checks,

● providing funds even though the check recipient may be on vacation, ill, or away on a business trip.

● Eliminating the danger of lost or stolen checks.

Most automatic deposit programs guarantee the deposit. However, consumers may be dissatisfied if banks do not send confirmation of the receipt of deposits and merely include them on the regular statements prepared by the bank.

Preauthorized Payments

Some banks offer an automatic payment service to their customers. The customer authorizes the bank to pay recurring bills such as mortgage payments or to transfer funds between savings and checking accounts. These arrangements are useful to banks because they eliminate transaction paperwork and reduce item processing costs.

The consumer benefits by:

● reducing trips to the bank,

● saving postage to pay bills, and

● knowing bills will be paid in time to benefit from discounts and grace periods.

On the other hand, consumers may feel that they have lost control over how their money is spent. They may also miss being able to manipulate their bank accounts and take advantage of "float".*

*"Float" is the time between the issue of a check and its clearance at the bank. This time lag makes it possible to write checks before funds to cover them are actually deposited.

Automated Teller Machines

The bank customer can use the automated teller machine at almost any time to withdraw cash, to transfer funds between checking and savings accounts, and to make deposits and some payments such as loan installments. The customer inserts a plastic card into the terminal and is guided through the transaction by a series of instructions that appear on the terminal.

Other Automated Bank Services

In some states, POS terminals located in stores are linked with banks. Consumers can authorize electronic funds transfers by inserting a card issued by the bank into the terminal. They can cash checks and pay for their purchases in the retail stores by transferring funds from their accounts to the retailer's account.

Consumers are also paying bills by phone rather than by writing checks. They can call their banks to authorize the transfer of funds to retailers or utilities from their accounts.

Privacy and Security

Most people consider information about their financial transactions to be private and do not want that information to be used for anything other than banking purposes. They also would not want data about financial transactions to be used for surveillance—keeping track of where they shop and where they bank. Individual privacy and the public interest are issues that are being addressed by the National Commission on Electronic Funds Transfer.

The Federal government is also looking for ways to prevent privacy invasion, fraud, and crime in computer use. The National Bureau of Standards has developed methods and guidelines for encrypting* computerized information and for verifying the identification of people seeking access to com-

*Encryption involves electronically scrambling computerized data into an unintelligible form for transmission between a terminal and a computer or between computers. Only those users who are authorized to receive the data have the key to return it to an intelligible form.

puters. These techniques for improving computer security are useful not only to the Federal government but also to the retailing and banking communities.

The Future

Bankers are planning a system that will allow you to purchase goods and pay electronically from your bank account through the use of a nationwide card.

Automated banking systems of the future may greatly reduce the consumer's need for carrying cash or a checkbook. The development of these systems will be shaped by many forces—the acceptance of the consumer, the competitiveness of banks, government regulation, and new technology.

CONCLUSIONS

THESE computer applications by banks, grocery, and retail stores may be the beginning of new ways of doing business. Automation can benefit both the consumer and business by improving services while helping business to control its costs.

There are, of course, many unresolved problems and concerns that must be addressed by government, labor, business, and consumers before automation is accepted as a familiar and welcome part of the marketplace.
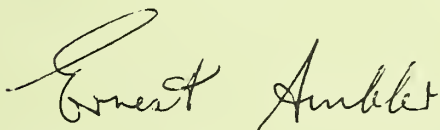
A Word from the Director

EASUREMENT and standards are needed and used by all areas of society. A consumer wants to compare energy consumption rates for a certain appliance. A transportation manager needs to measure the fire safety of bus seats. A chemical manufacturer must be able to monitor the environmental levels of toxic materials.

The National Bureau of Standards is a Federal laboratory that supports science and technology in the United States through the provision of uniform measurements, test methods, codes, and standards. Dedication to basic research leading to humane application of technology is a distinguishing feature of our work.

One important part of our work is the sharing of information— making sure that the results of our various projects are readily available to all who need to know. This publication is part of our Consumer Information Series, which is designed to share our knowledge and experience with you—the consumer.

"Automation in the Marketplace" is a topic of both interest and concern to many consumers. Some of our research in the field of computer science has produced information which we hope will be of practical value to you. We would like to acknowledge the assistance and cooperation of the following organizations in the production of this publication:

American Bankers Association
Computer and Business Equipment Manufacturers Association
Consumer Affairs Division, Department of Commerce
Consumer Federation of America
Federal Reserve Board
Food Marketing Institute
Giant Food, Inc.
Office of Consumer Affairs, Department of Health, Education
    and Welfare
National Retail Merchants Association

Ernest Ambler
Director

by
**SHIRLEY M. RADACK and
GRACE G. BURNS**
Institute for Computer Sciences
and Technology
National Bureau of Standards
Washington, D. C. 20234

**A Consumer's
GUIDE**

**FROM THE NATIONAL
BUREAU OF STANDARDS
U.S. DEPARTMENT
OF COMMERCE**