DATAMATION®

65

July

new horizons

UNDELIVERABLE SECOND-CLASS MATTER

- ☐ Moved—Left no address
- ☐ Unknown
- ☐ No such number
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- ☐ Unclaimed

MOVED TO THE FOLLOWING NEW ADDRESS:

General delivery
(Street and number)

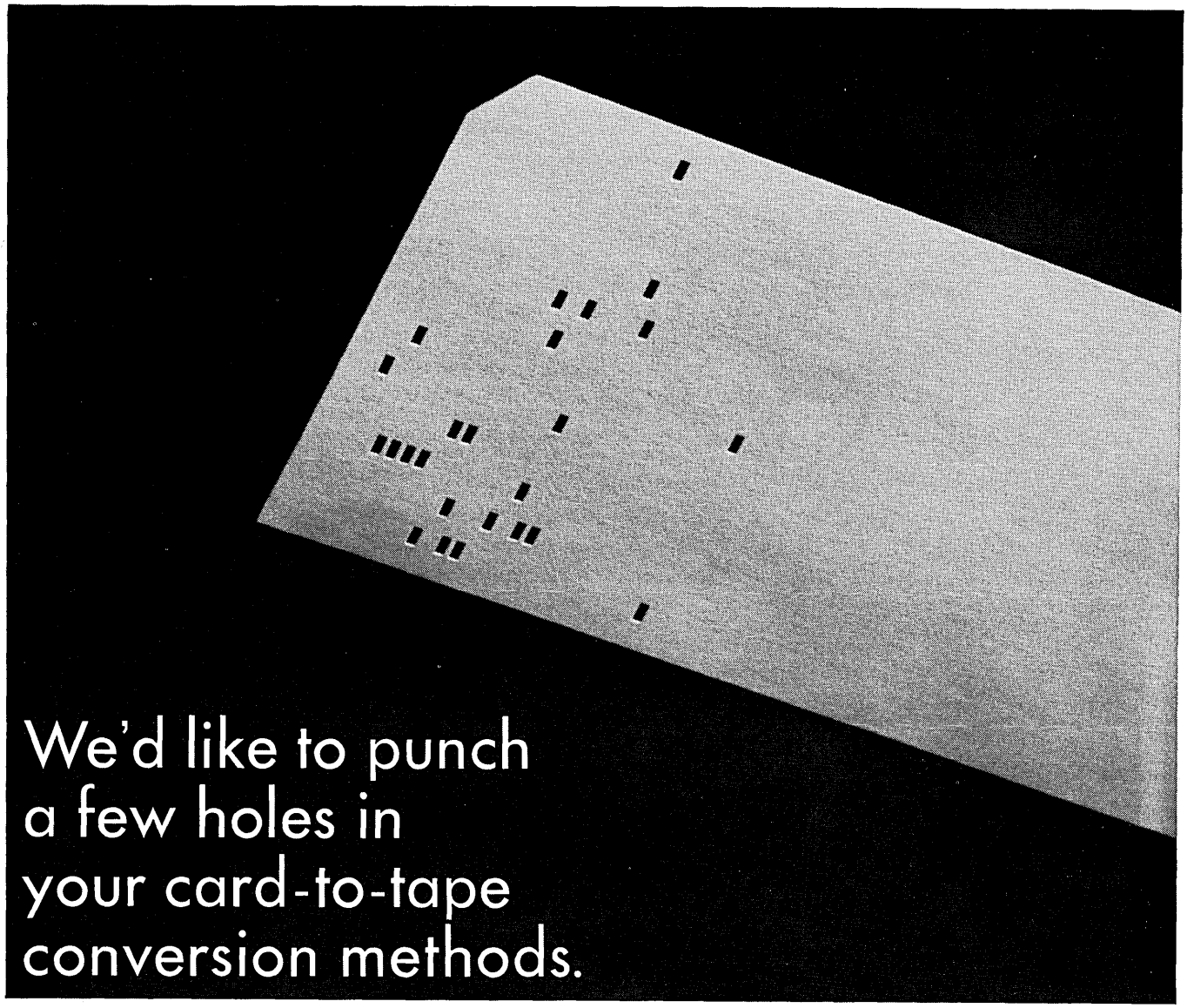
Garrisonville
(Post Office)

Virginia 22463
(State and ZIP Code)

change addr

POD Form 3579
Nov. 1963

c43—16—26336-8 GPO



We'd like to punch a few holes in your card-to-tape conversion methods.

New Ampex Card-Tape System operates at up to twice the speed of other systems. At one-third the cost.

Put your computer back to work at the job it was designed for—computations. Let the new Ampex Card-Tape System take over: it's the fastest, most economical converter system for high-speed, volume requirements.

What makes the CTS revolutionary: it can handle up to 1500 cards/min. for 80-col. cards and up to 2000 cards/min. for 51-col.—square or round edges. It produces high-density tape (556 or 800 CPI) to give you savings in computer processing time. And you can choose from four low-cost CTS systems to fit your speed and volume requirements. You can lease or buy.

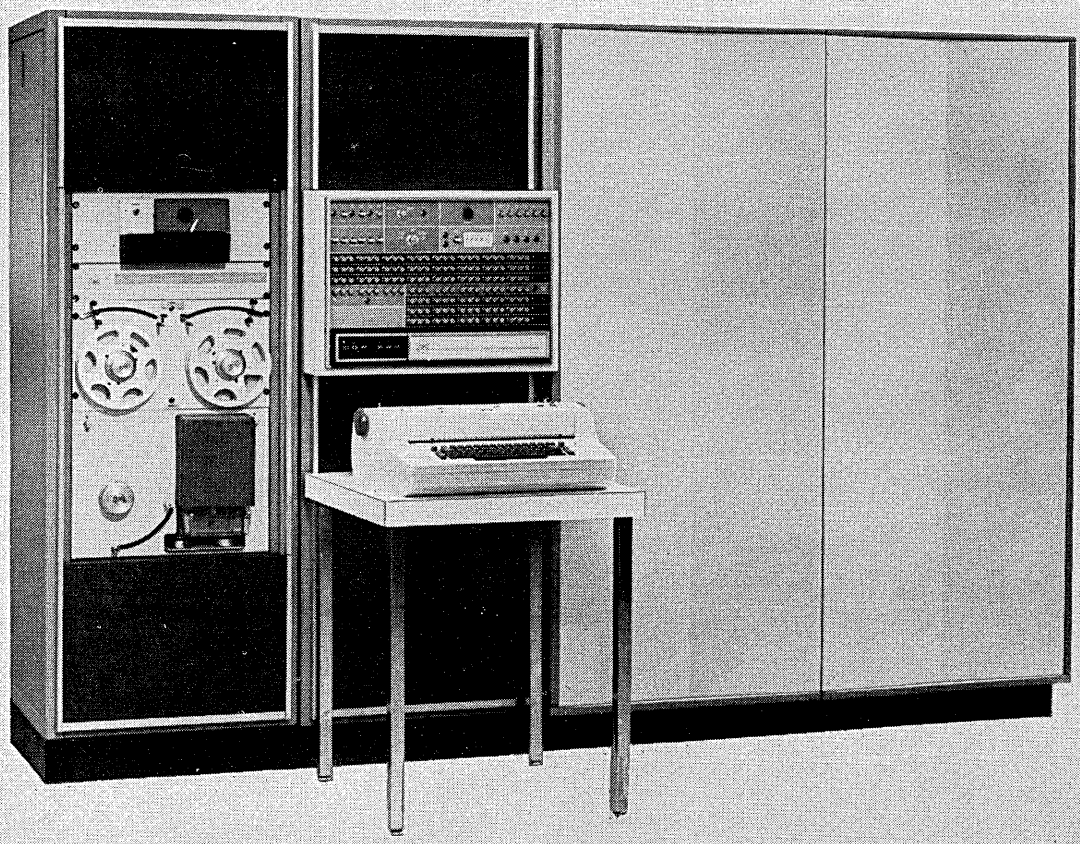
What makes the CTS efficient: you can operate it off-line—does not tie up your central computer. It's IBM compatible: generates tapes for IBM 7330, IBM 729 series, IBM 2400 series or ASCII tapes. Uptime is high because of automatic system stop on bad card jam; ability to be cleared by operator (no standby maintenance required); the incorporation of an advanced design tape transport whose highly simplified threading and gentle handling of tape give maximum data reliability; and space-age dependability of system.

What makes the CTS reliable: Ampex. A world leader in computer tapes, digital tape transports, core memory devices and tape recorders. Write for more information on the CTS. Write Ampex Corp., Redwood City, California.

AMPEX

CIRCLE 1 ON READER CARD

DDP-224, FROM $70,000



24-bit word, 1.9 μsecs cycle, 4096-word memory (expandable to 65,536) with typewriter and paper tape I/O unit options. Features transfer rates up to 325,000 words per second; 260,000 computations per second — 3.8 μsecs add, 6.46 μsecs multiply, 17 μsecs divide. (Typical add time with optional floating point hardware is 7.6 μsecs for 24-bit mantissa, 9-bit characteristic.) Special options available to combine several DDP-224's into large scale integrated multi-processor systems. Comprehensive service and programming software including FORTRAN IV. Mainframe priced from $70,000. Configuration shown: $105,800.

3C

3C SALES OFFICES: NEEDHAM, MASS.; FOREST HILLS, N.Y.; LEVITTOWN, PA.; SYRACUSE, N.Y.; SILVER SPRING, MD.; HOUSTON, TEXAS; HUNTSVILLE, ALA.; ORLANDO, FLA.; DES PLAINES, ILL.; DETROIT, MICH.; CENTERVILLE, OHIO; LOS ANGELES, CALIF.; PALO ALTO, CALIF.; KENT, WASH.; ALBUQUERQUE, N.M.

COMPUTER CONTROL COMPANY, INC.
OLD CONNECTICUT PATH, FRAMINGHAM, MASSACHUSETTS 01702

CIRCLE 4 ON READER CARD

FIRST STEP TOWARD EFFECTIVE ON-LINE, REAL-TIME DATA PROCESSING

Speeding up the collection and distribution of information is the first step toward effective on-line data processing. And Teletype machines are still the most versatile, reliable, and least costly terminal equipment available today.

Teletype Model 33 and 35 page printers and automatic send-receive sets operate on the same permutation code approved by the American Standards Association for information interchange. This means they "talk" the same language as most business machines and computers.

The Voice of Data Processing In many data processing systems, this Teletype equipment is used as input/output devices for computers as well as for on-line communications. In addition, they can be used to punch messages and data off-line for later transmission on-line at full speed to distant points or directly to computers.

These sets have new 4-row keyboards that are familiar to any typist, and eliminate shifting between letters and numbers to further reduce errors. Also, fixed information can be stored on punched paper tape and combined with variable data to save retyping.

Data Processing Uses of Teletype Sets An eastern food processor uses Teletype page printers to receive transmissions from its midwestern branches reporting their daily sales and inventories. These statistics are processed in a computer which provides management with up-to-date information on inventory and sales conditions.

A Texas gas company uses Teletype page printers not only to communicate messages and accounting data, but also to transmit information about field measurement equipment to the home office.

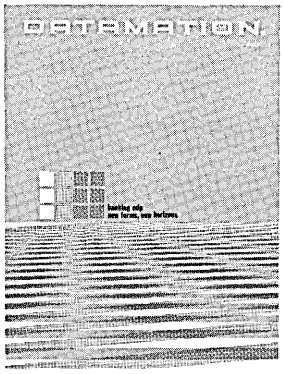
Other Teletype page printer applications include: airlines for real-time reservations, railroads to maintain optimum freight car inventory, insurance companies for real-time processing of policy payments and claims, hospitals to forward patient-treatment information to centralized billing and accounting, and in many other communications systems to speed the flow of information.

Applications Brochure Available The many applications of Teletype page printers in real-time data processing are another reason why they are made for the Bell System and others who need reliable communications at the lowest possible cost. To obtain a copy of our "HERE'S HOW" brochure write: Teletype Corporation, Dept. 81G, 5555 Touhy Avenue, Skokie, Illinois 60078.

TELETYPE®

machines that make data move

CIRCLE 5 ON READER CARD



july
1965

volume 11 number 7

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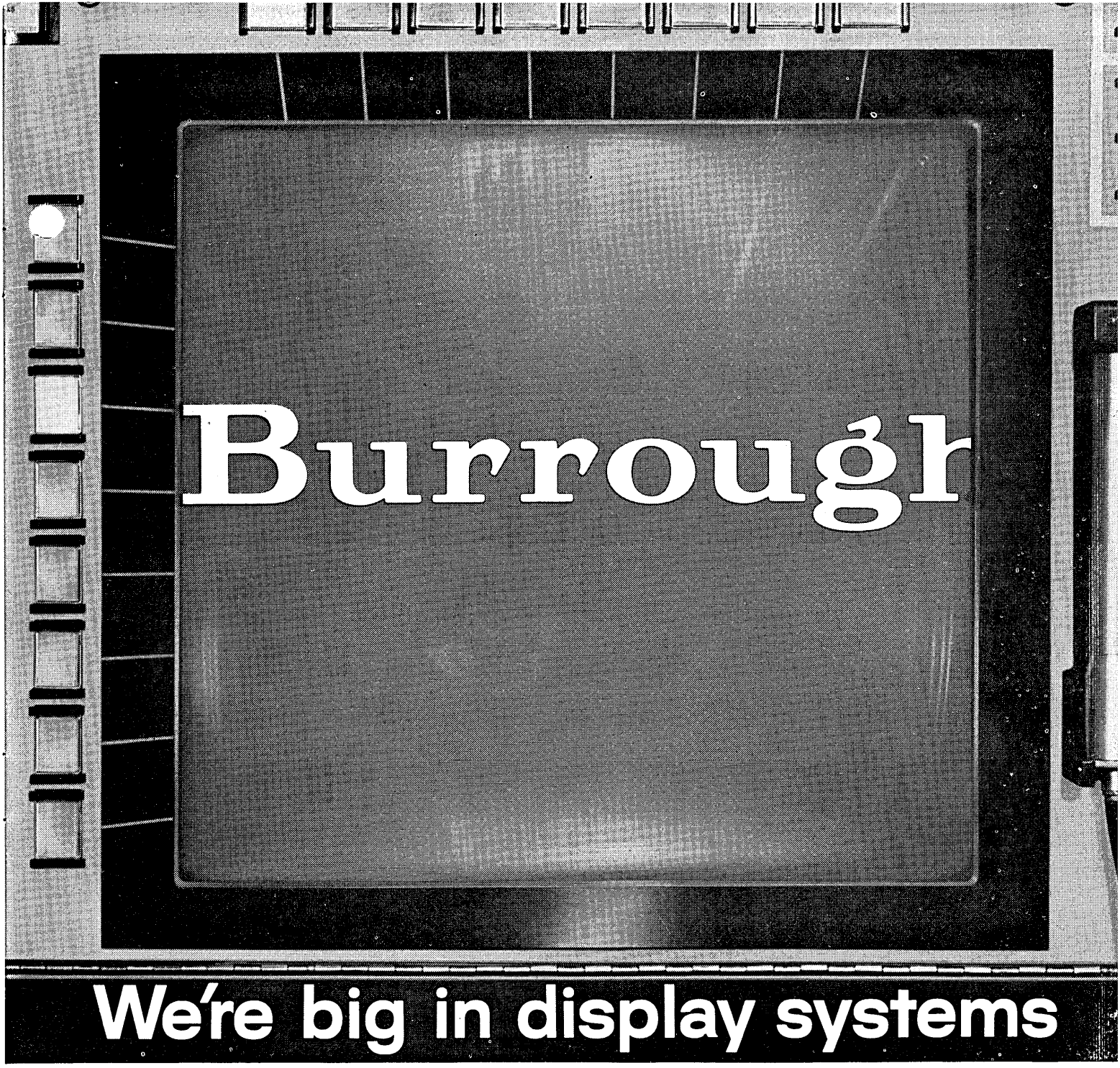


We're big in display systems

Photo of Air Defense Display Console

We've delivered hundreds of display systems to the Air Force, Army, Navy, NORAD and FAA. They range from microfilm recorders and CRT consoles to large screen wall displays. They're used in our nation's most advanced command and control, air traffic and information retrieval systems.

So, if you're looking for expert help in data display, write Burroughs Corporation, Defense & Space Group, Paoli, Pa., or phone 215, NI 4-4700, Ext. 237.

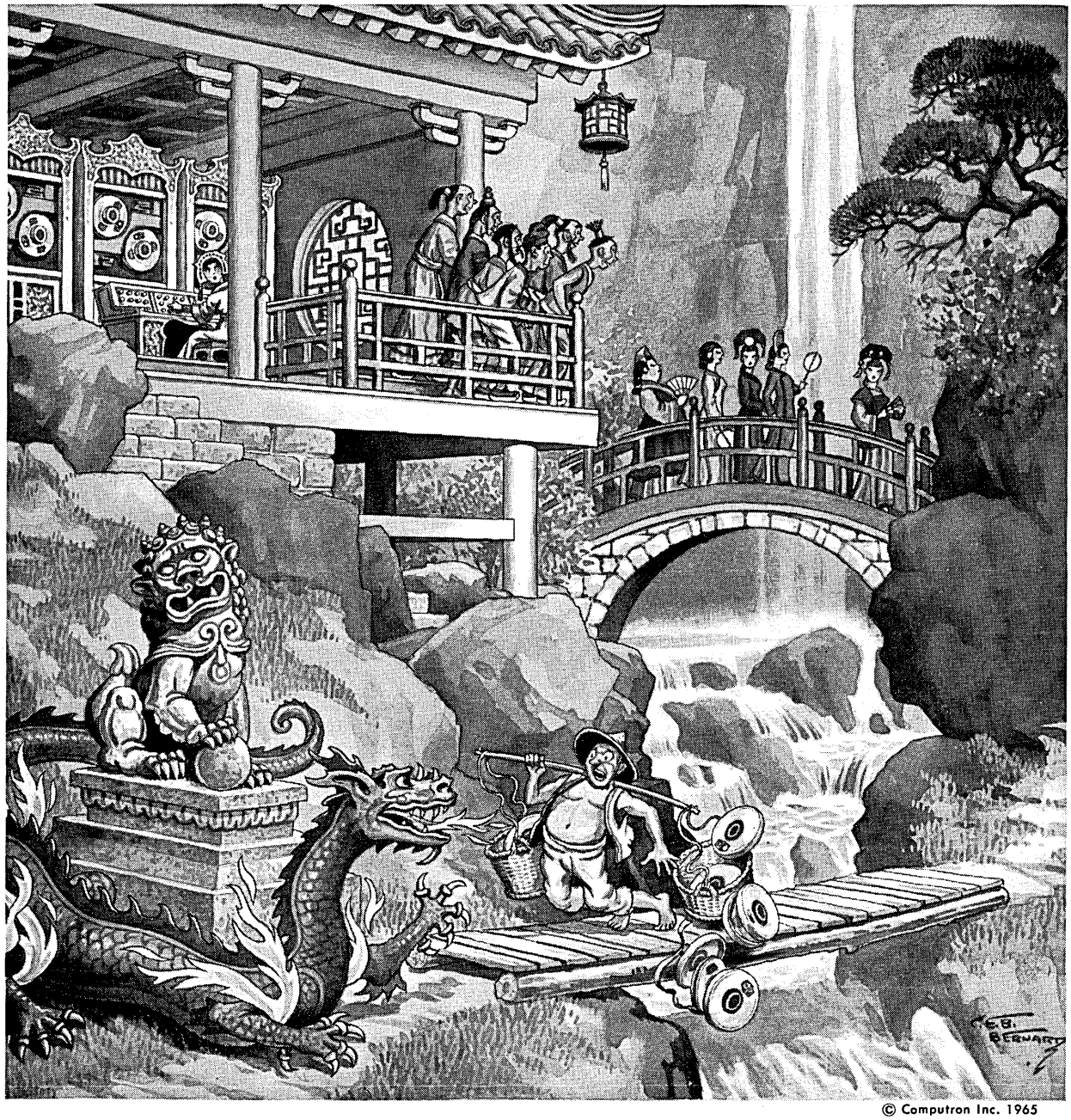
Ask for the new 20-page brochure "Display Systems from Burroughs."

Burroughs Corporation

CIRCLE 7 ON READER CARD

Burroughs—T.M.

AN OFF-BIT HISTORY OF MAGNETIC TAPE... #7 of a series by Computape*



Once upon a time, there was an Emperor who kept 3,007 concubines to cheer his leisure hours.

In fact, there were so many Chinese cookies around, the Palace came popularly to be known as "The Bakery".

The Emperor was a fanatically suspicious man — so much so, he had a special bank of computers installed just to keep track of his harem. (Information as to the precise whereabouts of each of his charges was continuously fed onto reels of magnetic tape.)

Yet all his precautions did not prevent his very favorite morsel, Lotus Lovely, from running away, one moonless night, with the milkman.

Pity the poor Emperor. He might have known that with ordinary magnetic tape you're bound to have a dropout problem. Which is why he switched to Computape.

One of a series of documentaries made possible by COMPUTRON INC., a company even more interested in making history than fracturing it. Our Computape is so carefully made that it delivers 556, 800 or 1,000 bits per inch — with no dropout. Available with 7, 8, 9, 10, 16 channel or full-width certification to meet your systems requirements.

Now — if Computape can write that kind of computer tape history — shouldn't you be using it?

*Reg. T.M. Computron Inc.

COMPUTRON INC.
MEMBER OF THE BASF GROUP
122 CALVARY STREET, WALTHAM, MASSACHUSETTS

COMPUTAPE — product of the first company to manufacture magnetic tape for computers and instrumentation, exclusively.

CIRCLE 8 ON READER CARD

DATAMATION 65®

july
1965

volume 11 number 7

automatic
information
processing
for business
industry & science

IBM announces three low-cost advances for SYSTEM/360.

Three new devices can help SYSTEM/360 grow as you grow...

IBM 2415 Magnetic Tape Unit

Our 2415 adds tape processing to SYSTEM/360 Model 20. It makes low volume tape jobs practical for Model 30. It reduces card handling and increases throughput.

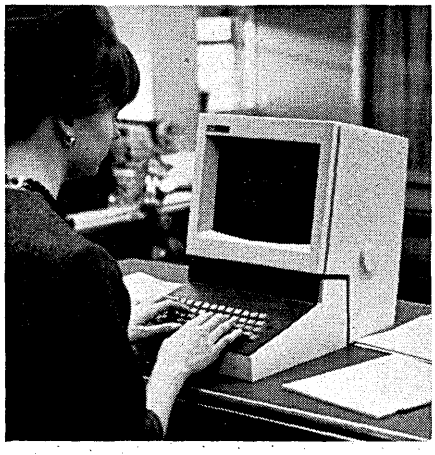
Data rate for our 2415 is 15,000 bytes or 30,000 digits per second. Its large storage capacity handles bill of material files, name and address files, and historical records.

IBM 2260 Display Station

Our 2260 consists of a fully buffered keyboard and CRT screen. When hooked into SYSTEM/360 (Models 30 through 75), it provides a quick, easy way to get information in and out of your computer.

You simply "type" your data on the 2260's alphanumeric or numeric keyboard. Data then becomes an image on its display screen.

The 2260 has 60 different characters, both letters and numbers. Twenty-three are special symbols.



When information appears on its 4 x 9 inch viewing area, you can check it or change it. Then you press a control key and data is fed into the computer's file. Almost instantly, the screen displays your solution. Or you can retrieve previously stored data for editing.

Hundreds of units—near or far—can be attached to one SYSTEM/360. When directly connected to a computer channel, our 2260's data rate is 2560 characters per second. On a telephone line, its data rate is 120 or 240 characters per second, depending on the data set used. Rental starts as low as $89 a month.

IBM 2314 Direct Access Storage Facility

Our 2314 is part of IBM's continuous effort to provide less expensive, efficient storage capabilities. When attached to SYSTEM/360 (Models 40 through 75), the 2314 gives you more storage capacity at a lower cost per character. It gives fast, direct access to large amounts of sequential or random data.

The 2314 uses small, lightweight disk packs. Each pack is removable and also interchangeable. Each stores more than 25 million bytes of information.

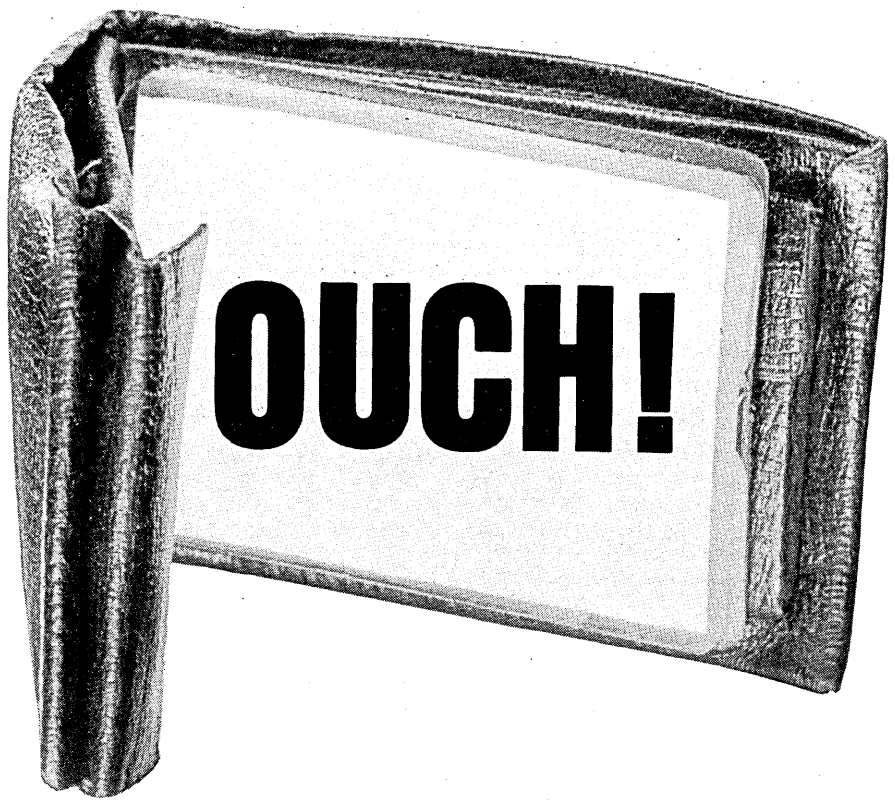
Changeover time from one disk pack to another: only one minute.

See your local IBM *sales representative. Ask him about these new devices. See how they fit into your* SYSTEM/360. *See how easily they fit into your budget.*

SYSTEM/360–The Computer with a Future.

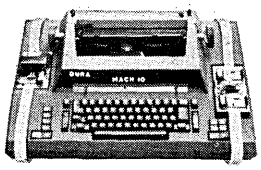
IBM®

CIRCLE 9 ON READER CARD



ARE COMPUTER FEED BILLS
PINCHING YOUR PROFITBOOK?

STOP IT!



. . . with the Dura® MACH 10®. An automatic typewriter, you say? It is. That's the simplicity of it. From standard typewriting action, the MACH 10 produces tapes for direct computer input. No need for specially trained operators, either.

Multi-step data preparation is eliminated. The MACH 10 takes only one—automatically punching out the tape as the operator types hard copy. No separate verification step is necessary. Hard copy can be visually checked for accuracy. If an error is made, you don't have to start over. The MACH 10 permits correction in seconds.

The MACH 10 also offers greater program flexibility because tape isn't limited by a set number of columns as on tab cards.

In the same time it used to take—two, three, even four times more data can be produced with a MACH 10. It dramatically reduces the cost of your computer feed bills. Details? Get them all. Call your local Dura representative, or send in the coupon below.

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Gentlemen:
Please tell me more about the Dura MACH 10

Name_____ Title_____

Company_____

Address_____

City_____ State_____ Zip Code_____

SPEED • SIMPLICITY • VERSATILITY

CIRCLE 10 ON READER CARD

DATAMATION Calendar

● Measurement and analysis of random data is the theme of a course offered at UCLA, Aug. 30.

● The German Study Group on Cybernetics (DAGK) will meet August 31-September 3, Kiel, Germany. The meeting will be sponsored by the Communications Society and a branch of the Assn. of German Electrical Engineers.

● Two seminars, sponsored by RCA Institutes Inc., will be held at Marriott Key Bridge Motor Hotel, Wash., D.C.—"Logical Design for Digital Systems," Sept. 13-17, and "Digital Systems Engineering," Sept. 20-24.

● Electronic Associates Inc. is offering the following courses: "Dynamics and Control of Process Systems," Sept. 13-17, San Francisco Computation Center; "Hybrid Computation," Sept. 20-25, Los Angeles Computation Center, Oct. 25-30, Princeton Computation Center; "Digital Computation," Oct. 4-8, L.A. Comp. Center, Nov. 29-Dec. 3, Princeton Comp. Center; "Modern Methods in Analog Simulation," Oct. 18-23, Princeton Center. Fees are from $200-275.

● Conference on urban planning information systems and programs will take place at the Windermere Hotel, Chicago, Sept. 15-17, under co-sponsorship of Northwestern Univ. and American Society of Planning Officials.

● A symposium on Long Range Planning for Management will be held in Paris, September 20-24, under the auspices of the International Computation Centre, Rome.

● Course on "Digital Simulation" for engineers, scientists and operations analysts will be held Sept. 20-24, Huntsville, Ala. Sponsor is Control Technology Inc., Long Beach, Calif. Fee: $250.

● Univac Users Assn. fall meeting will be held September 22-24, Pittsburgh Hilton Hotel, Pa.

● The 1620 Users Group will meet October 5-8, Americana Hotel, New York City.

175* engineers, scientists and mathematicians have already ordered our new PDP-8 general-purpose computer.

Here are some of the reasons why:

PDP-8 costs only $18,000.
Yet it gives you a complete and powerful computer capability with a fast 1.5 μsec cycle time, 12-bit word length, core memory, and the ability to work with almost any type of computer input/output device.

Many applications.
PDP-8 is being purchased for such diverse fields as oceanographic research, biomedical and psychological research, physics and mathematics. Applications such as pulse height analysis, time-of-flight and bubble chamber analysis. To control test equipment, analyze the data obtained and print out the results. To monitor and control petrochemical processes, automatic production equipment and nuclear reactors.

Field-tested programming package.
With PDP-8, you get Macro-8 Symbolic Assembler, FORTRAN System Compiler, DDT-8 Symbolic On-Line Debugging Program, Symbolic Tape Editor, Floating Point Package, Mathematical Function Routines and utility and maintenance programs. The same software package has been field-tested in a variety of installations on PDP-8's predecessor, the PDP-5.

Moreover, you join a large and active group of PDP computer users (DECUS) in various disciplines and industries. They share ideas, programs, advances.

A computer all your own? And why not?
Perhaps you've never seriously considered the many ways in which a computer could take over the tedious detail jobs and leave you free for more creative effort.

Now you can afford to dream a little.

**as of June 30*

For information about the PDP line of computers (including the new medium-size PDP-7 and the large-scale PDP-6), ask any computer expert. For user handbooks and technical specifications, just call the nearest Digital Equipment office. DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754, Telephone: 617 897-8821.

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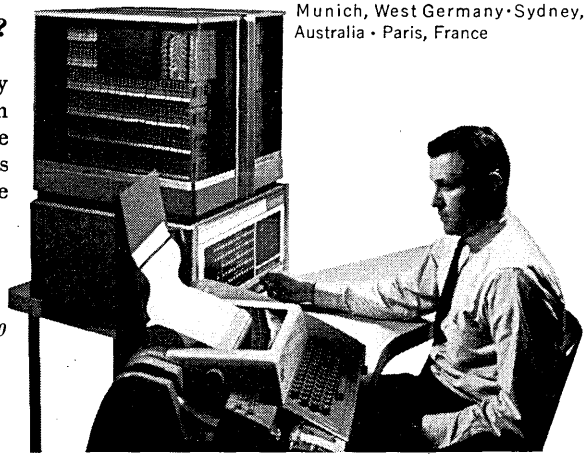


digital

CIRCLE 48 ON READER CARD

letters

australia revisited

Sir:

I get the unfortunate impression from the various articles in the March issue that computer design work in Australia had ceased on the completion of CSIRAC. This was not so. Some small machines were designed and constructed, such as a transistorized digital differential analyser and a small transistorized drum machine, since called "Snocom." Both were completed by Dr. M. W. Allen.

However, the most significant item found no mention in your issue. This was a machine, CIRRUS, designed and constructed by a small team headed by Dr. Allen, and comprising members of the Univ. of Adelaide and CSIRO, and has been in operation for the last two years in that university. The objective was to obtain as much computing power as possible from the little amount of money allocated towards buying equipment—about $60,000 to $70,000.

This device, although essentially a 36-bit-word machine, operates on 18-bit registers, all of which are heavily time-shared during each instruction, and which are controlled by an extensive read-only micro-program system. Because of the heavy reliance upon microcoded sequences, it is difficult to distinguish the division between hardware and software implementation. However, microprogramming allowed (using only paper tape peripherals) for fully multiplexing a number of programs, concurrently held in the main store, in a time-shared manner with virtually no increase in the hardware requirement other than additional paper tape peripherals. At least two separate operating stations had been working for some time. Furthermore the micro-program boards can readily be removed and a different set installed in a matter of minutes, thus changing the whole appearance of the system to the programmers—e.g., changing it into a list processor.

Allowance was made for part of the main store to be of read-only type and to contain the basic compiler and library of subroutines (about 8K words). It is possible for more than one program held in the store to access the same library routines and for more than one compilation to be time-shared within the same store.

Program location data, including control registers, are held in a "program catalogue" in a restricted area of the main store and all working space, modifiers, registers, etc., for each program occupy a small "register store" operating synchronously with 6-microsecond cycles of the "main store." Double indexing for the base addresses of a program and its register store area (as well as the current index value for array modification) occurs. This is carried out in a "routine phase" of the micro-program sequence which also allows for store protection. The "routine phase" leads to the required "execution sequence." All programs may automatically be relocated so that vacant areas of the main and register stores may be consolidated for further programs to be accepted.

All I/O is via a single multiplexed channel with buffers, and interprogram switch times are reduced to the order of only hundreds of microseconds.

T. PEARCEY
Canberra, Australia

computer conferences

Sir:

My reaction to the ACM Reprogramming Conference and IFIP Congress 65 is confirmed by conversation with colleagues and overheard fragments of comments by attendees: the organization, format and conduct of these meetings must be questioned. I would suggest the following:

1. The subjects of the meeting should be "identified" by keynote speakers well in advance of the meeting. Identification should take the form of abstracts or precis of the keynote address; such abstracts are the bases for invitations to submit papers.
2. All papers are refereed prior to their acceptance, and made available to registrants at registration time. No paper published in this way will be presented orally. On the basis of the refereeing, in-

dividuals will be selected to lead seminars at the meeting.

3. The format of the meeting should then be:
   a) Each keynote speaker makes his address, setting out the subject of his session.
   b) Following the keynote speech, registrants attend the seminar of their choice. At the seminar, the leader makes extensions of his printed remarks, as he sees fit. There would then ensue a dialogue among the participants.
4. Very likely—to judge from attitudes and activities at previous meetings—the scheduled seminars might lead to other seminars or informal meetings. Provision must be made to allow this informal activity.

It is not my intent to insist that this proposal is the only acceptable format for meetings of our society. Rather, I submit it as one way to improve the quality of such professional gatherings as those recently concluded.

ROBERT M. GORDON
Santa Ana, California

cusip & asa

Sir:

You state that banking is pursuing with other industries, and through ASA, a thing called CUSIP (April, p. 109). At the last multiple-industry meeting called by CUSIP it was stated that this program of developing a standard security identification numbering system was not going through the regularly available channels of the American Standards.

ARTHUR J. TUFTS
Life Office Management Assn.
New York, New York

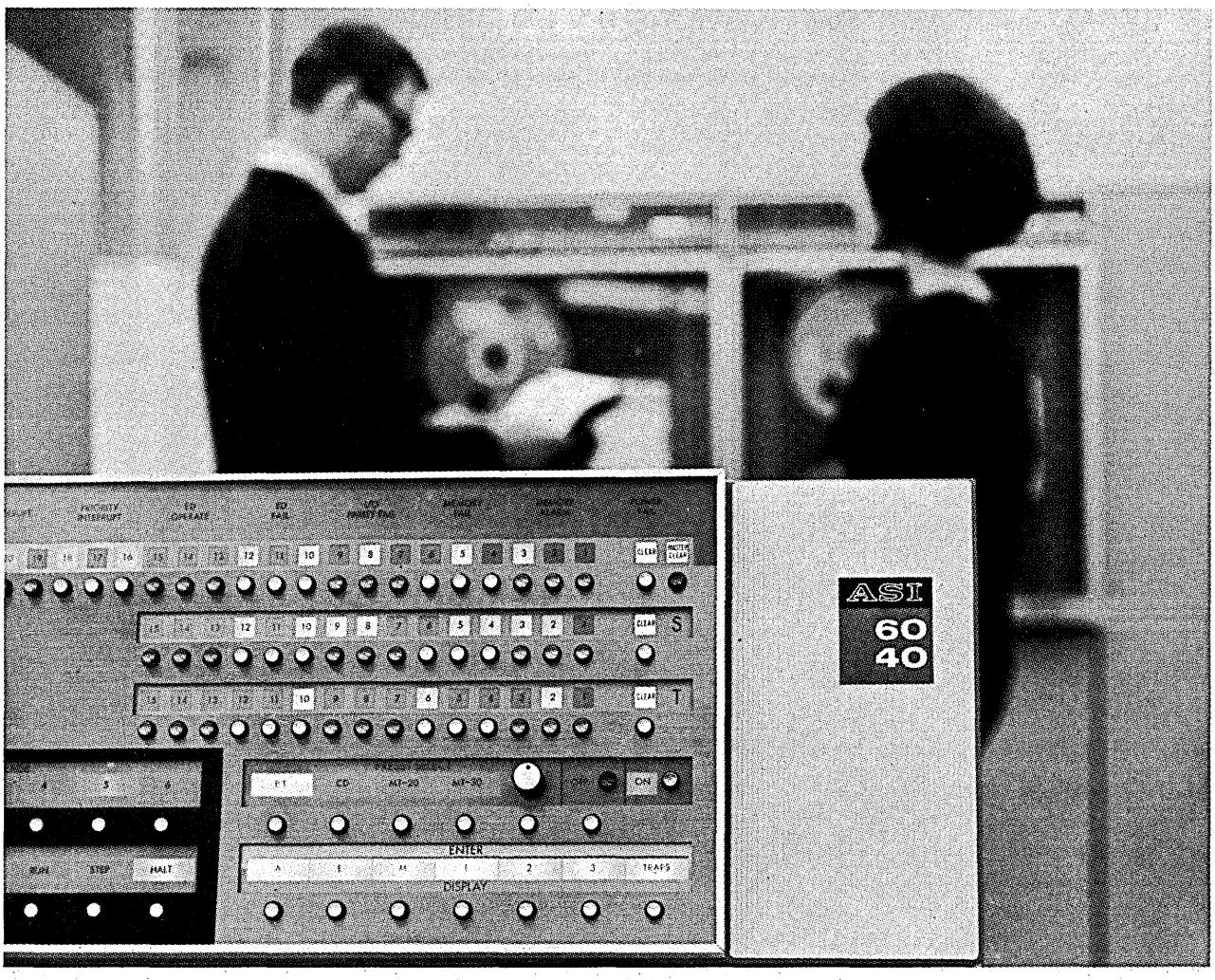
We stand corrected.

the balanced "t"

Sir:

It occurs to me that the author of "The T Formation" (May, p. 49), on proper design of organization charts, does not grasp the following simplifying theorem: the sum of the movements in both the clockwise and counterclockwise directions about any node of an organization chart should equal zero.

R. BENJAMIN
RCA-EDP
Cherry Hill, New Jersey



From ASI's continuing program of new product development

Behind this ASI console stands more than a superior computer . . .

Behind the ASI Computer stands a proven company policy to provide support and service to you as an ASI Computer user.

In addition to high productivity hardware, Advanced Scientific Instruments supplies its customers with as many, or more, extras as any other digital computer manufacturer. All resources of ASI are committed to providing all the support and service required in your application.

This support may take the form of special programs, in addition to the high speed Extended FORTRAN Compiler or the One-Pass Symbolic Assembler. It may be the quick reaction, top-level assistance to "black box" system integration with any other computer-associated device.

ASI service includes not only the customary programming, installation, and maintenance service but also the custom handling that is available only through a supplier who treats each customer individually.

All hardware is designed with the latest state-of-the-art improvements. Monolithic integrated circuitry and advanced packaging techniques are incorporated in the *ADVANCE* Series computers.

Even in regard to price, based on a competitive study, ASI offers equipment with more productivity per dollar than any competitive units.

Contact us now — an ASI representative will show you the special services which can facilitate your computer installation.

ADVANCED SCIENTIFIC INSTRUMENTS

DIVISION OF ELECTRO-MECHANICAL RESEARCH, INC.

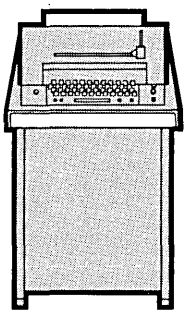
8001 Bloomington Freeway, Minneapolis, Minn. 55420

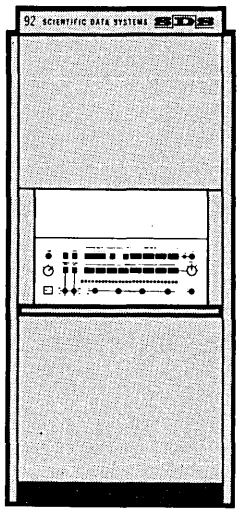
CIRCLE 16 ON READER CARD

Everybody's WORKING on integrated circuit computers. We're DELIVERING them.

SDS CASE HISTORY #258:

Last March at Beckman Instruments, Inc. SDS quietly delivered the first commercial computer to make extensive use of monolithic integrated circuits. Why were we so quiet about it? Simple: There'd been so many promises about integrated circuit computers we figured someone ought to deliver first and advertise later.





THE NEW SDS 92

Here's a short course on the SDS 92: It has a 1.75 μsec memory cycle time and a 3.5 μsec add time. For $29,000, it comes with 2048 words of memory, control console, buffered I/O channel and a Model 35 Teletype keyboard/printer. The memory is expandable to 32,768 directly addressable words and has a "scratch pad" feature allowing immediate access to operands, addresses and temporary storage. There is also a hardware index register so that indexing requires no additional time. Any number of optional buffered I/O channels with rates to 572,000 words per second, can be added to the basic unit.

THE 92's INTEGRATED CIRCUITRY

All flip-flops in the 92's main frame, including all registers and memory circuits, are integrated circuits. These monolithic circuits, built to SDS specifications and packaged in TO-5 cans, are mounted on plug-in cards along with other components. About half of the 100 circuit cards in the computer contain integrated circuits. We would have had to use 140-150 cards if we had used ordinary components. Fewer cards mean fewer interconnections, and as a result the reliability of the system is at least three times that of other current equipment. Fewer failures occur, and those that do can be fixed faster and more economically.

GENERAL PURPOSE FOR SPECIAL APPLICATIONS

The SDS 92 is designed for systems' applications. Its high speed and powerful computing capability, combined with its low cost, make it highly competitive to special purpose, one-shot equipment. And, being a general purpose computer, the SDS 92 offers the capability to change, expand and adapt to the requirements of the application-flexibility which cannot be obtained in specially designed hardware. Any of the SDS 900 Series of peripheral equipment may be used with the SDS 92, to provide it with a full line of tested, field proven communications devices. Several standard system configurations are offered for such applications as data scanning and logging, direct digital control, seismic data formatting, message switching, data collection, hybrid control, and digital events evaluation. These standard 92 centered configurations may then be further custom adapted to particular applications and needs.

THERE'S MORE TO THE STORY

If you're ready for integrated circuits, only SDS is ready for you. The SDS 92 is now in full production. Isn't it time you learned more about it? A simple inquiry or a phone call to our nearest sales and service office is a fast way to find out.

SDS

SCIENTIFIC DATA SYSTEMS, 1649 SEVENTEENTH STREET, SANTA MONICA, CALIFORNIA

Sales offices in: Santa Monica, New York City, Boston, Washington, D.C., Philadelphia, Pittsburgh, Wilmington, Houston, Huntsville, Cocoa Beach, Dallas, Chicago, Detroit, Albuquerque, Denver, San Francisco, San Diego, Seattle, Anaheim, Minneapolis, St. Louis, Phoenix. Foreign representatives: CECIS, Paris, France; Geneva, Switzerland; Kanematsu, Tokyo, Japan; RACAL, Sydney, Australia; Instronics, Ltd., Stittsville, Ontario, Canada.

CIRCLE 17 ON READER CARD

intelligence) and commercial (airline reservations, etc.). Editors got demo briefings of machine translation, automatic mapping, and displays, plus a discussion of integrated circuits and thin films and a look at the BRIC-1, an experimental prototype i.c. computer which will precede a new line of military machines (six months or so from now).

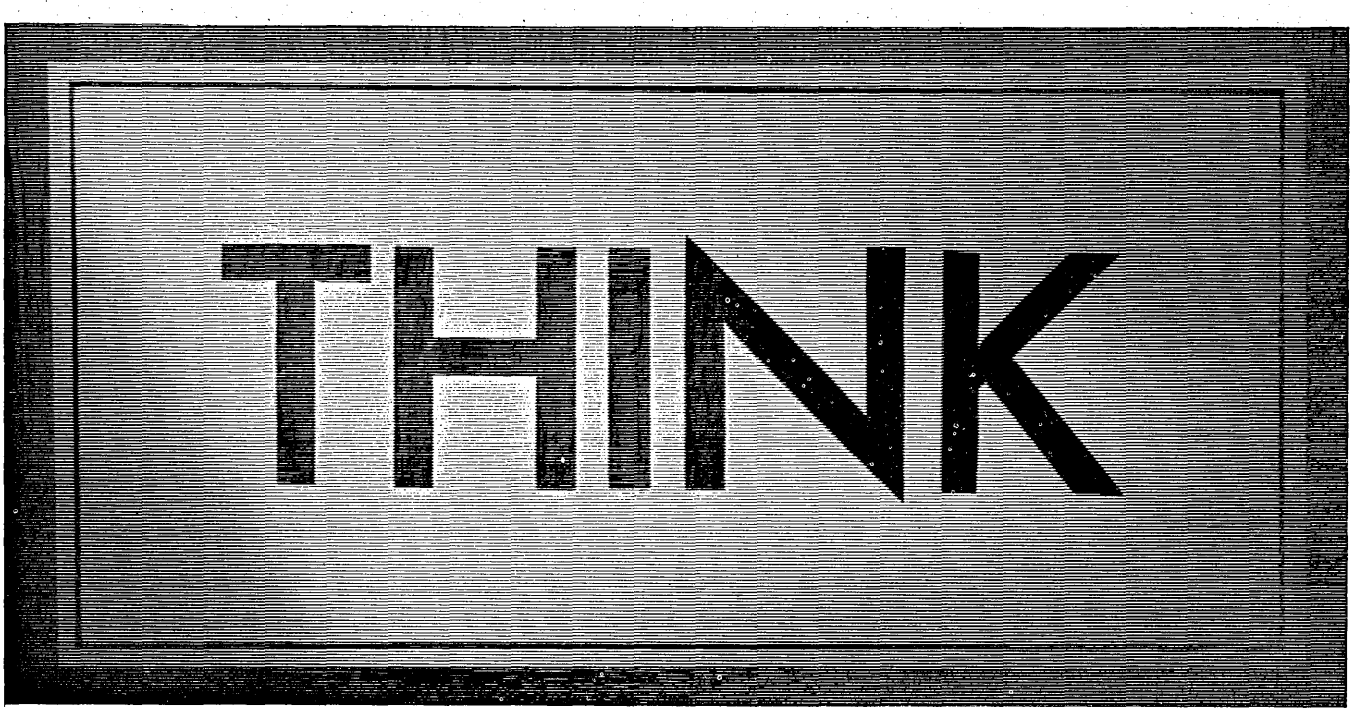
Afterwards, Dr. Ramo reviewed reasons for his company's retreat from the commercial computer business and process control. It seems the commercial side is "pretty well covered, has attained a mundane aspect." Besides, it isn't profitable. Process control, he complained, has drifted toward gp machines (B-R can buy 'em cheaper than make 'em), meanwhile glorifying hardware and forgetting the total process. Now in the bigger-than-computers information handling business, B-R plans a "bold and courageous" bid for leadership in C&C communications and intelligence, is willing to sweat out the difficult period of researching the research that will lead to products producing profits and glory.

USERS AWAITING 360'S GET FREE ADVICE

All 360 users should get COBOL subsets and test the programs they're going to run on the new machine, says Larry Schoenberg of Automation Sciences Inc. And instead of massaging the old machine during the reduced rent period, take the 360 time and use it for emulation, Schoenberg advises. Other tips from the NYC firm: those replacing two machines with a 360 should know that only one emulator fits a machine; possible solution is to get one emulator and one simulator. In '66, says ASI, emulators will be available for Spectra 70, will run faster than on the 360. But there's no emulator for the 360/75; you might want to get a 65 first and move up to a 75 within one year.

RUMORS AND RAW RANDOM DATA

Despite recent upgrading of the 1108 (added multiprocessing logic,262K directly addressable, 750-nsec memory), Univac may unleash a new line in August. Internal code name: Great Box A. Don't be surprised if it's 360-compatible...At a recent TC 2 Algol working group, one member held up the PL/I manual, said, "Any language requiring a manual this thick isn't worth considering." That's called the scientific attitude...Good bet dept.: IBM will announce a faster 360/40...SBC is burned up but good over a fat IBM contract (it could reach $30-million) awarded ITT's service bureau for design automation work on three 7094-II's...Prudential Insurance is looking for some customers for its special 360/40 Cobol, developed by CUC...ARPA is funding the linking of three big computers at UCLA's computing center, the med school and the WDPC. The idea: let users at remote terminals get into any of three 94's, which have access to each other's files. Each center will get a 360/40 which will be upgraded to 50's plus 1050 terminals and 2260 displays next year...One expert's advice to 1401 owners: sell. Quick. Now going for 80% of original price, but if IBM cuts rentals, watch out...Programmers are studying how best to use an IBM 7044, modified to address 2 million words, when it's full of working programs. A total of 2 hrs/day on the "404X" is being offered by IBM to ARPA-funded schools like MIT and UCLA, who will have on-line access to the large memory.



we did when we designed CTμL.

We thought about the logic designer when we created the Complementary Transistor Logic family of integrated circuits. We packaged both NPN and PNP transistors in a single, monolithic, Silicon Planar Epitaxial microcircuit. It allows you to obtain logic decisions with delays of 3-5 nanoseconds; you get rise times of 5-15 nanoseconds; binary counting rates of 30 to 40 mc.

We thought of the production manager when we packaged the CTμL. It isn't fussy. Doesn't require careful, expensive, touch-me-not treatment. Flow solder it. Insert it by hand or by machine. You can use both sides of the circuit board. Standard commercial production handling is all this little package expects.

We thought of the general manager when we put the price tag on. Why fight the eternal battle of speed versus cost? With CTμL you can have nanosecond logic at a price practical for commercial computers.

So why not give your next generation design some second thoughts? We have a complete data package at the ready. Just drop us a note. Meanwhile, see your Fairchild distributor. He has the CTμL family in stock. Put a few into **your** prototype. Chances are your competitors have thought of it already.

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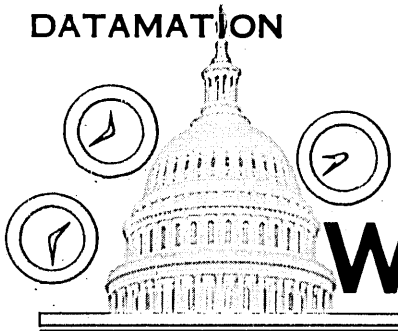
CIRCLE 19 ON READER CARD



WASHINGTON REPORT

DOD SOFTENS POSITION ON BROOKS PROVISO

Recent release of a report prepared under the direction of the Defense Dept.'s Robert Moot indicates DOD is prepared to implement, after a fashion, one of the recommendations contained in the Budget Bureau's recent report on government computer operations -- to wit, that contractors should be required to buy, rather than lease, more of the federally-financed computers they now employ on government projects. The proposed procedural changes, however, are a far whoop and holler from the concept of centralized computer procurement for federal agency and contractor alike, long urged by the General Accounting Office and embodied in the Brooks Bill, H.R. 4845.

Shortly the Brooks Bill is expected to be favorably reported on by the House Government Activities committee and come before the full House. This time, however, unlike 1963, significant opposition may be encountered on the floor. "A lot of early supporters of the bill have become aware of all its implications over the past two years, and now they're reluctant to go along with such a far-reaching change," noted one unwavering supporter of 4845.

NIH GOES 360, MAY GET COMPUTER STUDY ARM

IBM has nailed down another of the belweather computer-using agencies, this time the National Institutes of Health, beating out a passel of competitors with a 360/40-cum-65 configuration. The 360 will replace two Honeywell 800's, providing Number One with a measure of revenge for all those liberated 1401's. The interim 40, to go in by January, will be upgraded to a 65 by August '66. Up to 15 remote terminals on the NIH campus in Bethesda will share time on the system's central processor, augmenting the agency's already impressive array of computing gear which includes a recently acquired CDC 3200, a soon-to-be-installed CDC 3100 (linked to an analog computer), a bevy of 1620's and a Monrobot.

The House recently approved an additional $1.25 million for establishment by NIH of a new Division of Computer Research and Technology, and the Senate is expected to go along with the increment.

BITS & PIECES

Dr. Sam Alexander, pioneer computerite who heads up information technology research at BuStandards, will be the next chairman of the federal government's Inter-Agency Committee for ADP. Though an informal body, the IAC is currently handling several formal jobs for the Budget Bureau, arising out of that agency's recent report on government computer operations. One task force, under the AF's Joe Cunningham, is looking over computer selection practices and procedures by the various agencies, with an eye to suggesting improvements if needed. Report due September 1. Another IAC group is trying to figure out some way to standardize nomenclature on computer applications.

Now she reads information from stored computer records (or adds it)...instantly.

Suddenly . . . a clerk or teller has at her fingertips the ability for high-speed handling of business data. It took her only a few minutes to learn. The "missing information link" is provided by the new Stromberg-Carlson S-C 1100 Inquiry Display System. It is designed for banks, insurance companies, utilities, airlines and other organizations which must refer frequently to stored data.

Simple as a typewriter: When the operator receives an inquiry concerning an account or record she uses the keyboard to enter account number and appropriate computer code. She then visually verifies the complete entry on the cathode ray tube screen. By depressing the "transmit" key, she sends the message to the computer memory in a fraction of a second — and the S-C 1100 immediately displays the requested data on the screen. Entries can also be made by the operator and added to the stored record automatically.

Multiple units: Over 400 of these desk-top units may be used to work with a centralized data processing system. Two models are available — one displays up to 100 characters; the other up to 500 characters.

Benefits include: Increase of computer efficiency, better budget and inventory control, reduction in external and internal telephoning, manpower savings, greater personnel efficiency and better morale because of faster availability of information.

For complete details on the new S-C 1100, write: Stromberg-Carlson Corporation, Data Products—San Diego, Dept. F-36, P.O. Box 2449, San Diego, California 92112.

STROMBERG-CARLSON
CORPORATION
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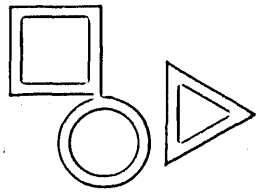


EDITOR'S READOUT

THE TWO WORLDS OF BANKING AND EDP

The fact that this month's issue highlights edp in banking may surprise or pain some of our readers . . . perhaps because they know either too much or too little about the ways in which banks are making use of computers. Of course, there *are* people in the computing profession who are surprised to learn that computers are doing *any*thing besides inverting matrices, calculating trajectories, and integrating ordinary differential equations. Many of those who do know shrug it all off with the "using a jackhammer to drive a thumbtack" argument.

Well, we don't claim that all of the uses of computers are equally important and intelligent. And a lot of the ways banks use computers don't intrigue us very much. But banks are, nevertheless, an economic force to be reckoned with . . . and they have already had a sizeable influence on the information processing technology. Even if you rule out MICR as a passing fancy, you can't wipe out the fact that one large bank (Bank of America), put one of today's leading computer manufacturers (GE), in business with one big order . . . and in the process set the tone and scope of banking data processing for nearly a decade.

And banking's ambitious plans for edp—discussed in several articles in this issue—make it clear that it hopes to become an even bigger force. To abbreviate and oversimplify, banking is making noises about becoming *the* financial information processing utility. They're talking about becoming the central clearing houses for all sorts of financial and credit transactions at every level—down to paying your bills and mine, and investing our money.

Despite the staggeringly important implications of these ambitions, banking and information processing remain essentially two separate worlds, with the manufacturer representing about the only common ground. Banking edp management does not, by and large, attend computer conferences. Computer people generally don't attend the ABA automation conference.

The problem has been created and cultivated by several things. In the first place, computing professionals have tended to look down their noses at banking's mundane uses of computers. And they talk a jargon laymen can't understand. Bankers, meanwhile, began with the fairly dubious assumption that bankers were best equipped to understand banking problems . . . including the use of computers.

There are signs that both attitudes are changing. More and more well qualified edp systems specialists are finding their ways into the ranks of banking top management. More competent computer professionals are contributing to ABA automation conferences. Someday, a banking edp expert may deliver a paper at an IFIP conference.

In the meantime, we hope that this issue of DATAMATION will help a little to bring closer together the two worlds of banking and edp. We think that the implications of banking's information utility dreams make that hope an urgent one.

BANKING AUTOMATION: A CRITICAL APPRAISAL

by ROBERT V. HEAD

In surveying the field of banking automation, it is necessary to distinguish between what has been accomplished within savings institutions and what has transpired in the commercial banks. The introduction of data processing equipment has been proceeding apace in both kinds of institutions. Essentially, the data processing activity within the savings banks (and here one may generically include savings and loan associations) has concentrated on development of on-line real-time systems employing teller window machines linked to a computer for the purpose of processing savings account transactions. These savings bank systems (and there are a number of them presently operational) are interesting in that they—along with the airline reservations systems—are among the earliest operational real-time systems for commercial data processing.

It is the purpose here, however, to examine the more complex data processing environment of a commercial bank. Because of the scope and variety of commercial banking services, there is abundant opportunity for system development of the most sophisticated kind. To grasp the true potential of the computer in such surroundings it is necessary to understand something of the characteristics of commercial banking.

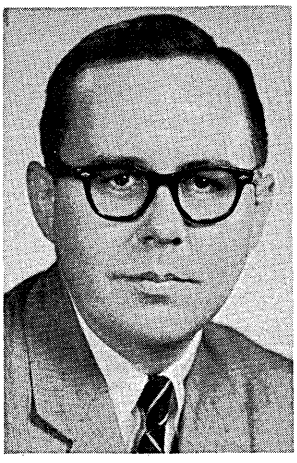
There are more than 13,000 commercial banks in the United States. The criterion for ranking these banks according to size is total assets. Bank of America, the country's largest, has assets of almost $15 billion. The typical bank is much smaller, however. According to *Fortune* magazine, there are only 50 banks in the U.S. with assets of more than $700 million.[1]

In general, the following activities form an integral part of the operations of a commercial bank:

- Demand deposit accounting. To the outside world this means checking accounting, and it is the bread-and-butter application of computers in commercial banking. It was to facilitate the processing of checks drawn on these demand deposit accounts that the E13B font for magnetic ink character recognition (MICR) was devised in the late fifties.
- Savings accounting. This is essentially the same application encountered in savings institutions. But in contrast to the savings banks, which have veered toward an on-line approach, commercial banks almost without exception* process their savings accounts on a conventional batch processing basis, despite the fact that the extremely low daily activity volume points convincingly in the direction of random access processing. There are two main reasons which have served in the past to justify the batch processing approach. First, the equipment used for demand deposit accounting was readily available for processing savings accounts. Second, the branch structure of many commercial banks is such that, unlike the savings banks (which tend to do business at relatively few locations), there simply are not enough accounts and activity at any one branch location to justify installation of the window machines and other costly trappings necessary for real-time processing.
- Loan accounting. Computers now perform much of the accounting for the wide variety of loans offered by commercial banks: installment, real estate, commercial, and personal.
- Personal trust. Here the bank serves as fiduciary for estates and other trusts, large and small. The investment portfolios in these trusts must be analyzed both from an income performance and from a legal standpoint to make certain that the terms of the trust are being fulfilled. This implies continuing analysis not only of the individual portfolios, but of the market performance of securities. Not much has been accomplished thus far in the application of computers to personal trust, probably because it is, from an accounting standpoint, relatively low volume.
- Corporate trust. Commercial banks act in a fiduciary capacity for corporations as well as for individuals. Here they serve as stock transfer agents, a task that requires not only maintenance of the shareholder records but the issuance of dividend checks, control of proxy solicitations, administration of stock splits, and kindred functions. Many commercial banks took their first tentative step into punched card systems in the 1930's and 1940's in an effort to accomplish more efficiently these laborious functions.
- Other services. Beyond the basic services we have noted, there is a wide, indeed almost bewildering, variety of additional services offered by commercial banks. Among the most common are safe deposit box service, "lock box" or remittance banking service, and computer-based accounting services such as payroll calculation and professional billing.

the accomplishments

Let us now endeavor to put into perspective the role



Formerly head of the Systems Planning Div. of the Security First National Bank in Los Angeles, Mr. Head is now manager of the Advanced Business Systems Dept., Touche, Ross, Bailey & Smart. Earlier, he was with IBM as a senior systems engineer on the American Airlines SABRE system and with GE on the ERMA project. He is a graduate of George Washington Univ. and holder of the DPMA's certificate in data processing.

[1] "The Fortune Directory," *Fortune*, August 1964, p. 156.

* The most notable exception being First National of Chicago, a pioneer among commercial banks in venturing into on-line savings.

which computers have played in commercial banking by first noting some of the more significant accomplishments and then examining a few of the problems.

A Successful Standards Program. Not only has the E13B font for magnetic ink character recognition been adopted as a standard but, more importantly, it has gained acceptance in an eminently practical sense. Today, the great majority of checks flowing through the nation's banks and clearing houses have MICR encoding. Compare this to the snail's pace at which standardization for the computer field in general has been proceeding and one may gain an appreciation of what the bankers (ably abetted by the equipment manufacturers) have managed to accomplish. Committee X3 of the American Standards Assn., the sectional committee concerned with all aspects of computer technology, has thus far published four standards—and of these, two pertain to magnetic ink character recognition![2]

Major Applications Operational. Most of the larger banks have within the past five years succeeded in converting the bulk of their high volume accounting applications to the computer. This must be accepted as no mean achievement especially when it is realized that most of the processing is carried out under extremely severe time constraints. For example, checks rejected for insufficient funds must, under the Negotiable Instruments Act, be returned to the payee within 24 hours; otherwise the bank upon which the check is drawn is obliged to honor payment. Furthermore, these systems must be capable of processing tremendous volumes of data within these time constraints. Many large banks nightly process millions of checks and deposits.

The processing of demand deposit accounts, savings accounts, and loan accounts is today largely a matter of routine for the larger banks. Nowadays their attention is being focused on: 1) refining these systems to gain more efficiency, 2) extending the scope of the processing, and 3) determining how equipment, which in some cases has been in operation for several years, may be upgraded to take advantage of new technological developments.

Automation of the Smaller Banks. Although the big banks pioneered the computerization of demand deposit accounting and other applications, the smaller banks have been moving toward an equivalent level of automation. In part, this is due to the advent of small computers well suited to the needs of these smaller banks, such machines as the Burroughs 273, IBM 1440 and NCR 315 being noteworthy examples. An even more interesting phenomenon has been the venture into computer sharing by the small banks, an outstanding example of pioneering by the more modestly endowed segment of the banking community.[3] To achieve such cooperation, these small banks have had to overcome not only their own understandable scruples about the security of account information in a competitive environment but have even had to obtain enabling legislation. United States chartered national banks are not ordinarily permitted to own or control non-banking enterprises, a proscription which, strictly speaking, extended to these cooperative data centers set up as jointly-owned corporate entities.

the measurability of progress

Surely the rapid and virtually complete automation of demand deposit accounting, coupled with an almost equally impressive penetration into other accounting areas, constitutes a success story that few industries can rival. It represents a record of progress from ground zero to almost complete automation of major accounting applications within five brief years.

But how *effective* has this effort really been? Could the banks have done better? Could they have accomplished even more within the same period of time by utilizing more effectively the human and machine resources at their command? How much better off are the banks with automation than without it? Has the cost of doing business really been reduced as a result of these innovations and, if so, by how much?

Put these questions to a banker and he will probably recite statistics which demonstrate the phenomenal growth in check clearings in the United States. He will project a set of figures to support the negative thesis that without automation the banks would, say by 1970, be buried under the weight of a paper avalanche of more than 20 billion checks a year. In other words, this argument concludes, the commercial banks had no choice but to automate in order to remain in business.

Perhaps. But this line of thought really sidesteps the fundamental query: could the banks have done a *better* job of system development? A candid answer to this question has to be that it is virtually impossible to gauge quantitatively the true success of banking automation efforts to date. This is because the controls necessary to provide a measure of effectiveness have by and large been lacking. The banking field is not, of course, alone in suffering from this deficiency, but nevertheless the weaknesses in measurement standards are strikingly evident here.

Let us identify a few of these deficiencies in standards which impede the derivation of objective and quantitative payoff information.

- Standards for clerical work measurement. Much analysis is now being done in banking by methods people concerned with establishing performance levels for clerical personnel engaged in repetitive operations. It is unfortunate that such standards were not more highly developed a few years ago, before large numbers of such personnel began to be displaced by the stored program machines. As affairs now stand, it is largely a matter of guesswork to arrive at the incremental improvement wrought by the computer. An effective work measurement and standards program established *prior* to the introduction of the computer might well have demonstrated that sufficient improvements in non-computer methods and procedures could have been made to deflate substantially the prodigies now being attributed to the computers. It is one thing to assert that a computer has replaced 100 bookkeepers. It is another to determine whether 100 bookkeepers were needed in the first place.
- Standards for budgetary control. Amazingly, the notion of justifying activities and measuring the performance of these activities through the mechanism of budgetary control is of fairly recent vintage even within some of the very largest banks. Without this kind of control, the performance of those departments affected by automation could not in the pre-computer past be adequately evaluated, with a consequent murkiness in any before-and-after dollar comparisons involving the computer.
- Standards for profitability accounting. In a system of profitability or product line accounting, now fairly common among manufacturing enterprises, the cost of offering a given product (or of not offering it) can be calculated. Banks have not generally tended to regard their services as products in this accounting sense and consequently cannot readily determine the relative cost and income attributable to demand deposit accounting, savings accounting, or loan accounting. In the absence of such profitability standards, it is difficult to decide which application to place on the computer first and

[2] Carl O. Orkild and Joe C. Nix, "Status Report on National Standards," The Interpreter of the Insurance Accounting and Statistical Assn., November 1964, p. 1.

[3] "They Share a Computer at Beverly," *Business Automation*, April 1963, p. 43.

how much to spend doing so in terms of the profit leverage exerted.

All these standards voids are interrelated. And, of course, their absence in many banks should not be construed as a blanket indictment. Some banks have had effective standards programs in one or all of these areas for many years. In general, though, it must be concluded that reliable quantitative measures of the efficaciousness of computers in banking are not available.

a qualitative systems view

Turning from consideration of the operational effectiveness of today's banking customs, there are other questions to be posed in attempting a critical appraisal. What can be said about the *quality* of the approach to computer-based systems on the part of the commercial banks? To what extent do these systems reflect computer professionalism in their design and implementation? Since we are unable to derive a quantitative measure of the banks' system performance, it seems to be in order that we examine a few key aspects of their systems efforts from a non-quantitative standpoint.

The Banking Services Dilemma. One of the most troublesome computer phenomena with which the banks have been confronted lies in the burgeoning field of computer-based customer services. To compete successfully in this new arena by offering payroll, billing, and other types of computerized accounting packages, a bank must not only master some rather sophisticated system design techniques; it must also develop an effective marketing approach.

The system design requirements resemble those encountered in the development of generalized programs by the equipment suppliers and the proprietary software houses. The banks, however, have had little experience in this complex and risky programming area. How far should a bank go in attempting to develop a generalized program for inventory control, for example? Such a package might have to be designed to fit one class of business while excluding another, thus affecting the bank's competitive exposure with respect to certain types of companies. And how far can generality be realistically pursued, even when user requirements appear to be well known? A substantial amount of resources might be invested in producing a payroll system having great generality, when perhaps it would be less costly to produce several less generalized payroll packages. Many banks have discovered the hard way that the very first prospect for a new system may turn out to have requirements that the system wasn't designed to handle.

There appears to be general agreement among the banks that these new services should be profitable and that the profit should come directly from fee income rather than from compensating balances. (The idea that the banks are offering "loss leaders" to attract new accounts is largely a chimera, reflecting the apprehension of the independent service bureaus. Their reasoning appears to run something like this: commercial banks, having acquired significant computer capability to perform demand deposit accounting, are now utilizing their excess capacity for customer services like payroll and billing at non-competitive rates. Actually, this excess capacity is in most banks non-existent, having already been channelled into savings, loan, and other internal applications. And most banks which have abandoned, or been forced by their competitors to abandon, the fee standard admit ruefully that this has been a grievous error on the part of all concerned. One large bank, for instance, has acknowledged the loss of more than $400,000 in net earnings in 1963 by providing account reconcilement service on a non-fee basis.[4])

marketing the services

But beyond this basic agreement about profitability lies a difficult dilemma. How can a bank effectively market these services, recognizing that they differ markedly from the old-line banking services? One major bank, in California, asserts that to market services effectively, there must be a central cadre of professional salesmen, experienced in selling and converting small businesses to computer-based services and, for maximum effectiveness, compensated on a commission basis. "Heresy!" retorts another bank, one of the few eastern institutions actively enlisted in the services fray. "This approach undermines and subverts traditional bank-cutomer relationships. How can these crass sales types appreciate the fact that the company upon which they are calling has balances with our bank of n dollars and a credit line of y dollars? What must be done is to market these new services through our existing line organization of branch managers. True, these men are not conversant with computer systems, but they are at least prepared to safeguard and promote the other vital interests of the bank."

And so the battle rages over the development and marketing of customer services, providing a good illustration of an automation-induced opportunity which the banks are having trouble exploiting.

The Managerial Pitfalls. In selecting managers to organize and direct the technical staff needed for their data processing projects, the banks' approach has in the past led to some fascinating Alice-in-Wonderland situations. Generally, the banks tended to select from within the organization men with ample banking background but whose knowledge of data processing extended no further than an IBM executive course. In banking it has not been unusual to encounter programming managers who not only cannot program but who are somewhat suspicious of the whole occult process that they have been called upon to administer. Symptomatic of the kinds of managerial shenanigans that this can lead to are the following honest-to-goodness instances:

- One huge bank ventured into data processing a few years ago with the astonishing conviction that the position of console operator represents a higher level of skill than that of programmer, with the result that the more adroit programmers were methodically lifted out of the programming section and transplanted to the computer room.
- Another bank, almost as large, succeeded in reversing the generally accepted ratio of programmers to systems analysts. An outsider not conversant with the topsy-turvy world of banking automation might reasonably expect that *one* computer-oriented system analyst should be able to keep at least *two* programmers productively occupied. But in this institution there may be unearthed not one but two systems analysts for every programmer! The productivity of this curiously-organized group can readily be imagined.

Considering such downright unique approaches to technical project management as these, it cannot be assumed, as do most bankers-turned-computer-administrators, that the high turnover rate in their organizations is due solely to the relatively low salaries offered. They should be prepared to admit that it is due perhaps almost equally to a

[4] *American Banker*, July 15, 1964, p. 8.

discouraging lack of managers and supervisors capable of establishing rapport with their technical staffs.

The Long-Range Planning Vacuum. Perhaps the most serious deficiency in the banks' involvement with automation has been their inability to conduct long-range system planning. What planning there is has mostly been oriented toward keeping the roof from falling in by staying on top of the need for increased machine capacity and remaining current on new hardware and software announcements. There appears to have been neither the inclination nor the capability to devise a strategic plan extending five or 10 years into the future. It may, of course, be conceded that the banks are no more vulnerable to criticism in this respect than are other industries. No matter. The dismal fact is that decisions about equipment, software, and the future course of applications development can be expected to be the wrong ones a good percentage of the time without a well-conceived and top-level-approved master plan. And, given the complex technological choices now available, just *one* wrong decision in development priorities or in new equipment selection can have implications for years into the future. A number of banks, for example, a few years ago made what seemed to be a sound accounting decision by purchasing their computers. But what they overlooked was that many of these machines were semi-obsolete then and were destined in a few years to arouse interest only as antiques. Today these same banks listen uncomfortably to prognostications about the dawning era of communication-based real-time systems while quietly seeking some face-saving method of either living with their electronic relics or absorbing the losses resulting from replacement. A sound long-range planning program could have eliminated such costly misjudgments as these.

what of the future?

Turning now from this catalogue of past accomplishments and transgressions, can one augur any major trends?

There are many industry leaders concerned, for various reasons, with the future of banking systems. Rudolph Peterson, president of Bank of America, talks publicly and earnestly about the coming banking millenium, describing the banks of the 1970's in which "we might have a computer center where we can tell you everything we have in every branch of the world." A company treasurer in San Francisco could thus get an immediate report on where the company holds pounds, francs, or dollars, make some currency transactions, and in a few minutes get a reading of the bank's total holdings. "In other words, Mr. Peterson says, "one world in banking."[5]

General David Sarnoff of RCA envisions an equally exciting future for the individual bank depositor who, assisted by the obsequious banking computers, will possess "an individual credit card for use anywhere to charge his bank account electronically over a worldwide data communications network that would link up with the telephone systems of all nations. Such an arrangement could employ single input units located in all retail establishments—service stations, restaurants, hotels, and other public facilities. These would be in direct and instantaneous communication with a system of banking computers to permit the transfer of funds without the many duplicate bookkeeping and mailing steps that characterize the present credit card system."[6]

Since the "big picture" has been sketched so dramatically by these gentlemen and others of comparable stature, it may be useful here to endeavor to play a somewhat more specific role by identifying some of the future trends in banking automation which support these top level prognostications. Here it is possible to discern several portents of major significance.

Development of Real-Time Systems. Commercial banks have already accrued a good deal of communications experience in the course of operating their present-day systems, as well as experience in working with random access storage—two fundamental concomitants to graduation to real-time data processing capability. Virtually every application area in a commercial bank is potentially adaptable to the real-time processing milieu, with the key prospects including demand deposit accounting, savings accounting, personal trust and corporate trust. Implementation pockets are already beginning to appear, the most praiseworthy example being the experimental inquiry system for demand deposit account balance information put into successful operation at Bankers Trust in New York City (see p. 34).

identifiable subtrends

The movement toward introduction of real-time systems into commercial banks actually encompasses several identifiable subtrends, chief among them:

1. Consolidation of file information. In today's bank an individual having a checking account, a savings account, and an auto loan appears as three different customers to the bank because the tape-oriented systems responsible for processing and controlling these various relationships are not "integrated." In tomorrow's system, based on a large random-access file of consolidated information, data about all banking relationships with a particular customer will be centrally available (at least in summary form) for response to inquiries made in real-time.
2. Development of time-sharing systems. The smaller commercial banks, already cooperating in the shared use of conventional data processing equipment, may be expected to extend their cooperation into the realm of time-shared real-time systems. This sort of thing is already well under way among the savings banks, and it may be expected that the small commercial banks will take their cue from this experience in an effort to remain competitive with their larger brethren.
3. Intercomputer communication, both within and outside the financial community. In parallel to the development of more sophisticated systems by the commercial banks, there is an effort to upgrade credit bureaus from their present manual systems devoted to the maintenance of credit records into more efficient and responsible systems. As these and other advances are achieved, a bank may be able to communicate in real-time with:
   —correspondent banks throughout the country,
   —non-bank sources of credit information,
   —major customers who possess their own real-time systems.

Advent of No-Checking Banking. These kinds of technological advances portend a future referred to in the trade as "no-check" banking. There is a very persuasive school of thought in banking which maintains that the way to alleviate still further the paper handling problems associated with demand deposit accounting is to attack these problems at their root by eliminating the cause of them all—the check itself. With the aid of a real-time system capable of communicating balance information—say, from the bank to the point of transaction at a department store—it would be possible to effect an automatic transfer of funds from the customer's account to the merchant's account without benefit of that piece of paper—the check—which now must clear through the banking system before

[5] *Newsweek*, November 4, 1963, p. 88.

[6] David Sarnoff, "The Promise and Challenge of the Computer," address to the Fall Joint Computer Conference, San Francisco, October 27, 1964.

the transaction can be regarded as complete. Similarly, in the case of the large company using a computer to produce payroll checks for its employees, it requires but little imagination to envision the communication of payroll data from the company's computer to that of the company's bank where an immediate transfer of funds can be effected from the employer's payroll account to the employee's checking account. Bankers feel, further, that many bills such as those for utility and telephone service will in the future be paid by means of automatic transfers between the consumer's and the creditor's accounts. Mr. Peterson predicts that in about five years "you will see a rather rapid drop-off in the use of checks by the public."

new faces & services

No-check banking is, of course, not entirely dependent upon the development of communication-based real-time systems, but they help. With their central store of instantly available current balance and credit information, they will necessarily accelerate the trend.

A New Generation of Management. The traumatic experiences which the banks have endured over the past few years in trying to cope with the complexities of large-scale data processing are resulting in increased recognition of the importance of the computer specialist, of the need for a kind of expertism which cannot be readily inculcated in those schooled in traditional banking methods. There has lately been a modest but noticeable invasion of banking by data processing people drawn from the ranks of consultants, equipment manufacturers, and experienced computer users. This mercenary army includes, not surprisingly, its fair share of hacks and drifters, unsuccessful hardware salesmen, and self-anointed prophets. But it also includes many solidly competent pros. Inevitably there must be a shaking out of the medicine-show element, but those who remain will find themselves in key slots within their banks. And from this new infusion of technical management will inevitably be drawn the presidents and executive vice presidents a managerial generation hence.

Transformation of Customer Services. The bank's preoccupation with computer-based customer services was mentioned earlier. This volatile activity, now in such a bewildering state of turmoil, will somehow have to settle down and reach an accommodation with the more traditional banking functions. Two future elements of such a rapprochement may be suggested.

1. Resolution of the scope of customer services. This may be accomplished by the banks themselves or may, by their default, be imposed upon them. There has been legislation introduced in the House Banking and Currency Committee, actively supported by the service bureaus, which specifies that no bank "may perform any clerical, administrative, bookkeeping, statistical, accounting or other similar service for its depositors, borrowers, or other customers, except to the extent that such services are a necessary incident to the proper discharge of lawful functions of such bank as a depositor, lender, trustee, or agent."[7] Entirely apart from the intrinsic merit of this bill (and serious doubts may be voiced as to whether it would do much more than create nightmarish problems of interpretation), why has the banking field been singled out from all other users of data processing equipment as the subject for regulation of the manner in which it uses its computer facilities? Not alone because banking has always been a closely regulated industry. Probably more contributory have been the antics of a small but strident minority of bankers in their unrestrained approach to customer services. Consider the case of the banker (a former IBMer, incidentally) who recently announced the capability of his institution to provide linear programs for optimizing the blending of sausages for hot dog factories. Most bankers, who view their services as a logically-related adjunct to primary banking functions, cringe lividly in the face of such kooky publicity.
2. Adaptation of customer services to the real-time era. Where, today, messengers collect the input data from the customer's office or from the local branch and bring it into the data processing center, we may expect tomorrow to have consoles located at the customer's place of business for communication of data between bank and services customer. An omen of this future may be found in today's billing services offered by banks to physicians and dentists, which feature an IBM 1001 for transmission of billing data to the bank.

Enhanced Role of the Management Scientist. There is a profound transition now occurring within banking, as in many other industries, from emphasis on computerized accounting systems to more sophisticated forms of computer usage. To take the place of today's accounting-oriented system analysts and programmers, we begin to witness the emergence of the mathematically trained management scientist. Eventually this will produce a copious bag of tricks to support the bank of the future. Meanwhile, there are many techniques already operational or undergoing active experimentation, among them:

- Credit scoring. Use of computer programs to analyze applications for loans and credit, either to confirm or supplement the judgment of the loan officer. Benefits here include consistency of decision-making plus the ability to "tune" the credit scoring mechanism to reduce losses and adjust to economic conditions in the community.
- Teller line simulation. These programs are being utilized to determine optimum staffing and relief patterns at teller windows consistent with a desired level of customer service.
- Security analysis. A great deal of attention is being concentrated upon computer analysis of the performance of stocks and bonds as an aid to the banks not only in making their own investments but in managing their trusts. Standard and Poors now provides a magnetic tape service which traces the performance of numerous common stocks.[8]
- Portfolio selection. Here, in the area of personal trust, efforts are underway to provide the trust officer with computer assistance to augment his own judgment as to the investment mix which best accomplishes the purposes of each trust and to adjust the portfolios according to changing circumstance.

These future prospects are enough to inspire all but the most stodgy and moribund traditional banker. And despite what might be described as an "image gap," there are few such bankers left today. Not long ago there were indeed a sizable number who felt that once the automation of demand deposit accounting had been accomplished, the programming staff could be disbanded and the bank return to the status quo ante, having completed the uncomfortable task of converting its bookkeeping records to magnetic tape. Today, several conversions later, most bankers are keenly aware that, for better or for worse, what has transpired thus far is but the first beginning. ■

[7] Abraham Multer, H. R. 9548, 88th Congress, 1st session, a bill introduced in the House of Representatives "to prohibit banks from performing certain non-banking services," December 20, 1963.

[8] *Communications of the ACM*, June 1964, p. 390.

DEAR MR. BANK PRESIDENT:

by DALE L. REISTAD

This report from a hypothetical consulting firm highlights the serious problems facing today's bank management as a result of the introduction of the computer to banking.

The banking industry is in the process of changing from a deposit and loan business to a financial consultant kind of business with an assist from its new friend—the computer. The transition may take another 10 or 20 years and will cost considerably more than did the original switch from bookkeeping machines to computers, but it will be worth working for, and paying for, in the long run.

To assess the impact that this change might have on its future, a major Midwest bank recently retained the services of Abercrombie, Bullfinch & Cudgel, a management consulting organization specializing in the ABC's of bank data processing. The consultant's report to management included a summary of the present status of banking automation, and analysis of current trends, and a list of conclusions and recommendations suggesting a drastic change in the customer servicing philosophy of the bank. The conclusions and recommendations, as typically phrased by Abercrombie, Bullfinch & Cudgel, follow in their entirety.

conclusions and recommendations

Conclusion: The bank has a fine, technically competent EDP staff doing a solid job of solving its own internal data processing problems; but hardly anyone outside the bank knows about it. The several consultants associated with this study agree to the general high level of the EDP program with respect to the various criteria evaluated, such as scheduling, control procedures, cost consciousness, and staff development. But studies conducted outside the bank show that the bank is not regarded as a "leader" in EDP by its customers, its correspondents, or by its competitors. In our opinion, the steps taken so far in the installation of a computer at the bank have been carefully thought out, thoroughly researched, and skillfully programmed under tight control procedures. Outside the bank the general reaction to the progress to date is "slow," "plodding," and "unimaginative." Management has not purposely kept its program "in wraps." In fact, management desires to have a "progressive" image for the obvious competitive reasons.

Recommendation: The bank should consult with its public relations counsel to determine more about the bank's image in the eyes of its present and potential customers. A definitive survey is required and a remedial program should be developed. The future automation programs recommended in this report depend to a considerable extent on the enthusiastic support of the customers and correspondents in the 100-mile service area of the bank.

Conclusion: The bank's efforts to date in the area of services to its 385 correspondent banks have been defensive in nature. No program for servicing these banks has been developed, but interested correspondents are given advice in systems planning and feasibility studies by the bank's EDP staff. The bank presently enjoys the largest correspondent business in the area but is the only major area bank not to offer a demand deposit accounting package.

Recommendation: It is not too late to design, program, and merchandise a bookkeeping service to the correspondent banks. Our study shows that over 20% of the banks, representing over 100,000 accounts, would be interested in considering a servicing arrangement with your bank. Such a plan could be based on a simplified version of the bank's present, fully operational DDA program. You could appeal to the upstate banks with a sales campaign based on the fact that you "waited until your own house was in order and the package completely debugged." The bank should also give serious consideration to offering a "full-services" package for correspondents, which would include DDA, savings, installment loan, and mortgage loan accounting. Although services to other banks may not increase the net contribution to bank income, in the long term this program will create outlets for other automated services; these will include major profit producers.

Conclusion: There is, at present, no formal program for developing a computer-oriented central information file

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(CIF) for the bank. The staff is aware of the future need for such a program but considers it more important at the present time to convert the two remaining internal applications, commercial loans and personal trust, before considering CIF.

Recommendation: The bank should not convert another application—including commercial loan and personal trust —until CIF has been thoroughly reviewed and a decision made by top management as to the bank's intent in this area. It is inconsistent with other carefully made plans for the bank's automation program that any more time and money be spent on master record development which may not be compatible with a future CIF. A brief review of demand deposit accounting, savings, and installment loan conducted by our staff indicates that while considerable attention has been given to master record planning, the main criteria to date for inclusion or exclusion of information has been the space it would take up on the tapes and the computer time required in sorting. We estimate that rehabilitation for CIF purposes of the 435,000 accounts now on the computer will cost the bank over $150,000! If personal trust and commercial loan are converted now as presently scheduled, the master records —and perhaps, as a result, a major portion of the programs—will have to be rehabilitated at a later date at a premium.

Conclusion: Although telecommunications problems are not now of major concern to the bank, it is conceivable that the installation of Touch-Tone, push button telephones in the state will precipitate a wave of new computer servicing opportunities. Some staff members are studying new techniques in this area and communications specialists are now reviewing the bank's present system.

Recommendation: Further study of telecommunications is definitely called for. The bank should form a telecommunications department and staff it with at least one technically qualified engineer, preferably a person who is knowledgeable in EDP and has an appreciation for marketing. The bank should immediately discuss the new equipment and techniques with telephone company representatives and meet with communications suppliers to determine what new equipment is on the horizon. Certain banks in the country, such as the Bank of Delaware in Wilmington, have already made substantial progress in using the telephone as an input to the central information file. This approach merits the careful scrutiny of top management. In any study of communications the bank should emphasize the present network that exists between the main office and branches, the major correspondents, and those corporate accounts with whom it is in daily contact.

Conclusion: To date, the bank has concentrated its automation efforts on the conversion of the bank's internal bookkeeping applications. The data processing staff is aware that in the future more emphasis will have to be placed on the management sciences, particularly as related to the field of bank investments and loan decision making. There appears to be an interest in establishing an operations research section within the data processing department as soon as management approves such a move.

Recommendation: An operations research section should be organized, starting with the hiring of a qualified operations research specialist as section manager. Recent studies made by The American Bankers Association indicate that approximately 50 banks have OR specialists on their staffs at the present time; many other banks are beginning to build OR staffs and are actively searching for people with the necessary skills.

There are a few programmers currently on the staff who, because of their backgrounds, could be transferred to the operations research staff if one is formed. Although there is no real urgency for the development of this section at the present time, it would be nearsighted for the bank to delay the project. One of the bank's closest competitors will soon announce the hiring of an OR specialist, a former college professor with a national reputation in the field of investments.

The bank may realize a potentially greater benefit from one OR assignment (say, for example, in the field of asset management) than it has to date from *all* of the converted internal applications. Other areas, such as portfolio management, risk analysis, and credit scoring, also offer great potential to the bank and are worth the bank's serious consideration.

Conclusion: The bank is apt to fall behind in the development of new markets and in the strengthening of its present market for existing services if competitive trends in this area continue, according to an independent survey conducted during the course of this assignment. The survey of present and potential customers of the bank indicated that it is not in the same "ball park" with the other two major banks in the city or the holding company which has made aggressive inroads in the western part of the state. Automation was *the* one area referred to most frequently as an area of bank weakness in the eyes of those surveyed.

Recommendation: The bank should concentrate on the development of financial packages suitable for computer processing and marketable not only in the bank's primary market area, but also in the entire state through its branches and the correspondent bank network. Professional billing appears to be one such service which merits investigation.

In recent months other banks have been selling computer packages to banks outside their marketing areas and, in some cases, entering franchising arrangements. It is recommended that the bank consider these approaches in the development of any future computer packages. One major area for new service development is financial consulting to bank customers who have discretionary income for investment purposes but are not candidates at the present time for normal trust services. The banking press has encouraged this for years, and the computer, tied in with the CIF, would provide the base from which the bank could operate such a plan. Government statistics indicate that over 200,000 families within the primary market of the bank and its branches have gross incomes over $8,000 annually, and that over 75% of these families have discretionary income and need financial guidance beyond what banks presently offer. This is just one example of the type of areawide, EDP-oriented, new service opportunities that the bank should explore.

Other new service areas which the bank should review include credit card processing, areawide charge account plans similar to BankAmericard, rent receipt processing, on-line savings utilizing a real-time computer service, and budget assistance for small businesses. The bank should determine the developmental costs for each of these plans, the market, the potential of the plan for producing a net contribution to income and generating additional bank business, and the relative importance or priority of the plan when compared to the various other plans under consideration.

Conclusion: The bank's present marketing assignments are handled by various specialists in public relations, in advertising, in officer call programs, and in branch location studies. There is no formal marketing research activity

and no overall coordinator of the bank's marketing plan. If the bank is to be successful in the future in selling the new computer services, it must have a competent, well-organized marketing team working closely with the data processing group.

Recommendation: The bank should appoint a marketing vice president from among its present group of "marketing-type" officers (public relations, advertising, sales management, officer contact program), and give him the responsibility of developing the overall marketing plan. A marketing research staff should also be developed and a close working relationship established between the marketing and data processing teams. These steps are essential if the bank is ever to compete on even terms with the other major area banks in the computer services area.

Conclusion: The present organizational structure of the bank was developed as a result of a management study in 1943. The many changes that have taken place since that time have resulted mainly in changes in reporting relationships. The organization remains "early 1940," pre-computer, and a matter of concern to the majority of the bank's officer staff.

Recommendation: If the bank is to sell computer services at a fee in the future, it must know its costs and be able to differentiate between profitable and unprofitable services before they are offered. Before the bank can select certain services to market, it must be organized to handle marketing research, and if it intends to "hard sell" to customers and noncustomers, it must have a sales organization that is trained to compete in the highly specialized computer services area. These factors should be of major importance in any organizational study conducted within the bank.

* * *

It is the final recommendation to the bank that it start thinking in terms of 1970 and 1975—in systems, equipment, personnel, services, and marketing—and plan accordingly. The computer has opened up broad new vistas; services will change dramatically; and banking as we know it today will slowly disappear. If the bank is to compete in the world of '70 and '75, it must prepare for it today. ■

COMMERCIAL BANK GOES REAL-TIME

with savings and dd accounts

by J. T. BERRYMAN

Tellers at Citizens National Bank in St. Petersburg can get up-to-the-minute information on demand deposit or savings accounts through an on-line, real-time data processing system while the depositor is at the window. The same on-line capability on demand deposit accounts is extended through telephone lines to four smaller commercial banks, and by the end of the year these banks will be using the system for savings accounts as well. All five banks communicate with the computer through Teletype machines located in their bookkeeping departments.

For Citizens, the inquiry system has the following advantages: (1) it attracts business from other small banks (potential correspondents); (2) depositors receive information faster with less chance of error; (3) the bookkeepers never have to search for lost or misfiled ledger cards.

At the present time, Citizens is breaking even on the processing services performed for others. These services thus help to support a system that Citizens, a $50-million bank, might not be able to carry alone. Furthermore, as new services already scheduled are added, the system will show a profit on outside work.

The remote inquiry service is a special feature of the complete demand deposit bookkeeping service provided for the correspondent banks and, of course, for Citizens.

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After savings accounts are added, other banking functions will be offered to all the banks as rapidly as programming and conversion are completed.

The processing is done by an NCR 315 system which includes the bank file inquiry processor with a 10K memory, three CRAM (Card Random Access Memory) units, a combination paper tape reader and punch, a central inquiry buffer, two MICR sorters with a single buffer, and a high-speed printer with its buffer.

The correspondent banks require only the Teletype machine, which rents for $109 a month, and the leased telephone line. All the leased lines tie into the central inquiry buffer in the computer room.

Citizens is contemplating the installation of another 10K memory to make possible more time-sharing operations.

demand deposit inquiry

Up-to-date demand deposit records for all four on-line correspondents and for Citizens are stored on a deck of CRAM cards, and during banking hours these cards are kept available in one of the CRAM units where they are accessible to the 315 processor. Six Teletype machines (two at Citizens and one at each of the correspondents) are linked to the system through telephone lines. An inquiry may be made through any of the Teletype machines at any time during banking hours. If simultaneous inquiries were made through all the machines, the last machine to start printing a reply would be delayed between four and five seconds. From that point on, all the machines would operate concurrently at normal speed (10 characters per second), with each machine printing only the reply to the inquiry initiated at that station. The program prevents inquiries from any one bank into the records of another.

A bank employee may use the Teletype machine to make any one of seven different inquiries, each indentified by a separate code digit. The employee enters the code digit and the account number through the keyboard; the machine pauses for a fraction of a second and then commences to print out the reply on the pre-printed inquiry form.

Code digit 1 indicates a request for the current account balance. The system replies by printing enough of the name (18 characters) to identify the account, the type-of-account code, the officer code, current status code, the current balance, and the available balance (current balance less today's checks under teller's hold).

Code digit 2 identifies a teller hold. If the teller is asked to cash a check he phones the bookkeeping department The bookkeeper enters the digit 2, the account number and the amount of the check. The Teletype machine then prints out the same information as under code digit 1 (identification, codes, current balance, and available balance); the amount of the check under question is included in the difference between current balance and available balance. If the balance that was available covers the check, no further entry is required and the hold is maintained on the balance for the remainder of the day—or until the check is processed at night. If the available balance does not cover the check, the system prints out NSF under remarks, and the teller is told not to honor the check.

In replying to code digit 3, the system prints out the same information as above, plus the transfer date, the transfer amount, the date of the last deposit, the amount of the last deposit, the date of last activity, the average balance, the analysis count, and the check count.

The reply to code digit 4 includes all the information provided under code digit 2 plus a listing of all transactions affecting the account since the last statement.

Code digit 5 requests the system to conduct a selective search and print out all items paid for a specific amount during the current month, along with the date of each payment. This facilitates tracing a check for a depositor.

Using code digit 6, the bookkeeper can over-ride the system and enter a hold larger than the balance, if such a transaction is approved.

Code digit 7 identifies a correction or reversal of a one-day hold.

savings inquiries

Savings accounts are handled in conventional fashion during the day, and the CRAM files are updated at night. Citizens has between 150 and 300 transactions a day on its 9,000 savings accounts. Daily activity should double when the 11,000 accounts of the correspondent banks are put on the system.

The remote inquiry system functions in the same way as it does on demand deposit accounts. The characteristics of the account number identify it as a savings account. The same seven-digit codes are used to make the same inquiries. The only differences from the demand deposit replies are that the interest earned but not yet credited replaces the amount of last deposit, and the interest earned and paid this year replaces the average balance.

The main reason the computer is used to handle savings accounts is that the interest is always up to date, eliminating the computation load at the end of every quarter. The application of the remote inquiry system to savings accounts is a convenient means of gathering information—for example, a full report of activity since the last statement—and the cost is negligible because the equipment is already provided to service demand deposit accounts.

time-sharing

Banking hours run from 9:00 to 3:30 each weekday. During this time, the CRAM deck containing the on-line demand deposit and savings account records must be available in one of the CRAM units. Currently, the system averages about one inquiry a minute from all sources, a condition which leaves the processor free for other work over 95% of the banking hours.

To use some of this available time, the system is programmed to produce depositors' statements on an interruptible basis, a procedure that averages about two hours a day.

As the system now stands, the 10K memory is capable of handling the inquiry program, but the statement run requires a 5K memory that is not available concurrently.

To permit time-sharing, half the inquiry program, the portion which is recorded in the first 5,000 cells of the main memory and includes the CRAM look-up routine and the user's application routine, is also recorded under control of the program on part of a CRAM card in the on-line account-record deck. When the statement program is fed into the system, it is recorded in the first 5,000 cells, overlaying part of the inquiry program. This sets up the condition that exists when statements are being prepared during banking hours.

The 315 system continuously checks the input lines from the Teletype machines in sequence. When it senses an inquiry, it accepts the message one character at a time, returning to the statement run between characters. Handling one character requires about five milliseconds.

When the entire message has been received, the portion of the inquiry executive program still recorded in the main memory assumes control. The statement run is suspended temporarily at a convenient point. The statement program is transferred to a card in the CRAM deck, and the CRAM look-up routine and the user's application routine are transferred from the card in the CRAM deck to the first

5,000 cells of the main memory. This portion of the program then finds the proper account record by using a directory technique, analyzes the inquiry and builds up the reply in the correct Teletype input/output area.

Control of the operation then passes back to the other portion of the program (the Inquiry Control System Executive) which reads the statement program back into the first 5,000 cells and begins to feed the outgoing message a character at a time. Again, the statement program functions between characters.

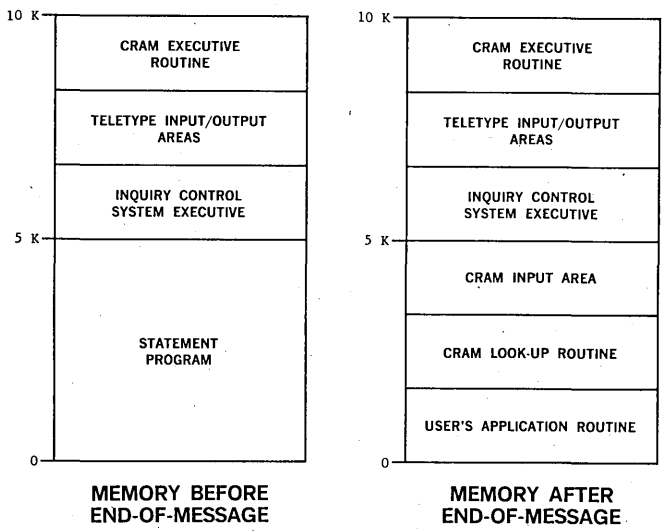
The CRAM look-up routine and the user's application routine are on the same card as the statement program to keep card-dropping to a minimum.

When two or more inquiries are received at the same time, the system reads a character from one, then a character from the next, and so on, processing statements in between characters. When all the inquiries have been read, the system processes them in sequence, then feeds out the replies a character at a time. An observer standing where he can see a Teletype machine and the high-speed printer will notice a pause in the operation of both while the inquiries are being processed that will vary in length with the number of inquiries but will never be more than a few seconds long. When the two machines resume operation, they will appear to start up simultaneously and will both operate at normal speed.

Citizens is considering adding a 10K memory. This additional equipment could eliminate some of the complications of time-sharing with the present system, but would not substantially reduce the time required to process statements. However, with the larger memory, more complex programs could be run on a time-sharing basis during banking hours. For example, programs could be compiled and tested, and the records of a mortgage company about to subscribe to the service could be updated during banking hours with the larger memory.

off-line processing

At the end of the banking day, the data processing department at Citizens receives the day's checks and deposit slips from its own proof department and, somewhat later,



from the correspondent banks. These are fed into the MICR sorter connected to the computer and read. The computer develops totals for comparison with the proof totals submitted with the work to establish that the input is in balance.

After all of a bank's checks and deposit slips run through the sorter once, they are set aside and the computer sorts the information electronically. When convenient, normally later in the night, the documents are sorted physically.

The information is sorted so that, under one account number, deposits precede checks, and the checks are sorted by amount with the lowest first. This procedure keeps the number of return items to a minimum. However, when an account is overdrawn, the system prints out a list of all transactions under the account. If the officers decide the overdraft checks are not to be paid, the bookkeeper reviews the checks and returns those checks indicated by the officer.

Actually, all the items are posted by the data processing system, even if an account is overdrawn. The night bookkeeper writes the names of the payees on the return item report. The next day, the items to be accepted are lined out, and the account numbers, names and amounts of the return items are listed on a tape-punching accounting machine. The 315 reads the account numbers and amounts from the tape to reverse the posted entries, then lists the same information along with the names of the payees in printing out the return item charges.

Once the electronic sorting of items is completed, the bank's demand deposit master file is updated. Then, the next day's on-line file—a less detailed version of the master file—is abstracted from the master file and set aside until the start of business in the morning.

For Citizens' management and for each of the correspondents, the data processing system develops the following demand deposit reports on a daily basis.

1. Unpostable Report—a listing of dollar transactions that cannot be posted for one reason or another.
2. Audit Exception Report—a listing of postings to accounts with abnormal status.
3. Overdraft Report.
4. Closed Account Report.
5. Service Charge Report.
6. Suspected Stop Payment Report—a listing of all items of same amount as stop payments.
7. Large Balance and Amount Report—a listing of balances of $10,000 or more and transactions of $25,000 or more.
8. Stop Payments Due for Renewal.
9. Full Sheet and Special Print Report—a listing of accounts for which statements are to be printed tonight.
10. Return Item Report—a listing of return items for officers who may choose to authorize payment.
11. Suspected Dormant Report—a listing of dormant accounts prepared once each quarter.

Between 4:30 and 5:30 in the morning, Citizens sends each of the on-line correspondents a trial balance journal, a posting journal, report journals, cycle statements, and the sorted checks and deposit slips.

The same reports are developed on savings accounts except for those such as the Return Item Report which obviously do not apply.

future plans

Currently, Citizens plans to use the 315 system to handle trust accounting, Christmas club, stockholder records, commercial loans, payroll and general ledger as quickly as these applications can be programmed and placed on the system. As they become available, they will be offered to the correspondent banks.

However, the long-range objective is a complete remote inquiry service. Under this system, each bank customer would be assigned just one account number, no matter how many bank services he uses. Authorized bank employees could then call for the complete file under an account number or any part of it as the occasion required. A loan officer using this system could have a detailed report on a customer almost immediately. This system would also be extended to correspondents. ■

AUDIO—RESPONSE IN BANKING

report on an experiment

by JOHN P. ROCHE and EARL S. ROGERS

Questioner: "Is the balance in account number 08005367 sufficient to cover a check for two thousand five hundred fifty dollars?"
Responder: "Two thousand five hundred fifty dollars—not good—balance five thousand dollars—uncollected three thousand dollars."
Questioner: "Give me more information on the uncollected funds."
Responder: "Two day uncollected two thousand five hundred dollars—four day uncollected five hundred dollars—end."
Questioner: "Don't post the hold."
Responder: "No action."

An arresting aspect of this otherwise drab conversation is that a human being communicated electro-mechanically by pushing buttons while a computer responded vocally in the English language. Equally curious to the observer was the calm, confident manner in which people accepted this form of dialogue with a machine. Their attitude seemed to say, "Doesn't everyone?"

For several months, personnel at Bankers Trust Co., New York, participated with IBM in a "real-world," on-line test utilizing audio response equipment. Some 30 members of the bank staff were involved as users of the equipment. They were asked not only to help evaluate a new procedure and the associated hardware but were also invited to suggest any way in which their work could be handled more efficiently. The human relations aspect of this approach was guided by an industrial psychologist, using individual interview techniques. Approximately 5,000 customers were affected, but only to the extent of carrying small, perforated plastic cards bearing their account numbers.

The operation selected for the experiment represented part of the work involved in handling customers' checking accounts. The test was a success, but a discontinued "successful" trial often invites the more skeptical to question "why?" In this case, there were two excellent reasons: (1) Some of the experimental model hardware had been made available to us for only a six-month period, (2) Using standard 1401 hardware for time-sharing is not economically feasible.

We will postpone any further tests in this area until announced multi-programmable systems are available.

procedures & hardware

We propose to outline in this article what was learned from the experiment and to indicate how this knowledge may be used in the future. Let us first review the experimental procedure and describe the equipment employed.

A representative branch of the bank, located a few miles from our computer center, was selected. Eight IBM 9 x 19 data transmission terminals, equipped with 15-button keyboards, were installed in the branch. These were modified 1001's on which the card slide readers were adapted to receive laminated cards punched with identification numbers. Each terminal required a 401-E Dataphone to transmit over standard telephone voice grade lines. Four 410-S receiving Dataphones were installed at the computer center to link the center with the bank's telephone system. Terminals were installed at each teller position. In addition, one was placed in the Loan Dept. and another in the customers' account officers' area.

In addition to the Dataphone sets and one terminal, the following equipment was installed in the computer area reserved for the experiment:

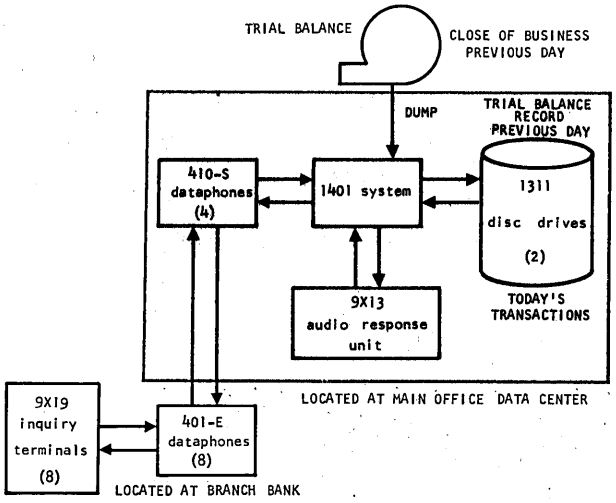
IBM 1401 8K processing unit with inquiry modifications
1402 reader/punch
1403 printer
1447 inquiry typewriter
Two 1311 disc drives and disc packs
9x13 audio response unit with 64 words or syllables recorded on its magnetic drum. (An interesting recording compression technique is used

Mr. Roche is a systems analyst in the Methods Research Dept. of Bankers Trust Co., New York City. He holds a BBA in management from St. Johns University.

to meet the restrictions of the half-second vocabulary drum tracks. This is the elimination of small portions of a word in such manner that although the duration of sound has been abbreviated, the shortened word is still clearly understandable).

The discs contained much of the information concerning the accounts serviced at the selected branch which a teller would require during the course of a day: book balances or overdrafts; uncollected funds; cautionary references; previous transactions for the day. To obtain this

Voice-Answer-Back Flow Chart



information a teller dialed the computer using a four-digit telephone number. The connection was then automatically made to one of the four receiving Dataphones. Next, the teller introduced a perforated plastic card recording his identification number. (In practice the card remained in the terminal while the teller was at his post). When a customer presented his individual account card, it was introduced in the terminal at the same time. If the customer did not present a card, the teller used the terminal keyboard to enter the account number. Account number keying accuracy was checked by the computer, which would repeat an invalid account number and call for reentry. This was possible because our account numbers include a weighted modulus-11 check digit. It was recognized that an incorrectly keyed account number might coincide with a valid number of another account. However, to include an audible verification of an account number with the rest of a normal message made the message too long, and the probable mathematical odds seemed to suggest a minimal risk. Of course, this is one argument in favor of card insertion.

After many years in Bankers Trust's Methods and Planning areas, Mr. Rogers has assumed an administrative role in the firm's Methods Research Dept.

the keyboard

The keyboard was used to request the information necessary for a particular transaction. Immediately the teller heard through the Dataphone receiver a natural sounding voice giving the required information. When a transaction called for an operation by the computer system, a command key was depressed which, for example, would record the transaction in the disc file and update the pertinent balances. Instantly verbal confirmation of the action taken was heard, a most reassuring feature.

The length of messages necessarily varied, but from entry of inquiry through response and any final action, about 30 seconds may have elapsed. Of a weekly average of 2,350 inquiries, keying errors occurred in 6% of the entries. These were brashly commented on by the computer's voice—"Not valid—re-enter!" Of major importance, there was no evidence of undetected keying errors. The inaccurate fingering generally had to do with invalid account numbers or the depression of an inquiry or command key out of proper sequence.

While the quantifiable data obtained from the logging feature programmed into the system will be extremely useful in planning our next course of action, IBM and Bankers Trust Co. were also interested in customer and staff reaction. The industrial psychologist assigned to the project concentrated his research on those actually using the equipment involved in the experiment. Bank personnel amazed all who were closely watching developments. Extensive orientation and training plans had been made, but there were some misgivings about the degree of acceptance that might be expected. Several of the staff, after all, were long accustomed to traditional procedures. Our fears proved groundless. The few workers who seemed somewhat doubtful at the outset were among the most enthusiastic users of the system at the conclusion of the trial. Negative reaction was minimal.

No formal interviews were held with customers, but it was not difficult to assess their reaction. A film had been produced by bank personnel for continuous showing in the branch lobby at the start of the experiment. Its purpose was to instill a sense of participation in the customers and to induce them to present their account cards when cashing checks or requesting current balance information. Customer cooperation in this respect was very good, but other than becoming cooperatively account card conscious, most customers seemed unaware of any change in procedure. However, there was acknowledgement that certain types of transactions were handled in less time than previously.

summary of experience

It is evident that we learned more from the experiment than the fact that the hardware and software would work. Perhaps this is the place to summarize some of our findings.

- Audio-response equipment is reliable and efficient for purposes such as have been described.
- Personnel can quickly adjust to the idea of dealing with a "talking computer."
- Terminals linked to computer systems can be used comfortably, efficiently and with a minimum of training by personnel long experienced in traditional banking operation procedures.
- Bank customers are most cooperative when asked to

accept a change of procedure, such as carrying and presenting an account card.

- Keying an account number was just about as efficient as entering a pre-punched card. However, we are aware that when high-speed Touch-Tone terminals are available, card reading time will be reduced.
- Long response messages are not always well suited to audio response. When programmed, provision should be made for pauses to permit the listener to write the message down.
- When one response indicates a sequential terminal entry, the response should end with a cue prompting the next step.
- During the initial training period, before the system went into operation, it was discovered that the tellers had difficulty in distinguishing the word "thirteen" from "thirty," "fourteen" from "forty," and so forth, in the computer's voice responses. This problem was solved by recording "teen" separately on the magnetic drum, and having the response unit assemble the words "four" and "teen" as a one-word reply. "Thir" and "fif" had to be recorded as well, but the net result was a clearer response—and a saving of four words.

We also learned that although systems design studies are more complex than formerly, and computerized pilot operations tend to be on the expensive side, the very complexity of modern equipment can be turned to good advantage in implementing temporary experiments. For instance, it was not necessary to disturb the usual work flow in the bank in order to perform the experiment. The regular data processing took place each night for the accounts at the test branch just as it did for all accounts at all branches. However, a tape, bearing updated balances and the other summary information, was available to the experimental unit before the opening for business each morning. The previous day's data on the disc files was replaced with the updated information. Thereafter during the day, transactions keyed into the terminals were instantly recorded in the disc files, the computer automatically supplying new balances.

real-time during down time

It was found also that customer service could be maintained in the face of equipment failure without reverting to the bank's main system, and with a minimum of confusion, by providing for manual intervention at the computer site. A printout of opening balance and other data, including the printed log, was available at this location and updated by hand during down time. These transactions were then keypunched and introduced through a recovery program when the computer went "back on the air." Service was maintained in this manner during the few emergencies, though somewhat slowed down. Of course, manual intervention required a telephone hookup that allowed us to intercept the terminal-to-computer calls.

Of importance to us was the evidence that audio-response is one method that can be employed to fill what has been referred to as a gap in the handling of one of the newer automated services being offered. We refer to the type of service represented by various bookkeeping service plans. Under such plans a terminal is installed in the office of a bank's customer. Data related to the customer's charges to his clients is entered and automatically recorded in the servicing data center. A confirming printout of data recorded is sent to the customer's office and, subsequently, bills to the customer's clients are prepared on the computer. In some cases, more complete accounting services are rendered.

What has been mentioned as a gap in this procedure is the absence of immediate verification that data entered into the terminal has been entered correctly and recorded accurately in the data center. Audio response may be one of the most efficient and economical means of confirming such source input.

The knowledge gained from the remote terminal and audio-response trial application will be helpful in current preparation for the next systems installations to be implemented. Certainly we have acquired a degree of confidence from our recent experience. Our course is being set by such factors as the development of computers with efficient multi-programming capabilities, the advance in economical and easily operated terminals, and the customer demands for automated services. Furthermore, the highly competitive nature of the banking business today makes it increasingly important to utilize all applicable new tools and techniques to achieve maximum operations efficiency.

other banking uses

Both customers and department heads of our own organization are properly intrigued with additional services which can best, and perhaps only, be supplied by the most sophisticated equipment available. Some of our resources are concentrated on how to exploit these new tools to the fullest. As inexpensive Touch-Tone terminals and multi-programmable computers become available we must be ready to consider in-plant banking applications such as the following in which audio-response will play a part:

1. General ledger accounting.
2. Budgeting and performance control.
3. Control of funds allocated for specific activities.
4. Credit analysis.
5. General supplies inventory.
6. Business development activity control.
7. Calculations currently made on desk calculators.

So broad are the possibilities for customer utilization that listing a few examples will suffice. We have been hearing from knowledgeable sources of the day when a housewife will look at a catalog and make purchases by phone, use perforated "identification cards" and push buttons for variable data. The result of this might very likely be the automatic debiting of the housewife's bank account and crediting of the merchant's account. The merchant, of course, would not overlook the opportunity to adjust his inventory control. This may seem far off, but not so distant may be this housewife's ability to dial her bank's computer direct and, by inserting her coded "identification card," obtain the current status of her account. Perhaps milady's difficulties with checking account balances are soon to vanish, to the delight of millions of husbands.

More and more we hear about the development of a national and even worldwide network, operating around the clock, making immediately available up-to-the-minute credit information about any individual anywhere, from a prominent executive with a permanent residence, to a migrant worker. Perhaps audio response will play a large part in these coming events.

We are not necessarily wed to the concept that all terminals must be of the "Voice-Answer-Back" type because of one harmonious "affair," but as we continue our studies for more efficient ways of doing our work, we expect the results of our experience to be extremely helpful. It is difficult to overlook the fact that V.A.B. offers the only terminal where the cost of pertinent hardware is located in one place—at the data center. Its moderate cost can be prorated over hundreds of terminals which are little more than your customary telephone. In any case, as this is written what is heard in the land is the voice of the computer. ■

THE BANK OF THE FUTURE

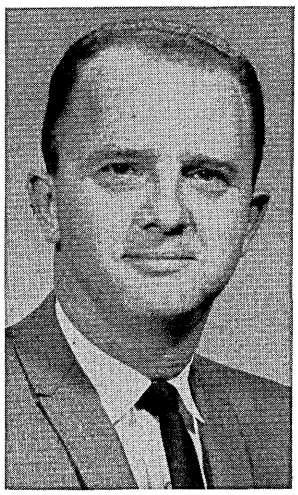
by ARTHUR S. KRANZLEY

Commercial banks will bring modern information processing to more businesses and individuals in the next decade than any other single type of enterprise or segment of our economy. Commercial banks will provide modern information processing in a manner which will put large and small business processing costs on a competitive basis. Commercial banks will become one of the largest classes of information processing equipment users in this country. Commercial banks will be repositories of the most complete market, business, and credit data ever available in the history of our economy.

These prognostications are based upon the real and emerging role of banks as merchandisers of financial services coupled to their traditional role in the acquisition and transfer of funds. They are also based on the advent of information processing equipment covering broader functional areas at more favorable cost and performance levels —all of which aids and abets this new role.

Evidence of the recognition of banking's changing role exists in abundance. Two recent examples illustrate the mounting testimony. First, at a meeting of all managers of a large bank in April of this year, the operating head of the bank admonished his managers to recognize that banks had three functions, viz. acquiring funds, placing funds, and providing financial services.[1] He went on to point out that it was imperative that the bank go out to the customer to pinpoint needs and desires in order to add new values to old services and to offer completely new services. In another setting, the vice president of the Federal Reserve Bank of Philadelphia told bankers attending a market research workshop to recognize these points:[2]

The kind of society that is evolving is one in which



Managing director of Information Sciences Associates, Cherry Hill, N.J., a consulting firm he founded in '62, Mr. Kranzley was formerly associated with RCA's entrance to the international dp field. He was also responsible for RCA's line of solid-state computers. In the past, he has been active in the planning and technical marketing of a number of manufacturers in the information-processing industry.

[1]Earl L. Bimson, executive vice president, Valley National Bank, managers meeting, April 1965.

[2]*Bank Management and The Marketing Concept*, David C. Melnicoff, vice president, Federal Reserve Bank of Philadelphia, American Bankers Association, Marketing Research Workshop, March 18, 1965.

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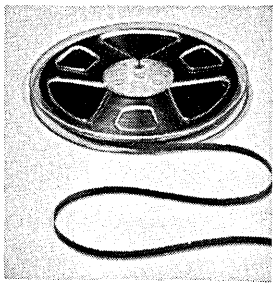

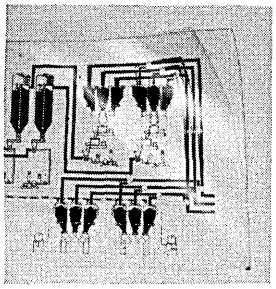

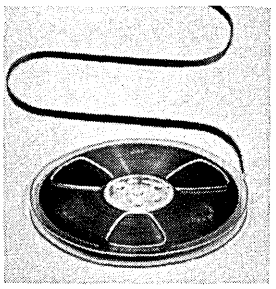

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CIRCLE 24 ON READER CARD

there will be a demand for a big bundle of fiscal and informational services. It will be a society in which the monetary "lubricant" will be under high pressure, requiring intermediary "pumping stations" of a higher order of sophistication. It will be a generator of paper-work on such a prodigious scale that revolutionary information-handling techniques—and institutions—will have to be developed to cope with it. These institutions and the "intermediaries" who keep the system going with ever-larger quantities of money and credit, will undoubtedly be of various types. Most important of them can be the commercial banks —more flexible, more diversified and, probably, bigger than they are now, but definitely the evolutionary development of today's commercial banking organizations.

Perhaps even more indicative is the following excerpt from his talk:

Bankers need not be limited in their thinking by the traditional boundaries of their trade. As business relationships change and as new machines and techniques become available, it may well be that the most useful source of new service ideas will come out of thinking about a bank as an institution with a more general function than that usually ascribed to it.

Returning to the equipment side, the ten-fold enhancement of computing power per dollar, the advent of on-line remote terminals coupled with multi-processing, and the increasing levels of compatibility provided by the industry in the past few years stand out as salient factors in the progress of commercial banks along these lines. It is safe to state that these new and improved products cannot help but affect the fundamental structure and business of commercial banks.

impact on commercial banks

It can be seen then that commercial banks could undergo a greater metamorphosis in this evolving scene than any other segment of the economic environment. Most bankers will concede that their current approach to data processing services, to merchandising of new services and to new bank organization is tentative at best and subject to either firm entrenchment or violent upheaval.

Historically, large commercial banks acquired computing systems to handle their major, conventional operations such as demand deposit accounting, installment loans, trust accounting, etc. Given these facilities, it was not long before a spate of conventional business applications, such as payroll, were being offered on a service bureau basis to assist in defraying costs or to entice a customer. As this practice grew and expanded, the dilemma of the bank service bureau versus more traditional roles for banks emerged. The banks with some available computer time reverted either to offering time and conventional application packages or held fast to operating banking functions for other banks and clients. When commercial service bureaus contested the former role, bankers across the country sought to rationalize or analyze their part in the picture. Not surprisingly, this dilemma is dissolving in the wake of constructive recognition that commercial banks' customers want this information processing capability—but want it applied to enhancement of existing services and to financial services which accelerate and expand the acquisition and placement of funds.

Putting this in another vein, the individual depositor (you, me, the business on the corner) needs and wants more help from the bank. This help or service may range from assistance in paying bills to planning regular investments. As individuals prosper or falter in the face of constantly increasing financial complexities, the "friend in the bank" must be more than a teller and supported by more than an alligator skin checkbook. Similarly, business accounts or customers operating in intensely competitive circles stand in need of financial services which will extend working capital to the maximum degree with minimum risk. For example, the commercial bank offering a sophisticated inventory control system and parallel financing on inventories so controlled is offering a financial service which allows a new level of entrepreneurial freedom.

In short, commercial banks are crystallizing now an approach to financial services which will relate these services to traditional roles. As they do, the service bureau connotation will fade in the light of a role which the economy at large will willingly accede to commercial banks.

What will the commercial bank attaining these lofty objectives look like? Only one part of the answer to this question is certain—it will be different.

The balance of the answer will and should consume as much attention as any other question facing bankers today. Organizationally, banks have begun a reasonably orderly attack on the marketing and development aspects of the question. Basically, this attack accepts that a bank must look and operate much like a conventional hardgoods company. Clearly, the future requirements on banks for new products (services) dictate an "engineering-research and development" organizational entity in the bank for new product conception and evaluation. Too, the marketing organization, re-oriented to finding needs, testing new products, and exploiting same, will more closely resemble its industrial organization counterpart. Similarly, to draw out the analogy, systems and branch operations in a bank have their parallels in the manufacturing segment of a hardgoods company.[3]

impact on the information processing industry

Far from being slow or nonprogressive in their application of available technology, commercial banks are pressing and urgently desire information processing equipment which is more functionally suitable, highly reliable, and properly priced. Disenchantment with program packages that do not fit, 90 to 98% reliable sorters, low quality printing, underestimated equipment complements, poor technical training, and long delivery schedules for encoders and teller terminals lead to increased pressure on manufacturers from banks.

Commercial banks want on-line data transmission. Commercial banks want inquiry and display consoles. Commercial banks want teller terminals. Commercial banks want remote terminals for users of their financial services. Commercial banks want new programming languages. Commercial banks want compatible application packages. In short, the heralded arrival of new developments in these and many other areas is eagerly awaited. However, commercial banks also want these developments to fit and suit their future needs—to work at the highest reliability levels —and to be priced commensurate with the value of the function or service provided.

Basically, commercial banks are content that this will be so and soon. The information processing industry via its clarions tells them so.

Why and when will the banks want this avalanche of capability? The answer to this question is two-fold. First, the banks are evolving an approach to financial services which demands such capabilities commencing now and extending into the Seventies. Second, the information processing industry must recognize, analyze, and interpret this

[3] *Evaluating New Services and Their Marketability*, Kranzley and Abouchar, Information Sciences Associates, ABA National Automation Conference, March 9, 1965.

approach into suitable products. Banking and the information processing industry are interdependent, and the pace and scope of progress will be based upon parallel developments within each.

This interdependent development is bound to be an evolutionary process. Commercial banks will be testing economics and market reaction at each step. The actual rate of transition to more elaborate approaches will be influenced to a great degree by the level and amount of clamor from bank customers and clients. This clamor, in turn, may well be set off and regulated by competitive practices of the commercial banks. "Oneupmanship" practiced by the banks will lead to more and more demand for extended and new services from the banks.

impact on competition & communities

Commercial banks will compete with service bureaus, information utilities, credit centers, and all other forms of enterprise which are based upon providing processing capability and information services for a fee. However, and this is of utmost importance, this competition will not be on a frontal or all-encompassing basis. Commercial banks will be providing information processing capability in the form of specific financial services tied to their primary function of handling funds. In these application areas, the bank's competitors will be confronted with products (services) which include features and characteristics which it is not possible for them to offer on an economical basis.

Conversely, these competitors will grow apace in the broader application areas for users, where commercial banks do not have legitimate corollary services and it is similarly not possible for them to offer same on an economical basis. In fact, it is appropriate to note that in due course the user of financial services from a bank and other services from a service bureau will be well served by extensive integration of input and output from banks to service bureaus.

In a sense, commercial banks and the other information processing enterprises are complementary. At this point in time and status, it is abundantly clear that such an understanding will be long in coming and fraught with much difficulty and controversy.

Concerning information processing and banks in the future, one aspect of the commercial bank's role seems to be neglected. To the extent that total information processing capability is an asset of considerable magnitude, its impact on a community or geographic area must be considered. In many communities and distinct geographic areas *today,* the commercial banks there now possess more total information processing capability than is provided by all of the other businesses or agencies combined in the area. Therein lies a responsibility which transcends the use of that capability for conventional bank operations and new financial service users.

The reference here is to leadership, guidance, assistance and even installations of equipment for hospital operations, urban planning, school scheduling, educational use, highway planning, and many other community-oriented endeavors. A step removed from this effort is that responsibility which may be assumed in use of the total information processing capability as a facility to attract new industry, government support, and professional people to a community or distinct trading area.

In virtually every metropolitan area of this country, perhaps excepting the five or six largest cities, an opportunity exists for commercial banks to foster a community-wide development of information processing capability. Practically speaking, such support ranges from bank officers and bank data processing managers being active in various community activities to promote modern information processing techniques, *to* the creation of community or geographic nonprofit centers which are chartered to pursue and support the applications and objectives mentioned.

The message conveyed here is that commercial banks should and will assume this responsibility as a part of the objective business leadership which is their responsibility. A total information processing capability applied and promoted in this manner will easily outrank most terrain, tax, transportation, and climatic characteristics which are cited in chamber of commerce brochures. Where this leadership is not assumed, it is not unreasonable to expect that it will be usurped by the nearby bigger city or neighboring community.

impact on the man in the street

What does all of the evolutionary change in commercial banks mean to you, me, and the business on the corner?

It means that your bank will pay your bills by preauthorization or specific authorization. This may in time be facilitated by use of your telephone or your personal terminal at home or in your office linked to the bank. Checks will largely disappear as an instrument used by the individual depositor or business.

Your credit line for secured and unsecured purchases will be adjusted regularly and will be available to you at all times. Your net worth position, investment plan, tax return, and estate trust will be calculated, analyzed, and reviewed for adjustment by your bank adviser with the assistance of his computing facility and your counsellors.

Virtually all of your retail purchases for goods and services will be facilitated by the credit token furnished by your commercial bank. The same token will be honored in other commercial bank areas from coast to coast for similar retail purchases.

Those costs of goods and services which emanate from clerical functions and delay in processing will be reduced substantially over a total period of some years. The extent to which these savings reach you and me will be obscured as always by the proliferation of new and improved goods and services which we consume. That this development will raise our standard of living still higher cannot be denied.

The bank will, in providing more services, be tied more closely to the individual and business than ever before. Bankers today and in years past have been exposed to many different types of businesses and become intimately familiar with some. This trend can be expected to continue and, in fact, accelerate as the banks more and more become repositories of all manner of credit and financial information, on both the consumer and commercial levels.

outlook

The information processing industry is challenging and will be challenged by the commercial banks in this country. This business arena stands to become the most interesting and dynamic of all of the user-industry relationships to date. Commercial banks become a middleman or retailer, in a sense, for the information processing industry. The business community, the urban community, and individuals stand to gain in large measure by the developments which we will observe in the next decade.

From a standing start in 1959, banking has accepted computers as no other major industry has. This has been the period of "second generation" computing equipment. With the advent of newer, better-balanced equipment it stands to reason that one can expect that more individuals and companies than ever before will realize the fruits of automation through the banking system's new services. What other industry using information processing equipment is so reshaping and gearing itself to take full advantage of computers in the offering of new (in addition to more efficient) services to its customers? ■

INTEGRATED DP FOR BANKS

an implementor's report

by MERLE D. COURSON

Perhaps no other type of business in our generation is as reliant on the daily capture of information from an immense volume of paper documents as the modern commercial bank. The heart of a bank—its prime function—is the acceptance of money for deposit from certain individuals to be lent to others under a variety of conditions. To place funds on deposit, properly and profitably, for the advantage of the stockholder at minimum expense is a prime reason for a bank's existence. Of course, this is an oversimplification; there are many arteries leading to and from this "heart" of a modern commercial bank.

Any commercial bank in a free-enterprise economy must consider of major importance its right and ability to earn a profit, and the main artery for generating profits is connected directly to the community served. It is there that the banking system provides a central store of working capital for a variety of business enterprises. These enterprises supply their stockholders and employees, through profits, new money which flows back into the banking system and completes the cycle.

The number of documents exchanged is staggering. In the course of a business day, it is estimated that 69 million checks are exchanged or passed by individuals into the banking system. This is particularly significant considering that less than 50% of all adults in this country use a bank checking account.

The exchange of checks, however, is only a part of the story; many other documents are involved in the average bank's program. While the check is the basis for withdrawal of funds from a depositor's account, loan payment tickets of various types are the basis for crediting a borrower's account. Still, these are only major categories of paper "items" the average bank must consider.

Others are time deposits and withdrawals, official checks, general ledger entries, accounts receivable and accounts payable documents. There are cash in and cash out tickets for working cash control plus collection entries. Trust departments generate a variety of documents, and there are still many others.

biggest paper mill

These are the factors that make the commercial banking system the largest processor of documents throughout industry. This means that the commercial banking system must constantly review systems and procedures, concepts and equipment, to capture and process data effectively.

A typical example of modern financial data processing is found at First National Bank of San Jose in San Jose, Calif. First National, while not among the giants, is a sizable bank, rating 293rd in size among the approximately 14,000 commercial banks in the U.S. Located in the fast growing Santa Clara Valley, it serves the South Bay community through 18 branches in a 50-mile radius. It is the largest independent bank between San Francisco and Los Angeles.

Electronic data processing began at First National in 1959 when an arrangement was made with Stanford Univ. to share a Burroughs 220 computer system. Magnetic Ink Character Recognition (MICR) equipment was installed for off-line sorting of checks and deposits. In that era, document input was taken to the computer 20 miles away in the form of punched paper tape and punched cards. The account numbers and dollar amounts of each check were punched into paper tape at the bank. Alphabetic information was captured using Add-Punch equipment. This document input was then carried by messenger to Stanford Univ. and converted to magnetic tape computer input. The shared system served us well. It permitted us to stabilize operating costs rather early in the history of bank data processing. Perhaps equally important, valuable experience was gained in the early use of electronic systems which later formed a basis for advanced concepts in the use of digital computers.

Mr. Courson is vp in charge of institutional planning at the First National Bank of San Jose, Calif. His responsibilities include the long-range planning for the computer center, as well as dp services for banking customers. He joined the bank in '57 as a systems analyst, the same position he had held at the U.S. National Bank of Portland. Educated in Vancouver, B.C., he also attended the Univ. of Oregon.

the integrated system

In 1962, concepts for the future had become reasonably firm. It became increasingly evident that a general rule should be established for future "paper processing" systems. In formulating the rule, it was assumed that the capturing of data from paper automatically would serve as the basis for next-generation systems. While the transmission of information directly to large "data banks" from the originator in an on-line status without paper document support was certainly possible, it did not appear to be economically feasible for some years to come. We thus concluded that paper documents, MICR-inscribed, would be the basis for data entry of all numeric information. This was not restricted to checks. Our policy was established at that time that *all* numeric dollar data, regardless of purpose, would be entered into the system by this method.

The "rule" established then was, "All documents, regardless of kind, shall be MICR inscribed at the time of first handling. Thenceforth entry shall be made into the computer for all additional distribution and processing of that data with related data integrated as single magnetic tape records where practicable."

First of all, checking account numbers which were already preprinted were considered as the master numbers for deposit accounts. Thus, savings and Christmas club accounts were given the "uniform" number used for checking accounts. Asset accounts (installment, mortgage and receivables) likewise are being assigned a uniform number. Obviously, this conversion cannot be done at one time since it would require a complete renumbering of all current asset accounts. However, as new loans come in, a uniform number is assigned. Thus a bank customer will ultimately have no more than two numbers even though he may have five or six different relationships.

Computer control under the universal number simply separates the data into particular program logic by a preprinted MICR transaction code read from the document at time of data capture. While the related accounts have similar internal programs, separate logic nevertheless must be applied internally within the computer. The transaction code dictates logic segmenting and application.

Since documents are now manually handled just once, it is obvious that the traditional multi-pocket proof/transit machines are no longer required.

Under the traditional method, proof machines were used with built-in bins for housing documents as they were proved in for amount. The individual machine operator in reading the document determined the distribution point (New York, Chicago, Los Angeles, etc.). Such systems, while a great improvement over hand batching systems, still left much to be desired. A relatively high training period, operator decision error in distribution and machine rental expense were among the problems.

Therefore, in 1962 we installed one of the nation's first "single pocket" proof of deposit operations using Burroughs P703 single pocket proof inscribers. Simultaneously, a Burroughs B270 was installed for proof/transit and data capture. Many advantages are realized in the "single pocket" concept including equipment economy, accuracy of input, low training factor and conservation of space, to name but a few. While the B270 computer initially handled the proof/transit and data capture functions, it was only a few weeks until conventional magnetic tape updating applications were added to the program repertoire. These included installment loan processing and stock transfer operations.

The important concept at this point in our data processing history was that a sound and economical basis for handling all future applications and growth had been established. *All* bank data is now captured on magnetic tape, regardless of application, for further processing. Additionally, data for comparable functions is captured under a universal account numbering process. This has proved advantageous in producing management and customer reports.

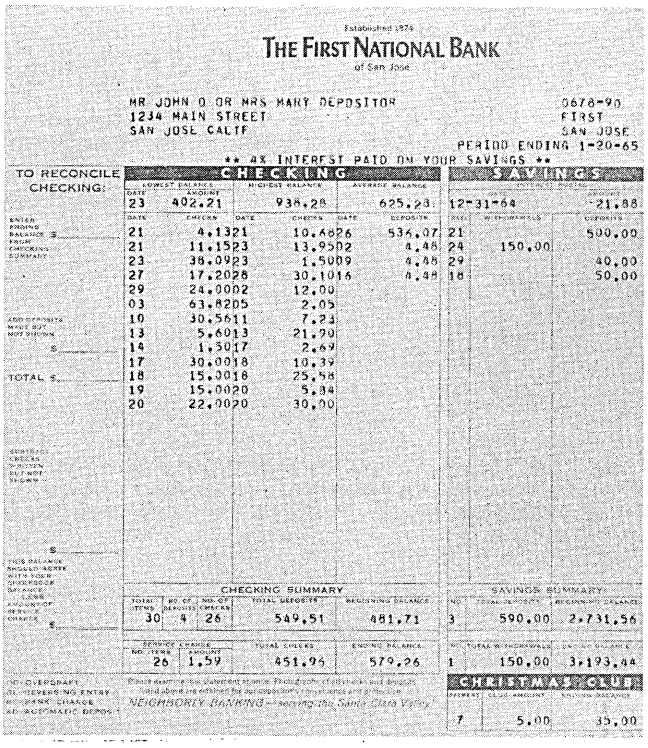
Turn-around documents, such as loan payment tickets and Christmas club coupons, are now prepared on-line as a by-product of original account setup on magnetic tape. Such documents, MICR inscribed, are re-entered into the system at time of payment as a normal part of the "single pocket" proof of deposit system.

one-statement banking

When the universal number plan was in use for all deposit accounts, programming began for integrated data processing. In October 1964 a Burroughs B5000 (later modified to a B5500) was installed to replace the Burroughs 220 in operation at Stanford Univ. The B5500 immediately took over all updating runs on demand deposit accounting plus interest calculations for time deposits. Time also was made available for a new development—customer services.

Through integrated processing, it became possible to provide a customer statement which showed the status of all items of deposit business: checking, savings and Christmas club. This integrated information is now provided to depositors on a single, monthly statement (Fig. 1). From an economic standpoint, it allowed us to combine teller operations so that one teller could handle the aver-

Fig. 1 Integrated Monthly Statement



age customer's complete requirements. Of course, postage and clerical savings are not to be overlooked.

A prime feature is the sales tool which integrated accounting provides. Our bank's most frequently contacted customer representative, the teller, has an unusually complete story at her fingertips. The daily balance printout shows at a glance the universal account number status of each type of deposit account the customer might carry. The teller now needs not fear "unknown" relationships when cashing checks. More important, through sales training, she has a complete "picture" of the customer while

in conversation with him. It is an ideal arrangement for increasing business.

Through the universal teller and the universal number combined with electronic data processing, new concepts for data input could be used. In the area of savings accounts, we employ data recorders with two-part snapout deposit and withdrawal tickets interleaved with MICR carbon. Savings depositors are issued customer convenience cards embossed in ABA-approved E-13B type font. The customer simply presents his convenience card to any teller when making a deposit or withdrawal. Insertion by the teller of this card into the data recorder along with the MICR carboned deposit or withdrawal ticket prepares—in less than three seconds—the ticket for automatic entry into the B273 computer system. No other manual handling of data is required at the teller level. Savings entries inscribed in this manner are entered into the data capture run with all other intermixed documents. The B5500, in its capacity as master computer, updates master savings files along with demand deposit files simultaneously.

With this integrated approach, there is no need for the conventional time-consuming passbook operation. Window service is substantially speeded and the customer gets a computer-produced statement as part of normal operations. It should be noted that integrated deposit accounting is probably feasible only with a relatively sophisticated computer operation, including sufficient core storage and a good internal operating system.

management reporting

A variety of management reports is available through the integrated approach. We have been extremely cautious, though, to evaluate carefully the end requirements for reports requested from the files. Only reports proved to definitely aid management in decision making have been made a part of the system. In loan accounting, rather conventional reports are provided. Type and dealer, delinquent, aged analysis, insurance subscriptions and market analysis reports are among those prepared as a general routine.

In deposit accounting, over and above daily trial balances, there are new business relationships, combined account and central information file reports. They are, in essence, a by-product of daily updating operations. In many instances, special runs are available for new business promotion in both asset and liability accounting.

More important, and again because *all* items entering the system are dollar inscribed and captured on tape, we can take full advantage of the computer system. It is here that data relative to income and expense, budgets and comparative historic data can be accumulated, updated and analyzed internally. Reports generated from these sources help management to control operating costs, income analysis and future projections.

Various management reports are prepared as a by-product from additional runs: stock transfer, capital note issues, personnel records, payroll and retail accounts receivable, to name but a few.

other financial customer services

Through electronic data processing, banks have been called upon to provide an increasing variety of services outside the realm of conventional banking. Business services such as accounts receivable, payroll, inventory control and other special applications are included in many portfolios.

At First National we have found accounts receivable servicing to be a normal adjunct to accounts receivable financing. Payroll processing is now being programmed, along with specialized financial applications.

Availability of computer time on our B5500 and B273 is not the only reason for pursuing such applications. This type of processing in many cases is a normal by-product of data capture through the integrated approach. Where it is not, it can, in many cases, be directly related to financial management—which banks are increasingly expected to provide. Of course it is necessary that such services be processed at a profit. We feel that the user must profit through increased accuracy, economy or information availability by allowing the bank to handle his data processing. The bank must build into its fee schedule a solid method for recapturing data processing costs plus a reasonable profit. By-product reports of such customer service processing are made directly available to bank management for financial analysis for line of credit where applicable.

Engineering and scientific time is also made available to users on the B5500 with ALGOL compiler and FORTRAN translator tapes available for loading on the drums. While such services may not be construed as of a financial nature, they can be extremely beneficial for a scientific community such as is found in this Peninsula area.

We do not support a large staff of programmers for this relatively large computer system; there are only five, including supervision. We have found that a small group with a good level of experience is far more efficient than many programmers with little experience. Communication problems are eased materially. COBOL is used exclusively for B5500 operations. The language has proven advantageous to us, and program compile time to object language is good. More important is the accurate and current documentation that comes as a by-product. Thus, run books are continually current with the latest documentation. Compact COBOL is being used on the B273 with satisfactory results.

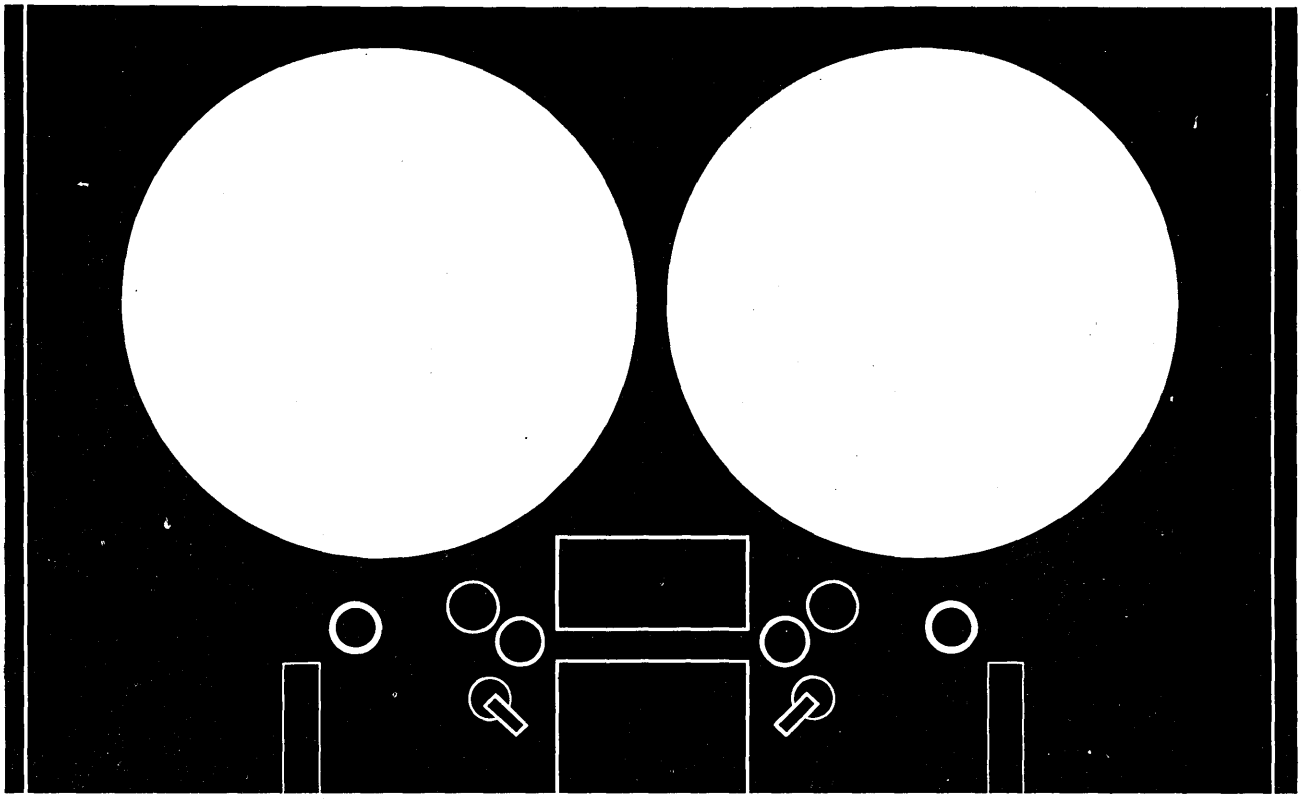
operations

For our bank of $150 million in resources, the B273/B5500 computer system provides computing power over and above today's requirements. As a serial single batch processor, equipment power would be more than adequate.

Special features, such as the built-in Master Control Program (MCP) and multiprocessing capabilities, provide even further capacity. The MCP enables the B5500 to use its multiprocessing capabilities to greatest potential by determining optimum sequence and combinations of jobs to be processed. At this writing, however, we are not multiprocessing because present workload volumes simply do not require it. Even during serial processing a component switch is provided, making possible the switching of I/O units in combinations to either central processor.

We are a growing bank and have introduced a number of new concepts during the past decade. Among these concepts are retail credit service, auto leasing and one-statement banking, to name a few. While our computing and data handling power is more than adequate, should further innovations be developed for banking by First National, there is little doubt that progressive management will easily find ways to make that computing power work to the benefit of the stockholder and the local community.

We believe it is up to individual bankers to find ways for recognizing the potential value of the computer as a significant tool of the trade. We like to think our bank is a little bit different because we have found some of the ways. ■



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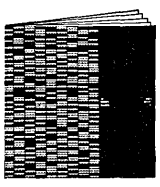

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THE USED COMPUTER MARKET

by GEORGE H. HEILBORN

Along with the development of the more exotic computer uses, such as real-time processing, communications switching, etc., one of the most rapidly growing areas of the field is the relatively prosaic used computer market. It is probable that in 1964 several hundred computers were traded in to manufacturers (and resold, rerented, or scrapped by them) and perhaps 50 to 100 scrapped or sold on the open market by owners. Both manufacturers and users are taking advantage of this development, albeit quietly for the most part, to dispose of older and less useful equipment and to broaden the EDP market. At the same time, buyers are finding it increasingly profitable to recognize the source of inexpensive data processing capacity.

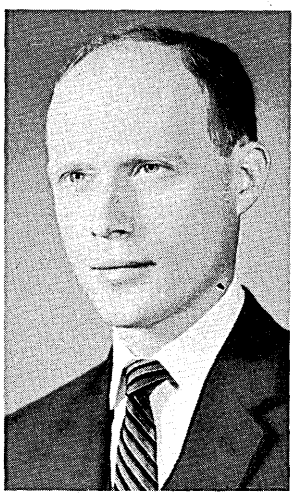
What type of equipment exists on the used computer market? It is readily apparent that, like used cars, different computers have different prices and trade-in values. There is no intrinsic value to used equipment—its value is what a buyer is willing to pay and the seller willing to take. Computers which were popular on the new equipment market, and thus have a wide distribution, will also be popular on the used market as additional systems, to boost capacity, or to replace rented equipment where the user expects to keep that type of equipment for a number of years. The equipment should have low maintenance costs, so that the advantages of purchasing equipment on the used computer market are not lost through high upkeep. The main reason for the demise of the vacuum-tube computer on the open market is that the maintenance cost for such equipment is not much below the total rental costs of the newest systems with equivalent or higher capacity. The same argument, of course, holds true for installation costs as well. It should hardly be necessary to add that maintenance should still be available, although this is not the case for some older equipment made by companies which have retired from the field of battle.

The type of equipment, then, for which there is little, if any, market includes that of defunct manufacturers, vacuum-tube equipment, one-of-a-kind machines (which means not only true "single copies" but any machine with little success on the original equipment market, and which has only a small number of installations), those for which maintenance is impossible or expensive (which is the case for even some transistorized equipment made by certain manufacturers), or which utilizes "non-standard" techniques (e.g., 90-column equipment). Even where such equipment can be sold, its lower price reflects these realities of the situation.

effect of new equipment introductions

One of the big questions posed by both manufacturers and users is: what is the effect on this market of the innumerable new equipment introductions? Generally, it can be said that prices for used equipment will decrease as a result of new equipment *deliveries* (not just introductions), but on a gradual basis.

It has been found, as a matter of practical fact, that the mere introduction of new computer systems does not appreciably affect the market price of older ones immediately. The reasons, on reflection, are clear: first, the prospective user does not really understand the capabilities (or, to use current parlance, the "cost-effectiveness ratio") of the new system without some weeks or months of analysis. Second, he does not know if the announced



Mr. Heilborn is president of Information Processing Systems Inc., New York City, brokers in EDP systems. He was formerly with Ramo-Woolridge Corp. and Philco Computer Division, most recently as 425L project manager. He holds a BA in physics from Northwestern University and an MA in physics from Harvard.

specifications will be met at the time of delivery. Most important of all, the attempt by manufacturers to forestall the purchase by their customers of competitive equipment encourages them to announce equipment many months, or even years, away from delivery. It can hardly be a secret that the majority of computer systems at the time of announcement exist more in the minds of logicians and on the breadboards of circuit designers than in production checkout areas. Thus, only when equipment deliveries start in volume does the older equipment begin to decline appreciably in value. It might be noted in this connection that vacuum-tube systems such as the 704 and 705 were still selling for appreciable amounts (i.e., six figures) as late as 1962.

purchase vs. rental decisions

Another question in the development of the used computer market is how many companies will continue to prefer to rent equipment rather than buy it. Generally, it seems that about 15% of the computer installations are purchased at first, the remainder being leased. It is also clear that as the age of a particular model increases, the percentage of purchased systems in the field also increases. Usually this is either because a company finds a system adequate, and hence can plan on continuing to use it for a number of years, or because the manufacturer decides to sell the system at a reduced cost.

There are, of course, certain corporations which purchase rather than lease as a matter of basic policy. Others find that they are much more capable than formerly of measuring the potential return and period of usefulness of an EDP system, and are therefore willing to purchase on the basis that sufficient use will be made of the system to make this worthwhile. The manufacturers have countered by reducing or eliminating the extra shift cost. This is important because it is mostly large corporations with two- and three-shift operations which tend to purchase equipment.

In addition, as users, particularly first-time users, get more experience on EDP systems, the utilization tends to rise. Hence it becomes more attractive to either purchase equipment or at least rent the most modern equipment without the payment of extra shift rental charges.

In the long run, however, probably more and more corporations will opt for purchasing rather than renting EDP systems. As the technology stabilizes, corporations will increasingly think in terms of using the equipment somewhere in their operations after the prime applications have been put on still newer or larger equipment, and there will be a slow but definite change in the direction of purchase.

Aside from price, one of the main factors which will tend to keep companies leasing equipment is the fact that manufacturers now offer such a complete line of "compatible" systems. Since trade-ins will probably be as poor in the future as in the immediate past, users who plan to make any changes (or fear they may have to make changes) within two or three years after installing a configuration will be attracted by the ability to trade in central processors, tape units, etc. without penalty.

residual values

One of the key factors in the lease-purchase decision is the residual value of EDP equipment. It has, in the past, been necessary to assume that this would be zero, since no independent market for such equipment existed. Now, however, the value of, say, a 360 purchased in 1965 may be expected to be still appreciable in five or more years. Even in the current generation of equipment, such systems

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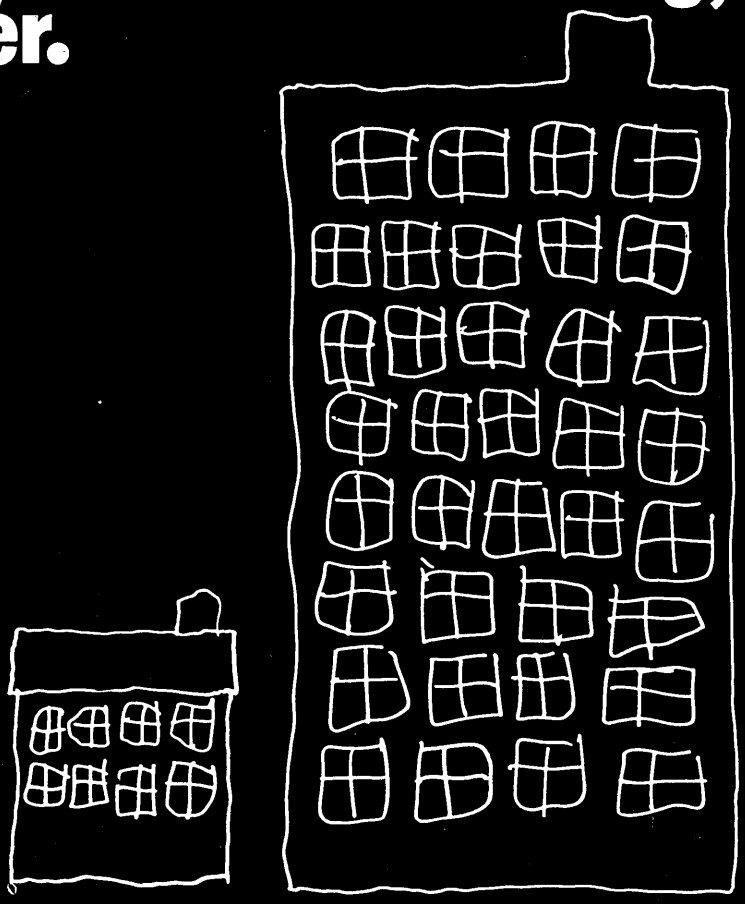

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CIRCLE 27 ON READER CARD

as the 1401 can be expected to retain a reasonable value for several years.

The higher the residual value, of course, the lower the total cost of ownership, and the more this path should be considered vs. that of rental. The consideration of residual value will probably also result, in time, in a decrease in the number of companies which purchase central processors but rent peripheral equipment, such as tape units. The reason for this is that they will find that as a percentage of original cost, the complete system will bring more on the open market than a partial system, offsetting the savings they now feel they are making on the maintenance costs of purchased peripheral equipment.

why buy used equipment?

The main reason for purchasing used equipment is naturally the savings that can be achieved. To buy a used system rather than buying or renting a new one from a manufacturer, if the system is to be used for some period of time, may result in savings of tens or hundreds of thousands of dollars.

Often purchasers are major corporations interested in adding to existing data processing capacity. In this case, the usual education function performed by the manufacturers is not necessary. Indeed, if the corporation has similar equipment, the programs already written can be immediately used on the just-installed machine. Personnel, both programmers and operators, are also ready to use the equipment without costly retraining.

The purchase of used equipment can also be an inexpensive way for small organizations to automate their accounting and other management functions. However, small companies wanting to follow this route must give intensive consideration to the methods of training their programmers and operators and the writing of their new programs before equipment delivery. Often, it is the manufacturer who is best qualified to perform these services, although they can, of course, be performed by outside consultants. In any event, for a used system purchased from another user, it cannot be assumed that these services will be supplied automatically.

On the other hand, one advantage to a small corporation, just getting its feet wet in the computer field, is that the type of used system it would buy would generally have been one of the more popular models of some major manufacturer. Hence often a large number of very useful programs is available without charge from the manufacturer's library.

The software available generally has little effect on the marketability or price of a used machine. The main reason organizations buy used equipment, aside from saving money, is that they have programs already written for that equipment. Even machines with extensive libraries go begging if there is no demand for the hardware itself. Therefore, also, only minimal software maintenance is usually performed or necessary. When programs are rewritten to any major extent, they will, if the corporation also has newer equipment, be rewritten for a newer machine. The factor of software may become more important in the future, however, as more used computers are sold as "first" systems.

effect on manufacturers

It is clear that in time the existence of a used computer market will affect the market for new systems. Manufacturers will have to evolve policies on used equipment in

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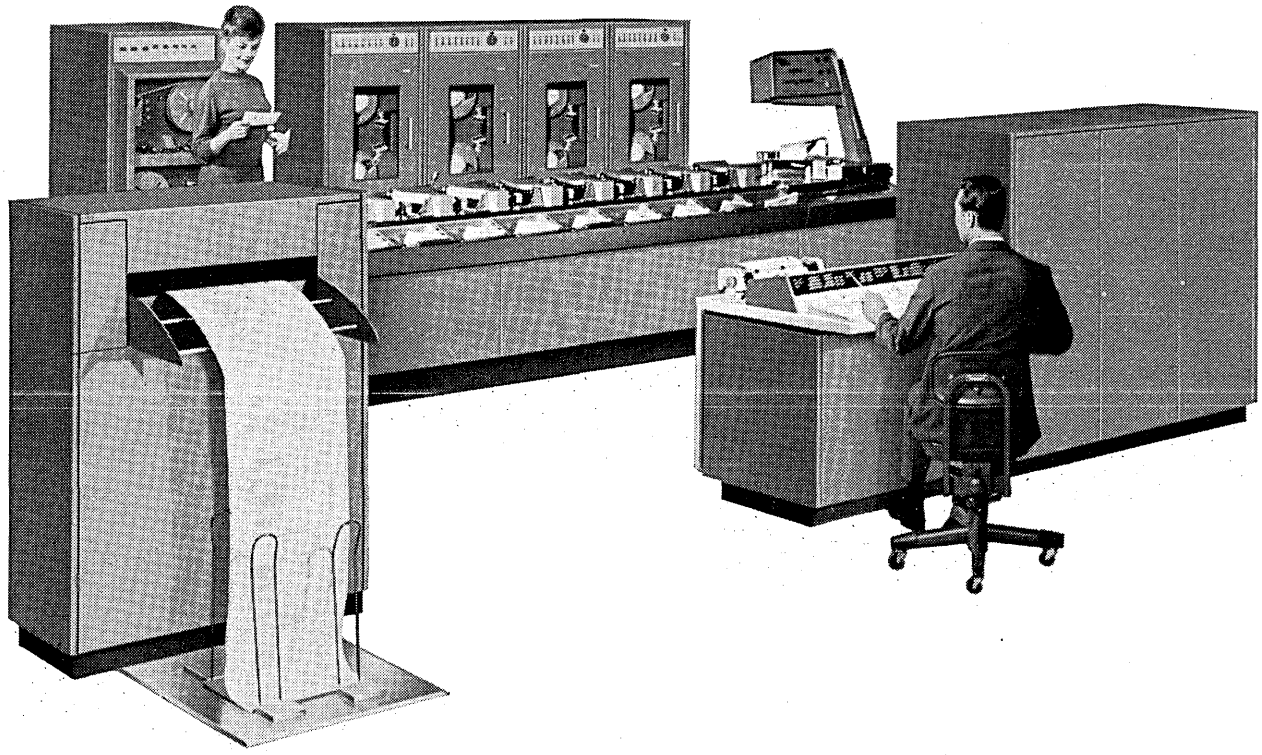

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some detail. They may find it desirable to take competitive equipment in trade and sell these trade-ins on the open market. They will want to create future markets for their own equipment by selling their own used systems to small companies which cannot otherwise afford computers.

The manufacturers have been faced with an increasing problem of what to do with their own computer equipment which they have had on rental, or have taken back in trade. One approach toward the sale of such older equipment is to sell or rent it, perhaps with a different model number and/or slower I/O equipment, as a lower-priced series of equipment. At least two manufacturers are said to have had some success with this approach, thus realizing continued income from equipment not otherwise economically productive.

One area which will probably develop further in the next year or two is that well-developed technique in the automobile market—the taking in on trade of competitive equipment. Several computer manufacturers have quietly done this on an exploratory basis, with varying success. In some cases, trade-ins have been unrealistic, since the manufacturer had had little experience in used computer sales—especially, of course, in selling competitive equipment. It is probable that the federal government will be the pacesetter in forcing manufacturers to give serious consideration to the competitive trade-in situation. In the past, the government has asked for a trade-in value for its old equipment, in some cases, when procuring a new system. Manufacturers, in turn, have allowed nominal trade-ins to the government on very old equipment, which they intended to scrap; the "trade-in" to that extent was only a disguised discount. This facile solution will not be possible when the government wants to start trading in 1401's and 7094's. Since the activities of the Comptroller General's office and the Bureau of the Budget have, in the last year, led to the purchase of great quantities of EDP equipment, it may be expected that the government will do its best to get any residual value possible out of this equipment at the time of buying new equipment.

prices of used edp systems

The general rule is that the price of used equipment cannot be higher than that of new equipment of equivalent performance plus the retraining and reprogramming costs involved. This rule is simple in theory, but difficult in application. In scientific systems, on the one hand, "systems performance" is almost entirely based on the calculation speed alone; the only peripheral equipment which comes into these estimates is that of tapes, and then really only on tape-limited problems or systems. That case aside, the merits of systems can approximately be evaluated by comparing arithmetic and memory speeds of the competing systems.

In business applications, however, the problem is not so simple. Most small business computers are useful more for their I/O abilities (printing and tabulating, card reading and punching) than for their computation speeds. Thus a several-fold increase in central processor or memory speeds, at even a slightly higher cost, may be of marginal or no value to a user. It is for this reason that commercial systems, such as the 1401, 1460, and others, will have a useful life of at least another five years or more in the used equipment market. Once prices for these systems on the used market approach that of a tabulator, there is obviously little point in renting a 150-line-per-minute tabulator when one can, for the same price, get a 600-line-per-minute printer with computer attached. *(con't. p. 55)*

How do you turn an ordinary analog computer into a state-of-the-art hybrid system?

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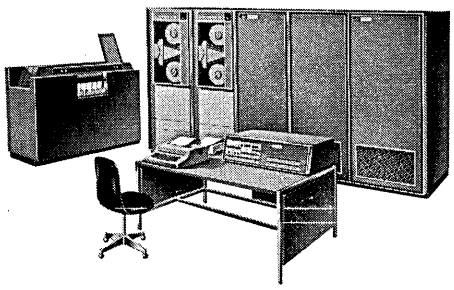

NASA will have new state-of-the-art simulation capabilities this fall when Raytheon Computer connects a 520 digital computing system and an advanced analog/digital linkage system to an existing analog computer. At Marshall Space Flight Center's Slidell, Louisiana facility, the hybrid system will be used for space vehicle control system and structure and fluid thrust coupling simulation, trajectory optimization and lateral-load and wind-profile studies.

The new 520 System offers substantial speed advantages in scientific and data systems computing. For example, multiply for 12-bit data executes in 3.5 μsecs. Floating point operations include 24-bit mantissa addition in 21-36 μsecs and 24-bit mantissa multiply in 25-28 μsecs. The 520 is the only computer in its class that can be optionally equipped with a 200 nanosecond access non-destructive readout memory for function generation, table lookup and subroutine storage.

520 software includes a new compiler-assembler with capability oriented toward hybrid computation. Called FLEXTRAN, it includes such instructions as: SET POT, READ POT SETTING, READ ANALOG ELEMENT, ANALOG COMPUTER MODE SELECT, READ ANALOG CHANNEL AND SCALE, CONVERT TO ENGINEERING UNITS.

Heart of Raytheon Computer's linkage system is the new Multiverter, which combines up to 96 channels of 0.01% multiplexing, a 0.01% 100 nanosecond sample and hold unit and an 0.01% 12-bit or 15-bit analog/digital converter in a single 5¼" drawer.

More information on the 520 System, the Multiverter and Raytheon Computer's ability to provide you with state-of-the-art hybrid computing is in Data File H-113J. Write today. Raytheon Computer, 2700 So. Fairview Street, Santa Ana, California 92704.

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specific factors

The key factors in the prices of used computer systems are:

(1) the prices of new equipment of comparable performance,
(2) the "demand" for a particular type of system—that is to say, its general usefulness and popularity,
(3) the manufacturer's prices for similar used systems,
(4) the manufacturer's trade-in schedule,
(5) the costs of installation and maintenance for that system,
(6) whether or not the equipment is still in production,
(7) the equipment configuration,
(8) the system's age.

Of all these factors, the one most often overlooked by sellers is (1), the price of new equipment of comparable performance. As mentioned previously, this is most readily seen in the case of scientific computers. The availability of a new machine with appreciably higher speeds immediately decreases the value of older and slower equipment to a quite appreciable extent. Not present in this case are the two factors which tend to make obsolescence of business computers slower: the fact that business computers of "higher speed" often have the same peripheral equipment as the previous model, which in business applications is often the limiting factor in throughput, and the fact that business programs tend to be "production" and therefore in use for years, whereas scientific programs tend to be specialized and "one-shot," or at least often modified, in which case program "inventories" have much lower value.

Generally, of course, sellers will not be able to obtain higher prices for their equipment than the manufacturer's selling price for similar used systems. However, open market prices generally exceed the manufacturer's trade-in value; otherwise there would be little incentive to sell on the open market. The system's trade-in value is naturally related to its age. Equipment configuration is important since balanced and complete systems, usable by many other companies, will command higher prices than partial systems, or "oddball" configurations put together for a specialized application. The other points listed above are probably self-explanatory.

One of the problems both computer manufacturers and users face in selling used equipment is that the market value has no necessary relationship to book value. Book value, of course, depends on the original price of the equipment, its age, and the depreciation policy followed. The latter might range, for example, from a double-declining-balance write-off over four years to straight-line depreciation over 10 years. The book values of two identical machines, bought at the same time by two different companies, may thus be vastly different. Both manufacturers and users have suffered unnecessary losses in disposing of used computer equipment by insisting on trying to "recover our book value," thus being forced to take a large loss by waiting while the market value steadily decreased, rather than taking a small "book loss" and selling while the equipment still had some reasonable value.

old myths and new realities

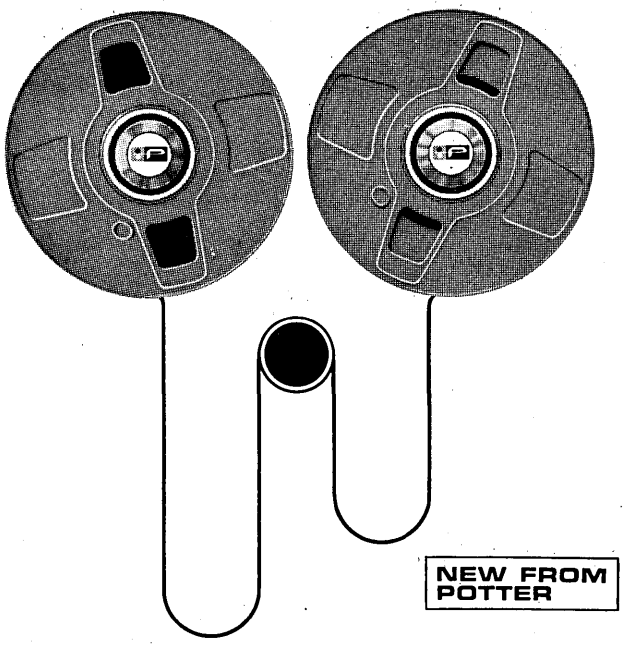
There are a number of other myths and realities that are worth commenting on. For one thing, there are numerous examples of corporations wishing to sell used EDP equipment for more than the cost of brand-new equipment of the next generation available for delivery at the same time.

Another common error by sellers is to attempt to sell equipment at the last minute before it is dismantled.

(con't. p. 58)

Need...

POTTER®

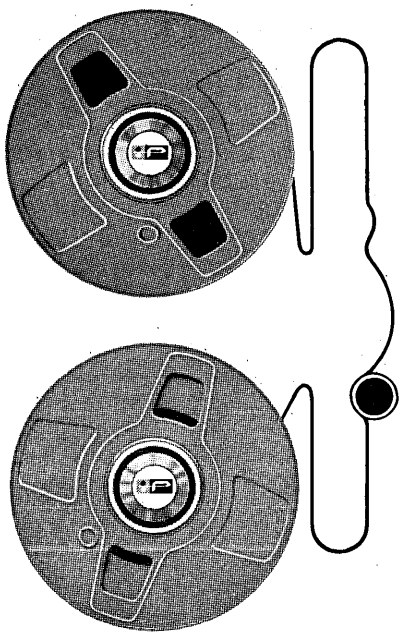


SINGLE CAPSTAN PERFORMANCE AT MEDIUM SPEED is now available in one of Potter's newest units, the SC-1060, which offers bidirectional tape speed to 120 ips at 800 bytes/in. This model is operable at 7- or 9-channels (IBM or ASCII) and offers a rewind time of less than 75 seconds for 2400 feet of tape. The single capstan design of this transport provides an optimum tape path in which the oxide surface of the tape contacts nothing but the head, and that only during actual read/write operation. The tape does not contact the read/write head during rewind. The SC-1060 uses no air bearings, thus eliminating tape motion during standby.

MILITARY RUGGEDNESS PLUS SINGLE CAPSTAN HIGH-SPEED OPERATION make Potter's SC-1150M the industry's most advanced transport. Able to withstand 50 g's shock, it runs at 150 ips, 800 bytes/in., and in 7- or 9-channel format. Loading is fully automatic with IBM type reels and the unique tape drive design is the last word in operational simplicity. In the SC-1150M, the tape path design allows the oxide surface of the tape to touch nothing but the read/write head which retracts during rewind.

This transport design is especially suited to the demands of military environments such as trailer-mounted and shipboard systems. It has frontal access to all components, a self-contained, filtered air cooling system, and can be operated under local or remote command.

CIRCLE 33 ON READER CARD

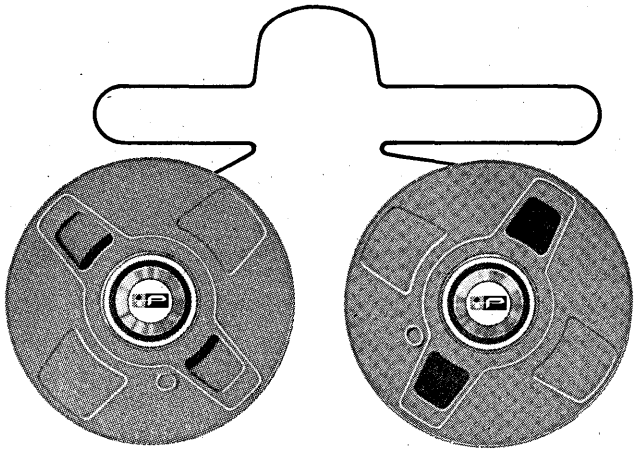


INCREMENTAL TRANSPORTS designed by Potter especially for computer application provide one-character-at-a-time reading and writing. These steppers feature completely asynchronous operation to 300 characters per second in IBM-compatible formats, 200 and 556 bpi. The MT-SR (read/write) and MT-SW (write only) incremental transports have maximum spare parts interchangeability with the MT-24, -36, and -75 Potter transports.

CIRCLE 34 ON READER CARD

The industry's

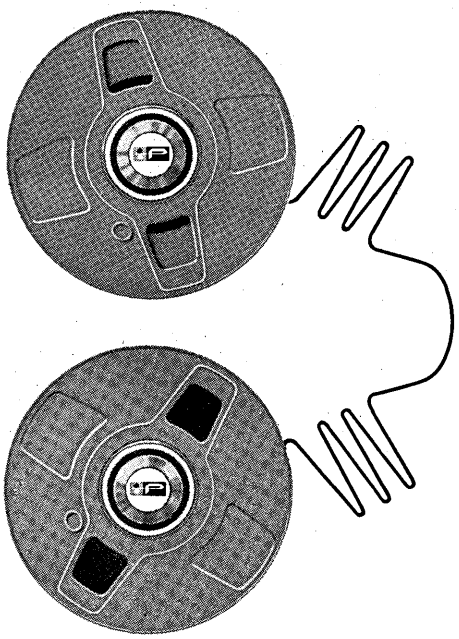
...transports?
has the products



LOW COST AND HIGH PERFORMANCE are outstanding features of Potter's MT-24, MT-36 and MT-75 vacuum column transports. The three units share a common logistics program having interchangeability of most parts and identical maintenance, training and operating requirements.

These units offer densities to 800 bytes/in. and transfer rates to 60 kc. The MT-24 operates from 1 to 36 ips, the MT-36 to 50 ips, and the MT-75 to 75 ips. The series is specially suited for medium-sized computer installations with mass storage and sequential access requirements.

CIRCLE 35 ON READER CARD



MAXIMUM PERFORMANCE IN MINIMUM SIZE—with Potter's MT-120 tension arm transport which occupies only 24½ inches of rack space. Enlarged vacuum buffers accommodate more tape and give smooth, rapid response. The MT-120 offers speeds from 75 to 150 ips, 800 bytes/in. packing density and data transfer to 120 kc. Other features include pushbutton loading and solid-state control circuits.

The companion M906II-2 transport offers similar performance characteristics and handles standard tape widths from ½ to 1¼".

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USED MARKET . . .

Equipment should be offered for sale about six months before the projected delivery date to the new owner, so that the buyer is in a position to make adequate preparation for the system after all negotiations have been satisfactorily concluded. In the same fashion, buyers should be aware that a particular equipment configuration can rarely be found in one or two months.

Buyers often wish to buy the most popular systems on the used equipment market, which have correspondingly higher prices, when it would be possible for them (particularly first-time EDP users) to do their work with other computers of equivalent capability, available at much lower cost.

Two other misconceptions seem to have spread like the plague recently. In one, the corporation believes that it can put a rented computer on the market, and after it finds a buyer, purchase the computer from the manufacturer, using the rental credit it has accumulated. It then intends to resell the machine at the price it must pay the manufacturer after the credit, plus enough to "make a profit" and also possibly pay a broker's fee. The difficulty with this idea is that this resulting price will almost invariably be well above the open market price for the equipment. In addition, few if any reputable brokers or buyers are attracted by this type of proposition.

The other misconception is that of selling a purchased computer for delivery one or two years later, meanwhile re-renting it from the buyer. The intended effect is to shift all risk of decreases in the market value to the buyer. The latter, on the other hand, while he receives a rental (to be lower, of course, than the manufacturer's, since otherwise the seller would deliver immediately and rent from the manufacturer), has no use of the equipment. Obviously, the thing that makes this so patently attractive to the seller makes it equally unattractive to the buyer, who is therefore not interested.

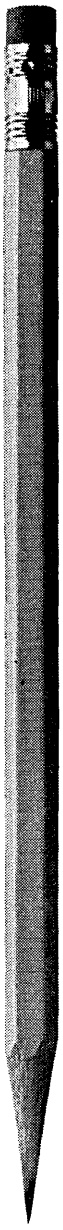
the computer broker

In selling used computer equipment, the manufacturer, of course, has an appreciable advantage over the computer user, in that he has an experienced sales staff. The user, however, who is generally in some unrelated field and does not have the expertise of the computer salesman, has, in the past, had to take a hit-or-miss approach toward the selling of used computer equipment. This has resulted in the emergence of the computer broker, who is in a position to advise on the marketability and value of used EDP systems, and is able to sell such equipment for organizations planning to obtain new systems. The organization can thus sell equipment without the major expense of funds and management time otherwise necessary. The broker is also a source of independent counsel on the purchase and sale of computer systems.

summary

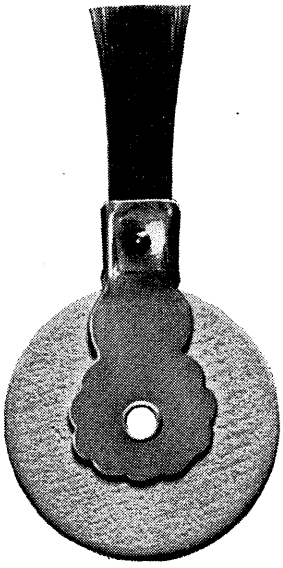
The main point to be emphasized here is that appreciable savings can be made by a corporation investing in a used computer system instead of a new one, particularly if the required programs and trained personnel are already available. The value of such an approach depends naturally on the specific situation, and the corporation must do some analysis in order to determine its optimum path in each case where additional capacity is needed However, a growing number of organizations have found this technique profitable.

By the same token, users who have purchased EDP equipment and are upgrading their installations, should consider the desirability of realizing the extra income possible by selling equipment through established market channels rather than trading it in. ■

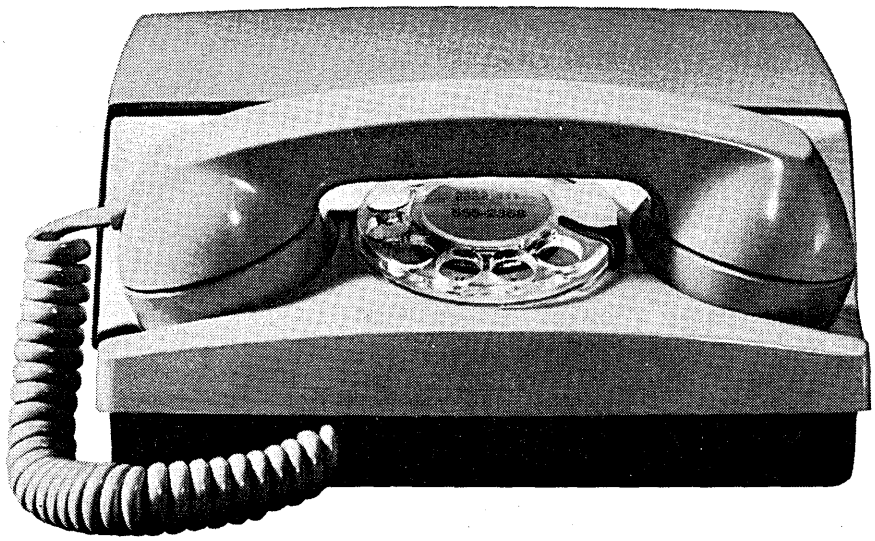


"Guess who saved $75,000 for a customer of Atlas Stationers?"

"Well, who?"



"I did."



"Actually, I shouldn't take all the credit. I'm just part of the Atlas Order-Mation* system, which is saving money for a lot of customers."

When an Atlas customer needs office supplies, it's just a matter of feeding punched cards through a card reader connected to a Bell System Data-Phone** data set.

The order flashes over telephone lines from distant locations to Atlas headquarters in Los Angeles. The cards are automatically duplicated and processed so that Atlas can start filling the order within minutes.

Because of the fast, automatic reordering operations, Atlas customers are able to reduce clerical details, paperwork, and inventories. A chain of department stores saved approximately $75,000. An electrical company saved $28,000. An astronautics firm saves $5000 yearly.

If you're interested in keeping customers buying from you, consider what Data-Phone service could do for your customers and your business. We can show you how.

Just call your Bell Telephone Business Office and ask for the services of our Communications Consultant.

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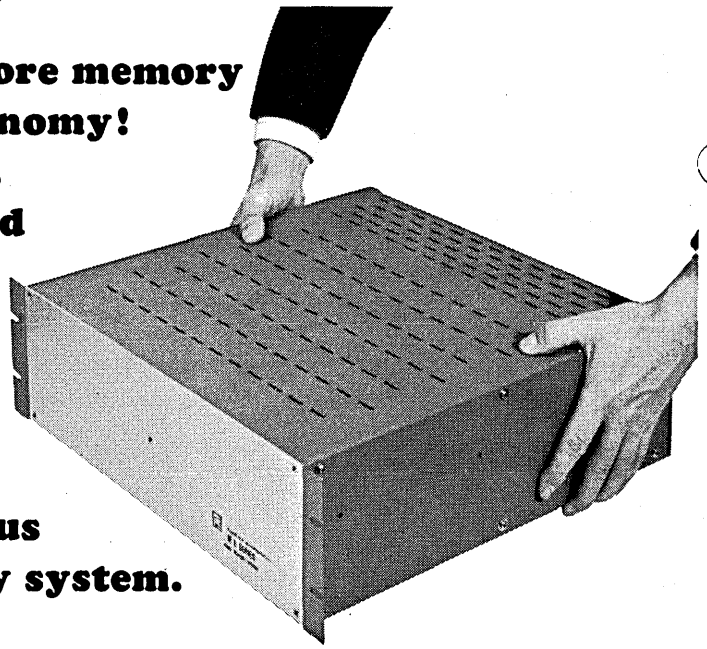


If you're looking for an optimized, standard memory system that can be ordered out of a catalog without lengthy specifications, tiresome telephone discussions, and several months of waiting—and have been looking for the economies of integrated-circuits to show up in core memory systems, then this is your answer!

The Fabri-Tek Series MLA5 Integrated-circuit Core Memory System:

Memory-type—coincident-current, random access, ferrite core

Cycle time—5 microseconds

Capacities available—128, 512, 2048 words with from 2 to 26 bits per word in increments of 2 bits.

Relay rack packaging—All capacities are packaged in one relay rack size (5-7/32" high by 19" wide)

Circuitry—Integrated circuits used in all sections except where absolutely necessary for efficient memory operation.

Standard options available—address register, power supply, current-accepting input interface, high-power drive output interface.

Delivery time for standard sizes—45 days.

A separate portable exerciser is available to check out Series MLA5 systems.

The Fabri-Tek Series MLA5 memory system has been engineered to provide maximum reliability and economy for a particular set of standard requirements. If you want faster, larger, or more versatile memories, just ask us. There is a Fabri-Tek core memory system to meet every memory problem.

For complete operational data and ordering information on the Fabri-Tek Series MLA5 Integrated-circuit core memory system: Call, wire, or write Fabri-Tek Incorporated, Amery, Wisconsin. Phone: COngress 8-7155 (Area 715). TWX: 715-292-0900.

FABRI-TEK INCORPORATED

CIRCLE 39 ON READER CARD

IFIP CONGRESS '65

Time-sharing, the idea, became time-sharing, the reality, for thousands at the recent IFIP Congress 65 in New York City. The exhibit area had more remote consoles than an airline ticket office. Still, people had to line up to play question-and-answer games with a distant computer and to write and debug a FORTRAN program. And if you still didn't understand the significance of the latest "in" topic, there were technical sessions on its use in engineering design, hospital information systems, and programming. In the corridors, stop a member of a foreign delegation and hear him tell about its importance to the "developing" nations.

As Mexico's ebullient Sergio Beltran said: "What is convenient for industrial countries is vital for less-developed countries. Time-sharing is vital."

No less vital, but rather bedfellows to it, are such techniques as multiprogramming, graphic I/O, multiprocessing, communications, and information utilities. And these, too, got their share of comments. The man-machine idea carried over to the closing session, which was devoted to research reports on the way man processes information.

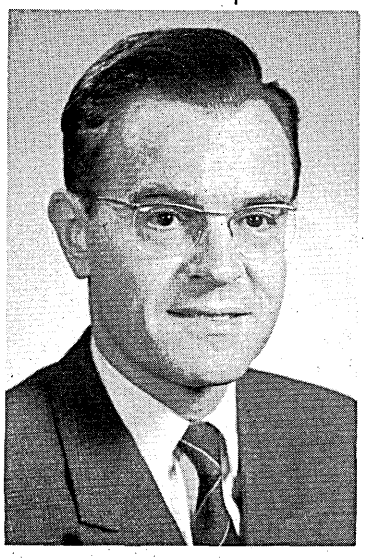
That was the kind of week it was for more than 4,500 registrants, including some 800 from 34 other countries. The Russian delegation of 13 top computer scientists arrived a day late. Their attendance remained in doubt because they were denied the privilege of taking post-conference tours by the U.S. State Dept. But IFIP got around that by cancelling sponsorship of the tours. By the end of the week, politics gave in to science, and one of the delegates, Prof. A.P. Yershov, made it out to the West Coast to talk to the L.A. chapter of the ACM.

At the opening session, Dr. Donald F. Hornig, special assistant to the President for science and technology, spoke of the role of computers in science and technology and in the modelling of the economy. The Commerce Dept., he said, recently completed a five-year study of the U.S. inter-industry structure. The data from this permits tracing of the "intricate chain reaction throughout some 86 segments of the economy resulting from any change in one of the segments." This data, plus the model, will permit the government to determine how changes in fiscal or tax policies will affect the economy. All these applications, he observed, involve numerical data, but the next decade will bring progress in the processing of natural languages and the coupling of "man's heuristic capabilities and the computer's algorithmic capabilities."

The technical portion of the conference was perhaps best summed up by RCA's Mr. Memory, Jan Rajchman, who said: "The presence of more sessions on software, rather than hardware, is an accurate indication that the problem today is more one of correct usage than improved hardware." Rajchman, in the session Outlook in the Memory Area, went on to say that the hardware challenge is still greatest in the area of integrated memories. This is not to deny, of course, that cores are getting cheaper and faster.

Equally adamant but more dramatic was IBM's Fred Brooks in the session Trends in Computer Design. In a paper described by several observers as excellent, Brooks said: "In the information system of the future, hardware and software functions must be integrally planned and precisely divided, and one and the same architect must specify all. No team of specialists can cope with the subtleties of system interaction which will be our lot; only single minds can. I know of no one today who is really professionally qualified to do this. The profession of systems architecture awaits population. The information science achievements of the 1970's will depend upon our response."

IFIP President Speiser

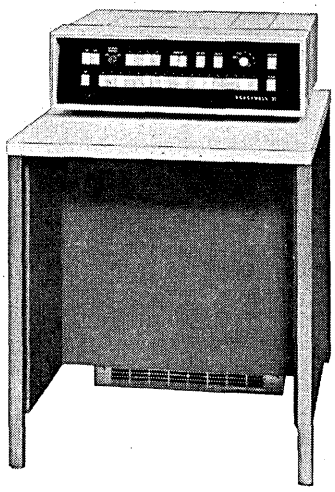


The information system architect, Brooks noted, is replacing the computer architect. In place of revolutionary hardware developments, we can look forward only to gradual, evolutionary growth—at least until software developments catch up to hardware capability.

But were software sessions well attended? Not necessarily. The session Programming Practice suffered from being scheduled concurrently with another having the magic words: Man-Machine Interaction. Chaired by J.C.R. Licklider and directed to remote consoles and displays, this session drew an SRO crowd. Ivan E. Sutherland, of the Defense Dept.'s Advanced Research Projects Agency, described the ultimate display—an Orwellian unit that would enable researchers to understand and sense scientific theories and principles by projecting information through all the senses.

At the same session, Licklider described the basic principles and criteria of the display device of tomorrow. For one thing, he said, the computer should be used to reinforce the learning process involved in the use of the display. This can be accomplished, he implied, by making sure that the computer is completely clear and friendly. "The computer is fast enough," he said, "and can afford to be polite." He called it "terse in, verbose out." The terminal device, he added, should be highly multidimensional. He referred to his own I/O device, which has a keyboard, printer, couple of CRT's, stylus, Rand Tablet or Teager Table, camera, joysticks and bowling ball devices, headset, clock, telephone, and light switch. Understandably, he calls it a hippopotamus because it's like the definition of one: a mouse built on a cost-plus-fixed-fee contract. About the only things missing are a foot pedal and microphone.

This entire area of displays and



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We're talking about the H21 – central processor for the new Honeywell 20 Digital Control System. The main frame price, starting at $21,000* is one of many features which make it an attractive component for real-time systems.

Some other features are:

Word Length: 18 bits plus parity and memory guard bits. Single word instructions provide 8192 directly addressable core locations.

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Memory: Magnetic core, random access; 2,048 to 16,384 words capacity; prewired for field expansion; non-volatile on power failure.

Memory Guard: Gives "padlocked" protection against accidental modification of guarded core locations.

Direct Memory Access: Independent path to memory for external I/O operations on a fully buffered, cycle-steal basis.

Silicon Hybrid Circuits with low active component count insure reliable system operation from 32 to 120° F.

Indexing may be combined with indirect addressing.

Three-Address Register Commands allow three-address arithmetic and/or logical operations with single word, one cycle instructions.

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Parallel I/O Channels — designed to provide efficient and convenient interface with user's system equipment.

Typical Operating Speeds (in microseconds, including accessing and indexing): register arithmetic/logical operations, 6.0; load/store, 12.0; multiply, 54.0.

Options: Auxiliary drum memory, magnetic tape unit, high speed paper tape punch and tape reader, priority interrupts, DMA.

Software—An extensive software package includes CONTRAN, the new compiler-level programming system for real-time control; FORTRAN IV with linkage capability to executive programs; and CAP assembly system plus arithmetic, utility, and diagnostic programs.

The H22 central processor with a cycle time of 1.75 microseconds is available at a slightly higher price.

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*Basic price of $21,000 includes H21 central processor with 2K core and input/output typewriter with integral tape punch and reader.

Honeywell

CIRCLE 51 ON READER CARD

graphic dp generated interest in the sessions the way time-sharing did in the exhibits. But an attendee observed that nothing memorable emerged from the sessions—nothing like the DAC-1 graphic I/O system described at the last Fall Joint Computer Conference by General Motors and IBM.

In the session Economics of Programming, Westinghouse's A. J. Whitmore advocated the establishment of corporate standards to cut programming costs. One of the standardized areas should be hardware selection. At that firm, guidelines have been set for cost recovery: gross savings should equal the rate of expenditure after one year; after three years, all out-of-pocket costs of equipment should be recovered.

The setting of standards to cut costs was questioned, however, by Jim Cooley of Prudential. Cooley, in addition, preferred simpler programming languages over the higher-level variety. The firm, in fact, has Computer Usage Co. constructing a simpler subset of COBOL in preparation for a 360 delivery. If IBM had spent its money to improve COBOL instead of trumpeting PL/I, "our job would not be so difficult," he said.

In rebuttal, the next speaker, IBM's Carl Reynolds, commented, "There has been no degradation of resources put into COBOL." Over a year ago, IBM proposed a better COBOL. No one, including the firm's marketing staff, took it up. "You," he said to Cooley, "decided to go your own way too."

software patents

A case for the patenting of computer programs was made by Morton C. Jacobs, Philadelphia patent lawyer, at the panel discussion Legal Aspects of Computer Software. Anything that is part of a machine or the processes followed by a machine is patentable; a program is a process followed by a machine, and therefore should be patentable, Jacobs said. At a press conference following the session, he added that new legislation is not needed to accomplish this. The Patent Office, however, must be convinced that a program is not merely a "mathematical formula"—which is not patentable.

Jacobs also made the point that people should not wait for a legal decision on this. File for a patent, he said, because use and publication of the program can cause forfeiture of the right to patent. Similarly, if a program is copyrighted, its patentability (if ever accepted) will be lost within one year.

Disappointment in the refusal of government lawyers to participate in the panel was expressed by the moderator, C.J.C. McOustra of International Computers and Tabulators Ltd., London. "We are all here to learn," McOustra said on behalf of panel members and the audience. And the government stood to profit equally from the discussion.

At a non-session held for the edification of the press, the idea of information utilities was discussed by Martin Greenberger of MIT and Richard E. Sprague of Touche, Ross, Bailey & Smart. Sprague traced such developments as real-time airline reservations and savings institutions systems, stock transaction information systems, and time-shared service bureaus. He then described a community-wide credit card system developed by the Sperry Utah Div. of Sperry Rand Corp.

Devised for Salt Lake City, hardware and software have been developed for the Consumer Purchasing Service, Sprague said, and the concept has been roughly priced out. No buyers yet, he added, although the banks would benefit most from it and are the logical people to start the ball rolling.

With terminals at subscribing stores linked to local banks, and with the use of one credit card, residents would be able to cash checks, open charge accounts, and make purchases without handling cash. Add the no-check payroll system and the question of the percentage of silver in our coins becomes a moot point. On a daily basis, say, the checking accounts of consumers and merchants would be credited and debited.

Greenberger pointed out that the latter "will have a dampening effect on cycles in our economy." He also said that such systems as the CPS will not have a socialistic effect, but will still leave a lot of room for competition.

Public acceptance of these advanced ideas is, of course, another question. This was pointed out at another press meeting by Jordan J. Baruch of Bolt, Beranek & Newman. Predictions of capability in the area of computerized systems have tended to be wrong, Baruch said. Things happen faster than predicted. But predictions of *use* have been optimistic. As recently as 1960, some things were predicted for the year 2000—but are already available, he said. The technology is here, but the demand isn't.

reactions

While the technical program served

to expose the variety of work going on in the field, it also presented too many papers in too many parallel sessions. Those who attended the mathematics sessions were very pleased, but the hardware boys were disappointed. Typical gripe of the latter: papers were too philosophical. Or as one observer phrased it: "Let's hear less from the supervisors, more from the working class." It was also pointed out that several technically-competent speakers failed to come through with good papers.

In short, the difference in philosophies of the program committee of IFIP and AFIPS was evident. The former relies on invited papers and must sacrifice quality for geographical spread. In contrast, AFIPS is much more selective, rides herd on authors until a good paper is produced, and is quicker to adopt new methods of presentation. At the next Fall Joint, for example, some sessions will be devoted only to discussions, following the distribution of pre-published papers. In the same breath, we must note (and wish AFIPS would too) that IFIP held no evening sessions.

Also to the credit of IFIP was the slick way in which the conference was run, extending from registration through the sessions. We've become so accustomed to smooth functioning that snags are generally conspicuous by their absence. Extra green stamps also go to good women speakers. Mrs. Sedelow, in the excellent session Form Recognition in Medicine, Music, Literature and Law, stands out.

Not so obvious to many in attendance was the convention's international flavor. "It was just like a Spring Joint meeting," complained a registrant. With rare exception, it was difficult to distinguish a foreigner from a local product, and few had the chance to formally meet someone from abroad. Through press briefings, however, reporters were able to learn that Europe, generally, is stronger in programming and numerical analysis than in hardware. And in many parts of the world, labor shortages make the use of computers a necessity for economic growth. From Argentina to the USSR, computer science courses are being added to the curriculums of universities. These range from introductory and programming instruction for all students to technical courses for engineers and mathematicians.

the exhibits

Main attraction under the Big Top was time-sharing, and GE was the king, judging from the crowd. With a backdrop of a little red schoolhouse, GE offered lessons in on-line use of their 235 back in Phoenix through a half dozen Teletypes. Eager participants, waiting in line to go on-line, followed printed instructions to play Nim or work an order-processing routine with the machine. Unscheduled games appeared as the week wore on, though, and fun-lovers who knew the Teletype user codes began getting into the program. The computer started telling visitors, "You can be sure if it's Westinghouse."

Other remote operators, with only terminals on the floor, were Keydata Corp., Control Data, Digital Equipment Corp., Univac, and a group of four universities. Univac's 1001 card controller was on-line to an 1107 in Oslo, Norway, and CDC was using its 6600 in Los Angeles. Announcing its entry into the management information systems market, CDC demonstrated its remote calculator, CRT/keyboard console, and a document reader. There wan't much new from the other big boys.

Some of the most interesting machines appeared at exhibits by the small outfits. Wang Laboratories, for example, was showing its LOCI computer, a desk-top unit with a price starting at $2,750. Its unusual mode of operation involves digital generation of logarithms which are combined to give instant results for mathematical functions. A mod II includes a one-card reader. Perhaps this is the answer for unfortunates who lack a MAC console at home.

Scientific Data Systems demonstrated its DES-1 differential equation solver. Consisting of the 9300 mainframe and a special console, the DES-1 enables the user to modify the nature of his computation "on the fly" as dictated by his understanding of the partial solution at any given time.

In the area of peripherals, Bryant Computer Products introduced a drum memory with four access mechanisms. The PhD-170 can thus be used simultaneously by four processors, or one track can be read by four heads at once. Each access mechanism has 43 flying read/write heads to serve all 2,752 tracks; capacity is 172.8-million bits.

Data Equipment showed its Grafacon 1010, commercial version of the Rand Tablet. It also announced an agreement with Bunker-Ramo to produce the Teleputer, consisting of an alphanumeric and mathematical symbol keyboard with a 5-inch CRT. It is intended for coupling with the 1010.

Data Systems, which appeared healthy and confident but now is re-

portedly closed down by parent Union Carbide, introduced a DSI-2000. Successor to the 1000, it has a 4K memory with a 1.65-usec cycle time.

overseas exhibitors

Considering the international billing of the conference and exhibits, there were very few displays from abroad. (Similarly, many domestic manufacturers discounted the buying power of the crowd and held back on showing their inventory). Biggest booth belonged to International Computers and Tabulators Ltd., which has sold about 200 of its 1900 series computers in the eight months since announcement. ICT demonstrated its Optical Print Quality Monitor, which produces a CRT display that shows the results of measurement of print quality, including paper characteristics, image dimensions, and inking.

Facit of Sweden had some paper tape equipment, including a 1,000-cps reader that will stop between characters. The firm was quietly celebrating its corporate anniversary—the 550th. It just got into the dp business recently in its history, starting with hand-cranked calculators a few decades ago.

On the components front, Toko Inc., of Japan, had an operating 4K-word, plated-wire memory that has a 300-nsec cycle time. Also called woven thin films, this variety is said to be suitable for large-volume, low-cost production by machine. Librascope has had a licensing agreement with Toko since August of '64, giving them exclusive U.S. marketing rights and the right to build units here.

All in all, the show was short of stunning surprises but well suited to the interests of the international audience (small-to-medium-scale computers, hybrid configurations, communications gear and terminals). An estimated 12,000 people had at least a glimpse of the 82 exhibits, including more than a hundred high school students heavily burdened with sales literature. If they seemed lost, they had much company.

new ifip president

At the closing session of the conference, it was announced that Dr. Ambros P. Speiser of Switzerland had been elected president of IFIP. It's a three-year term for the director of the IBM Research Lab in Zurich. The next meeting, IFIP Congress 68, will be held in Edinburgh, Scotland, from August 5-10, 1968. ■

Why G.E. is the leader in time-sharing computers

The reasons are basic: advanced hardware, proven software, more experience, delivery now. To be specific . . .

1. **Our giant new GE-600 system outperforms all others.** It's not a beefed-up and "converted" general-purpose machine. It was *designed* from scratch for time-sharing by a team of experts who knew what the problem was, knew what the answer had to be.
2. **We're winning the really big orders.** Wherever "throughput" is the word, the hands-down choice is the GE-600.
3. **What we promise, we deliver.** We delivered the first GE-625 just 9 months after announcement — *and we delivered the software with it.* Remember, you can't power a time-sharing system with a "paper" computer that's two or three years from delivery.
4. **We've already put time-sharing "on the air."**
5. **Our medium-scale computers . . . GE-400's . . . are designed for time-sharing, too.**

If you want the latest information on time-sharing — write us, phone us, visit us. **General Electric Computer Department, Phoenix, Arizona.**

GENERAL ELECTRIC

CIRCLE 45 ON READER CARD

When this headline was current news... digital recording tapes had a packing rate of 200 bpi.

Today, 800 bpi is standard; improvement in tape and base is the reason.

In analyzing the sensational development of EDP over the past decade, most of us naturally talk in terms of improvement of hardware. But when you stop to examine them, the contributions made by tape manufacturers have been quite remarkable.

The tape of today *looks* like the tape of 1954 . . . but think of the differences: improved oxide coatings to increase total capacity, reduce fluctuations in performance; much stronger binders to reduce dropouts and flaking, lengthen tape life; smoother surfaces to give longer, error-free wear; thinner coatings and better production controls to guarantee reel-to-reel uniformity.

Working hand in hand with the tape manufacturers during this time has been Du Pont. Improvements in the uniformity, stability and overall reliability of the base of MYLAR* have played a vital role in making possible the sophisticated tape in use today. Continuing cooperation of research and development facilites assures continuing improvements in the future. Your guarantee of the most advanced tape is the manufacturer's brand and a base of MYLAR polyester film.

*Du Pont's registered trademark for its polyester film.

DU PONT REG. U.S. PAT. OFF.

only DU PONT makes MYLAR® POLYESTER FILM

Better Things for Better Living ... through Chemistry

At the base of all tape improvements: Mylar®

CIRCLE 46 ON READER CARD

WORLD REPORT

SOFTWARE WINS OUT OVER U.K. POLITICS

After much hullabaloo about Buying British and saving the local computer industry, the British government has placed a contract with Univac for a $2.5-million 1108 system to be installed in December '65 at the National Engineering Lab in Scotland. Prime appeal: APT III. Announcing his decision in Parliament, Minister of Technology Frank Cousins said a major effort is to be made to use computers for design automation and for developing numerical control techniques for manufacturing processes.

"My department is negotiating for a suitable British machine," Cousins said. "Until one is available, an American computer will be used. There is no British computer that will face up to the requirements of automatic program tools capable of five-axes cutting."

The system will include on-line display and light pen devices for automated design work. When the two-year contract is up, ICT will be able to bid its 1900's, which will have APT III running by then.

RUSSIA-ENGLAND LINK OF COMPUTERS BEGINS

First stages of a computer link that will connect Moscow, Rotterdam, and Birmingham, England, are now being established. This will further a scheme called External Integration, invented by a Dutch consultant, H. H. Bor. With a Univac 1107 in Birmingham and a Minsk II in Rotterdam, Bor hopes to prove that a business Esperanto is possible.

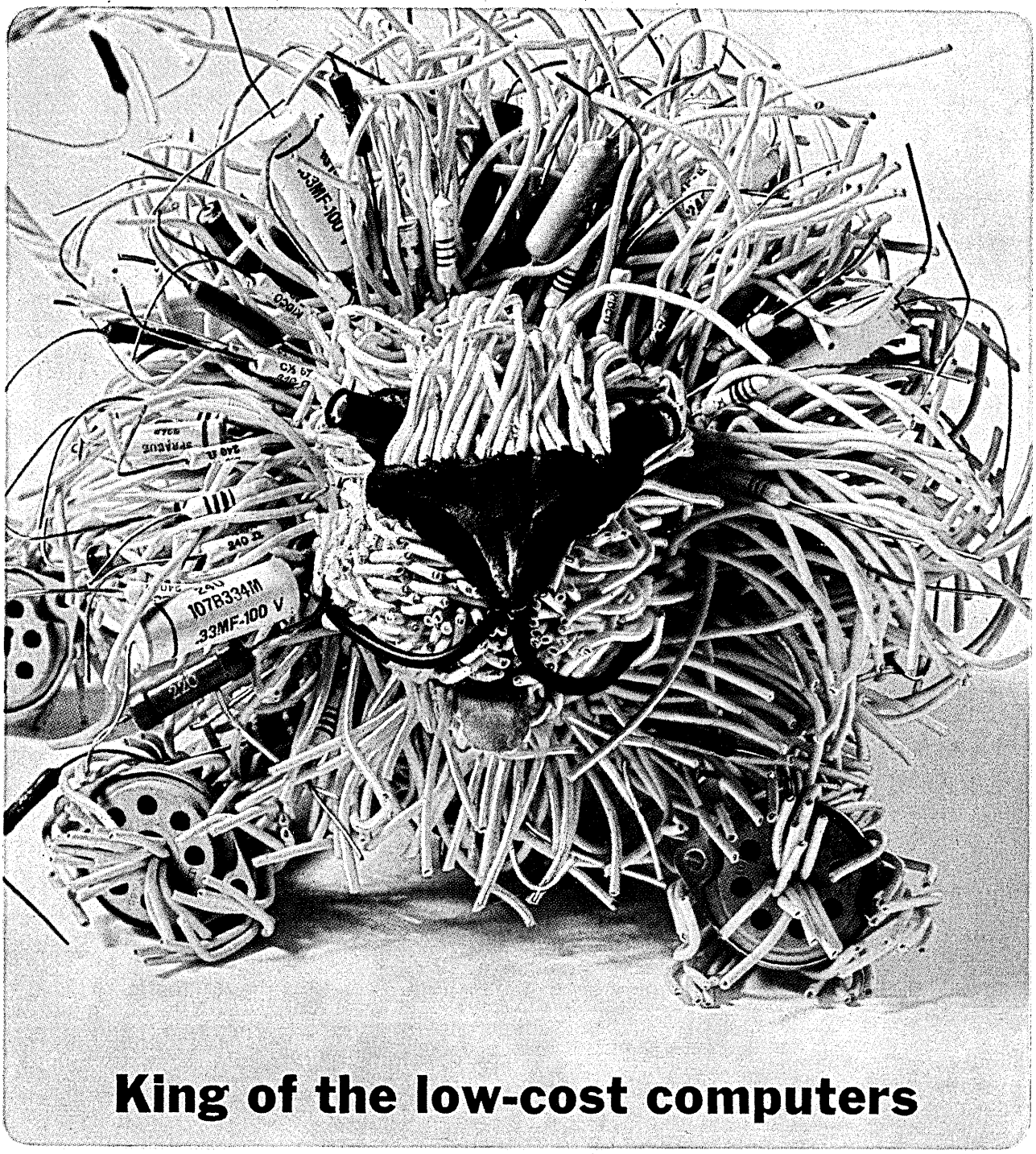
The whole project hinges on a somewhat complex standard coding idea that he believes will provide a common communication language for commercial operations. The Minsk II at the External Integration Exchange (run by Bor in Rotterdam) will take business messages in a standardised format from the U.K. and pass them on to Moscow, and vice versa. The 1107 is at Computer Services, Birmingham, one of Europe's largest service bureaus. Bor's explanation of his scheme to a British audience last month left even the experts a trifle mystified. At the best, they are suggesting he may be 10 years ahead of his time.

SCANDINAVIANS EXPERIMENT IN BIOMED COMPUTING

A leading Scandinavian medical centre, the Gentofte Hospital, Denmark, will install an IBM 1800 for on-line monitoring of patients during preparation for special X-ray techniques in angio-cardiography. It is hoped to analyse cardiograms on-line so that smaller injections of contrast fluid can be used, thereby reducing risks to patients. Research is also to be conducted into the possibility of linking the computer directly to a heart-lung machine for automatic control during surgery.

IBM has also been participating in a pilot health screening project in Sweden that involves using a computer to process data from extensive medical checks on a group of 90,000. From clinical and lab examination information, the machine selects people with any abnormal values for thorough examination by a doctor. If successful, the technique is to be

(Continued on page 103)



King of the low-cost computers

If you're ready for full-scale data processing — but not ready to pay a king's ransom for it — the powerful new Honeywell 120 is just the computer you need.

The 120 is the lowest-cost real magnetic-tape computer system anywhere.

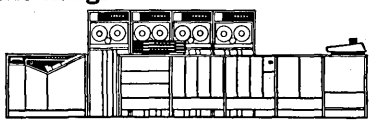
It has a memory capacity of up to 32,768 characters.

It reads and punches cards while it computes.

As a 3-tape system, it starts as low as $2610 per month.

Model 120 is the smallest member of a royal family — namely, Honeywell's compatible new SERIES 200. So if the 120 isn't big enough for you, we'll tailor a larger system to your exact dimensions. We can do that because we've refined all our hardware and software down to the smallest increments of capability ever offered. No wasted capacity: no wasted money. Later, you can add on in gradual, economical increments. It's what we call Dimensional Data Processing.

Interested? Call a Honeywell EDP sales office. Ask to see the king.



Honeywell

ELECTRONIC DATA PROCESSING

CIRCLE 47 ON READER CARD

NEWS BRIEFS

EARLY BIRD TESTED FOR CROSS-OCEAN COMMUNICATION

In June, the Early Bird satellite "buzzed" with the traffic of test data, facsimile, and voice programs transmitted by major communications companies—such as Western Union International, ITT Communications, and RCA Communications—and their customers. The tests, conducted over narrow and broadened channels, were to determine the capabilities, reliability, and accuracy of satellite transmission for commercial applications.

Several of the common carriers have applied for the leasing of channels on Early Bird, but no costs for the prospective service have been set. ITT Communications did note that it will probably use cable rates for voice-grade lines—$4/minute and a three-minute limit per message.

Among those companies that took part in the experiments was IBM, which demonstrated tape-to-tape transmission of engineering data from its Armonk, N.Y., headquarters to its plant in Ensomme, France. Pictures and color separations were sent across the Atlantic by the Associated Press and the London *Daily Telegraph*. Pan American World Airways tested the satellite for sending airline and hotel reservations via PANAMAC, computer-controlled reservation system. And RCA Communications transmitted an electrocardiogram from a ship at sea to Paris.

NEURON SIMULATION COMPUTER DEVELOPED AT PURDUE

A model of a pattern recognition computer, whose design is based on electronic simulation of a nerve cell, has been developed by two electrical engineers at Purdue Univ. Thus far, the small-scale model, built by Prof. King-Sun Fu and Wen C. Lin, has recognized hand-printed Roman and Chinese letters.

The system consists of a photo-cell grid, which scans and converts the black and white patterns into digital signals, joined to a box enclosing 200 interconnected circuits, or "neurons," and an I/O panel board. The circuits, made of two transistors and six resistors, give the computer the bi-polar threshold logic of the nerve cell: the circuit either fires or inhibits firing in response to the stimulus of visual patterns, including weak stimuli which are repeated or multiple.

The circuits are arranged into three banks: (1) the transformation layer, which receives and reduces the pattern from 144 to 24 bits; (2) the correlation layer, which compares the 24 bits with the pattern references stored in memory, feeds the correlation coefficients back to the first layer via a learning loop to inform it how to adjust its threshold for succeeding patterns and fires the same coefficients to (3) the decision layer, which indicates to which class the pattern belongs. A second learning loop may correct the decision layer. If the pattern does not belong to any class in memory, the computer can reject it by firing a rejection set of lights.

CARNEGIE TECH GETS COMPUTER CENTER GRANT

Carnegie Institute of Technology has received a $5-million grant from Lt. Gen. Richard K. Mellon and trusts created by him to found a new department of computer and information sciences.

Several projects will result from the gift. A 60,000-square-foot building will be put up at a cost of $2 million. Over a five-year period, $1¼ million will be spent for research in computer development and applications. A named professorship will be endowed for three-quarters of a million and one million will be applied on the purchase of a new computer.

The new department will take only graduate students to start with, but plans are being made for later expansion to accommodate undergraduates too. Research at the center will include an increased effort in the development of computer languages, a program headed by Dr. Alan Perlis.

LOWER COST, NEW HARDWARE PREDICTED BY DIEBOLD

After studying government and commercial research efforts and developments, the Diebold Group Inc. has forecast technological advances and equipment cost reductions during the next few years. Projections for input devices include: multipurpose typing stations selling at $3,500–6,000 in 1966; touchtone dials at $100/unit in 1968; and limited vocabulary voice input (1,500 words) at $60K for 10 speakers by 1969.

IBM's George G. Heller gives hands-on computer demonstration to nursery-school kids, an attempt to acquaint them with new world of computing. Presentation on this was given at IFIP Congress 65.

BUILD YOUR FUTURE IN WORLD-WIDE BUSINESS AUTOMATION AT NCR, LOS ANGELES

At the NCR Electronics Division, you build your career on hardware—not hope. Advanced developments like CRAM and the NCR 315 RMC Rod Memory Computer—the first commercially available computer with an all-thin-film main memory—are a marketplace reality. (And bear in mind that the NCR marketplace consists of more than 120 countries!) If you want to combine career stability with go-ahead, on-line opportunity... if you want to earn a good living while enjoying the good Southern California life... look into the opportunities on the page at the right.

NCR

ELECTRONICS DIVISION

CIRCLE 90 ON READER CARD

For microelectronic circuitry, the typical add time, excluding memory reference, will decrease to 50 nsec by 1970, and the typical MTBF will be 1300 hours by 1967. Chip image files will increase in size from 230 million characters (1964) to 100 billion by 1968; cost per unit will decrease from $1 to $.60 by 1966. By 1969, Diebold said, the industry will have developed magnetic-optical techniques, magnetic recording of index information, thermoplastic image and digital storage in the same media, laser read/write, and electronic deflection of the laser beam.

MONTGOMERY WARD CHOOSES C-DEKS

Data input equipment for Montgomery Ward's catalog operation has been ordered from Colorado Instruments, Inc., following successful field testing of nine pilot units delivered last summer. Within the next 18 months, the big retailer plans to have its nine catalog houses and at least 1,000 catalog ordering stations tied into a computer center. Each customer's order will be recorded, processed by a satellite computer, and forwarded to the center.

The first order is for 130 Computer Data Entry Keyboards to equip stores in the Kansas City area. The Ward model C-Dek produces punched paper tape and is actuated by a 27-column keyboard. Internal logic reduces operator errors by inhibiting the record function until all order information required has been entered.

TIME-SHARED BUREAU SLATED FOR ATLANTA

Late this fall a time-sharing service for production and scientific applications will be offered nationally by Computrol Systems, Inc. in Atlanta, Ga. The bureau will be built around an IBM 1620 II (20K memory, with a two-megacharacter 1311 disc file, which will be able to handle up to approximately 100 terminals). The main feature of the bureau will be the availability of problem-oriented input consoles developed by CSI.

William Glover, president of the new company, is specially designing the console panels for specific applications, such as feed and cement blending, paper trim, and digital simulation of analog computers. IBM 1070 terminals will be built into the consoles as multiplexer units. CSI has also modified for time-sharing the 1620 MONITOR operating system, which includes disc-oriented FORTRAN II and SPS II, and is developing special I/O routines for software packages such as linear programming and traverse analysis.

Cost of the service, in addition to approximately $2500 to $150/month for the optional special console, will range from about $800-1100/month, depending upon the size of the problem, number of runs, and length of communications lines. This price also includes software and $290/month for the 1070 unit.

OCEANOGRAPHIC DATA SENT VIA METEOR TRAILS

A method of transmitting data by bouncing radio signals off trails left by meteors entering the earth's atmosphere, called meteor-burst communication, was recently demonstrated by the Boeing Co., Seattle, Wash. Designed for an oceanographic research program conducted by the Univ. of Washington, the system is said to have a range of 1,000 miles. The test signals, however, were sent 450 miles—from the Cobb Seamount, an underwater mountain in the Pacific Ocean, to a coastal station.

Reported advantages of using meteor trails above the ionosphere are increased stability and control of the radio signal, which are little affected by sun spots, and the use of equipment operating at low power and on VHF, thus avoiding the crowded HF wave bands.

While the tests were conducted from a vessel at sea, the idea is to construct a transmission tower atop the Cobb Seamount. It could be the first of its kind on the high seas. Oceanography data obtained at the site would then be stored there and transmitted to shore under control of a land-based station. The availability of trails seems to be no problem; millions of meteorites enter the atmosphere daily.

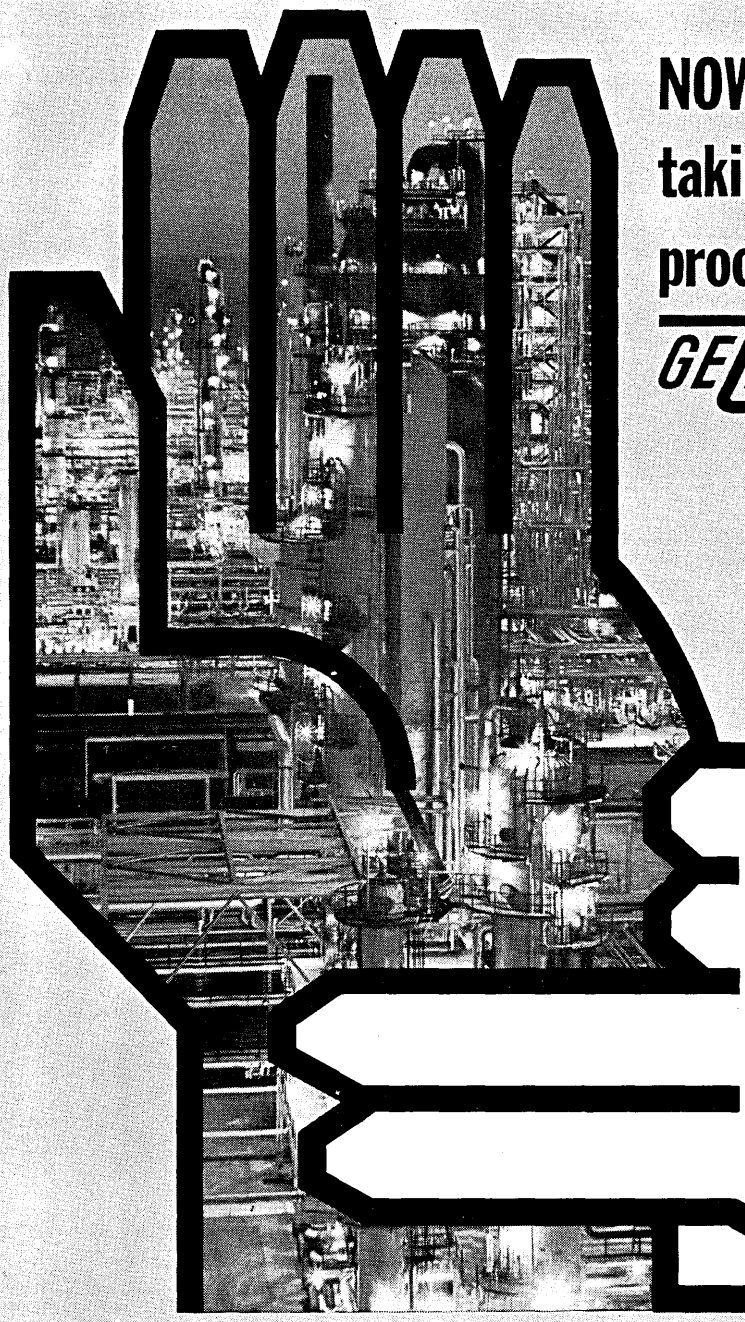
● New York and Chicago computer centers to service traders on the Over-The-Counter market are being set up by Data Network Corp., recently organized firm planning to provide computer service to different industries. Early in 1966 the Masterquote centers will each have a 360/40 with a 7770 audio response unit (and an eye toward the 360/67 in future). Terminal equipment available will include the IBM 1092, 2260 visual display, optical reader, Mimo—stylus-operated keyboard of Data Trends Inc.—and touchtone dials. Data Network claims this is the first of the stock market information services to offer continuous, current bid-asked

quotations (input by subscribers) on the more than 17,000 unlisted stocks. Normally it is attainable only by calling any of the several dealer firms handling a particular stock. Other market data will also be available, and the service will store and protect transaction data in its disc file for bookkeeping purposes. Cost of the service, including terminals, will range from $100 to "several thousand" a month.

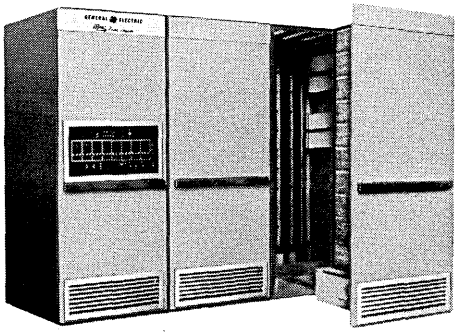
● Both Ultronic Systems Corp. and Bunker-Ramo are adding equipment to their New York computer centers to provide on-line real-time management information service to diverse companies for such applications as inventory control and sales analysis. For its Recallit service, Ultronic is using an RCA 3301, with five 3488 random access files having a total of 5.4 billion characters. BR is initially using a 32K Univac 1050 and a Fastrand drum with 65-million character capacity. In addition to memory storage space and terminal and communications equipment, the service of both companies will include systems analysis and programming.

● Two French Navy frigates will be aided in missile-launching by an onboard digital computer system, the BG-Ea, developed by IBM France's military division. When radar registers enemy penetration, the data will be transmitted to the BG-Ea, which will choose targets and appropriate weapons, and control acquisition and tracing of the target and aiming and guidance of the missile. The computer, which operates in serial or parallel mode, has an instruction memory of 4K 20-bit words (extendable to 8K), a working memory of 2K 20-bit words (extendable to 4K), and 64 I/O channels. Among input devices are a shaft digital positioning coder and a video frequency input unit. Output units include planned position indicator displays and a servo mechanism decoder for d-a conversion.

● Bunker-Ramo has reduced the purchase prices of the 200 line of keyboard-CRT devices by 5 to 10%. The 203 sells at $1775, or is $50/month. Rental for both the 211 and 212 is $35, with purchase prices being $1000 and $1075, respectively. Rental on the control units for the 200 series range from $200-230, a 34-40% reduction; communications equipment for computer interface is 9-24% less.

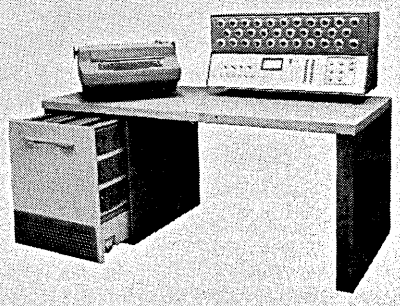


NOW! Process pulse-taking achieves better process performance with GE/PAC* DATA LOGGERS



GE/PAC Data Logger (stored logic)

GE/PAC Data Loggers—the most advanced data logging equipment on the market today—help you know your process better. Optional performance features give you a wide range of capabilities from simple data accumulation to advanced scan, log, alarm and performance calculations. You determine the degree of standard or high-precision accuracy you need from 0.5% to 0.1%, with a wide choice of functions also available. GE/PAC's high-performance signal conditioning methods assure accurate signal conversion and noise filtering. Designed to operate in environments with wide swings in ambient temperatures or corrosive atmospheres, GE/PAC Data Loggers can be the initial equipment in fully automating your plant or process. They are expandable to full control computer capability by simple plug-in techniques. Prices range from $20,000 to $150,000. *Ask for Bulletin GEA-8177. Contact your nearest General Electric Apparatus Sales Office or the General Electric Company, P.O. Box 2918, Phoenix, Arizona 85002.*

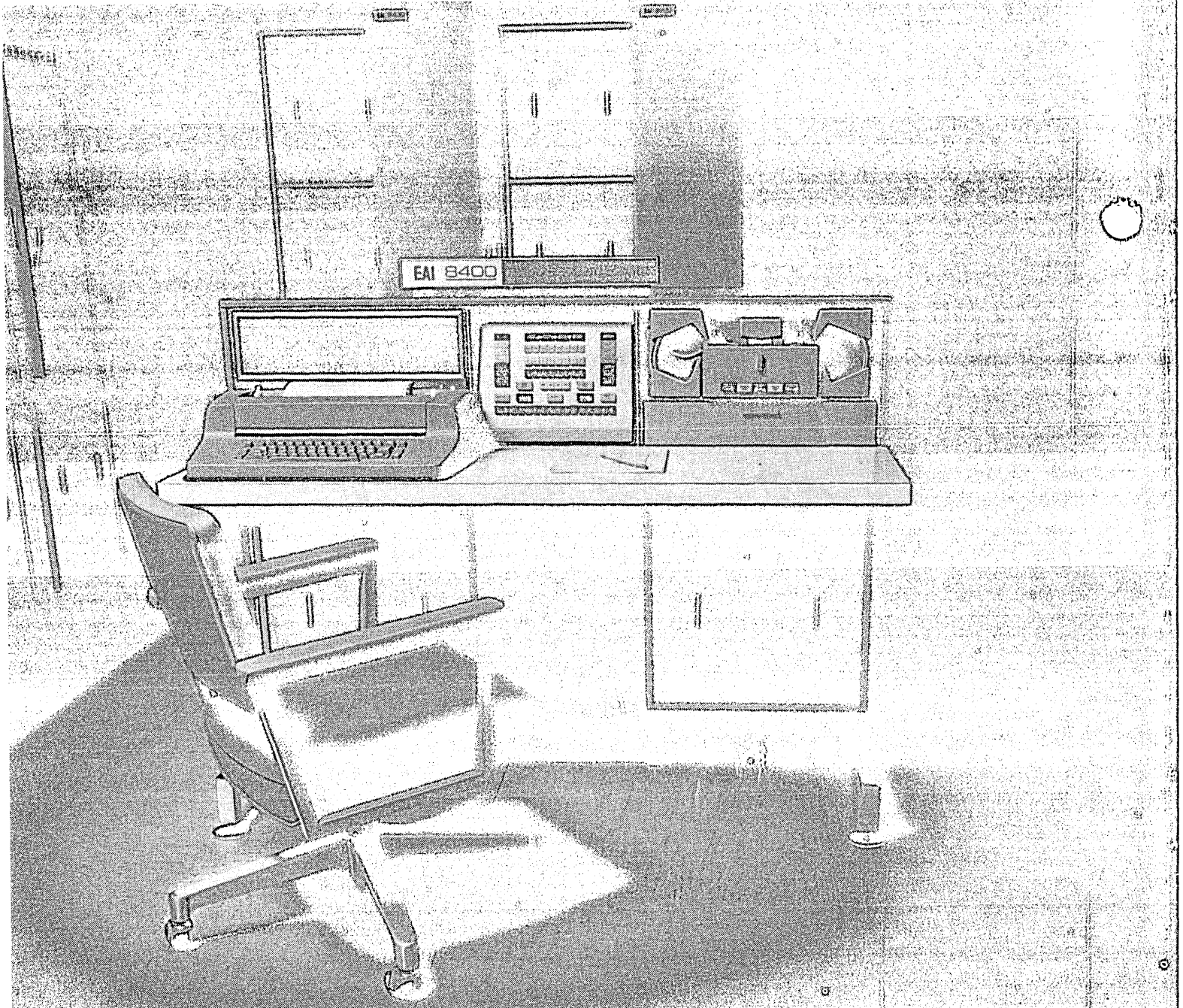


GE/PAC Data Logger (wired logic)

GENERAL ELECTRIC

* Trademark of General Electric Co.

CIRCLE 58 ON READER CARD



IS HE MAKING OFF-LINE CHANGES? . . . NOT WITH THE EAI 8400.

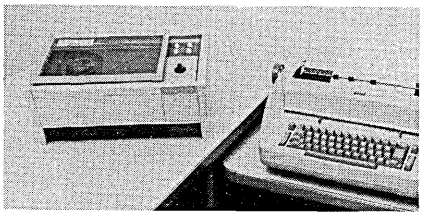
Effective computer simulation requires the ability to make changes on-line to your mathematical model. With the difficulties inherent in using your digital computer's binary language, you are probably making changes off-line with costly reassemblies. Not so, with the EAI 8400 Scientific Computing System. Chained symbol tables permit changes to be made on-line in the user's own symbolic terms. Regardless of what changes he has to make, he can completely recover his program in symbolic language. Disassembly, a new concept from EAI, reconverts the model in memory to a relocatable symbolic language output—complete with all linked subroutines. A listing in the original symbolic terms documents the revised program. And . . . strict program sequence is maintained by Dynamic Storage Re-allocation which automatically opens or closes the program as changes are made. This is another example of how 15 years of experience in simulation enables EAI to combine its creative software and advanced hardware in solving tomorrow's simulation problems today. . . . Write for full details.

EAI® ELECTRONIC ASSOCIATES, INC. West Long Branch, New Jersey

NEW PRODUCTS

miniature tape systems

Miniaturized systems use transport 9 by 12 by 6 inches, weigh under 25 pounds, hold 2.4 million bits on 3¼-inch reel of quarter-inch one-mil com-



puter grade tape. Unit searches at 22,240 bits/second, transfers at controllable speeds. DARTEX, INC., Anaheim, Calif. For information:

CIRCLE 130 ON READER CARD

incremental curve follower

Model 471 provides tracing and digital recording of continuous graphic data in IBM 729 tape format. Tapes are compatible with character or word oriented computers, may be prepared in either 6 or 8 character/word formats. Resolution is ± .01 inch at lineal speeds up to 45 inches/minute. CALIFORNIA COMPUTER PRODUCTS, Anaheim, Calif. For information:

CIRCLE 131 ON READER CARD

electronic accounting system

The 395-300 electronic accounting system gives 20 totals on a magnetic disc and uses computer addresses and instructions. Fourteen-digit words are used for totals, can be accessed 29 times a second. Peripherals include a 100-cpm card reader, card and paper tape output units. NATIONAL CASH REGISTER CO., Dayton, Ohio. For information:

CIRCLE 132 ON READER CARD

tape editing punch

CAC Model 301 is a manual tape editing punch to insert single line or block of characters in paper tape. COMPUTER ACCESSORIES CORP., Huntington, L.I., N.Y. For information:

CIRCLE 133 ON READER CARD

automatic send/receive set

Model 35 Teletype eliminates repetitive manual typing, positioning and programming. Recommended for on-line use, unit has repetitive data on paper tape, keyboard for variable information. Operating speed is 100 words/minute. TELETYPE CORP., Skokie, Ill. For information:

CIRCLE 134 ON READER CARD

new model destroyit

Electric paper shredder for confidential document disposal has automatic feed reverse to prevent jamming. ELECTRIC WASTEBASKET CORP., New York, N.Y. For information:

CIRCLE 135 ON READER CARD

file ring container

Ring Stor is container for plastic file protection rings used on mag tape, is available in 8 or 12-inch sizes. WEBER OFFICE SPECIALTY CO., Glendale, Calif. For information:

CIRCLE 136 ON READER CARD

self-contained tape punch

General purpose tape punch for system use has patch panel for any format, backward/forward switch control, and buffer. AUTO-TROL CORP., Arvada, Colo. For information:

CIRCLE 137 ON READER CARD

PRODUCT OF THE MONTH

The model CTS-2000 Card-Tape Conversion System is first in a series of media conversion devices developed by the firm, marking a change from its standard product line. The new system is said to handle card-to-tape conversion at twice the speed and one-third the cost of previous methods. It is intended to reduce computer time demands for such conversion in commercial and government data processing installations.

Four versions of the device are offered, all with editing, formating, and error-checking facilities. Reading speeds range from 400 to 2000 cpm and prices from $24,000 to $38,000 Deliveries will begin this fall. Tape densities can be 200, 556, or 800 characters per linear inch and format is suitable for IBM 7330, 729, 2400, and other ASCII equipment. AMPEX CORP., Redwood City, Calif. For information:

CIRCLE 138 ON READER CARD

← FOR EAI CIRCLE 50 ON READER CARD

What is it about a growth environment that brings out the best in a programmer?

To a programmer or systems analyst, a growth company means excitement—more stimulating problems, greater opportunities for advancement, and greater personal rewards. The growth environment brings out the best of his talents and abilities. Because, in a proven growth company like IBM, he must work constantly toward greater technical achievement.

Consider the impact of IBM's System/360, which a little over a year ago inaugurated a new era in computer capabilities. Now these increased capabilities are stimulating the development of new programming techniques and new applications to a host of information-handling problems. The result: a ferment of expansion that is being felt throughout the company.

Today at IBM there are *more career openings than ever before* for programmers and systems analysts—more opportunities to achieve distinction, recognition, and personal advancement. Investigate the advantages of this growth environment at IBM's Systems Development Division in Poughkeepsie, New York, and at IBM Headquarter facilities in the White Plains-Armonk, New York, area.

We would be pleased to give you more detailed information about the available positions that can make the most of *your* talents and professional goals. The positions listed below represent only a few of the many immediate openings at IBM.

To inquire about additional career positions at other IBM locations in Alabama, California, Maryland, Massachusetts, Nebraska, New York, Texas, and Virginia, please write in confidence, outlining your interests and experience, to Manager of Professional Staffing, Dept. 701G, IBM Corporate Headquarters, Armonk, New York 10504. IBM is an Equal Opportunity Employer.

Suburban New York City
(Armonk, Harrison, White Plains, N.Y.)

Programmers • Provide technical assistance in operations techniques of Computing Centers: develop measurements of installation effectiveness

• Develop and implement advanced centralized information-handling systems

• Develop programming applications for various industries as part of an operations research programming team

• Program a Real-Time Airlines Reservation System

Qualifications: B.S. or M.S. degree with at least two years' experience in commercial or scientific programming, or in the operation of large computer installations.

A few trainee positions are also available for recent college graduates.

Systems Analysts • Design, install, and maintain major information-handling applications and centralized systems in such areas as Financial Planning, Accounting, Engineering, and Manufacturing.

Qualifications: B.S. or M.S. degree with at least two years' experience in systems analysis in functional areas; programming knowledge is required.

Write to: R. F. Beston, Dept. 701G, IBM Corporation, 112 East Post Road, White Plains, New York.

Systems Development Division
Poughkeepsie, New York

Programming Systems Testing • Develop new techniques for testing systems, evaluating performance, and coordinating systems development. Involves systems generation, editing, and related test activity.

Programming Evaluation • Write tests to evaluate and improve systems performance. Requires experience on medium-to-large computers and familiarity with COBOL, FORTRAN, assembler sort, or control systems.

Supervisory Programs • Develop control program functions, including systems supervisor, symbolic I/O interrupt control, machine control, stack-job scheduling IOCS, data management, time-sharing in peripheral I/O multiprocessing.

Programming Languages • Write compilers for assembly language, FORTRAN, COBOL, and PL/I.

Business-Oriented Programming • Develop advanced sort-merge techniques, report generators, and file maintenance programs.

Programming Documentation—Technical Writers • Research, organize, and write publications describing new programs for customer presentations.

Programming requirements: B.S. or advanced degree with at least one year's programming experience.

Technical Writer requirements: Four years' writing experience with at least two years in the technical or scientific writing field.

Write to: A. E. Short, Dept. 701G

IBM

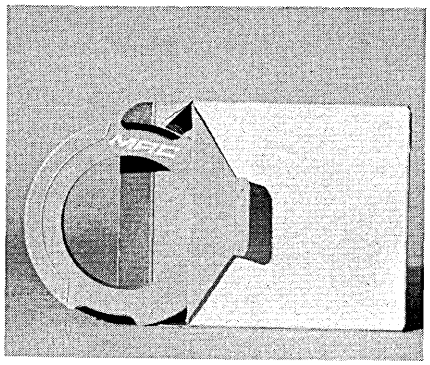
IBM Corporation
Box 390
Poughkeepsie, New York

miniature 10-line display

D3 Series display has 10-line input and in-plane display in one-inch package, plugs into standard 14-pin tube socket. UNITED COMPUTER CO., Phoenix, Ariz. For information:
CIRCLE 139 ON READER CARD

magnetic tape mailer

Special 200-foot reel of tape comes in reusable container ready for mailing. Weighing only 5½ ounces, Tran-



siTape can be mailed anywhere in this country for 14 cents. MAC PANEL COMPANY, High Point, N.C. For information:
CIRCLE 140 ON READER CARD

automatic film reader

PFR-3 Programmable Film Reader has resolution 10 times that of predecessor PFR-1, converts photographic data into fully processed digital form under program control. INFORMATION INTERNATIONAL, Cambridge, Mass. For information:
CIRCLE 141 ON READER CARD

decimal-to-binary switch

First thumbwheel 2 and 3 position switches with pure binary output offer simplified setting of binary numbers. No conversion time is taken, and models convert 0-99 to 7 bits or 0-999 to 10 bits. ENGINEERED ELECTRONICS COMPANY, Santa Ana, Calif. For information:
CIRCLE 142 ON READER CARD

digital-to-synchro converter

Series A7025 has single speed resolution, accuracy to 5 seconds of arc, in computer-controlled servo positioning or indicating systems. ASTRO-SYSTEMS INC., Mount Vernon, N.Y. For information:
CIRCLE 143 ON READER CARD

collection/transmission system

Data collection and transmission system provides verified record at input source. Bar code system is tied into standard telephone line or direct private line. Embossed plastic cards for

codes can also hold alphanumeric descriptive information. ADDRESSO-GRAPH-MULTIGRAPH CORP., Cleveland, Ohio. For information:
CIRCLE 144 ON READER CARD

perspective drawings

The Illustromat 1100 makes visually and mechanically accurate perspective

drawings from two-dimensional illustrations, with the subject assuming any angle of rotation or tilt. It also produces mechanically accurate axonometric drawings or projections from orthographic prints. Built in is a 41-amplifier analog computer. Manually tracing the original, an operator reportedly can complete a perspective drawing in 1/60th the time over an artist. PERSPECTIVE INC., Seattle, Wash. For information:

CIRCLE 145 ON READER CARD

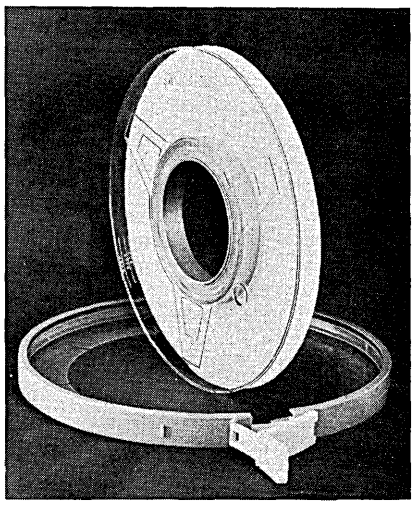
monolithic ferrite memory

Memory units now in pilot production for tests and evaluation are available to manufacturers. Cycle times as low as 200 nanoseconds are quoted. MF-2100 is a word-address, 64 word by 64 bit unit with integrated diode matrix. COMMERCIAL ENGINEERING, RCA ELECTRONIC COMPONENTS AND DEVICES, Harrison, N.J. For information:

CIRCLE 146 ON READER CARD

tape container

Wrap-around container for solid-flange computer reels reduces storage



space needed by nearly 50%. MEMOREX CORP., Santa Clara, Calif. For information:

CIRCLE 147 ON READER CARD

solid state data terminal

Data terminal can read and punch paper tape and edge punch cards, simultaneously produce printed document and data. Speed is up to 175 words/minute, on or off-line. Machine both transmits and receives, is compatible with all major computer systems. DURA BUSINESS MACHINES, Madison Heights, Mich. For information:

CIRCLE 148 ON READER CARD

electronic calculator line

First two models of solid-state calculators with automatic floating decimal system. Cogito 240 and 240SR have product registers of 52 decimal places, visible working registers, three memory registers, full register transfer. SCM CORP., New York, N.Y. For information:

CIRCLE 149 ON READER CARD

plotter/buffer

Model 110 produces on-line plotting for any System/360 configuration. Core buffer stores up to 2,048 6-bit command characters, has data acceptance rate up to 500,000 bytes/second. CALIFORNIA COMPUTER PRODUCTS INC., Anaheim, Calif. For information:

CIRCLE 150 ON READER CARD

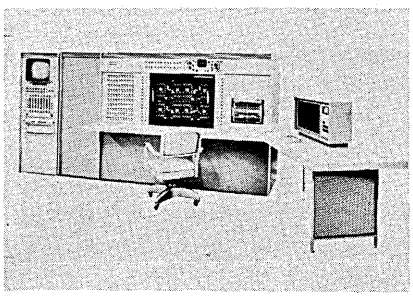
mark scanner

The MRC 801, which can be used as a punched-card reader, also reads both sides of a marked card at 400/minute. Each card can contain up to 2,000 marking positions, and reading is photoelectric. Three output stackers have 1,000-card capacity, the same as the input magazine. Cabinet size: 45 x 25 x 32 inches. MEASUREMENT RESEARCH CENTER INC., Iowa City, Iowa. For information:

CIRCLE 153 ON READER CARD

analog computer

The Ci-500 is a 100-volt model with up to 350 operational amplifiers. Control console has visual readout indicators, and two patchboards handle the problem and the digital logic.



Using pushbutton switches to activate the digital logic circuits providing the control signals for various functions, interfacing for a hybrid configuration is said to be facilitated. Full power 50ma operation provides four-place accuracy in linear computer operations and increased speed in iterative computation and simulation. COMCOR INC., Anaheim, Calif. For information:

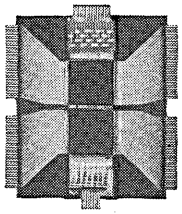
CIRCLE 154 ON READER CARD

A totally new memory technology from RCA

NEW BATCH-FABRICATED HIGH-SPEED MONOLITHIC FERRITES

Each monolithic array contains 4096 "virtual cores" with an effective diameter of only 5 mils within a single, solid, sintered ferrite wafer only 1 in. by 1 in. by 0.005 in.

RCA monolithic ferrites offer all the proved advantages of ferrite technology plus:



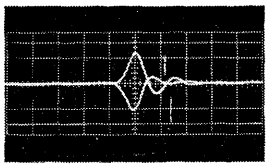
□ **Potentially much lower cost** than wired core-memory planes because RCA monolithic ferrites can be mass-produced with standard ceramic processing techniques.

□ **High-density packaging.** Type MF 2100 unit, as shown, is complete with two monolithic memory wafers, and an integral diode matrix assembly. It requires only 3.75" x 4.5" for a memory capacity of 4096 bits in two -"core"- per bit linear-select operation.

□ **Very high speed.** Full cycle time (read, delay, write), as low as 0.2 usec for 64 x 64 array.

□ **Low drive current requirement.** Less than present small-core memories: only 400 ma read, 120 ma write for 45 mv output and 35 nsec switching time.

□ **High output voltage.** Equal to conventional cores. Trace indicates over 50 mv each for differential 1 and 0 output. Compare this with other bulk-fabricated systems having output voltages of only 1 or 2 mv.



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TYPICAL PERFORMANCE IN 64 x 64 ARRAYS								
READ CURRENT			WRITE CURRENT		DIGITS		TYPICAL OUTPUTS	T_s
I ma	T_d (50%) ns	$T_r T_f$ ns	I ma	T_d (50%) ns	I ma	T_d (50%) ns	1 & 0 mv	nsec
400	110	45	100	120	30	200	35	60
400	80	30	120	100	30	200	45	35
400	60	30	150	30	30	100	30	35

Available now in developmental 4096-bit arrays for testing and evaluation. Call your local RCA Sales Office or write today for information to: RCA Electronic Components & Devices, Memory Products Operation, 64 "A" Street, Needham Heights, Mass. (617) HI 4-7200.

CIRCLE 54 ON READER CARD

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COMPUTER CHARACTERISTICS

plus time-sharing

by DAVID E. WEISBERG*

After a temporary lull of new announcements around the beginning of the year, the pace has quickened in recent months. With the 14 new computers added to Section I (the general-purpose section) in March and the eight shown below in June, the Quarterly now contains data on 134 general-purpose commercial computers as well as 37 special-purpose machines intended primarily for process control (Section II), and 106 general-purpose computers manufactured abroad (Section III)—for a total of 277 computers reported in the latest issue.

The material from the June issue reprinted here does not include some rather extensive changes to computers already in the Quarterly. Probably the most dramatic recent announcement was IBM's decision to drop the System/360 models 60, 62 and 70 from its product line and replace them with the models 65 and 75. Part of the change was the introduction of a 750-nanosecond core memory which is used for both of these new computers. The 360/75 has an add time of about 0.8 microseconds and is comparable to the Univac 1108 and the CDC 3800.

After the IFIP Congress in New York at the end of May, it is clear that this can perhaps be considered the year of time-sharing. Not only was the term being tossed about quite generously by the speakers but many actual demonstrations were made. This raises the question of what factor makes a computer economically adapatable to time-sharing. First, it should be pointed out that time-sharing can be done at a substantial effort and somewhat inefficiently on just about any computer, but a few particular hardware features can drastically increase the effectiveness.

Since a time-shared system has many users "on the air" at one time, it is necessary to switch back and forth rapidly between different programs. If they are small enough so that several programs can reside in working storage at the same time, some mechanism is necessary to prevent cross-interference between programs. On older computers this is being accomplished by executing the programs interpretively while on the newer computers hardware-implemented memory protection is being used. When set for a particular program, limits are defined which prevent reading, writing or transferring except within the specified areas. The importance of this feature has been recognized by Adams Associates as warrant for adding it to the Quarterly as a salient feature to be considered.

Another feature which substantially improves time-shared efficiency is a dynamic relocation capability, especially if it permits programs to be loaded into non-continuous areas of memory. The 360/67, which is a time-sharing version of the model 65, has this capability implemented through the use of an associative memory. Each address is assembled or compiled relative to a fixed location and is modified at execution time to obtain an effective address.

The knowledge that a particular block of memory has been written into or read out of is also extremely valuable in increasing the effectiveness of exchanging programs and data between working storage and an auxiliary storage device. This can be done by setting flag bits for each block when either a reading memory or writing memory operation takes place. Since the monitor can sense these flags in determining its next action, it can avoid the unnecessary saving of an unmodified program or data block when a new block is loaded into memory from the auxiliary storage unit.

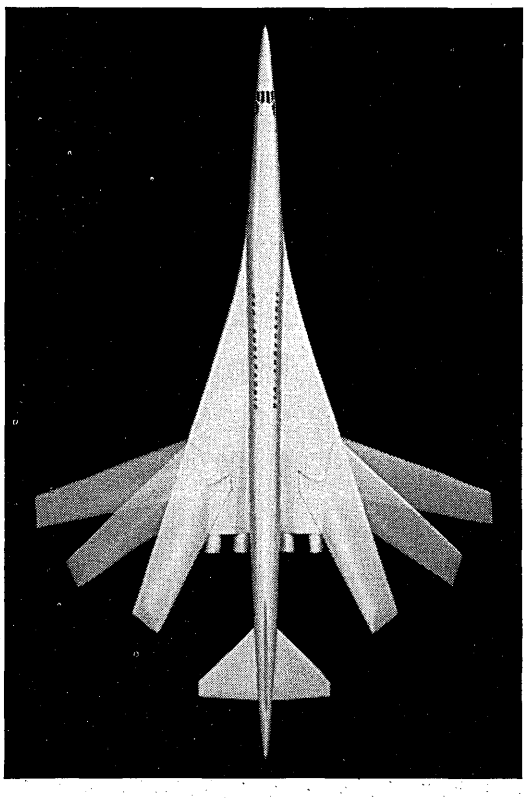
Numerous other features are desirable for efficient time-sharing. The computer should have a set of hardware control instructions which are executed only by the monitor or control routine. A highly flexible priority interrupt scheme is also very desirable as is the ability to give input-output channels long sequences of instructions rather than have the program continually interrupted.

One last comment—the implementation of an effective time-sharing system is not a task to be undertaken by the faint-hearted. ■

SECTION I

	Monthly Rental Typical Range	*First Delivery* Month and Year	*Processor Speed* Complete Add Time in Microseconds	Storage Cycle Time in Microseconds	*Internal Storage* Capacity in Thousand Words	Word Size	*Magnetic Tape* Thousands of Characters per Second	Buffering	Read Forward and Reverse	*Disc Storage* Capacity per Unit	Access Time in Milliseconds	Thousands of Characters per Second	*Drum Storage* Capacity per Unit	Access Time in Milliseconds	Thousands of Characters per Second	*Peripheral Devices* Cards per Minute In — Out	Paper Tape Characters per Second In — Out	Printer Lines per Minute	Off-line Equipment	*Other Features* Program Interrupt	Index Registers	Indirect Addressing	Floating-point Arith.	Memory Protection	Byte. Manipulation	Console Typewriter	*Software* Algebraic Compiler	Business Compiler
RAYTHEON 520	$4,000 (2-30)	10/65	1[C]	2	4-32[E]	24b	9-120[G] MR WC	√	—	2.9 M 250	50	—	—	—	—	800[M] 250	300 110	2500 300	—	√	7	√	√	—	√	√	√[Y]	—
	C. Add time variable from one to five microseconds. E. 256 to 512 words of non-destructive BIAX memory available. G. IBM compatible. M. 100 cpm reader and punch also available. Y. FORTRAN II and IV.																											
ASI ADVANCE 6000	$3,000[A] (2-15)	3/65[B]	3.8[C]	1.9	4-32	24b	22.5[G] MR WC	—	—	—	—	—	—	—	—	800 250	300 110	400[P]	—	√	3	√	√[U]	√[V]	—	√	√	—
	A. Series consists of five Models 6020, 6040, 6050, 6070, 6080. B. For Model 6020. Other models will follow until 2/66. C. On Model 6070, a faster processing unit is available in addition to regular unit. G. On Models 6020 and 6040, upper limit is 62.5K cps and IBM compatible. P. Incremental plotter and analog conversion equipment available. U. Available with Models 6050, 6070, and 6080 only. V. Model 6080 only.																											
GENERAL ELECTRIC 115	$2,500 (1.8-4)	/66	148[C]	8	2-8	1a[F]	21-42 none	—	—	1.5 M 445	125	—	—	—	—	600 300	400 100	600[P]	—	—	—	—	—	—	—	√	—	—	—
	C. Addition of two 5-digit numbers. F. 8-bit characters or two decimal digits. P. 160 columns per line.																											
SEL 840	$2,160[A] (1.4-6)	7/65	3.5[H]	1.75	4-32	24b	90 MR WC	—	—	—	—	—	—	—	—	200 15	300 110	300 1000	810	√	1[U]	√	√[W]	—	—	√	√	—
	A. 5-year lease required. B. Including indexing. U. Expandable to 3. W. Optional Double Precision and Floating Point Hardware.																											
IBM 1130	$1,250 (.6-1.6)	9/65	8	3.6	8	16b	— —	—	—	512 K 150	35	—	—	—	—	400 100	15 15	80	—	√	√	√	√	—	√	√	—	—
SEL 810	$600[A] (.5-3)	7/65	3.5[H]	1.75	4-32	16b	90 MR WC	—	—	—	—	—	—	—	—	200 15	300 110	300 1000	—	√	1	√	—	—	—	√	√	—
	A. 5-year lease required. B. Including indexing.																											
DATA MACHINES 620	$600[A]	7/65	3.6	1.8	2-32	16b[F]	9-90[G] MR WC	—[J]	—	—	—	—	—	—	—	100 100	300 120	300[P]	—	√	2[S]	√	—	√	√	√	√[Y]	—
	A. Rental price not announced. Price is derived from purchase price and does not include the cost of magnetic tape units. F. Other word sizes can be built in and they are software compatible. G. IBM compatible magnetic tapes. J. Optionally available. P. 600 and 1000 lpm printers also available. S. Two index registers in hardware. Up to 32 more optionally available in core.																											
DATA MACHINES 610 Series	$325[A] (.3-.5)	7/64[B]	6000[C]	3000[D]	.2-4[E]	12	— —	—	—	—	—	—	—	—	—	— —	24 10	—	—	—	1[S]	—	—	—	—	—	—	—
	A. No rental prices announced. Prices derived from purchase price. B. Models 611 and 612 will be delivered 9/65. C. Model 612 has add time of 200 microseconds. D. Memory is magneto-strictive delay line. Model 612 has cycle time of 100 microseconds. E. Model 610 has only 256 word memory. S. Model 610 does not have an index register.																											

*Mr. Weisberg is a senior staff member of Charles W. Adams Associates, Inc., and editor of that firm's "Computer Characteristics Quarterly," available for $10 a year from Adams Associates, 575 Technology Square, Cambridge, Mass. 02139.



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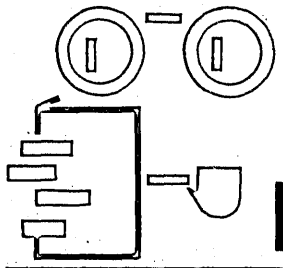
CIRCLE 116 ON READER CARD



NEW LITERATURE

COMPUTING COST: 40-page book by computer manufacturer explains how companies can determine their need for a computer and how much it should cost. Designed to help a company analyze its present computation cost, the booklet poses a series of multiple-choice Q and A. Using a simplified chart that relates to size of staff, cost/hour and percentages of staff time, a firm can quickly evaluate its current monthly computing cost. PACIFIC DATA SYSTEMS, Santa Ana, Calif. For copy:
CIRCLE 160 ON READER CARD

DISC FILE: 25-page manual describes large-capacity dual-access dp/f 5025 storage unit. Included are applications, design features, access and capacity information and interfacing considerations. DATA PRODUCTS CORP., Culver City, Calif. For copy:
CIRCLE 161 ON READER CARD

INTEGRATED CIRCUITS: 44-page catalog features line of silicon monolithic integrated circuit digital logic modules. Technical description, specifications and logic diagrams for each PAC type are included along with loading rules and typical waveforms. COMPUTER CONTROL CO. INC., Framingham, Mass. For copy:
CIRCLE 162 ON READER CARD

DATA EXCHANGE SYSTEM: 12-page brochure presents model 8550 system including the nature of data language, program control, subsystem specifications and system experience. BECKMAN INSTRUMENTS INC., Fullerton, Calif. For copy:
CIRCLE 163 ON READER CARD

BIOMEDICAL ELECTRONICS EQUIPMENT: Study covers market potential for electronic equipment and systems for therapeutic, diagnostic or research work in medicine. Historical and projected data are presented for industry, five major segments and 16 product groupings. Industry structure is detailed and appendix contains description of 56 medium-sized firms active in field. Price: $100. ECONOMIC INDEX & SURVEYS, Colonnade Bldg., University Circle, Cleveland, Ohio 44106.

RECORDS PROTECTION: Booklet details need for adequate protection from fire and water damage for mag tapes, cards, microfiche, discs and drums. Also, how to evaluate records to assure adequate protection, duplication of records and standards. SAFE MANUFACTURERS NATIONAL ASSN. INC., New York, N.Y. For copy:
CIRCLE 165 ON READER CARD

PAPER TAPE READER: Four-page bulletin describes series 119 paper tape reader. Drawing shows mechanical functioning of star wheel sensing system and tape feeding mechanism. Mechanical and electrical specifications and description of available tape reader models are included. OHRTRONICS INC., Montvale, N.J. For copy:
CIRCLE 166 ON READER CARD

RAND TABLET: Two-dimensional, digital graphic input system for general purpose computers is described in brochure, including applications, system description and specifications of Grafacon 1010. DATA EQUIPMENT CO., Santa Ana, Calif. For copy:
CIRCLE 167 ON READER CARD

ID CARD READER: Two-page bulletin describes applications and performance of card reader designed to operate under adverse conditions where safety and security are primary factors. GE CO., PROCESS COMPUTER SECTION, Phoenix, Ariz. For copy:
CIRCLE 167 ON READER CARD

PRODUCTS AND FACILITIES: 36-page illustrated brochure lists complete line of measuring and transmitting instruments, process controls and computer systems available. Described in detail are the 700 line of computers, control and data systems and application in power, process, nuclear and marine fields. BAILEY METER CO., Wickliffe, Ohio. For copy:
CIRCLE 168 ON READER CARD

TAPE MAINTENANCE: Series of booklets, "Management Looks at Computer Tape," survey the techniques for control of performance and life expectancy of computer tapes. Subtitled "The Technical View," the first in the series considers the physical characteristics of tape, their significance in computer operations and objectives and techniques of a tape management program. GENERAL KINETICS INC., Arlington, Va. For copy:
CIRCLE 169 ON READER CARD

PROGRAMMING SYSTEMS: 16-page brochure features automatic programming systems, diagnostic aids, and library of sub-routines available with SDS 92, 910/20/25/30 and 9300. Brochure contains selections on MONITOR and MONARCH, META SYMBOL, SYMBOL, FORTRAN II, FORTRAN IV, ALGOL, Programmed Operators, AID, business software programs, CPM. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For copy:
CIRCLE 170 ON READER CARD

PLANNING TECHNIQUE: Planning and control networking technique with applications in design engineering is the subject of an eight-page booklet. Project and program managers have control of CPM, PERT and PERT/COST. Also covered are the weekly seminars held in various cities. PLANALOG INC., Philadelphia, Pa. For copy:
CIRCLE 171 ON READER CARD

MEDIUM-SCALE COMPUTER: 12-page brochure describes EAI 8400 scientific computing system and operational characteristics in terms of system's autonomous processor, exchange and memory modules. Also lists complete instruction repertoire. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J. For copy:
CIRCLE 172 ON READER CARD

COMPUTER LITERATURE BIBLIOGRAPHY '46-'63: 463-page computer-produced bibliography and index provides access to 6,000 articles published in nine journals and over 100 proceedings in dp. Articles are listed according to author and book has a KWIC section. Price: $3.75. SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, Washington, D.C. 20402.

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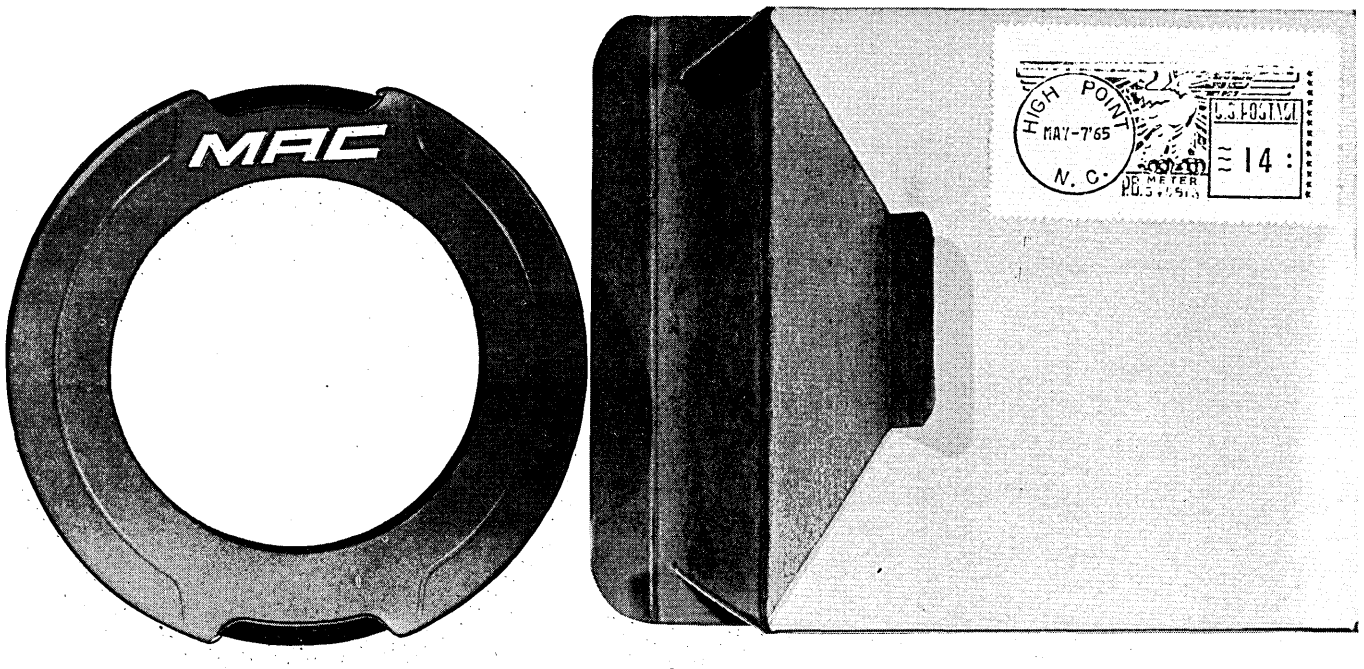

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DATAMATION

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REPROGRAMMING CONFERENCE

The ACM Reprogramming Conference, an ACM Special Interest Symposium co-sponsored by ACM and Applied Data Research Inc., convened at The Nassau Inn, Princeton, N.J., on June 1.

This conference was marred, beginning with the welcoming address itself, by the lack of acceptable definitions of the basic terms describing the subjects with which the conference was to concern itself. Thus, for example, a preponderance of attention was paid to what I will call "the recoding problem," that is, the literal translation, line for line, of the instructions that are a code—or program—for one computer into the lines of code that are meaningful to a different computer. Some persons in attendance even objected to calling this "recoding;" they prefer "transliteration" as more apposite. What is important, however, is that no author who talked about recoding or transliteration called it by either name: all of them talked about reprogramming.

None of the authors seems to have been an auditor during the first morning when Professor John W. Carr, III, of The Moore School, delivered the second technical paper of the conference, "A Radical Approach to Reprogramming." In Professor Carr's view, reprogramming involves every aspect of the mechanism—people, algorithms, languages, machines—that enter into the solution of problems; in this view, moreover, reprogramming goes on all the time, as one or more of those elements change. That does go to the root of the matter, of course, but in no other sense was the approach radical.

Even this view, which I regard as a very pragmatic one, was apparently too academic for the registrants and the authors of papers! For the registrants managed to sit through one presentation after another on the theme "How I Recoded from the BULGY 4050 to the STUFT 1905." Three papers, consuming 1½ hours of the conference—10% of the technical sessions—were straight out of the Honeywell sales literature for LIBERATOR.

A substantial step above the "How I Recoded . . ." presentations were those that were concerned with "languages" that would possess features to facilitate reprogramming. Professor Carr, for example, asserted that programming languages must be richer in their ability to permit declarative statements, not only those that are meaningful to humans but also those that can provide useful and usable information to a programming system (i.e., both hardware and software).

Martin Goetz, of ADR Inc., talked about "A Proposed Software Programming Language." By "software" he meant programs that are not amenable to a compiler or other high-level language but are ordinarily written in assembly language (i.e., machine language). In describing his proposed language, Goetz perpetuated the notion that there is no important distinction between effectiveness and efficiency; what really counts is catering to the puzzle- and trick-minded coder for whom minimum object time execution is the *ne plus ultra*. On the other hand, he was concerned to provide "a language which incorporates test data preparation, source language debugging output, computer flow chart documentation in an integrated system . . . [and one] which allows maintenance and modifications to be performed with a minimum of difficulty."

M. L. Graham presented a paper reporting on work done by himself and P. Z. Ingerman, both of Westinghouse: "An Assembly Language for Reprogramming." Their meta-language "can be used to specify the mapping of any language which conforms to a canonical list form into an arbitrary stream of bits. The bit stream can be treated as a machine language program. . . Thus, this meta-language can be used to map from one assembly language into another or from the assembly language for one machine into the machine language for another." A processor for this language is being built by the authors.

Interestingly, the question, "How much code can be translated by computer program?" elicited the responses "From 70 to 95%," depending on differences in hardware, languages and coder deviousness. No one seemed shocked by the idea that complete *mechanical* translation is out of the question.

The pendulum swung to the extreme opposite of pragmatism in the papers by W. H. Burge, Univac, and F. P. Larkin, RCA. Both presentations, "A Reprogramming Machine" by Burge, and "Complexity in Program Translation" by Larkin, qualify for the "poorest presentation" award, The Booby (close competition was provided by those who read preprints, word for word).—ROBERT M. GORDON.

large-scale time-sharer

THE HONEYWELL 8200

by THOMAS C. CULL

The H-8200 is a large-scale, time-sharing computer that combines in a general-purpose system the ability to understand both "words" and "characters." It is designed for mixed business and scientific data processing applications in which multiple and real-time access to a computer is essential. The H-8200's ability to handle both words and characters makes it possible to use programmed instructions for two completely different computer series: Honeywell's word-oriented Series 800 and its character-oriented Series 200.

Memory and input/output protection features, plus extensive interrupt capabilities, make the H-8200 useful for time-sharing applications. It can share memory among the equivalent of 10 central processor groups (multi-processing); run nine programs at once (parallel processing); and have more than one "live" program controlled by a single processor group (multiprogramming). More than 3,000 remote stations can share time simultaneously.

The H-8200 will provide new users with a system able to perform as part of a standard data processing installation, while at the same time providing uninterrupted growth for current users of the H-120, 200, 1200, 2200, 4200, 800 and 1800.

Users of Honeywell's Series 400 systems will also be able to grow into an 8200 through an automatic program translator. The translator, now being designed, will enable conversion of H-400 and H-1400 programs into Series 200 language.

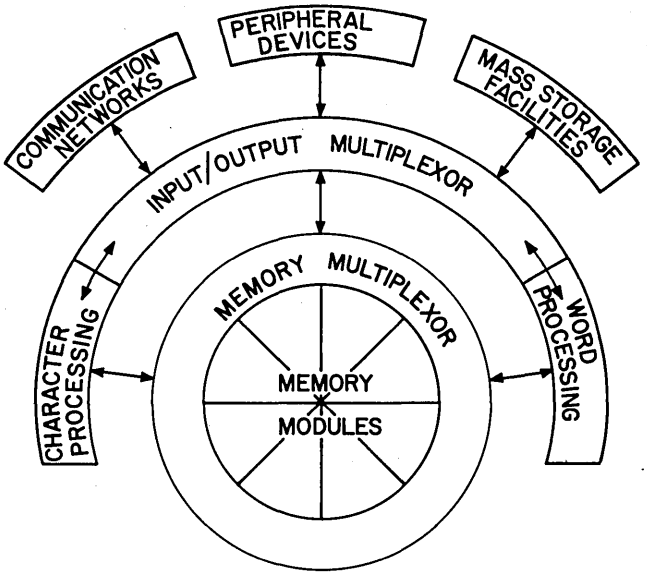
system organization

The H-8200 contains three major subsystems: processor, memory and input/output.

The processor has within it 10 programming groups, nine running active programs and a tenth—the master control group—monitoring the entire computer. Eight active programming groups handle data and instructions in the form of fixed-field-length words, the ninth in the form of variable-field-length characters. The master control group provides intercommunication among all active programming groups, and coordinates the actions of all groups and subsystems. The processor also includes console, display and manual controls.

The time-sharing ability is made possible by assigning a protection identification tag to each word-oriented programming group and three such tags to the character-oriented group. Tags can be set or changed only by the master control group. Each 512-word (4,096-character) block of memory also has a tag.

The memory subsystem has one to eight memory modules and a memory multiplexor. Each module holds



MODEL 8200
SYSTEM ORGANIZATION

131,072 characters (16,384 words) for a maximum core storage capacity of 1,048,576 characters (131,073 words). Memory cycle time is 750 nanoseconds per eight-character word. Basic data transfer rate to peripheral devices is 1.33 million characters a second.

The input/output subsystem comprises an input/output multiplexor (I/OM) and up to 32 program-assignable read/write channels which "float" among the periph-

Mr. Cull is director of Product Planning for Honeywell EDP, Wellesley Hills, Mass.

eral devices connected to the system. Up to 48 peripheral control units, and their associated devices, can be connected to the subsystem, with any 32 of them operating simultaneously.

The I/OM will accept input from or provide output to any standard peripheral device in the Series 200 line and major peripheral devices of the Series 800 lines. Devices include Honeywell's magnetic tape drives, line printers, card readers and punches, random access memory storage devices and data communications controls and terminals. Any peripheral device is available for either word- or character-oriented programs.

Peripheral devices can interrupt the H-8200 via the character-oriented programming group, which has three levels of operation: normal mode, internal interrupt mode and external interrupt mode.

With this ability, it achieves two types of parallel processing: word-oriented programming groups automatically execute a string of orders in each active programming group; while the character-oriented programming group can instruct one program to use as many cycles as it needs and then allocate its remaining cycles to a lower-priority program. The master control group controls interaction between the two types of processing.

the circuitry

The 8200 uses monolithic integrated circuits in its logic elements and hybrid circuitry in its memory elements. Arithmetic, logic and input/output sections have High-Level Transistor-Transistor-Logic (HLTTL) integrated circuits throughout. Honeywell has developed custom HLTTL circuits having high-speed performance at one-quarter the power levels of other integrated circuits of comparable performance. Speeds average five nanoseconds per logic level.

Memory circuits use ceramic-based hybrid circuitry—with 20-mil ferrite cores—to provide a four-to-one size reduction over discrete-component memory units.

Central processor, I/OM and memory multiplexor will occupy less than eight cubic feet. A one-million-character memory will fit into approximately eight modules, each approximately four cubic feet in size.

The Honeywell 8200 computer is scheduled for first deliveries during the second half of 1967. Monthly rentals range from $21,700 to $51,000. Purchase prices range from $1.1 million to $2.5 million. ■

Honeywell considers IBM and GE computers as "major competitors" to the 8200. These are the 360/65, with which it is price-competitive, and the 360/75, with which it compares in performance. It also butts against the GE 635, the price of which is still in flux, and falls between Control Data's 3000 and 6000 series. The 8200 is faster than the top of RCA's Spectra series, the 55, and compares in power to the Univac 1108.

Software: PL/I is not being offered at this time by the company, but it reportedly will be implemented when the language's "growing pains" are overcome and it gains acceptance. Instead, the machine will be delivered with "proved out" software from the 200's and 800's, in addition to an operating system designed to use specific hardware features of the 8200.

EUROPEAN'S VIEW OF IFIP '65

by JACK HARWELL

After a visit to the States, most European computer people return home with more than a slight tinge of envy among their impressions. Since such excursions are taken to glean information from the highly successful and advanced installations, it is easy to become both overawed and slightly alarmed at the rate of development in the U.S.

Although the May IFIP conference in New York was an international event, the dominant impression for me was of the determined effort and progress being made by U.S. researchers and users to resolve the problems of time-sharing and to exploit the opportunities of man-machine interaction.

One of the yardsticks for measuring progress available to the European on this occasion is to compare the content of IFIP 65 with the earlier international meeting at Munich three years ago. The earlier conference was concerned more with the future while this year's gathering dealt more with the reality of these forecasts.

Some areas of computer science have progressed almost beyond belief while others have temporarily faded from view. In the latter case, techniques such as machine translation of languages—that took great prominence at Munich—have proved difficult to implement. On the other hand hardware trends have continued with expected rapidity, although not quite in the directions predicted. It seemed unlikely three years ago that core stores and silicon semiconductors would be pushed up to nanosecond speeds and megabit capacities and down in size and price to provide today's specifications. At that time these characteristics were expected to come with development of the then novel devices of film memories and circuits and so forth. In a similar vein the way in which the potential of time-sharing has fired the imagination of American users was an almost unpredictable event.

This last area of development emphasizes the disparity between the two transatlantic computer communities. In New York there was a general tendency to regard batch data processing as a bit old-fashioned and dull. New horizons have been opened with the arrival of reliable and reasonably priced communication channels, so that large time-shared systems can be operated at economic rates. The rate at which advances in telecommunications are being absorbed by systems designers to give computers a far wider role is nothing short of phenomenal.

However, batch processing is still very much the reality in Europe, and to discuss time-sharing is in the majority of cases to talk "heady stuff." In practical terms IFIP 65 may well have brought a hint of dissatisfaction into the life of an individual looking for ways to progress his magnetic tape or disc batch dp system—particularly if he was seeking solutions to perennial headaches, such as resolving the data capturing problem.

Most beneficial to visitors from this side of the water was probably information on the thinking behind developments in software controlling systems and learning at first hand of the American attitude toward experimentation on an operational scale. Even the most fervent worker in the time-sharing field accepts that these are early days of an evolution: and although big machine systems with very large immediate access stores and backing files are being adopted, hardware is being relegated to an almost secondary place. The questionnaire approach to systems programming, where a user can converse with a machine in a collaborative effort, seems in itself an admission that progress must be by experiment. IFIP 65 has undoubtedly posed some new questions for the average industrial and commercial user.

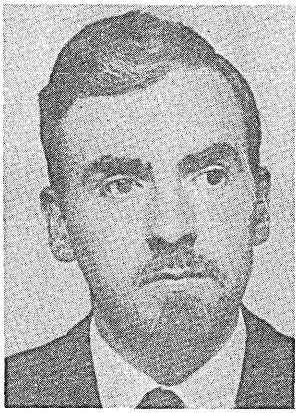
On the one hand he has been told that computers have increased in power over the past few years by one-hundredfold and dropped in price by a factor of 10, and on the other that the big future is in time-sharing of large expensive systems.

He is now faced with the basic dilemma of whether to consider installing small but powerful new machines or to examine the possibility of becoming one of several users of a time-shared installation. Potentially, it seems that for less dollar-cost he may be able to rent terminals for the latter and gain access to a computer of no mean power and to a library of programs representing hundreds of man-years of effort that is steadily accumulating. At the moment the industry is unable to specify in quantitative terms how such schemes are to be organized in the immediate future or, indeed, what the absolute costs in software and systems investment is going to be for the user.

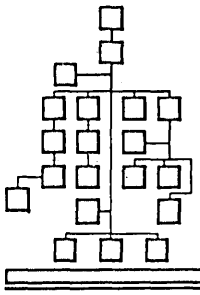
This is likely to be a key issue with the European user who, in general, spends less than his American counterpart on equipment, and endeavours to get fairly complex software schemes operating on a modest amount of hardware. It is possible that various trade-offs offered by time-sharing may be the answer to his nagging conscience over budgets.

To further this development in Europe, more ready-made software packages are needed. Many of the basic and foolproof tools required for the business user appear to be some way off. This was certainly an impression I gained from IFIP, where the main theme involved thrashing out the philosophy behind the more complex controlling software schemes needed to make this new area of computing a practical proposition.

Of course the Congress is essentially a fashion show of current ideas and designs; and like the Paris equivalent in haute couture, the average buyer has to wait some time for the cheap production line model to come off the shelf.



Mr. Harwell is head of J. Harwell Data Processing Ltd., a British software house and personnel consultant. At the IFIP Congress 65, he chaired the panel on Program Development and Documentation; he is also chairman of the Law Study Group of the British Computer Society. Originally a law graduate, he has been in the computer industry for nine years, specializing in systems programming with NCR and Honeywell.



people IN DATAMATION

■ Clarence W. Spangle, formerly managing director of Honeywell Controls Ltd., London, has been named vp and gm of Honeywell's edp div., Wellesley Hills, Mass. He will be succeeded by L. Ralph Price.

■ Paul A. Quantz has joined Philco's information systems department, Philadelphia, Pa., as manager of the programming department.

■ C. Raymond Smith has been elected executive vp and director, Bunker-Ramo Corp., New York. He was formerly vp, Martin Marietta Corp.

■ Dr. Richard I. Tanaka has been named consultant to the president of California Computer Products Inc., Anaheim, Calif. He was formerly with Lockheed Missiles & Space Co., Palo Alto, Calif.

■ Prof. Ambros P. Speiser, IBM Research Labs, Switzerland, has been elected president of IFIP and M.J. Carteron, France, secretary-treasurer.

■ Richard E. Utman, formerly manager of advanced systems development, J.C. Penney Co., has joined Computer Usage Co., Mt. Kisco, N.Y., as technical director.

■ The Diebold Group Inc., New York, has named Federick D. Brown director of their newspaper research program. He was formerly executive vp, Digitronics Corp.

■ Peter C. Patton has been named manager, Univac 1107 Computing Group, Department of Aircraft Technology, Technical Univ., Stuttgart, Germany.

■ Edward F. R. Hearle has been appointed director, data systems services, Griffenhagen-Kroeger, Inc., San Francisco, Calif., consultants specializing in public administration and finance.

■ Burke Marshall has been elected to the new post of vp and general counsel of IBM, Armonk, N.Y. He was formerly assistant attorney general in charge of civil rights, U.S. Justice Dept. Richard A. Trachy has been named manager of the Rochester, Minn. development lab which is responsible for OCR devices, control systems and industry oriented terminals.

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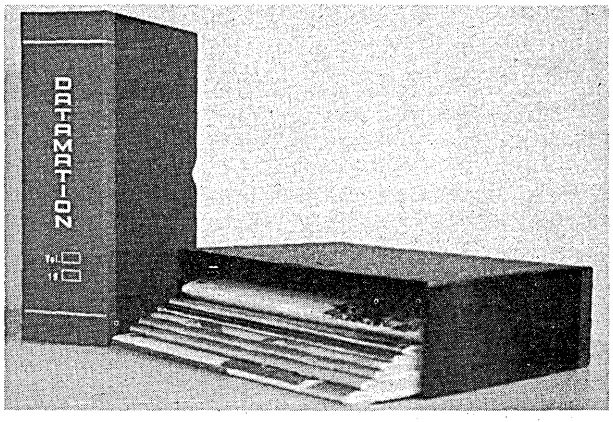

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USSR'S YERSHOV SPEAKS IN L.A.

t-s by 70 predicted

Parents of problem children are always glad to hear that other parents have similar troubles. So American computer specialists attending a recent L.A. ACM chapter meeting were delighted to learn that Soviet computer users have complaints just about like theirs.

The speaker, Dr. A. P. Yershov, head of programming at the computer laboratory of the Siberian Division of the Academy of Sciences in Novosibirsk, indicated that lack of memory capacity is, as it is here, a chief source of unhappiness there. The general problem, he said, was "there are not enough machines, and they are not good enough." And he indicated that input-output gear was less than ideal. The most impressive thing about American computing to Yershov was the size of memories. And the biggest attraction at IFIP's Interdata exhibit was the proliferation of good peripherals.

Yershov described the organization, work and plans of his computing laboratory, which employs over 300 people, and which performs theoretical and practical research, and acts as a service bureau to other segments of the Siberian Division of the academy. Hardware consists of two vacuum-tube M-20's and a medium-scale, solid state Minsk-2.

Programming for the computer at Novosibirsk is open shop; operations are closed shop. About 1600 people a year use the computer, some 500 of them every week . . . or every day. In one day there will be about 300 runs, if the computer works. "You may forget what means the vacuum-tube computer," Yershov added, "but we know it very well." But he noted that useful time at the center is 16 hours a day. Turnaround time? Run results are generally returned "next morning," Yershov said, indicating that one program may require 10-15 "talks" with the computer.

Primary programming effort in recent years has been in the development of ALPHA, an extended-ALGOL compiler (45K instructions, 20 passes), five years in the making. Designed for use on the M-20 (a 4K core machine which averages some 20,000 instructions/second), the compiler produces object programs at the rate of 150 three-address instructions/minute. "It was very difficult," Yershov said, but ALPHA has been in operation one year, and some 2000 programs have been translated, and the compiler has increased program production by two or three times.

Future programming efforts at Novosibirsk will emphasize man-machine communications, Yershov said, and work is underway toward the development of a time-sharing system for the BESM-6 computer. The "6," which will cost approximately 3 million rubles (one ruble = $1.10 at the official government rate), is a one-address transistor machine which features a 2-usec, 16-32K core, plus 16 tapes and 800K of drum storage, and averages about one million instructions per second. The T-S system, expected to be fully operational by 1970, will include about 100 teletype units, and 20 remote consoles linked over "high-speed" telephone lines.

Of other computer work in the Soviet Union, Yershov noted the announcement of plans for ALGEC, a language which will combine ALGOL and an economic (or business) language. Presumably, it would be of primary use in centralized or regionalized economic planning by computers.

In the question-and-answer period, Yershov indicated that he has a sense of humor. One question, "Are your computers adequate for real-time calculations of trajectories and orbits," he recognized as a new version of "If your computers are so lacking, how come you're so advanced in space work?" His answer: "I don't know, but if we can fly . . ." (Laughter, applause). ■

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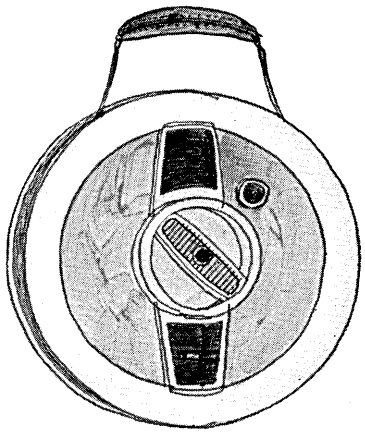

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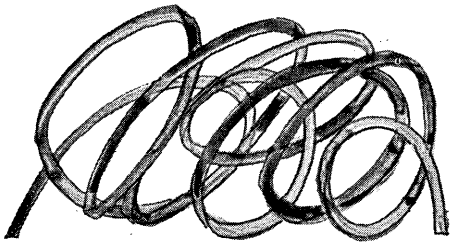

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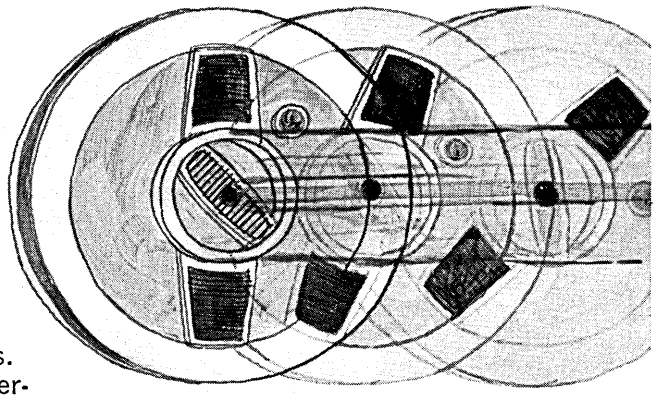

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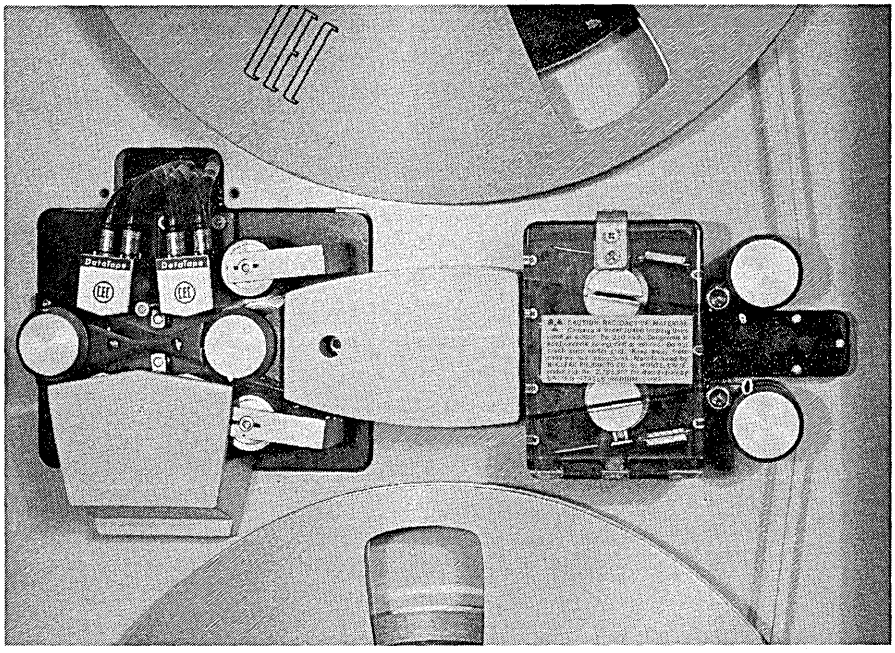

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3 **Six speed switchable video FM**—d-c to 500 kc.

4 **Single source responsibility.** All components are designed and manufactured by CEC...including the video FM!

Important features:

▣ Pushbutton selection of *six* transport speeds along with associated electronics.

▣ Each of the VR-3600's 7 or 14 record/reproduce channels can be used for data storage in the 400 cps to 1.5 mc or d-c to 500 kc frequency range.

▣ Automatic end-of-reel sensing stops tape without leaders; transfer switch provides start command for nearby recorder and 30 second overlap of recorded data between machines—at no extra cost.

▣ IRIG or 18.24 kc AM servo system or time expansion/contraction servo system using common assemblies mean low cost for any version or combination of servo systems.

▣ Tape is constantly cleaned by optional vacuum/ionization; tension controlled, in all modes, by closed-loop servo control.

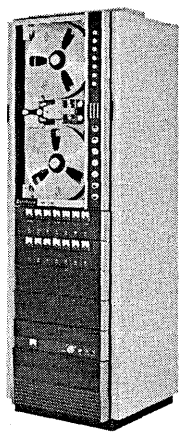
▣ Individual plug-in equalizers (6 per amplifier) meet all specifications simultaneously. Buy only those required, then set and forget.

▣ Record and reproduce amplifiers are solid state; the direct system fully amplitude- and phase-equalized.

▣ Tape transport skew is less than 0.5 μsec; complete cumulative flutter less than 0.30% p-p at 120 ips.

▣ The system may be supplied in single or dual rack configurations, with or without a dolly.

For *all* the facts about the VR-3600, call CEC or write for Bulletin 3600-X16.



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CIRCLE 59 ON READER CARD

(Continued from page 69)

applied to larger groups for health control. Although an expensive method of analysis, the application is being considered by other countries, such as the U.K., which operate a state medical service.

WHEREAS PEOPLE ARE SO ERROR-PRONE

British bankers are a little embarrassed at present about earlier claims that computers and automatic reading machines are all for the benefit of the customer. During a day's work in mid-June, an E13B-encoded cheque for $6500 of a Joseph Burnett was duly processed by machine. Unfortunately, ignored were certain hieroglyphics penned in by Burnett, altering the name of the branch of the bank at which payment was to be made.

Burnett countermanded the cheque, but the computer was too quick for him and the money was paid. In principle, no cheques are refused by the main U.K. banks, and they can be drawn at other branches or even other banks, provided a person's identity is proved. The reasons for Burnett's actions are a little obscure, but the main issue on which judgment has been reserved for a few weeks is whether the bank is responsible for not detecting an alteration to the cheque.

The banks fear that if the law finds against the customer, other people who alter cheques may be tempted to cut off the MICR coding line, thus throwing the computer system in confusion; alternatively, if the court should find against the bank because of the computer's mistake, this would leave the banks at risk when a customer countermanded a cheque.

AIR TRAFFIC CONTROL IN FRANCE GOES IBM

Twin IBM 7040's with a 7740 multiplexor computer have been installed at the first of three centres responsible for French air traffic control. This will cover automatic control functions for civil aircraft in the northern control zone of France, centred in Orly. Machines will be placed later at Aix-en-Provence and Bordeaux for completing national coverage.

Radar data is fed directly into the 7040's, which automatically schedule traffic information and present it to controllers via printouts and visual displays. The multiplexor computer links the civil system with military and other air control centres for coordinating all flights.

IBM has already installed machines for STRIDA, the French military control system, and are doing a similar job for Italian defense. As a result, they expect to rate high for the computer contracts in the NADGE scheme, which will give air defense coverage from Scandinavia to Turkey.

ODDS & ENDS

Midyear profits of ICT dropped 50% to $7½ million, and a gloomy forecast for the next 18 months by board chairman Playfair caused the firm's stocks to drop $17 million (18%) on one day. This despite talk that worldwide sales of the 1900's, in some seven months after announcement, exceeds $50 million...GE made its first sale in the last 12 months in Australia: a 115 system. Meanwhile, it looks like a CDC 6400 will be going to Adelaide Univ...Quelle, the large German mail order house, is expected to order Univac 1108's for real-time management control of its distribution and warehousing system...An 1107 will be used by 200 townships in Sweden as a central cooperative.

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CIRCLE 105 ON READER CARD

DATAMATION FEATURE INDEX- Jan. to June '65

JANUARY

Automated Displays p. 24-37

Four articles cover various facets of automated data display. Dr. Ruth Davis traces the short, spasmodic development . . . from Babbage to SAGE. Albert V. Shortell Jr. describes the use of displays for on-line programming. George W. N. Schmidt describes the display system for NORAD. Irv Abzug covers a 360 subsystem combining display, light pen and film recorder/scanner for on-line graphic information processing.

Dear Mr. President p. 39
by Louis Fein

A computer specialist examines some of the assumptions underlying two views of the effects of automation, and suggests the need for more information before either is translated into action.

The Large Scientific Job Shop p. 42
by L. I. Press

The continually growing backlog of work of computer installations indicates a growing mismatch between today's capabilities and tomorrow's needs. The author offers guidelines for systems designed to meet those needs in the face of suddenly relaxed hardware constraints.

FEBRUARY

Message Switching p. 24-31

Two articles highlight topic. H. J. Mitchell looks at tomorrow's world through the I/O channels of the message-switching computer, linked to international communications networks. Jim Atwood, Jack Volder and Gerald Yutzi look at the system design characteristics and on-line performance of a C-8401-controlled message switching system.

Computer Science at West Point p. 32
by Major William F. Luebbert

Two-part article concluded in March issue discusses philosophy behind the program, curriculum, hardware, and an input technique for handling large numbers of students' problem decks.

The Evolution of FORTRAN p. 37
by Charles Wimberly

Comparing the development of FORTRAN to the evolution of natural language, the author claims that FORTRAN has developed more rapidly because of the financial investment, but the forces involved still follow a predictable pattern. He opposes premature insistence on compatibility and the freezing of language specs.

The QUIKTRAN System p. 42
by John H. Morrissey

Commercially-available personal computation service allows subscribers to time-share a 7040/44, using remote 1050's. Highlighted are design, equipment configuration and language facilities.

(con't p. 106)

FEATURE INDEX . . .

	St. Paul, Minn. (Defense Systems Division / Data Processing Division)	Whippany, N. J.	San Diego, Calif.	Blue Bell, Pa. (Suburban Philadelphia)	Johnsville, Pa. (Naval Air Development Center)	El Segundo, Calif.	Washington, D. C.
Programming Supervisor							E
Commercial Software Development	A			B			
Applications Programmers	C	C	D	B	C	B	E
Programming Research	C A			B			
Command & Control Programmers	C	C	D		C		E
Integrated Systems Programmers	C A		D		C		E
Aerospace Programmers	C				C		E
Systems Programming Design	C A			B			
Technical Programming Support	A			B			
Documentation Programmers	C A			B			E
Guidance & Control Programmers	C A	C					E
Systems Programming Instructors	C			B			
Programmer Trainees	C	C		B			E

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FEATURE INDEX . . .

article, these users prefer 7094 COBOL over FORTRAN for business dp.

MAY

IFIP Congress 65 p. 31-39

Five articles cover computing around the world. D'Agapeyeff covers software in Europe, and John Pinkerton covers hardware in Europe. Recently returned from a tour of computation and cybernetics research centers in Russia, Dr. Edward Feigenbaum reports on people, practices, and publications. Computing in Latin America highlights the inordinately active role of universities, and spots future trends and problems; and finally the historical development and current status of computing in Canada are traced by Glinski.

IBM vs. RemRand p. 54
by George Schussel

The first of a two-part article concluded in June issue chronicles the early struggle for leadership of the computer field.

JUNE

Updating an I. R. System p. 24
by Jack Sieburg

The author explains how to set up and maintain an information retrieval system, using the Air Force's project LITE as an illustration.

Quality Control & Assurance in Records Conversion p. 27
by Norman Schneidewind

Author presents an analysis of the problems involved in specifying and checking the accuracy of large file conversions, with a method of choosing and applying suitable standards. He also gives definitions of terms commonly used in quality control, an outlined summary and references.

Characteristics of Priority Interrupts p. 31
by Emil R. Borgers

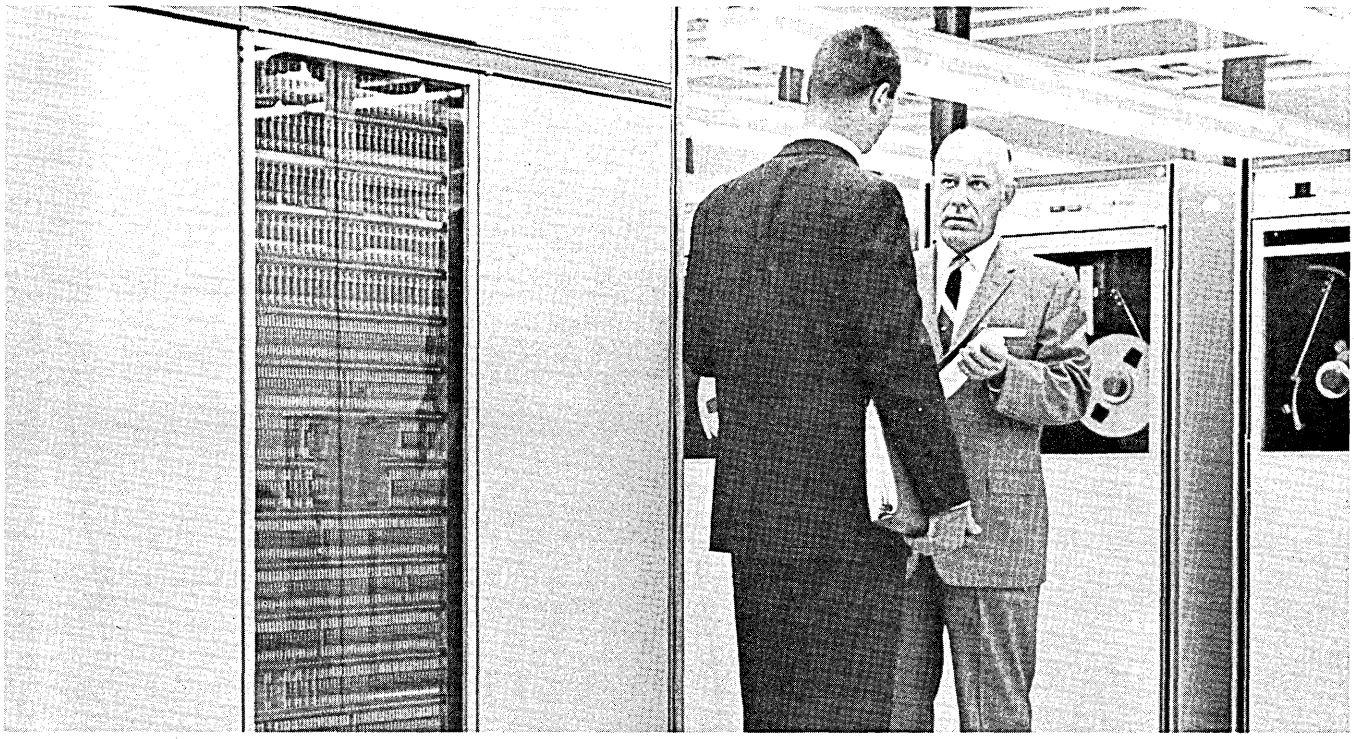
Author defines criteria for interrupt systems and discusses three methods now in use.

Computer Sectioning and Class Scheduling p. 35
by Martin Faulkner

Computer program at Washington State helps to solve the problem of building a time schedule of course offerings with a minimum number of student schedule conflicts. Major modifications, the time problem, processing and reports, and costs and advantages are included.

What's So Hard About Software? p. 50
by Frank P. Lambert

There seems to be "a shifting focus in data automation research and a growing recognition of the impact of software on total system performance." Author pursues this thesis and makes suggestions for finding out what you really need. ■



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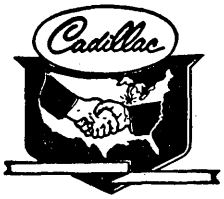

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