[*The following is an undated IBM press fact sheet published around 1956. It provides a concise overview of the variety of time-related products manufactured and sold by IBM in the 20th century*.]

HISTORY OF THE TIME EQUIPMENT DIVISION AND ITS PRODUCTS

Today the familiar letters IBM represent a worldwide enterprise whose products and services reach the farthest outposts of commerce and industry. Although the name of the International Business Machines Corporation did not come into being until 1924, the history of the organization goes back to 1911.

In that year three companies that had been operating separately for more than 20 years -- the Tabulating Machine Company, the International Time Recording Company of New York, and the Dayton Scale Company -- consolidated to form the Computing-Tabulating-Recording Company.

In 1914 the Board of Directors of the company succeeded in interesting Mr. Thomas J. Watson who, by reason of long and highly successful experience in the specialty field, was eminently fitted to manage the company. He immediately established far-reaching policies in engineering, research and patent development work, and an educational program for the building of skilled manpower.

The name of the company was changed to International Business Machines Corporation in 1924. In 1933 IBM acquired Electromatic Typewriters, Inc., Rochester, N. Y., thus adding a new product to its line. The Dayton Scale Division of the company was sold in 1934 to the Hobart Manufacturing Company. The IBM World Trade Corporation was founded in 1949 as a wholly owned but independently operated subsidiary handling the company's foreign business.

IBM products and services, used in more than 75 countries, include: Electronic Data Processing Machines, Electronic Calculators, Electric Accounting Machines, Bank Proof Machines, Test Scoring Machines, and Service Bureau Facilities; Electric Typewriters; Time Recorders, Electronic and Electric Time Systems, Traffic Recording and Toll Collection Systems, Electronic and Electric Paging and Communicating Systems, and Electric Scoreboards, among many others.

Time Equipment Division

The history of IBM's Time Equipment Division actually begins with three important 19th century inventions. In 1888 Willard Bundy invented the Bundy Key Recorder, a mechanical time recorder which, at one stroke, did away with all inaccuracy and disputes incident to the making up of a correct payroll. It consisted of a series of typewheels driven by a clock movement and arranged to print the exact time on a paper tape when a specially designed key was inserted into the recorder. Each employee had a numbered key and, when the recorder printed the time, it also printed the key number.

In the same year another type of time recorder was invented by Dr. Alexander Dey. Dey's Dial Recorder had employees' numbers around the circumference of a large ring on the front of the machine. To record his starting and stopping time, an employee positioned a pivoted pointer arm around to his own number and pressed it into a guide hole, thereby printing the exact time opposite his number on a prepared sheet inside the machine.

The third important invention in the time recording field was made in 1894 when Daniel M. Cooper patented the world's first card attendance-time recorder, known as the Rochester Recorder. Cooper's method used a printed card, divided by heavy horizontal lines into seven equal spaces for the seven days of the week. Each day's space was subdivided into IN and OUT spaces for both morning and afternoon registrations. When an employee inserted his card into the recorder and pressed a printing lever, the time was printed in its proper space on the card.

The companies formed for the manufacture of these three recorders later became part of the International Business Machines Corporation.

When IBM, under the leadership of Thomas J. Watson, started its research and development program in 1914, the Time Equipment Division of the company had a fairly complete line of time products. There were attendance and job recorders, a time stamp, a clock system, and a program machine for operating audible signals.

Time Recording Equipment

Card Attendance Recorders

The early card attendance recorder consisted of an elongated wooden case with a spring-driven clock mechanism housed in the upper section, and a shaft running down to a typewheel assembly in the lower section. This recorder was manually wound, with manual printing of time registrations. Shifting from IN to OUT columns and day-to-day changes were also manual.

During the early 1900's improvements in the attendance recorder included lateral shift of the card receiver for automatic IN-and-OUT positioning of the receiver, abutment change mechanism for automatic day-to-day spacing of time registrations, a two-color ribbon mechanism for visibly indicating late or overtime registrations; electric drive operation and self-regulation from a master clock.

Automatic Card Attendance-Time Recorders

The attendance-recorder field was revolutionized in 1938 when IBM introduced the first fully automatic card attendance-time recorder. This recorder, with card-actuated trip mechanism, featured direct subtraction; by this method each day's registrations moved vertically up the card and day-to-day positioning moved across the card; this allowed simple computation of each day's attendance time.

A program device mounted within the recorder permitted minute-to-minute changes in the spacing of registrations and in the operation of audible signals. This recorder became known as

the 8500 series. In 1948 and again in 1953 additional features were announced so that today the 8500 series recorder not only records time and programs audible signals automatically, but in addition will synchronize indicating clocks connected to it.

Attendance and Job-Cost Recorder
In 1940 the first recorder, designed specifically for a small business staff and capable of use both as an attendance recorder and job-cost recorder was introduced. This was a small compact machine with positioning of card and printing of registrations accomplished manually. This machine with many added refinements is called the Type 780 Recorder.

Automatic Consecutive-Spacing Recorder
Another major development in the time-recording field occurred in 1949 when IBM announced the first automatic consecutive-spacing recorder, known as the Type 8400. This recorder, featuring automatic positioning of card registrations by means of holes punched into the card, virtually eliminated the danger of over-printing time registrations where complex shift schedules were concerned. In addition, this recorder could be equipped with a program mechanism for sounding audible signals and could be used as both an attendance recorder and job-cost recorder. Compact in size, it was the first automatic recorder designed to meet the needs of smaller business organizations.

Job-Cost Recorders
The first job-cost recorder was developed in 1899 and contained a printing mechanism similar to the one used in the Dey Dial Recorder. This recorder was spring driven with either left-hand or right-hand manual printing.

Principles of electric drive and self-regulation were added to this recorder, and in 1935 IBM announced the first automatic trigger-trip job recorder. Once a job card or ticket was positioned in the receiver, the time was automatically printed. Today's automatic job-cost recorder is known as the Type 2500.

Recording Door Lock
The IBM Recording Door Lock was introduced by IBM in 1924 and redesigned in 1933. This is a door lock with a mechanism for recording key number and time the door was locked or unlocked. Interlocking bolts for additional doors and special catches for windows may be electrically connected to the lock to prevent its operation unless all bolts or catches are secured.

Time Stamps
The forerunner of present-day time stamps was a recording mechanism, enclosed in a box-like base with the typewheels exposed through an opening in the top of the base. Mail and other papers to be time-stamped were placed over the opening, and forced against the typewheels by manually depressing a plunger supported by a gooseneck protruding from the base. In 1935 an entirely new concept of time stamping was provided with the announcement of the first fully-automatic paper-trip time stamp; with numerous improvements this is now known as the Type 7800 Time Stamp. IBM also manufactures a semiautomatic time stamp (the 7400) and a manual-trip time stamp (the 7500).

Traffic Recorder
The IBM Traffic Recorder was introduced in 1936. Photoelectric cells were spaced diagonally across a road or highway; vehicles passing through these cells interrupted the beam, thus closing a circuit to the recording mechanism; this action accumulated the count of the number of vehicles, and once each hour printed the total count on a paper tape.

Toll Collection Systems
In 1940 IBM developed toll collection equipment for the Pennsylvania Turnpike. Each patron entering the Turnpike was presented with a validated ticket in the form of an IBM card. Remote registers were employed to keep an accurate record of vehicles entering and leaving the Turnpike.

In 1951 an improved toll collection system was developed for the Oklahoma Turnpike. Each patron was presented with a validated ticket which also had the number of axles of the vehicle printed on it in order to properly classify the vehicle and determine the rate.

At about the same time IBM engineers were developing new methods of control, utilizing punched-card principles, and in 1954 announced the toll collection system with dynamic weight classification whereby each vehicle was classified by weight. As a vehicle approaches the toll booth, the toll operator depresses an axle key and inserts a fare card. The card is immediately validated with the transaction number, day of year, hour and minute, and other identification numbers printed on the card. Axles, class (determined by vehicle passing over weight platform), interchange number, and a time factor are punched into the card. At the exit the card is presented by the patron, inserted into the recorder, and the proper axle key depressed. Again information is printed on and punched into the card. The three factors -- entrance and exit locations, plus classification -- determine the amount to be paid. The card is then forwarded to the central office and is used as a source document for auditing purposes. This modern system has many devices built into the equipment for the protection of revenue, and will be used extensively on new highway programs throughout the country.

[*See page 8 of our online exhibit "They Also Served: An Album of IBM Special Products, Vol. 1" available on the Internet at http://www.ibm.com/history for an illustration of, and additional information about, the IBM Toll Collection System*. -- Ed.]

Electric Time Signals

Master Clock Systems
The original clock system consisted of a pendulum-operated master clock to which secondary units (such as indicating clocks, attendance and job-cost recorders) were connected by wires. The master clock, the timekeeper for the system, once each minute sent an electrical impulse over the connecting wires advancing the secondary units one minute. For the operation of audible signals, a program device, controlled by the master clock, caused signals to sound on a predetermined schedule. This program device consisted of a perforated paper tape. The time schedule was punched into the tape, and when the perforations arrived at a definite point in the travel of the tape, an electric circuit was closed to operate signaling devices such as bells, horns, etc.

The master clock system of that period was a forerunner of the IBM Self -Regulating System marketed in 1924. This was the first system with definite provision for keeping secondary units in agreement with the master clock. Once each hour each individual secondary unit was compared to the master clock for accuracy; if behind time, the secondary would accept as many extra rapid impulses from the master clock as it needed to restore itself to master-clock time; if fast, the secondary would be held up until again in agreement with the master clock. If program signals were operated on the system, the program device was also checked each hour, and corrected when necessary, so that uniformity in indicated recorded and signaled time was assured.

IBM engineers continued their work in this field in a never-ending search for new, more flexible and economical methods of achieving accurate, uniform time.

In 1947, the first steps in what was to become a major revolution in the time system field was undertaken. A new highly accurate master control was introduced, featuring a frequency-regulated master movement that required no manual regulation as was necessary on pendulum-type master clocks.

A new concept in automatic program controls was announced. This featured a small, compact drum into which signal-setting reading bars were inserted. Although the size of this machine was reduced, the machine offered far greater flexibility in programming than had heretofore been achieved.

These new units were housed in a modern, functionally designed case and became known as the Type 91 series master controls.

Electronic Time Systems

One year later, in 1948, IBM revolutionized the time system field by announcing the first electronic time and program control system. This system featured the automatic self-regulation of individual indicating clocks and recorders, and the automatic sounding of signals without special clock and signal circuit wiring.

New quiet-operating indicating clocks with sweep-second hands were connected to local 110-volt 60-cycle outlets.

Signaling devices were connected to local unswitched lighting circuits.

Automatic self-regulation and automatic sounding of signals were accomplished by sending electronic pulses over the existing alternating current building wiring, thus eliminating the need for special wired circuits.

This system opened up vast new markets by affording institutions and industry the advantages of synchronized time for the first time without the expense of special wiring and it was completely flexible in that indicating clocks, recorders and signals could be moved from one location to another at minimum wiring expense.

The twelve-hour correction feature, added to the Electronic Time System in 1953, provided a means of restoring individual indicating clocks, connected to local outlets, to correct master control time after a power failure of up to 12 hours. This feature virtually eliminated the necessity of ever manually setting an individual indicating clock.

In January 1955 the twelve-hour correction feature was added to Time Recorders and to the Master Control Program Device.

The IBM Synchronous Wire-Connected Time and Program System was also introduced in 1948. This system embodied many of the features of the electronic system, including a broad range of individual correction, and the use of new synchronous-motor indicating clocks -- except that special wires are required between the master control and the various subsidiary units.

As installations of the Electronic Time and Program System multiplied, so too did the applications for its use. IBM engineers have kept pace with this growth.

In 1953 the flexibility of this system was markedly improved by the introduction of the Type 91-3 Master Time and Coded Program Control and the coded signal receiver. These new products met the requirements of modern secondary and regional schools for a greater number of program circuits.

Central Control System
In 1955 the IBM Central Control System was announced. This system using carrier frequency pulses took over the routine manually-performed operations of industry and accomplished them automatically without special wiring. Such utility functions as turning lights on and off, transferring heating systems from day to night operation, turning air conditioning and ventilating motors on and off, these and hundreds of other operations can now be done automatically with the resultant savings in light, heat, and power and the man-hours required to accomplish them manually.

The announcement of the Central Control System will broaden the base of the Time Equipment Division operations as a complete line of controls is now available in the field utilities, controls that do not require special wiring.

IBM Indicating Clocks
IBM manufactures a wide variety of indicating clocks. Single-dial and double-dial indicating clocks with two types of dials and several different case finishes are available to meet the many requirements of industry and institutions. In addition, IBM Executive clocks consisting of skeleton dials in modern and conventional styles, and attractively designed hands and rosette are available in a wide variety of finishes. These clocks meet the requirements of architects for attractive ornamental clocks for installation where something more elaborate than the standard indicating clock is required.

IBM Outside Clocks
IBM outside clocks are considered "Landmarks of Time" and are installed in hundreds of communities throughout the nation. Operated by heavy-duty induction motor-driven movements and controlled by self-regulating master controls, IBM outside clocks are models of precision accuracy. A wide variety of outside clocks are available from the familiar tower-clock to the direct-read clock that indicates correct time in illuminated numerals.

Radio Supervised Time Control
The IBM Radio-Supervised Master Time Control and the Studio Clock System are two recent advancements in precision timing.

The Radio-Supervised Master Time Control includes a radio receiver tuned to the time tone originating at the National Bureau of Standards -- Stations WWV and WWVH. The receiver is mounted inside the master-control case and wired through a timing and signal-checking mechanism to the master-control movement. Automatic correction of the master control occurs when the radio receiver receives the time tone. The master control then initiates correction to all indicating and recording units on the system.

This unique Master Time Control can also be equipped to operate the IBM Studio Clock System; this consists of specially engineered synchronous-motor indicating clocks whose second-hands arc checked once every minute with the accuracy of the Master Time Control and corrected when necessary.

Other Products

The Time Equipment Division of IBM, in addition to the manufacture and sale of products directly related to its name, is engaged in many other fields.

Fire-Alarm Systems
IBM Fire-Alarm Systems are installed in hundreds of schools, hospitals and other locations where immediate egress of personnel from a building is of paramount importance in the event of fire. IBM provides many types of fire-alarm systems, varying with the requirements of the individual building.

A simple system consists of fire alarm stations, generally located near the exits. When the glass is broken in the station, a circuit is completed, sounding all signaling devices, such as horns and bells, continuously.

Another type of system employs fire-alarm stations, that have their own code mechanism. Operation of the station sounds the code number of the particular station on all signaling devices, thus denoting the point of origin of the fire.

[*See page 4 of our online exhibit "IBM's Swing Era Oldies (Vol. 1): A Sampling From The 1930s" available on the Internet at* http://www.ibm.com/history *for an illustration of, and additional information about, IBM fire alarm systems*. -- Ed.]

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Telephone Systems
IBM Intercommunicating Telephone Systems are used extensively in schools and other institutional and industrial buildings to provide a means whereby a central office may carry on a two-way conversation with any outlying station. In addition one outlying station may be connected to any other outlying station through the central office.

Scoreboards
IBM Electric Scoreboards are of the finest quality available and feature timing movements of the DEAD-STOP type that provide precision accuracy. Score indications and other pertinent information are accomplished by lamp banks, providing illuminated numbers readily visible from a distance. Control of timing operations and switching of numeral indications are done remotely by a press-box control unit with manually operated switches. Scoreboard equipment is available for both indoor and outdoor use.

Hospital Signaling and Communicating Equipment
There has been a vast hospital construction program underway, nationwide in scope. To meet the requirements of modern hospitals for attractive dependable signaling and communicating equipment, IBM offers a complete line in this field.

IBM Nurse's Call Systems provide a patient with a means of summoning assistance. Over each patient's bed, a calling station consisting of a receptacle, pilot light and extension cord with locking button is installed. A patient requiring assistance depresses the locking button to its extreme position and releases it. This operation accomplishes the following: turns on a bulls-eye lamp at the bedside station, and in the dome light over the room door. It momentarily sounds a buzzer and causes a light to glow at nurse's duty stations, diet kitchens, etc., and momentarily sounds a buzzer and illuminates the room number on an annunciator at the nurse's station. Lights are extinguished when the nurse visits the room and resets the locking button.

The IBM Nurse to Patient Communication System provides all the features of the Nurse's Call System in attracting a nurse's attention. In addition, however, audio-type speakers are installed at the bedside station and connected to a master phone at the nurse's station. When a patient initiates a call, the nurse depresses a key on the master phone set corresponding to the designated room number and can then carry on a two-way conversation with the patient. The room speakers are highly sensitive so that a patient lying in bed and talking in a whisper may be heard by the nurse at her station. This system, developed during the war years to offset a shortage in nursing help, allows a nurse to first ascertain the needs of a patient before going to the room, thus accomplishing in one trip what formerly required two trips. In addition a nurse at her station, by depressing keys corresponding to the various rooms can listen in to each patient and detect unusual breathing, etc.

The Doctor's Register System consists of one or more panels with individual, engraved doctor's name plates which are illuminated by individual lamp compartments behind each name. Upon entering the hospital, a doctor operates a switch located adjacent to his name on the entrance register. This will cause his name to be illuminated on all associated registers, indicating his

presence in the hospital. The system may be equipped with a recall feature that indicates to a doctor entering the hospital that there is a message for him.

The Doctor's Visual Paging System consists of a series of lamp annunciators mounted vertically or horizontally in corridors and strategic areas of a hospital. A selector keyboard, generally located at the telephone switchboard, controls the numerical indications on the annunciators. Each doctor is assigned a number that flashes on and off on all annunciators in the building when a doctor is being paged. Annunciators are sometimes equipped with buzzers or chimes that will attract attention to the annunciators when in use.

IBM Interval Timers are used in hospital operating rooms. Similar in appearance to standard Indicating Clocks, the dial has a minute circle with minute and second indications only. These timers are used to guide the anaesthetist in the administering of anaesthesia and are sometimes used in scrub-up rooms to assist the doctor in determining the amount of time elapsed in scrub-up periods.

Electronic Paging System
An outgrowth of the Electronic Time and Program System was the announcement in 1953 of the New IBM Electronic Paging System. This system made it possible to transmit coded audible or visible signals within a building, plant or area to locate designated personnel. Paging is accomplished without special wiring, because signaling devices are connected to local AC lighting circuits and respond to electronic pulses transmitted over the building wiring.

Lectern
The IBM Lectern, originally conceived by Mr. Thomas J. Watson for use in IBM meetings, was introduced commercially in 1954. Expertly designed and constructed of walnut veneer, it features push-button elevation of the console to meet individual speaker's height requirements, push-button adjustment of the manuscript table angle, speech timer with edge-lighted dial, provisions for the mounting of microphones, and many other features designed to create speaker comfort and audience appeal.

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These are the products of the TE Division of today. A continuous program of planning, developing and engineering assures us that the embryo products of our laboratories will result in the new products of tomorrow.