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68

October

software packages

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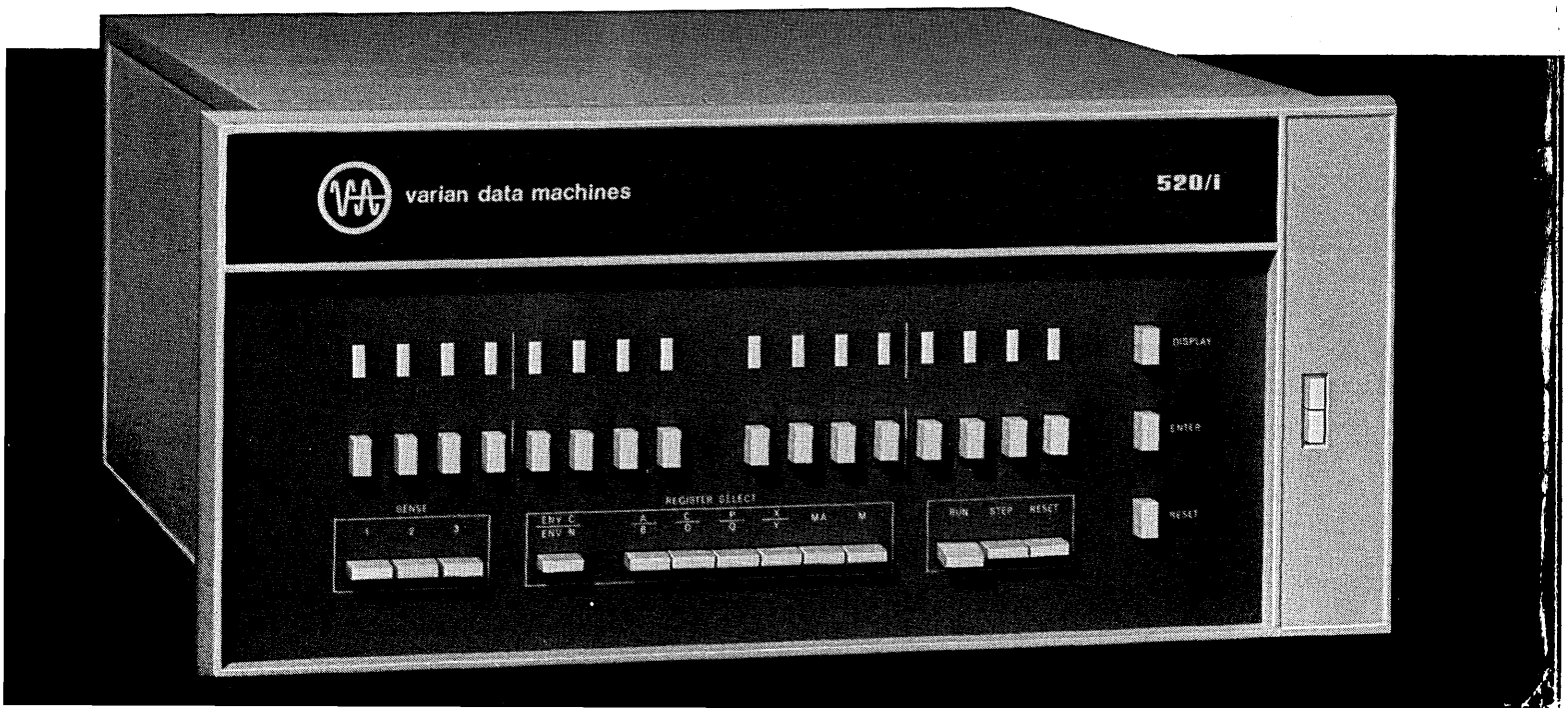
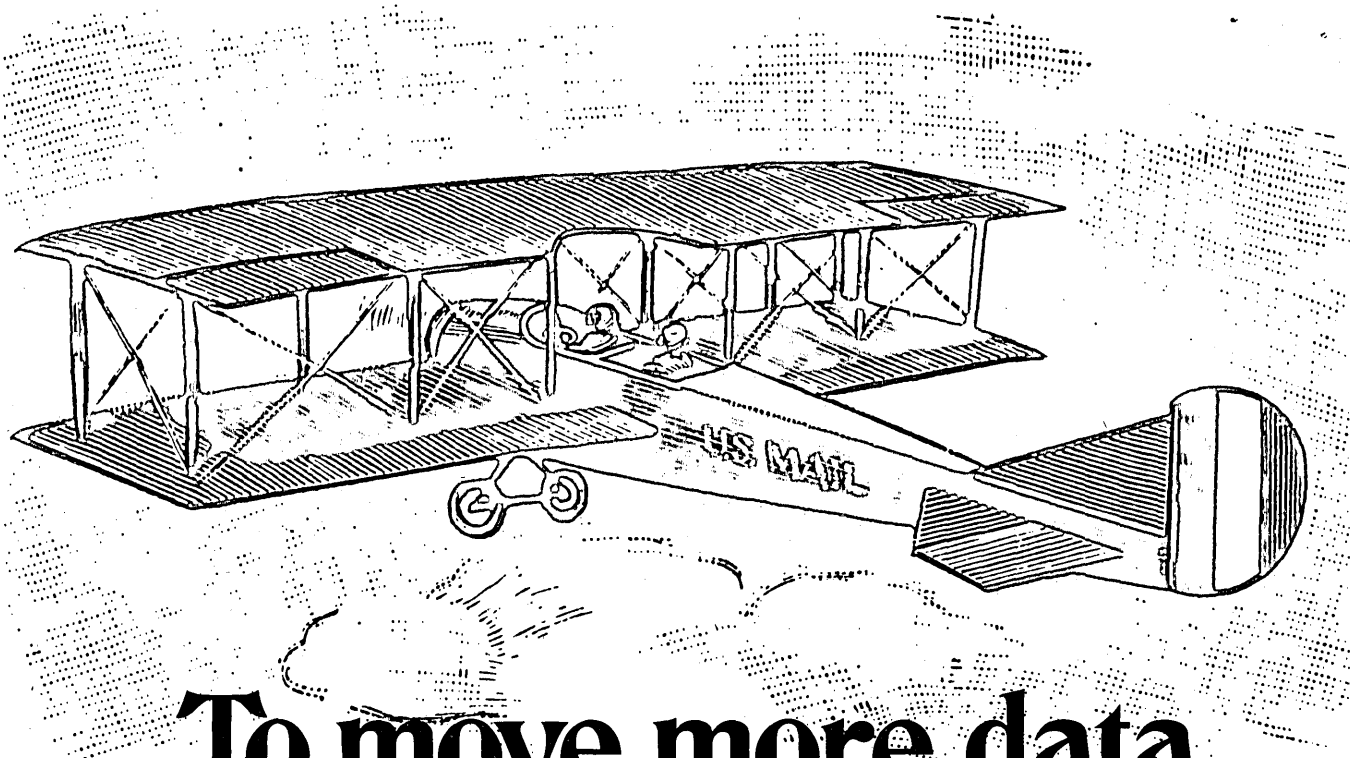
CIRCLE 1 ON READER CARD





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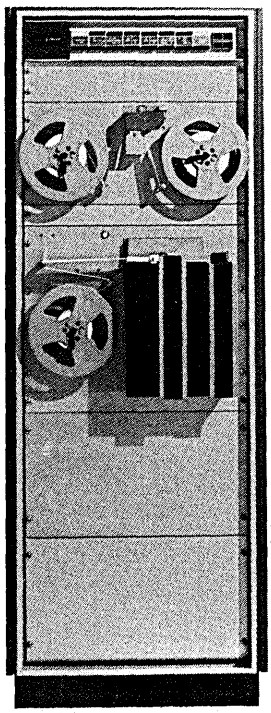

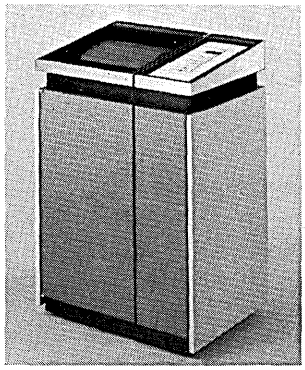

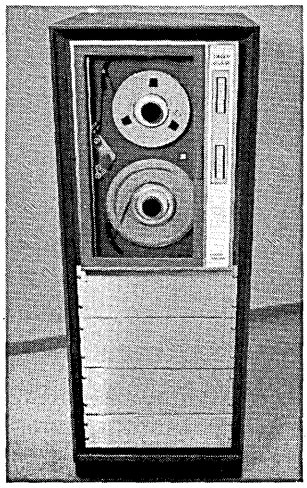

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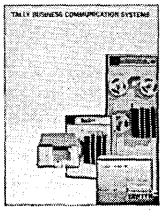

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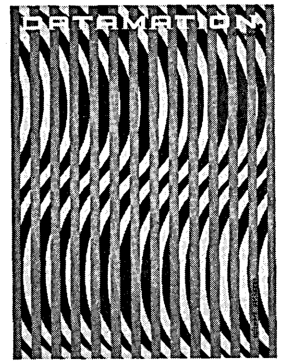

october
1968
volume 14 number 10

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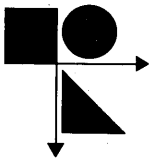

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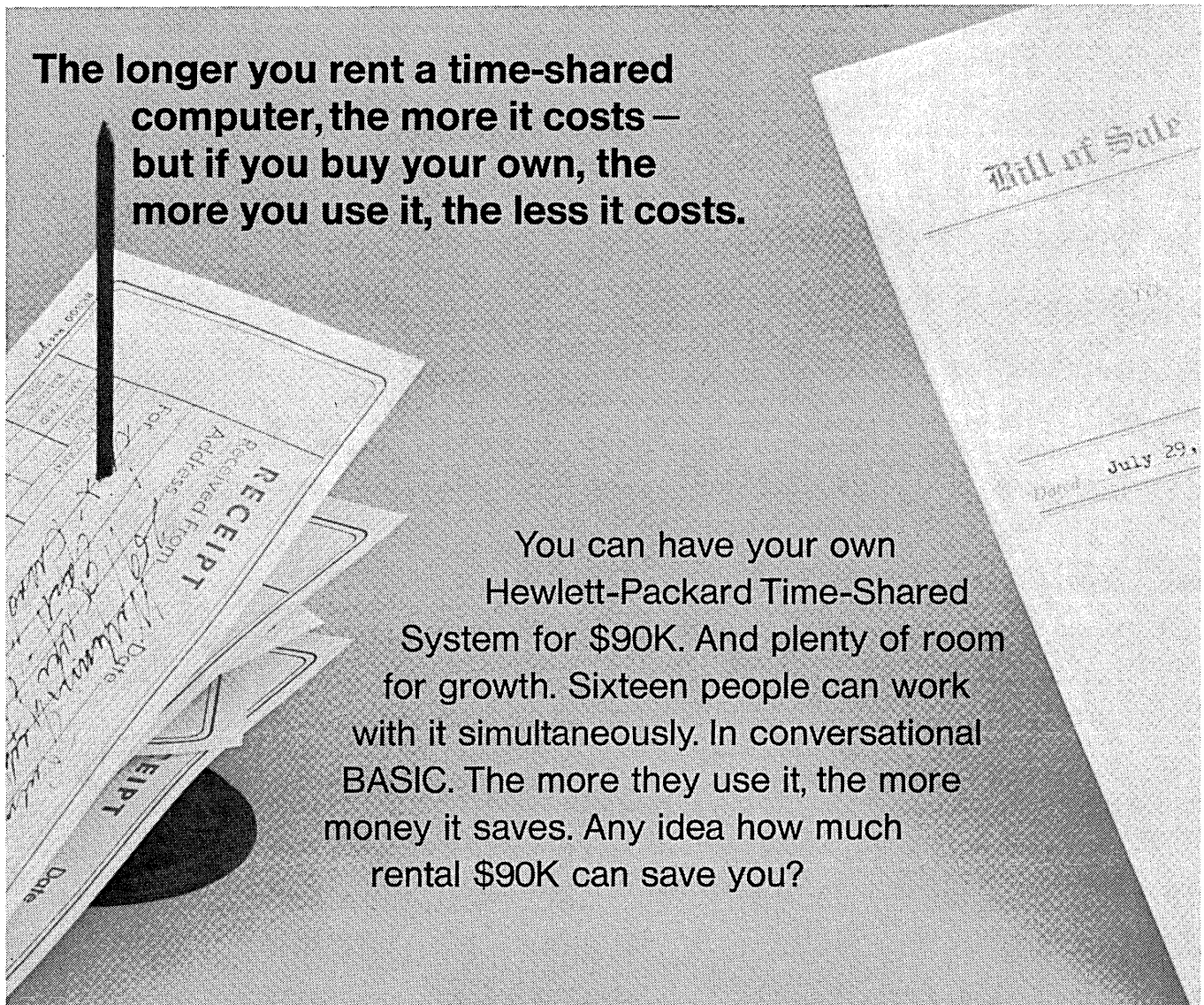

You can have your own Hewlett-Packard Time-Shared System for $90K. And plenty of room for growth. Sixteen people can work with it simultaneously. In conversational BASIC. The more they use it, the more money it saves. Any idea how much rental $90K can save you?

The HP 2000A Time-Shared BASIC System gives you —among other things—one HP 2116B Computer, 16K memory, expandable disc storage, a control teleprinter and proven time share software.

The high-speed computer gives the illusion that one has the computer to himself. And integrated-circuit construction means long life without obsolescence.

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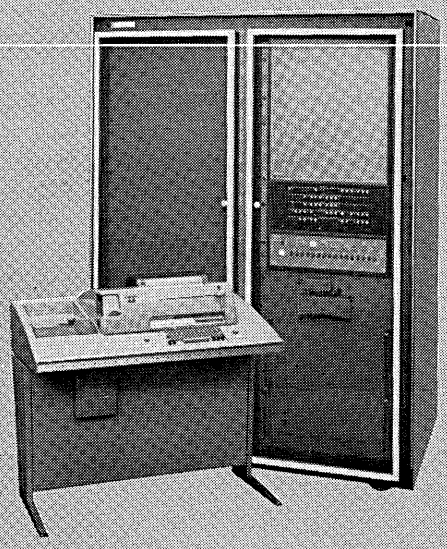
Terminals can be located anywhere. Direct wire connections save on phone charges. But with telephones, any number of terminals can be accommodated—within the limit of 16 at a time.

The genius of the HP Time-Shared System is its Conversational BASIC Compiler, a powerful programming language that you can learn in three to four hours. Yet the computer can also be used in the batch processing mode with Assembler, FORTRAN and ALGOL Compilers, peripheral I/O devices and scientific instruments.

So, when you're tired of paying the high cost of giant time-shared systems, see what $90K will buy for you. Call your HP field engineer, or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.



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DIGITAL COMPUTERS

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DATAMATION 68®

october
1968

volume 14 number 10

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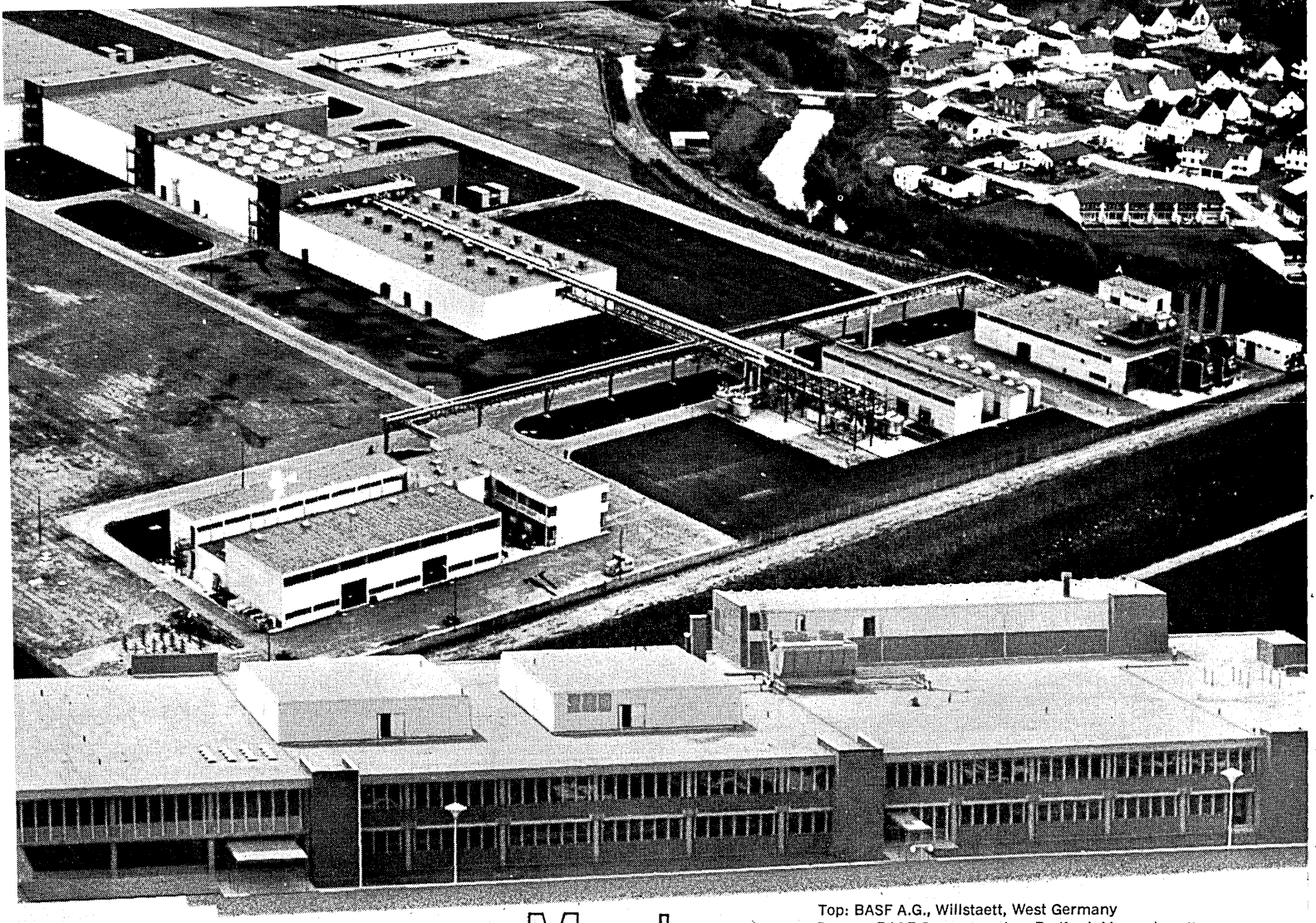
Adage INC

CIRCLE 9 ON READER CARD

calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
Oct. 28-31	Annual Meeting	San Francisco	UAIDE/Ellen Williams, R-COMP-S, Marshall Space Flight Center, Huntsville, Ala. 35812
Oct. 28-Nov. 1	10th Annual Exposition & Conf.	Chicago	BEMA, 235 E. 42 St., New York, N.Y. 10017
Nov. 7-8	2nd National Conf.	Los Angeles	Assn. for Precision Graphics/W. G. Reimann, Litton Systems, 5500 Canoga Ave., Woodland Hil!s, Calif. 91364
Dec. 9-11	Fall Joint Computer Conference	San Francisco	AFIPS, 345 E. 47 St., New York, N.Y. 10017
Dec. 9-11	24th Annual National Electronics Conference & Exhibition	Chicago	NEC, 1211 W. 22nd St., Oak Brook, Ill. 60521
Jan. 13-14	Symposium: Applications of Sea-Going Computers	San Diego	Marine Technology Society, P. O. Box 2158, La Jolla, Calif. 92037
Jan. 15-17	2nd Annual Simulation Symposium	Tampa	Simulation Symposium, P.O. Box 1155, Tampa, Fla. 33601
Feb. 13-14	Mgt. Conf.: Expanding the Service Center Markets	Las Vegas	ADAPSO, 420 Lexington Ave., New York, N.Y. 10017
Mar. 24-27	Int'l. Convention & Exhibition	New York City	IEEE, 345 E. 47 St., New York, N.Y. 10017
Mar. 26-29	16th Int'l. Meeting	New York City	Inst. of Management Sciences/B. Mayer, SBC, 1350 Ave. of the Americas, New York, N.Y. 10019
March 30-Apr. 2	Graphics Conference	Urbana, Ill.	W. J. Poppelbaum, Univ. of Illinois, Urbana
Apr. 1-3	6th Annual Meeting & Technical Conference	Cincinnati	Numerical Control Society, 44 Nassau St., Princeton, N.J. 08540
Apr. 21-23	Conference: Effective Use of Computers in the Nuclear Industry	Knoxville	Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tenn. 37830



Top: BASF A.G., Willstaett, West Germany
Bottom: BASF Computron Inc, Bedford, Massachusetts

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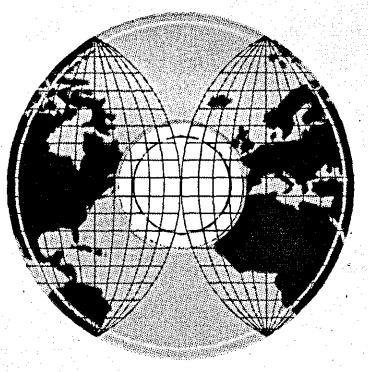

BASF Computron Inc

CROSBY DRIVE, BEDFORD, MASSACHUSETTS 01730

Better magnetic recording through two-world technology

CIRCLE 11 ON READER CARD

letters

on revolution & reaction

Sir:

(Letter withheld at request of author.)

SHELDON B. WEINBERG
New York, New York

business dp programs

Sir:

I wish to add several comments to Dr. Couger's article, "Business DP Degree Programs" (July, p. 49).

Since a great deal of the statistics cited are from the report "Computers in Higher Education," it should be pointed out that the data in this report are at least three years old and somewhat out of date and incomplete. Hence, it would seem quite difficult to arrive at any valid conclusions regarding the "quality" or "quantity" of the various degree programs in computer science.

Most of the academic institutions that reported their computer programs and curricula to the SRE board were oriented toward second-generation systems simply because practical experience on third-generation systems at these institutions was minute. Naturally, it is not surprising that Dr. Couger can conclude that "the majority of bdp degree programs inadequately prepare a person to participate in the design of third-generation systems."

DR. JOHN MANIOTES
Section Chairman
Computer Technology
Purdue University
Hammond, Indiana

airline systems

Sir:

An otherwise well-written article on ATARS (July, p. 85), has one obvious error. You say PARS has been adopted by five foreign and eight domestic airlines, and mentioned the fact that it is working at Alitalia, implying it is not working anywhere else.

Continental Airlines was the first airline to implement the PARS Package and started operating its system May 26 of this year. Alitalia took the Control Program of the PARS Package while grossly modifying the Application Programming of what is today known as IPARS (for International PARS). This would place Continental Airlines in the position of having been the first airline in the world to implement a PARS System successfully.

MAURO S. WEISSMAN
Director
SONIC 360 Reservations Systems
Continental Airlines
Los Angeles, California

laboratory systems

Sir:

I would like to set the record straight on three small, but important, details mentioned in your article on the Institute of Laboratory Medicine's automated laboratory system (July, p. 91).

First, Dr. Glenn Fellows is with Spear, not ILM. The two organizations worked so closely with each other that it was difficult to tell who worked for whom. But officially, Glenn's a Spear man.

Second and most important, Medical Development Corp. is not at Perth Amboy General Hospital. It is corporately separate from ILM, the hospital's non-profit laboratory. Some ILM staff members also work for MDC but the two entities are totally separate. The distinction is important so that readers don't get the impression that profit-making organizations are operating in a hospital. By law, a hospital qualifies as a non-profit organization only if all entities within it are non-profit. This is the case at Perth Amboy General.

Third, the MDC programs are constantly being modified and expanded; hence the cost is subject to change. The $3,500 price you quoted is no longer current.

WILLIAM J. ARDREY
Evanston, Illinois

googology theorem

Sir:

The googology theorem (July, p. 143) seems somewhat incoherent to me. Of course, Mr. Barney Google may only have been jesting, since his name is the same as that of the well-known comic-strip character. Actually, however, the googol is defined to be 10^{100}; the name was invented by the nine-year-old nephew of the late Edward Kasner of Columbia University. Kasner created the googol as a sort of practical infinity. It is a very well-kept secret among scientists generally that practically all numbers used in astronomy, chemistry and physics are less than a googol.

ALAN CATHCART
New York, New York

professional societies & activism

Sir:

In the last few years, scientists in general, and computer people in particular, have become more aware of the social, psychological, economic, and political effects of their techniques on society. This moral awareness should be encouraged, and scientists should feel a moral responsibility for the products of technical advances.

These questions are certainly, therefore, legitimate subjects for professional concern and response, both individually and collectively, since we can lay claim to some amount of expertise. A professional computer man might, for example, predict what computer techniques exist or will be developed, and when; what its societal effects are likely to be, extrapolating from our past experiences; and perhaps even offer a judgment of the advantages and dangers to society of its use or misuse.

Many people might quarrel with the abrogation of this much collective authority; I would have to qualify it myself before I could live with it. To go into matters not directly relating to data processing, as urged by Charles Bloom (Aug. Letters, p. 11), is to step onto dangerous ground.

First, to speak on a subject of professional concern is to claim expertise, presumably with the objectivity of the scientist. Going further afield is a political, not a professional, activity. To

claim expertise in foreign policy or urban problems on the basis of computer knowledge would be patently ridiculous, and would serve merely to reduce our "clout" in matters more germane.

Next, the argument that the times demand the use of the tools at hand: I disagree that a professional society represents a useful tool. It contains the assumption that, since we are all computer experts and hence highly rational people, we will hold political opinions in common, a fact not exactly self-evident. If this course is pursued, a candidate for president of the ACM will have to state his political views

The lethal label.

With proper handling, computer tapes can be "scratched" and reused almost indefinitely. However, careless removal of previous labels can crush reel flanges against tape edge, and kill a good tape.

Moral: Hold flanges away from tape when removing labels.

Antidote for tape problems: Audev. Whether you use our series 61 or premium K-68, you're in good company. These are the tapes used by the top U.S. companies.

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letters

and affiliations, what official position he would take on Vietnam and the gold standard.

In fact, all activist sentiment has been based on the assumption that the positions taken, say, by the ACM would be their own. If my own political position is in the minority in my party, I may still be willing to allow it to speak for me. If my *technical* opinion is in the minority in ACM, ditto. However, as virtually the official spokesman for the programming community, it speaks for me whether I am a member or not. Of course, splinter and the differences might be resolved, and a plank agreed upon in time to take an official position, at the Fall Joint Computer Conference.

In short, I would encourage activism, but feel that the involvement of professional societies should be confined to issues of professional relevance.

FRANKLIN GRACER
Yorktown Heights, New York

hands off the future

Sir:

Robert Gelman's comments (Aug. Letters, p. 15) are interesting. His main point seems to be that if one could really predict the future state of a finite, deterministic system in less time than the system required to reach that state, he might then interfere with the predicted result. Ergo, the supposed contradiction.

He then follows with the astounding statement that we actually could make a precise prediction of such a future state if we stood aside in a second system, made and processed our "universal snapshot," and promised not to convey energy to the first before its predicted state was reached.

No so, Mr. Gelman. Such a promise could not be made. For the very "snapshot" which gave us our knowledge of the entire momentary configuration of the universe would have already messed the universe up beyond all recognition. The universe is exceedingly delicate, and our measuring instruments unbelievably gross and clumsy, according to Mr. Heisenberg. "Look but do not touch" is a maxim which we just cannot ever follow, he warns us. And I do literally mean "beyond all recognition," for if we try to make a second observation to see just how our first observation changed things, we can do it, but then the second observation throws this delicate universe into a third state, and so forth.

In other words, the conveyance of "energy" to the observed system must perforce take place at the very instant of observation. There are some tradeoffs permitted as to just what we are willing not to know about the perturbation we have created, but the *total* world-picture at any instant is certainly uncertain. And without complete input data, no amount of computation could produce a guaranteed prediction of things to come.

Can we lay the ghost of this old debate once and for all? The universe *is* surely going to have some state or other at every future instant, and it *is* predetermined, but we are *never* going to know in advance what it will be.

PHILLIP ROSENBLATT
New York, New York

corp vs inc

Sir:

Re Aug., p. 31: --------OW!!!! You really meant to say major investors took money and ran from Standard Computer, *Inc.*, not *Corp.* Can't blame you, though, for the names were all too similar. With the name Standard "Inc" likely to depart the scene, life here in Santa Ana at Standard "Corp" will be a little less confusing.

Anything you can do to convince your knowledgeable readers that Standard Computer Corp. is here to stay would be appreciated. Neither we nor our investors are cut and run types.

W. L. WOOLLEY
Director of Marketing
Standard Computer Corp.
Santa Ana, California

correction

Sir:

Please refer to Table 1 in the article entitled "Third Party Leasing" (Aug., p. 22) written by E. L. Meadows. The "Purch. Instead of Rent" category under the Cumulative Cash Flow Differences for the fifth year should read + 58.4 instead of + 54.4.

J. M. ADKINS
Philadelphia, Pennsylvania

our error

Sir:

There was a misinterpretation as to the function of Decision Science's SIMUL8s package (Aug., p. 124). It is designed to simulate the PDP-8, PDP-8/S, and PDP-8/I series computers on the larger IBM 360 or CDC 3600 general purpose computers.

A. J. OWENS
Vice President
Decision Science, Inc.
San Diego, California

great late data date

Listen here! To paper tape talk. It's Telespeed equipment. A tape-to-tape system that can transmit a whole day's data demand in a matter of minutes. Feed a computer ten, fifteen, up to twenty times faster than copy can be manually typed. Move large volumes of data unattended during the night when line costs are lowest. Another answer from Teletype R&D for moving data at high-speed.

* * * *

Imagine moving an entire inventory list of over 7,000 items from warehouse to home office in a few minutes. A list that if manually typed in tabular form would take many hours and a hundred feet of paper to reproduce. This is but one of many capabilities that Teletype has designed into its line of Telespeed tape-to-tape terminals.

Telespeed equipment is being used to exchange data with central on-line computers. In point-to-point data exchange for both distributing and collecting data in any number of remote locations. It is code insensitive. Communicates in any 5, 6, 7, or 8-level code including the U.S.A. Standard Code for Information Interchange (ASCII).

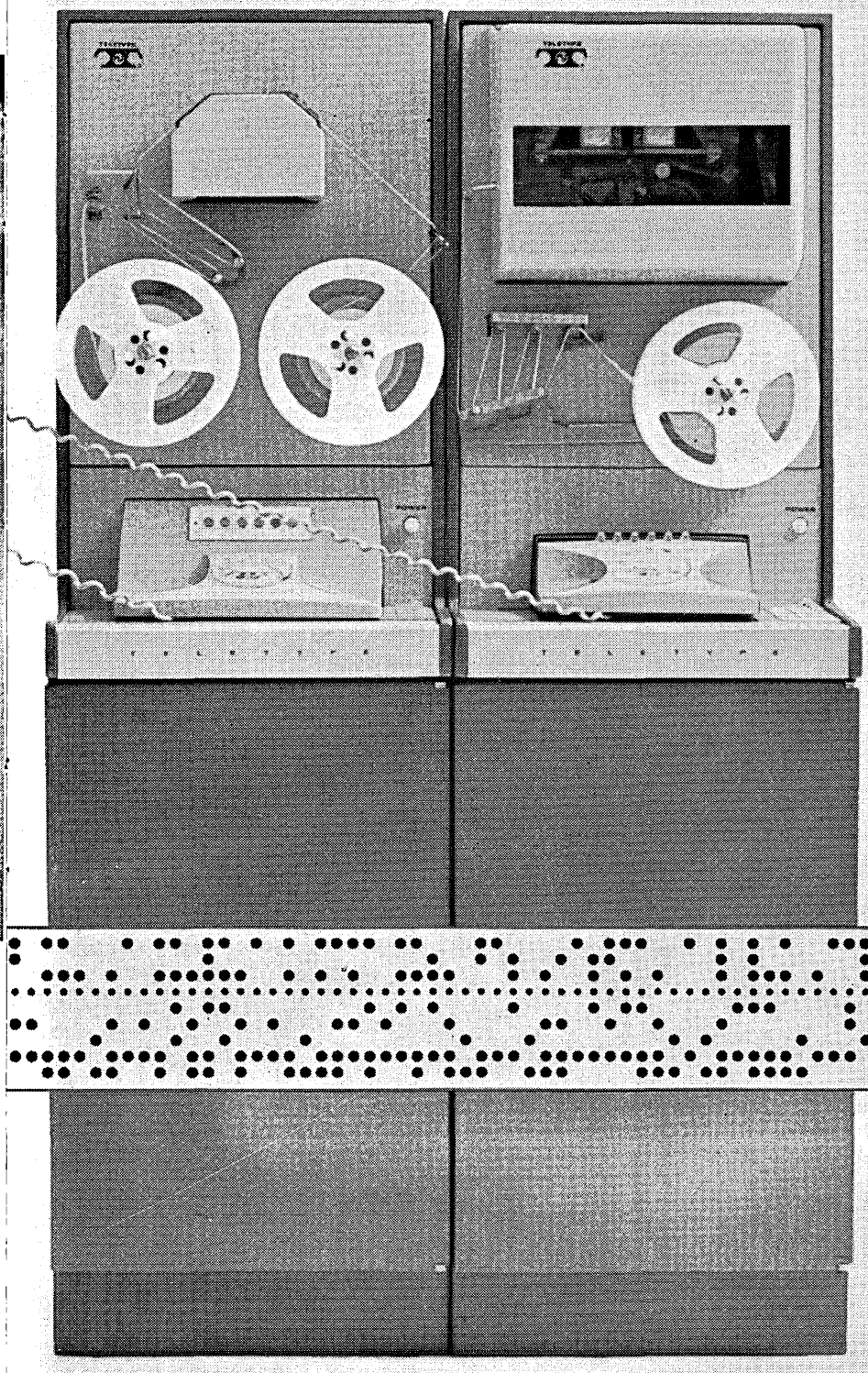
And, ASCII is perfectly compatible for use with most computers and other business machines.

Detects and corrects transmission errors

Telespeed 1200 EDC terminals provide automatic detection and correction of transmission errors. An extremely important capability in computer use and high-speed numeric business data transmission. This Telespeed equipment delivers up to 120 characters per second. And it is compatible for use with Telespeed 1050 equipment that operates at 105 characters per second. The Telespeed 750 terminals shown at right are extremely economical high-speed tape-to-tape equipment that provide data handling capability of 75 characters per second.

machines that make data move

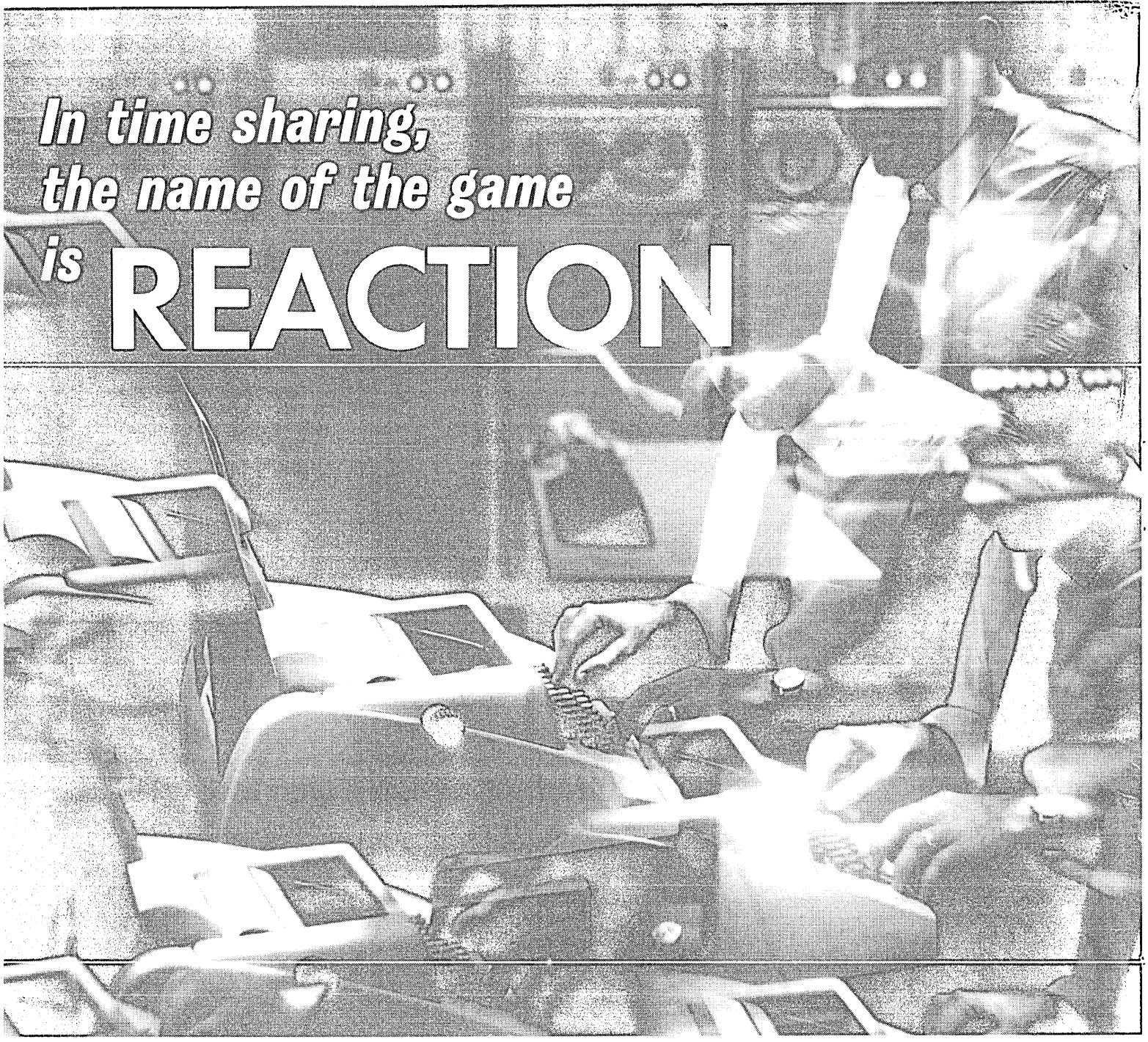
TELETYPE®



Unattended operation

All Telespeed sending sets can be equipped for unattended transmission to a receiving unit allowing you to accumulate data on punched tape throughout the day and transmit it during the night when line costs are lower. Day or night—data transmission by paper tape offers greater economy and speed all around. And the paper tape converts easily to printed copy.

Telespeed equipment is one of many exciting moves being made by Teletype R&D *in moving data at very little cost.* That's all we're really concerned with. Providing economical, versatile, incomparably reliable data moving equipment. If you would like to know more about Telespeed tape-to-tape equipment and all of its unique capabilities, write Teletype Corporation, Dept. 81K, 5555 Touhy Avenue, Skokie, Illinois 60076.



A remote keyboard becomes your computer. You use the computer for those time-stealing little jobs you've been doing manually. As well as for the real brain busters only a big machine can tackle.

You enter programs and debug from your own terminal. Programs of any size. In ALGOL, FORTRAN, COBOL and Basic. You compile-and-go, right now. With turnaround pared to a sliver.

At Time Sharing Systems Inc., Milwaukee's largest commercial T/S service, users in dozens of customer firms take reaction like this for granted.

T S S I chose a B 5500 for time sharing. Why?

Because B 5500 hardware *and* software were designed specifically for multi-user, multi-program, multi-purpose operation. That makes a B5500 a natural for time sharing. As a good many computer people are discovering.

As, perhaps, you should discover, too?

Burroughs

CIRCLE 13 ON READER CARD

look ahead

DALLAS SERVICE FIRM WILL OFFER TINY TERMINAL

Electronic Data Systems, Dallas commercial edp turnkey specialist, enters the hardware market with a unique data terminal small enough to put in an attache case and have room left over for a bundle of sales brochures.

It's 9x9x2½ inches, weighs five pounds and is powered by a "lifetime battery," good for a minimum of 500 recharges. It can communicate with any computer that has a voice answerback unit-- from any telephone--through an acoustic coupler. The basic model has 12 keys for sending information; pushing one of them dials the computer. Each user will have a permanent identification number for his terminal, which will be relayed to the computer for security purposes. Options will include an incremental tape recorder and alphanumeric keyboard.

Rental will be $20/month; purchase $1110. Initial orders should be delivered around the first of the year.

MOVE OVER, EVERYBODY!!

More competition for the keyboard-to-tape boys.

Right about now, Viatron, an eight-month-old Mitre spinoff, should be announcing its version of a system for conversion of source data to computer storage medium. System 21 is a cheaper, less sophisticated version of the crt/keyboard/tape cartridge system Systronics announced in June. The secret of cheapness lies primarily in use of large-scale-integration techniques and of anyman's tv set. For $40/month (rental only), the user gets a crt (320 characters), Selectric-type keyboard (convertible to 026 format with the flick of a switch), two tape cartridge drives, and an LSI micro-processor with 512 microinstructions and small video-driving memory. One tape provides record formats, the other stores 1000 80-character records.

A $100/month converter translates the tape data onto punched cards through an 029 keypunch. And for $250/month, Viatron provides a converter and IBM-compatible tape drive for cartridge to computer-tape translation. A $25/month communications adapter, plus Bell 103 or 202 data set or acoustic coupler, permits tape-to-tape or tape-computer transmission in ASCII. For hardcopy output, the firm will provide its "simple" printing control unit which can be placed on the regular office Selectric to print out any record on the cartridge.

The fun part is that the processor, keyboard, and cartridge drive unit -- a package 4"x12"x12" and 10 pounds -- can be detached from the crt, taken home and hooked into the tv set, if the kids aren't watching. Thus, a salesman, say, can enter his orders on tape, verify on the tv, and even transmit the tape data to the company computer via an acoustic coupler on his home phone....Deliveries for System 21 begin third quarter 1969.

In November, Potter announces KDR 3100, but it already has an order for 1,000 units from the British ICL. KDR 3100 is more like the Mohawk or Honeywell units (direct source data to magnetic tape) and

Air Conditioning is okay for people ...but not computers.

Computers need continuous environment control—just the right conditions of temperature, humidity and filtered air—24 hours a day. SES,® Site Environment Systems, are specifically designed and built to provide these requirements. They create and maintain the ideal ceiling-to-floor, wall-to-wall environment for computer rooms, no matter how large or small. There's a unit or combination of units to meet your exact needs because SES is available in a complete range of sizes—3, 5, 7½, 10, 15 and 20 tons. And they are completely self contained for easy installation. Yet they're so flexible they can easily be changed to up-flow or down-flow air discharge arrangements in the field.

Do your computer a favor and check out SES Site Environment Systems. Write Environment Control Division, Floating Floors, Inc./Subsidiary of National Lead Company, Room 4618, 111 Broadway, New York, N.Y. 10006.

SITE ENVIRONMENT SYSTEMS
National Lead
Environment Control Division
NL SES

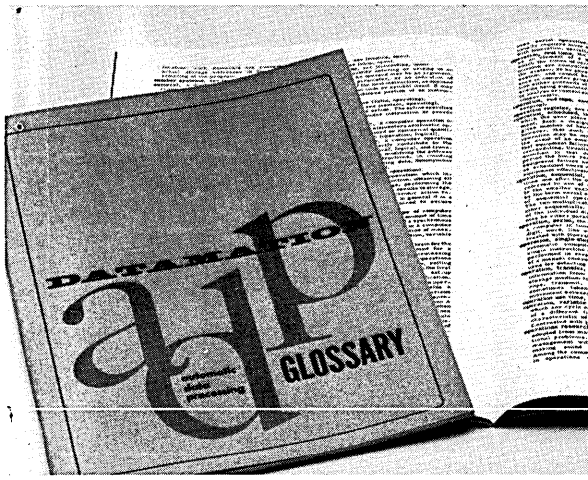
NEW

ADDRESS?

We know you want Datamation to follow you. If you're changing your business address, please use the card at the right and mail it to us **now.** We need your **old** address label, too. Paste it on the card (see instructions) to facilitate handling.

NEW AD
Name
Title
Company
Address
City
Your Sign

DATAMA
INFORMAT



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"costs no more than the older systems." It consists of a Potter single capstan mag tape transport, (800 bpi, 7- or 9-channel), expandable memory with basic capacity for an 80-character record and control program data, "Potter original" keyboard, and i.c. electronics. It operates in the entry, verify, search, display, and record/read modes.

ANOTHER PUNCH FOR KEYPUNCH MARKET

And if all the units above aren't enough to dent IBM's keypunch market, the government has come up with another way. The fed has 15,000 model 024 and 026 keypunch units, of which 3,000 are owned and 5,000 on rental "accrual." The latter means it should be able to buy any of them at about 25% of original cost ($1600 for the 024, $3500 for 026). There is, however, a desire to replace many of them with the $3500 029's. But rather than trade them in, one agency's dp group has developed a way to convert the older devices to an 029 simply by rewiring and replacing old keyboards with 029 keyboards. The government is hoping to do this conversion for under $1500 per machine and the GSA is now discussing the idea with manufacturing and service firms. IBM reportedly won't do the converting, but is willing to maintain the converted.

IBM EYES NEW MARKETS

Look for IBM to move into the education biz. Already offering a $1600/yr. systems analysis course and a programmed instruction package, IBM is allegedly clamping down on the use of "IBM" by independent schools, will convert its education centers into training-for-profit sites. With a wary eye out for trust busters, the hungry I is also contemplating entering the facilities management game. And in Jan. they'll set up a new Financial & Regulated Industries marketing group, analagous to GEM.

MULTIMEGABUCK MARKET LOOMS FOR BIGGIES

Over $8 billion worth of "very large" and "super" computers will be installed by December 1972, according to a private report prepared by a Wall Street firm. The shares will be divvied up among IBM(41%), CDC(28%), Univac(14%), Burroughs(12%) and "the rest" (5%). Translation of "very large" is systems like the B6500 and 7500, CDC 6400, IBM 360/75, and Univac 1108; "super" are the CDC 6500, 6600, and 7600, IBM 360/85 and dual 65's and 75's, B8500, and dual 1108's.

Elsewhere, a mainframe maker has projected that 5000-7500 systems whose price averages around $5 million each will be sold between now and 1975.

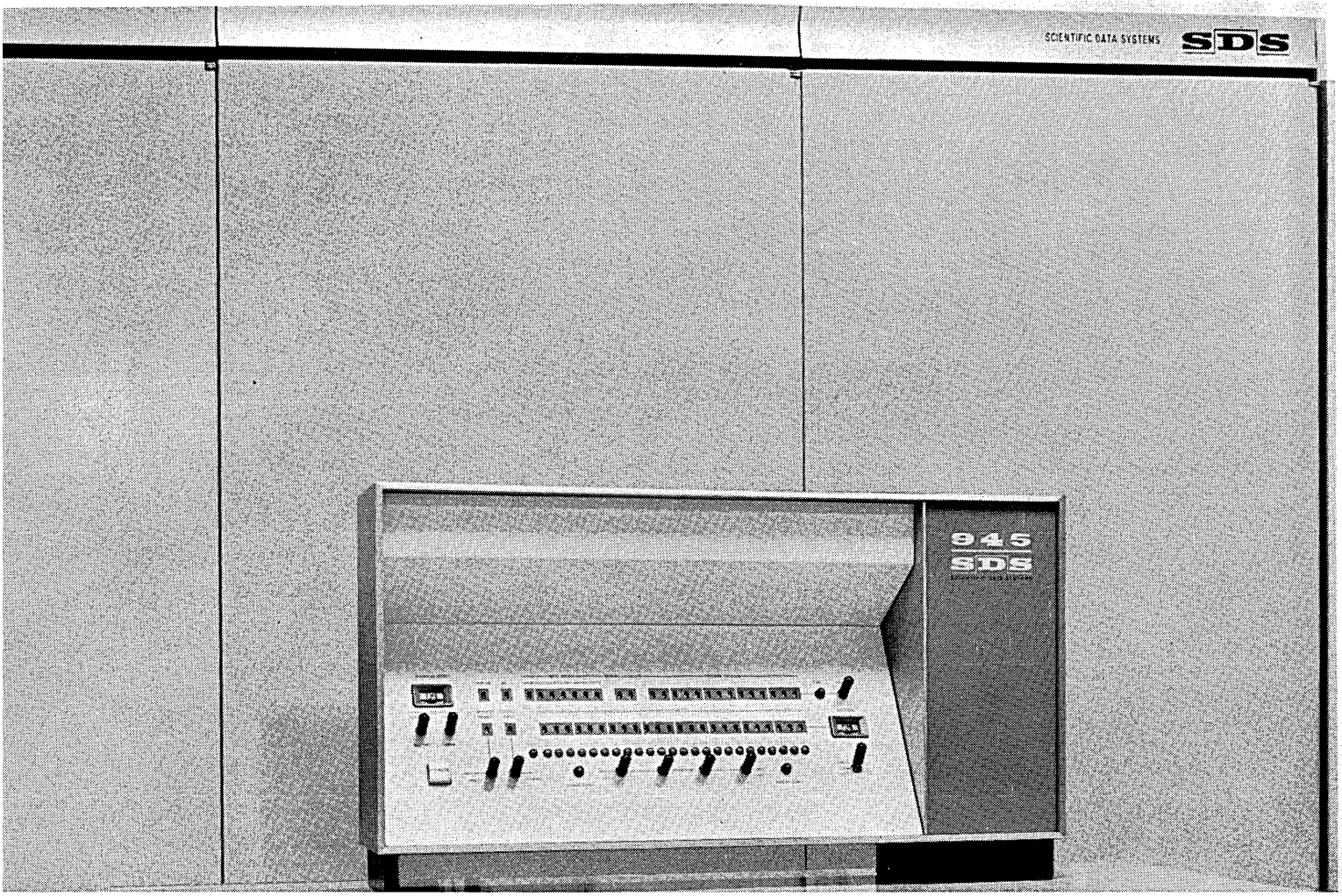
NBS LAYS DOWN COBOL LAW

Manufacturers are fuming over the Cobol standard power play of the National Bureau of Standards. Anticipating last month's acceptance of the latest version of the language, NBS sent letters to manufacturers in July telling how language standards would be used to cut costs and achieve compatibility both within the federal government and between the U.S. and other government bodies, government contractors, and the public at large.

To the chagrin of many Cobol-makers, NBS specifically defined four compiler levels for the standard Cobol to minimize combinations acceptable, noted that all compilers would have to pass validation tests, and "in the event there is a need for interpretation of the federal Cobol language specification, NBS will issue clarifications deemed necessary."

The loudest complaint is against NBS assuming the power to interpret. Says an NBS spokesman, "They'd

(Continued on page 173)



We put the best time-sharing software you can get in a less expensive box.

$10,000 a month less.

Anyone who knows much about time-sharing knows that our 940 has the best time-sharing software you can get. Because there's more of it, and it can do more, and because it is working.

But up to now the only way you could get our 940 software was to get a 940, or rent time on one.

Now you can also get it with our new 945 computer. The 945 will cost you less than $15,000 a month. That's about $10,000 a month less than a 940. And it's as cheap as renting 5 full time terminals from a time-sharing service bureau. (You get 24 with the 945.)

In fact, the 945 is the least expensive time-sharing computer on the market. It's every bit as fast as a 940, it has the same excellent response time, and it uses the same software.

Which means that the 945 comes complete with Basic, CAL, conversational Fortran, Fortran II, a two-pass assembler, a text editor (QED), a debug package, a utility package and a complete library of special programs and routines. And even though the 945 is new, the software has been proven by the toughest customers you can find: time-sharing service bureaus.

Then why is the 945 so much cheaper?

Simply because fewer people can use it. The 940 is designed for service bureaus and large companies with hundreds of different users. The 945 is designed for companies and institutions with dozens of users.

The 945 can recognize up to 64 individual users. And up to 24 people can use it at the same time.

That, more or less, is the whole idea of the 945.

Less people can use it and more people can afford it.

SDS

Scientific Data Systems, Santa Monica, California

CIRCLE 15 ON READER CARD

editor's readout

WHAT TO DO UNTIL THE SOFTWARE PACKAGE GURU COMES

In a handful of articles in this month's issue, DATAMATION takes what we think is a fairly balanced look at software packages, but there are a few stray thoughts hanging out the edges of our editorial software package package, and for what they're worth, here they are.

For one thing, we think that the term "software" is far too shadowy, too sloppily used. We think, for instance, that it is important to distinguish between systems software—the monitors, compilers and assemblers which flow from the mainframe manufacturers like glue—and applications packages, programs hopefully designed to do particular jobs under the benign if confusing guidance of systems software.

The distinction is crude; it's not sufficient, but it's necessary. It would be even nicer if more thorough and careful distinctions could be made between several layers of software, but that's asking a lot of an industry which hasn't yet decided the difference between a programmer and a systems analyst, except in terms of salary. But it's worth a try, and perhaps the infant software association would like to take a crack at such an effort, which would appear to be over the heads of BEMA's standard glossary subcommittee.

Even if we accept the stirring notion that there can be well-designed, off-the-shelf, useful plug-me-in packages, it's painfully clear that some work has to be done to make this wonderful dream a less-than-nightmarish reality.

We're lacking, for instance, any adequate standardized form for describing programs. As of now, there is almost no way of knowing if a program will really run on your particular peculiar combination of hardware and software (systems software; sorry) without running the deck. In one case, a software package broker discovered that what he thought was a generalized package had to be modified for every new customer who showed up. Unfortunately, the need for such modifications was not figured into the basic price of the package, with disastrous economic results.

Users can laugh at this plight of a pioneering company trying to turn an art into a profitable science . . . except that the last laugh is on them. They're paying a painfully high price today for generalized packages provided by the manufacturer . . . packages only a handful of them can use. They're paying the terrible hidden cost of duplication of effort; they're pouring precious manpower hours into trivial problems which have already been solved a hundred times elsewhere . . . and wondering why there's such a shortage of programming talent.

We know that it's not easy to find, select and install a wide range of applications packages. But there *are* highly useful, polished programs available, as our survey of package users in this issue proves. The survey also proves that, as in the case of successful use of hardware, the results are a rather direct measure of the sophistication and wisdom of the user and the level of sophistication of the package.

There's no easy answer. The industry must more carefully engineer software, and its description must become more thorough and standardized before off-the-shelf software packages can become a widespread and economically practical reality. In the meantime, the user who devotes time and care to the analysis of available software packages can save himself a lot of bucks, and gain a little ground at least on the apparently insoluble manpower shortage problem.

what to look for

SOFTWARE PACKAGE ACQUISITION

by ROBERT V. HEAD and EVAN F. LINICK

The term "software," like many in the lexicon of computer specialists, is difficult to define precisely. Like the technology it stands for, it is subject to redefinition from time to time and to varying degrees of individual interpretation. For purposes of this discussion, software will be defined as including not only the series of program instructions needed to direct the computer to do a particular job but also all related steps in the development and use of these programs. "Software" in this broad sense, then, comprehends the entire process of systems analysis and design, programming, testing, and implementation, as well as the documentation that accompanies this process.

There are also a number of ways in which software can be classified. Perhaps the most useful scheme is to divide software into two broad functional categories—systems software and applications software. Systems software includes software that is useful or necessary in allowing an organization to use the computer efficiently. Applications software, which may depend heavily on various types of systems software, is designed to perform specific computational and data processing tasks.

In addition to the scheme of classifying software into the categories of systems and applications programs, there are several other commonly applied distinctions that merit mention. Computer manufacturers often classify the software they supply according to how it is developed, distributed or maintained. IBM, for example, currently divides its programs into four types. Types I and II are "IBM supported programs," meaning that these are tested programs and will be maintained and updated by IBM. Type I programs consist of systems software and Type II, applications software. Types III and IV are "contributed" programs not supported by IBM. Type III are those programs submitted internally, that is by IBM employees, and Type IV are those contributed by IBM customers.

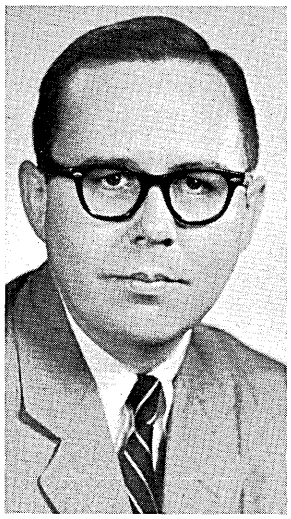
A software package is a well-defined computer program or group of programs designed to accomplish some generally useful objective. It may be complete and usable "as is" or may have to be adapted to particular user requirements through modification.

When software specialists speak of a "package," they are usually thinking of all of the software necessary to perform some self-contained and well-defined job such as payroll accounting. It is also usually assumed when using the term "software package" that the software as well as the task itself is complete and well-defined. Another characteristic of a software package is that it is made available to a number of users in some mass produced "canned" or "off-the-shelf" form.

In the earliest days of the computer industry, the machines were delivered with virtually no software. Users programmed in machine language and had to develop their own software to supplement what the manufacturer did supply. It soon became evident that there were certain types of programs that almost all users needed, since many users were individually writing nearly identical programs. Informal, and later formal, user groups were set up to share and exchange programs of mutual interest. The concept of developing programs of general applicability and thereby saving the time and money that would otherwise be wasted in "reinventing the wheel" had its origin in these early cooperative efforts. These shared programs were among the first software packages.

In addition to subroutine libraries and utility programs to perform such common functions as converting data from punched cards to magnetic tape or printing the contents of core memory, symbolic programming languages and rudimentary input/output systems began to appear. It gradually became clear that the usefulness of the computer was highly dependent on the hardware/software combination available, not just on equipment capability alone. Realizing this, computer manufacturers began providing systems software to go along with their equipment. Soon this became the accepted and expected procedure, and manufacturers competed for sales on the basis of software as well as hardware specifications.

While systems software was being supplied to users by



Mr. Head, until recently an executive with Software Resources Corp., is a member of the ACM and the Institute of Management Sciences, and holds the DPMA CDP. He is the author of a book,* Real-Time Business Systems, *and numerous articles on information systems technology.

the manufacturers, most users continued to write their own applications programs. However, with the increasing numbers of computers in use and the growing costs of applications software development, packaged applications programs were bound to appear. Multi-divisional companies began to appreciate the advantages of applications software which could be used by all divisions. This led to standardization of operating and clerical procedures combined with increased generality in the computer programs. Industry groups interested in similar computer applications soon recognized the advantages of a packaged approach, and competitive pressures caused the manufacturers to offer applications packages in an effort to make their equipment more attractive to various industries. Indeed, some manufacturers now have their sales organizations structured along industry, rather than product, lines.

Perhaps because of these efforts by the manufacturers, there was until recently little interest in commercially available, i.e., non-manufacturer-originated, software. However, with the advent of third generation computers and the tremendous recent growth in the number of computer installations, particularly those in the low cost range, this picture is changing. Manufacturers have been hard pressed to provide essential systems software. Users have had to expend huge programming resources in conversion efforts. And, of course, good programmers are in very short supply.

Moreover, the compatibility provided by third generation hardware and the growing acceptance of common programming languages has made the concept of packaged applications software more feasible. This has helped to stimulate a major new development in software technology —the sale of software packages. While manufacturers continue to supply software at no additional charge to those using their machines, the professional software companies and the more sophisticated users have begun to sell their computer programs.

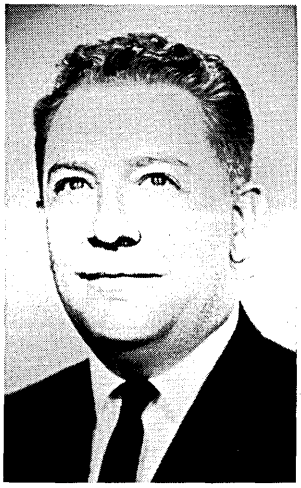
sources

The manufacturers. Perhaps the most notable characteristic of manufacturer-supplied software is that it is "free," i.e., there is no out-of-pocket purchase or lease cost. It should be remembered, though, that the development of both systems and applications software represents a significant cost-of-sales expenditure to the manufacturer, and that these expenses are necessarily reflected in the price of his equipment. This means, of course, that the user who does not take advantage of manufacturer-supplied software is, in effect, not utilizing software resources for which he is indirectly paying.

Manufacturer-supplied packages have sometimes been criticized as being poorly designed and inadequately implemented. Marketing considerations have been known to override technical considerations to the user's disadvantage. The level and quality of maintenance support may vary greatly also. On the other hand, many manufacturer-supplied packages are well-designed and efficient. In general, the fact that the manufacturer supplies a package free of charge should not induce in the user an undue feeling of confidence. These packages should be evaluated as carefully as any others.

User groups. Many user groups maintain a program listing or library service to enable free exchange of programs among their members. Programs submitted to these libraries or listing services usually are not screened in any way. Therefore, software varying widely in quality tends to get into these lists and there can be little or no guarantee as to the adequacy of design, performance or documentation of the listed software. Moreover, those submitting programs are usually not able to provide any great degree of support or maintenance of these packages. In fact, some users who have submitted good programs in the past no longer do so because of the nuisance (not to mention time and expense) arising from continuing phone calls and letters requesting additional details, advice, and assistance.

Other listings. The American Bankers Association provides a catalog free to member banks under a service called ABACUS. The United States Savings and Loan League offers



Mr. Linick is a member of the product planning staff of the advanced information systems div. of Informatics, Inc. He was formerly manager of R&D for Software Resources Corp., and has also been associated with Scientific Data Systems and Honeywell EDP. He has a BA from Amherst College and an MS from Stanford; he also holds the DPMA's CDP.

a similar Software Exchange service to savings institutions. A private organization called International Computer Programs publishes a catalog in which anyone may list his software. The catalog is updated quarterly and is available for a yearly subscription fee of $25.

In many cases, the manufacturers provide similar lists or services beyond those offered by their user groups. For example, IBM's industry marketing organization publishes a listing called the "Finance Program Exchange Directory" which provides information on programs developed by banks for the System/360 and available for purchase.

Additionally, many computer industry trade and professional publications now highlight software packages as regular departmental features. And, of course, most of these publications carry advertising for software packages as well.

Generally, all these types of listings are subject to the same drawbacks as the user group catalogs. Although such listings serve a useful purpose by identifying package sources, by their very nature they are unable to provide reliable information as to package quality. Moreover, there is a wide variety in the amount of information provided about the characteristics and performance of available packages.

Software companies. Software companies represent the newest source of software packages. Although the principal business of these companies is still contracting for the development of custom-tailored programs, they have been able to utilize their growing experience (and sometimes the actual work done on contracts for custom-tailored systems), to produce packages of interest to large numbers of users. In some cases these systems have been designed initially with the intent of marketing them to many users, particularly when the software company feels it has identified an unfilled need and has the specialized skills to exploit it. (Both systems and applications packages are available from the software companies.) Packages developed and sold by software companies will usually be accompanied by thorough documentation and at least some installation support. Frequently such packages have been designed and programmed by experienced professionals, often with specialized industry or applications knowledge. None of these things can be assured, however, and a particular package and the qualifications of its originator should be examined carefully.

the make-or-buy decision

Once a decision has been reached to seriously consider the use of a package, it is important to make sure that objectives are well defined before proceeding. Is the need immediate or long range? Does the company require the latest and most sophisticated approach available or can it settle for a simpler or interim solution and invest some time in gaining more experience? Is immediate performance more important than adaptability to future expansion and growth? These and similar considerations will affect the importance or weight given to the various factors that should be considered in deciding whether to acquire a package and in selecting the best one.

Before choosing the package approach, the user should compare the advantages of obtaining a package against the alternative of developing a custom-tailored system. This essentially involves performing a "make-or-buy" analysis, that is, estimating as accurately as possible the cost and time of an in-house programming effort versus the cost of acquiring a package and performing any necessary modifications. In conducting such a make-or-buy analysis, recognition should be given to the fact that package costs are much more of a known quantity than the projected costs of an in-house system that has yet to be developed.

Package selling prices range from several hundred dollars to $100,000 and more. Most commercial application packages fall within a range of $2,000 to $20,000. For this expenditure, the purchaser should expect to receive a fully operational system, good documentation and a reasonable amount of technical support. For a purchase price of say, $10,000, a week's on-site installation support would not be unreasonable.

For packages in this price range, the purchase price usually represents *one-fifth* to *one-tenth* of the total cost of developing an equivalent package. In other words, the developer will usually attempt to recover his development costs over the first five or ten sales.

Time as well as cost is an important factor in performing a software make-or-buy decision. The lead time to undergo a complete specification, programming, debugging and documentation effort will usually be considerable as compared to the procurement of an immediately available package. And even if an organization can specify exactly what it wants without extensive preliminary study, an in-house development project might not, in the end, meet all performance requirements or might run into unexpected delays due to misunderstandings, unforeseen debugging problems and the like. An existing package, on the other hand, can be evaluated immediately as to its capability and performance.

Another way of looking at the lead time question is to view it in terms of making optimum use of the organization's in-house technical resources. If the technical staff is overloaded, or if there are higher priority or more profitable ways in which they can be employed, the package approach can hold great appeal.

There are certain attitude problems which may affect the package decision making process. A careful and objective assessment of the user's own capabilities is, therefore, important. System analysts and programmers have an understandable inclination to want to apply their skills to new and different areas of development in which they may be inexperienced. Unfortunately, many of the objections that a software package doesn't "fit," that it fails to meet certain specialized needs, or that it is not sufficiently elegant or sophisticated may really mask an "I'd rather do it myself" attitude.

Data processing management must be realistic about when to indulge the preferences of the professional staff. Often, the more specialized knowledge and experience of an outside source, as reflected in a workmanlike "canned" approach, will satisfy a need more satisfactorily than an ambitious or esoteric in-house development effort. Moreover, the use of purchased software developed by seasoned programmers adept at applying state-of-the-art techniques can have the added benefit of exposing the purchaser's staff to new systems techniques and approaches.

Despite the economic justifications for purchasing a package, there may still be some resistance on the part of data processing managers accustomed to obtaining software "free" from the computer manufacturers. Also, it may be difficult to find a source of funds to purchase a package under existing budget categories and controls. For these reasons, it is wise to recognize the potential advantages of purchasing packages by creating a new budget category specifically for this purpose or by making provision for reallocating funds earmarked for program development or programming staff expansion.

Once a decision has been reached to evaluate the packages available to perform a particular application, it is essential to establish a clear-cut basis for evaluation. For most commercial applications, a review of sources of information

will probably reveal the availability of more than one package capable of doing the job, and the prospective purchaser should obtain the specifications for each in order to do a comparative evaluation.

It is extremely important to determine in some formal way *before* the evaluation begins how much weight or importance to give to various evaluation criteria. This is particularly true when conducting a comparative analysis in order to assure an unbiased appraisal. It may be useful to devise a numeric rating scheme when performing such a comparative analysis.

Specific criteria to be used in evaluating a package are covered in the remainder of this section.

Package cost. The most obvious direct cost factor of a package is the purchase price (or lease price, if there is one). Additionally, and of equal or perhaps greater importance, are the *indirect* costs which may be incurred by the purchaser in:

1. Making modifications
2. Training personnel in use of the package
3. Getting the package installed and operational
4. Establishing control and clerical procedures
5. Conversion
6. Production running of the package
7. On-going maintenance

Careful consideration should be given as to how many of these services are included in the initial purchase price. These additional cost factors associated with package acquisition should be quantified and added to the purchase price of all candidate packages.

Quality of the package. An indication of the quality of the design and performance of a package may be obtained by determining who developed the package, how, and for what purpose. The reputation and experience of the developer is a good indicator, though of course not necessarily conclusive. For example, a package developed by a manufacturer or some well-known user may have been the work of a trainee or may be a reprogrammed version of a second generation system. On the other hand, a package developed by an "unknown" software house may have behind it the work of individuals with many years of solid systems and programming experience.

It is important to determine beforehand the minimum requirements as to package features, but to avoid unrealistic prejudgments. Just because a system uses sequential instead of indexed sequential files, for instance, or has slightly different output formats from those desired, does not mean that it will not do the job adequately. The purchaser should be careful not to assign undue importance to features that would be desirable but are not essential.

Design features. At a more technical level, the purchaser should examine the various features and techniques embodied in the system design. For example . . .

1. Do the master files contain all necessary fields of information?
2. What type of file organization and data management is used?
3. What provisions are made for reruns and file protection?
4. What control procedures and audit trails are incorporated?
5. What input and output options are provided?
6. Are special forms required?
7. Are the programming techniques unduly complicated and sophisticated?
8. Is the system designed to permit ease and flexibility of operation?

Generality. Generality in package design is among the most important package criteria. A package priced at $15,000 may be a better buy than one available for $5,000 if it provides sufficient additional capabilities or efficiencies. For example, does an installment loan package allow only single bank usage or is it designed to service correspondent banks as well? Will a payroll package handle state and local withholding requirements for a company that has employees in several states? Is input sorted or sequence checked and validated automatically by the system or is this a manual procedure? Do account numbers have check digits?

Expandability. Expandability is almost equally important. How easily can additional features be added? Can larger volumes of data be processed efficiently? Is there room for master file growth? Can the system be adapted to on-line inquiry? In other words, how easily can the system grow to meet the user's projected needs?

The types of features, generality and expandability built into the package must be measured against the user's unique requirements. Design trade-offs made to achieve generality in areas that are not of importance to a user's specific needs may result in relative inefficiencies in terms of throughput, file size, memory size, or equipment configuration when the package is utilized in a given organization's environment to satisfy its particular needs.

In such cases a simpler, more straight-forward package, while perhaps not as esthetically appealing, may offer a better solution if it does all that is really required efficiently and at a lower initial and on-going cost.

Operational status. One of the most positive benefits in acquiring a software package is that it may already be operational and error-free. Conversely, commitment to a software package still in the development stage has sometimes led to costly disillusionment as a result of delays and failure to meet specifications.

It should be clearly established, therefore, how long each package under consideration has been operational in a production status. If possible, references should be obtained who may be contacted regarding both the performance of the package and the reliability of the supplier. In many cases, it may be worthwhile to visit some of these references to see the system in actual operation or at least to witness some form of demonstration. Such an on-site visit can also provide valuable insights into how the system is being used, the level of personnel required to utilize it, and a better overall "feel" for how it will fit the purchaser's own needs. In arranging for an on-site visit, discussions should be scheduled with operations personnel who have a "hands on" feeling for the adequacy of the system under consideration.

The actual throughput or performance efficiency of the system should also be established. Computer processing and set up time should be considered as well as more general turn-around and clerical time consideration. Throughput capability is especially critical for frequently used programs such as daily runs which process high volumes of data.

Actual, not theoretical, timings should be requested from the supplier and verified when possible, with references.

Equipment configuration. The exact equipment configuration necessary to use the package should be determined. Of particular importance are the model of central processor, special features (e.g. decimal arithmetic, memory protection) and input/output devices including types, speeds, and special features. Of equal importance is similar information relative to any off-line or supporting equipment, such as a card sorter, that may be required. Overlooking any of these features may result in additional unexpected costs or modifications.

Determining the minimum equipment configuration can be more difficult than it may appear at first glance. Many packages are adaptable to variations on some basic configuration with possible corresponding changes in throughput, maximum file size, etc. Some packages capable of running in a 32K byte memory may be designed to run more effi-

ciently with 65K bytes; others may not. In some cases, magnetic tape storage can be used for files ordinarily maintained on disc (or vice versa) with no loss in efficiency. In other cases this may not be so. A nominal three-disc system may mean exactly three discs or may in certain circumstances be reduced to two or increased to four.

These and similar factors should be considered in determining the configuration needed for the user's present and future requirements. They also should be kept in mind when, as suggested previously, a demonstration is witnessed or throughput is being evaluated. Differences between the demonstration configuration and the user's actual configuration may be of considerable significance.

Programming language. The importance of the package programming language and operating system is a relative question, and may often be largely a matter of individual installation standards and preferences. If the package under consideration is a utility routine or a specialized application package that may never need modification, the language in which it is programmed should be a minor consideration. On the other hand, if the purchaser expects to modify or augment a package, he may have problems with a package written in assembler language if the programming staff knows only COBOL, or vice versa. If the programming staff has used only assembler language and the company acquires a package written in COBOL or FORTRAN, or perhaps some non-standard language, there will be an additional investment of time and money to train them in the use of the new language.

If a package is written in COBOL or FORTRAN and is running on a different computer from the one the purchaser is presently using, it may be relatively easy to make the package operational on the purchaser's computer. However, experience in doing this type of conversion suggests that it is not always a trivial job. The time and cost to do such a conversion must be investigated carefully by qualified individuals. Exactly who will be responsible for performing the conversion must also be clearly established.

Similarly, the conversion of a program from one operating system to another is not always a trivial task. This job may be easier, though, if the programs are written in COBOL or FORTRAN rather than in assembler language. Converting an assembler language program from, say, the IBM/360 Basic Operating System (BOS) to the Disc Operating System (DOS) may be a formidable problem. If an installation normally uses DOS and is offered a package running under BOS, it may be preferable to continue running the package under the existing operating system rather than converting to the one normally used. However, the additional operating problems that this can cause could make this procedure undesirable.

Documentation. An excellent clue to the overall quality of a package, and the professional competency of its developer, is the availability and quality of package documentation.

A good, operational package will generally have complete documentation at all levels. A package that is known to be running well in production circumstances elsewhere and seems efficient in all respects, may still be a poor investment if there is not sufficient documentation to support its successful installation and operation elsewhere.

Documentation should exist on four basic levels:

1. System
2. Program
3. Operations
4. User

There are no current standards or formats for these types of documentation. They may be presented in many varying ways, either as separate documents or combined. However, no matter in what manner or order, certain essential types of information should be available. A documentation checklist is provided on page 27.

Installation support. The extent and quality of installation and conversion support available with a package can be of vital importance. If a company is paying more than a nominal sum for a package, say more than $2,000 or $3,000, it should expect a reasonable amount of initial on-site support. The nature and extent of the on-site support included in the purchase price should be clearly understood, as well as any possible extra costs for additional services. An unequivocal understanding is especially desirable when there are modifications to be made before the package can be used.

The availability of qualified people on the supplier's staff to provide on-site support should be established. In some cases, it may be appropriate to specify the availability of a particular individual known to be well-qualified, although this may meet with understandable resistance on the part of the supplier, should it cause him significant personnel scheduling problems. Here, the experience and reputation of the supplier is an important factor. It should be noted, though, that even if the package is obtained from an equipment manufacturer or large software company, this does not necessarily assure that the local representatives are well-trained or experienced in the use of this particular package.

A frequently overlooked installation problem is that of file conversion or file creation. Candidate packages should be examined to determine the systems approach and programming features available to assist in this conversion task.

In addition to the basic job of file conversion, the task of "program conversion"—getting the programs operational on the purchaser's own equipment and under his version of the operating system—can be one of the most troublesome aspects of package installation. Selection of options available in the package and variations between computer installations can make this more of a problem than might at first be anticipated.

Training can also be an important element in the successful implementation of a package. Training may be needed at all levels—clerical, operational, programming, systems, customers and, last but emphatically not least, management. Because of the importance of training the purchaser should require the package supplier to spell out what training is included in the package purchase price.

The need for on-site assistance can, of course, vary greatly from case to case, both from the standpoint of the nature of the package and the level of sophistication of the purchaser. It is unrealistic to expect the package supplier to assume the entire burden of a successful installation.

However, a reasonable amount of on-site assistance in the form of consultation and guidance can do much to prevent costly "wheel spinning" and dissatisfaction with an otherwise estimable package and should, therefore, be considered mandatory.

Maintenance. In addition to installation support, the acquisition terms for a package should include some assurance of error-free operation for a reasonable period of time. Ordinarily this might take the form of a specific commitment to fix all "bugs" discovered within a minimum period of time such as 90 days or six months and a general assurance that modifications and improvements will continue to be made available, perhaps for an additional fee, beyond that time.

It is prudent to ascertain exactly what post-installation maintenance services will be formally agreed upon and at what price. Generally, some evaluation should be made of the capability of the supplier to perform maintenance and generate improvements on a long term basis. Remarks made

previously relative to availability and quality of installation support apply to maintenance support also.

Often, certain features of a package may be misunderstood or particular shortcomings overlooked at first which later come to be regarded by the purchaser as "bugs." The supplier, on the other hand, may view the correction of these defects as an improvement beyond the scope of the original package. It is necessary for both parties to be reasonable under these ambiguous circumstances, and maintain a good working relationship. The purchaser should have some recourse if the supplier, however inadvertantly, misrepresented his product. On the other hand, the purchaser should expect to get along without, or pay for, features which were clearly not included in the package and which he later discovers he wants or needs.

Usually a supplier should be willing to provide information from time to time as to how certain modifications or extensions may be made to his package. If these are significant changes, there may be a change for this information or for actually making the changes. Another approach being followed by some suppliers is to encourage the formation by purchasers of "user groups" for particular packages to facilitate the exchange of information and share the development costs of new features of mutual interest.

future of software packages

How far can software package development go? No one can really say at this point, though it does appear that we are merely at the beginning of what could become a major sub-industry within the growing software field.

No doubt we shall in the future witness the introduction of more packages that are developed as *packages* from the beginning rather than generalized after the fact. We can expect to see a rising interest in proprietary software on the part of the major software companies, as they come increasingly to realize that an investment in developing a package that can be sold many times is potentially much more profitably that conventional kinds of contract programming. We can also expect to see a more clearly defined relationship between buyer and seller of software, as more experience is gained in negotiating contracts and supporting the sale of packaged programs.

From a technical standpoint, there is no reason to believe that the progress already achieved in the methodologies and techniques of package design and development is going to stop. We may expect to see larger and more ambitious efforts to produce application packages such as integration of related business subsystems for payroll, accounts receivable, accounts payable, sales analysis, inventory management, labor distribution, budget control, general ledger accounting, and the like into a single, massive package.

Packages should also play a major role in new areas such as computer assisted instruction and applications which may be run in a time-shared processing environment.

There is some indication that, as in the past with computer user groups, software package users and prospective users will increasingly join together in order to utilize packaged software more economically and efficiently. As has already been noted, there is precedent for this in that some of the first software packages were the result of joint user efforts as, to a large extent, were more recent developments of common programming languages.

One way in which users could seek to work together is to engage in joint development efforts for new software packages. Under this approach, a number of users might join in specifying the requirements for a particular package and share the development costs, perhaps utilizing the services of a competent software house to perform the actual development work. The sponsors would benefit by combining their capabilities and experience to produce good package specifications, and by substantially reducing their development costs. There are already some activities of this kind under way.

We can also anticipate an increased demand on the part of computer users for separate pricing of hardware and software as a result of their growing sophistication in software procurement. One manufacturer now supplies a COBOL compiler for its third generation systems *only* on an extra cost lease or purchase basis.

Proponents of separate pricing argue that individual users indirectly pay for software that they don't need or can't use, that the manufacturers supply only the minimum in quality and quantity needed to sell their machines, and that "free" software inhibits competition and the concomitant development of packages incorporating advanced techniques and high performance capability. It may well be that demands from software companies, user groups and perhaps the federal government will eventually result in separate pricing.

In conclusion, it is fair to state that there have been and will continue to be many problems in the software package business—whether viewed from the standpoint of a manufacturer seeking to enhance the sales of his equipment, a software company endeavoring to produce and market new "products" or a user striving to control skyrocketing system development costs. But there are no problems that seem insuperable, and many users are already demonstrating that there are genuine benefits to be obtained through software package acquisition.

Table 1 Documentation Checklist

Overall System Documentation

- General system description.
- System flow chart.
- Equipment configuration.
- Operating system and programming language specifications.
- File definitions and layouts.
- Input and output definitions and layouts.
- System scheduling and control procedures.
- Actual or estimated system timings.
- File protections and audit trail provisions.

Program Documentation

- Detailed description and detailed logic flow charts for each program.
- Significant program details such as tables, special constants, program switches, accumulators or counters.
- Description of special programming features, methods, modifications.
- List of all other programs, sub-programs, macros, library programs called by each program.
- Assembly or compilation listing, cross-reference listing, load map, memory dump.
- Test data and sample run showing inputs, outputs, console log.
- Actual or estimated run times.

Operations Documentation

- Input preparation procedures.
- General description and flowchart for each run.
- Operator set-up instructions.
- Description of all abnormal operating conditions.
- List of all normal and abnormal messages and halts, meanings o each and corresponding action to be taken.

User Documentation

- User oriented system description.
- Descriptions of required forms and equipment.
- Source data preparation procedures.
- Error and exception handling instructions. ■

ON THE ECONOMICS OF THE SOFTWARE MARKET

the four confusions

by MELVIN E. CONWAY

Lest the reader misunderstand my motives, let me make clear straight off that I am not against the separation of pricing of computer software and hardware by those firms which supply both. (They are commonly called "computer manufacturers" for some obviously biased reason.)

The reason I have written this article is that I have become disturbed by the growing amount of public misunderstanding on the subject of software pricing. This misunderstanding has been aggravated by the absence of any effective counterargument to the self-interested assertions by representatives of the U.S. government and the software industry that separation of software/hardware pricing will be good for everybody except big, bad IBM. My purpose in writing this article is to supply some of that counterargument.

I apologize to those readers who will be offended by my repeated and one-sided references to International Business Machines Corp.; I could find no other way to express myself in a way which is both realistic and straightforward. Also I wish to emphasize that my analyses are the result only of personal speculation and are in no way based on privileged or proprietary information.

cost vs. price

There exist several common confusions on the subject of the economics of software. I shall point out four of these in the course of this article and discuss them individually.

The first confusion is between cost and price. When an article is sold by a seller to a buyer, the amount of money which is transferred from the buyer to the seller in exchange for the article is the *price* of that article. The price of an article generally is, or can be, known by both parties. The *cost* of the article is generally not known by the buyer nor, in many cases, by the seller either. The cost is the amount of money which the seller has paid out or will pay out in order to put the article into condition for the sale. The difference (price minus cost) is frequently called profit, and making it large and positive is often a principal objective of the seller.

People who should know better have confused price and cost. Consider "Grosch's Law," which says that, within reasonable limits, if you pay X times as much for a processor you'll get X^2 times as much speed from it. If Grosch's Law were about the price of a computer it would be a triviality, subject to the whim of whoever sets the price of the computer. However, it is not a triviality but an interesting observation about engineering realities, because it is a statement about cost, not price. Yet there is at least one current magazine article confirming that the 360 line is indeed a verification of Grosch's Law. Since this article deals with 360 prices, not costs, all it confirms is that somebody influential in IBM thinks that Grosch has come up with a neat pricing guideline.

What is the *price* of software supplied by the "Big Eight"? The price of IBM software seems to be zero. When you buy an 1130 or a 360 you can take the software or leave it; you pay the same. This, many believe, is unfair competition against vendors who sell software without computers attached and must charge for that software.

hardware vs. software cost

What is the *cost* of computer manufacturers' software? This question brings up confusion number two which arises from numerous public statements to the effect that people are paying more for software than for hardware. The confusion is that we are dealing with two uses of the word "software," which refer to completely different things.

The statement that users pay more for software than

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hardware means: over a given period of time a user pays more money to his own employees to *support* a computer than he pays to the manufacturer to *provide* that computer. Note that the manufacturer-supplied software is covered by the latter payment.

Thomas J. Watson, Jr., Chairman of IBM, stated in March, 1966 that IBM had paid about as much money for 360 software development as for 360 hardware development. This is another, still different, statement. It says that IBM's 360 programming budget, accumulated up to that point in time, was comparable to its 360 *engineering* budget. (It may be bigger now.) The statement does *not* say that a similar fraction of your rental dollar is going to pay IBM programmers as is going to build the colored boxes you see in your computer room.

design vs. reproduction cost

Which brings us to confusion number three: The difference between cost of design and cost of reproduction. The creation of a mass-produced article proceeds in two stages. First it is designed or engineered. The cost of this design stage is a function of the nature of the article: its complexity, its need for reliability, and so on. It is not, for our present purposes, a function of the number of these articles ultimately produced.

The second stage of creation is the production and sales stage. The cost of this stage is (roughly) proportional to the number of articles produced. Thus it can be thought of as a constant cost per article, which we shall (inaccurately) call the reproduction cost, times the number of articles. If we let D be the total design cost and R be the reproduction cost per article, the total cost T of producing n articles is given by the following approximation:

$$T = D + nR.$$

In order to price an article for sale it is helpful to know what it costs. Assuming that an equal share of the design cost is assumed by each of the articles produced, the per-unit cost C is given by the following formula:

$$C = T/n = (D/n) + R.$$

Note the inverse relationship between volume and cost; this is one source of the notion of "economy of scale."

The per-unit cost C of conventionally mass-produced articles is almost always dominated by the reproduction cost R. For very large volumes we have:

$$C = R, \text{ approximately.}$$

Software, viewed as a mass-produced article, is strange because the design cost D can be very high and the reproduction cost R very low. For software which has a small sales and support cost, the reproduction cost is essentially the cost of copying a tape or punching a deck. Thus the per-unit cost of unsupported software approaches zero as the volume becomes very large.

a software cost estimate

Let us use what little public data exist to estimate the cost of 360 software development. Please keep in mind that this estimate is very crude; I shall attempt to err on the high side. Following this I shall attempt to estimate 360 revenue on the low side. Thus we shall have a high estimate of the percentage of 360 revenue which pays for software development.

According to *Fortune* magazine (October, 1966) Mr. Watson, in his March, 1966, SHARE address, estimated the 1966 360 software budget to be $60 million. Later in the same article *Fortune* says that in 1963 and 1964 IBM was not able to apply its full manpower to 360 software because of commitments to earlier products. We can now postulate a development cost contour, based on these data, which is shown in Fig. 1 (p. 30). We assume a constant $60 million/year effort from 1965 through 1968, dropping to $30 million/year over 1969, and continuing at this level through 1974. Adding up the dollars, we get a total program cost of $495 million. The reasonableness of this estimate is supported by a statement at the end of the cited *Fortune* article: ". . . the cost of this [360 programming] effort may run over $200 million."

Estimating total-program 360 revenue would be sheer speculation, but since I want to err on the low side I can employ the following assumptions to permit me to make another estimate instead. First, I assume that in the aggregate, the revenue from a 360 computer will exceed the sale price of that computer. (That's the point of renting, if the manufacturer has the cash and can control product obsolescence.) Secondly, I assume that 360 shipments will continue beyond 1970. (This assumption is ridiculously conservative, in view of the fact that the 704-7094 design lasted for a decade as a result of momentum alone, and without today's awareness of the agony of reprogramming.) Thirdly, I assume that the total flow of sale value of equipment shipped from now through 1970 will exceed the present flow of value shipped due to 20's, 30's and 40's alone. (After all, there are machines like the 25, 50, and 65, which

may do quite well. And remember: IBM grows.)

Now, on the basis of rental price and volume data on the 20, 30, and 40 available in the February, 1968 issue of *Computers and Automation,* and using a sale price/rental price ratio of 45 months gathered from a sample of 360 prices (excluding maintenance) in IBM's FY 1968 GSA schedule, we can draw the following conclusions. First, the sale value of 360 equipment (i.e. models 20, 30 and 40) installed through 1967 is $5.97 billion. The shipment rate of 1000 systems/month achieved in 1967 is apparently divided roughly as follows: 400 20's, 400 30's and 200 40's. Using the sale prices calculated as above, this gives a current sale-price shipment flow of $398 million/month or $4.774 billion/year. (This is approximately equal to IBM's current annual revenue, which is reasonable.)

Adding up the numbers, we conclude that the total shipped sale-price value of models 20, 30 and 40 extrapolated through 1970 is approximately $20.2 billion. On the basis of the assumptions I stated before, we can safely conclude that total 360 revenue will exceed $20.2 billion.

Dividing our programming cost estimate of $495 million (or less) by the revenue estimate of $20.2 billion (or more), we conclude that the cost to IBM of 360 programming does not exceed 2.5% of 360 revenue.

Now that we have in hand an estimate of IBM's 360 programming cost we are in a position to ask the question: How would IBM's prices change if 360 software pricing were to be separated from 360 hardware pricing? The following analysis is tempting. IBM's overall product revenue/cost ratio in a given year is approximately 4/3. Assuming each dollar of product cost is responsible for bringing in the same profit (a simple-minded but still useful assumption) we can say that at most 3.33% of the user's rental or sale dollar is buying software. Therefore, a 360 without software would cost 3.33% less than one with software.

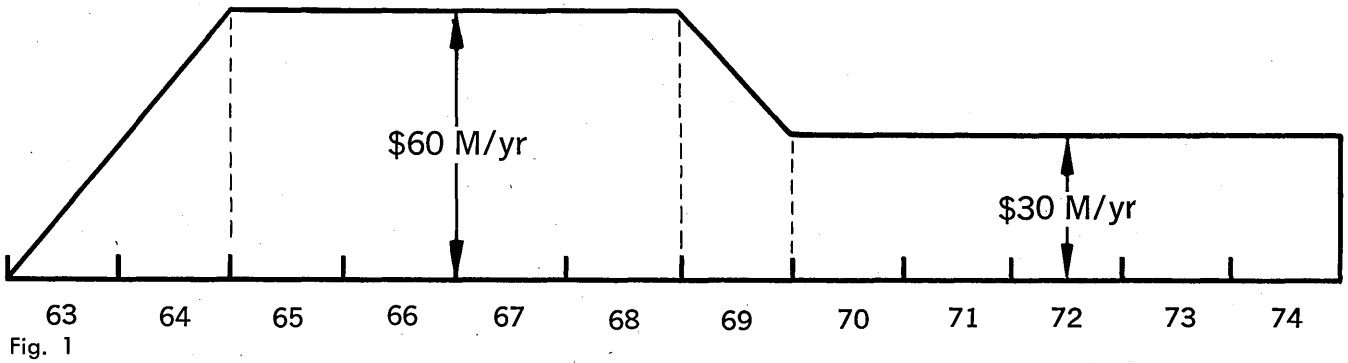


Fig. 1

implications of separate pricing

Three-and-a-third per cent! Would you, as a manager of a $10,000/month 360/30 installation, give up IBM software in order to save $333 per month? You needn't answer, because the question is irrelevant. First of all, the analysis which leads to the 3.33% price differential is misleading. The no-software price may be 3.33% less than today's price, but what about the with-software price? Let's see.

Assume that IBM has separated its pricing and it ends up with the same set of hardware customers, but 90% of them elect not to buy the software. This does not change IBM's development costs, and if we assume that IBM will set prices to maintain its profit margin, our revenue estimate is unchanged. But now the half-billion dollar software bill is being paid by one-tenth as many people. Put another way, that tenth of the user population which, with integrated software pricing, was contributing $66 million (one-tenth of software cost plus profit) toward software revenue now must contribute the whole $660 million because the other nine-tenths of the population has opted out. Assuming all systems had rented for $10,000 per month and IBM's profit remained unchanged, the following situation would prevail.

Old scheme: Integrated software pricing
Rental = $10,000/month
New scheme: Separate software pricing
A. No-software option
Rental = $9,667/month
B. With-software option
Rental = $12,997/month

In other words, if nine-tenths of IBM's hardware customers elect to go elsewhere for software (and IBM has advance knowledge of this so it can price rationally) you, as a new IBM prospect considering a system which would have rented for $10,000/month under the old pricing scheme, are faced with the choice of saving $333/month from the old price and buying your software elsewhere or paying $2,997 over the old price to IBM for software. Everything else being equal, an outside software vendor can meet IBM's software price by offering to you for $3,330/month a package which used to cost you $333/month. Not bad . . . for the software house.

Of course, you might observe, my assumption that nine-tenths of IBM's customers will go elsewhere for software is wildly unrealistic. I agree. I chose the exaggeration to make clear the point that the economic structure of separating the pricing of software from hardware has within it a quality which is self-defeating both for the computer manufacturer and for the user. Recall that because reproduction cost is so low and design cost is so high, the per-unit cost of software is peculiarly sensitive to volume. Everything else being equal, the software producer with the highest volume will have the lowest per-unit costs. This effect is much more pronounced than in conventional mass-production equipment manufacturing where the reproduction cost dominates the design cost and the effect of volume on per-unit cost is only a second-order effect. Considerations of law and conventional wisdom aside, it seems to me that a case can be made that software monopoly offers some advantage to the consumer. (This argument does not take into account important non-cost factors, such as the effect of competition on quality.)

The effect of separate pricing on the manufacturer is also self-defeating. As he loses software customers to independent software houses his per-unit costs go up, he is forced to raise prices, and he drives away more customers. The consequence of a separation of software pricing is an incentive structure which encourages the manufacturer to abdicate his present role as a supplier of software, system integration, and associated services. The software houses might have a field day but what about the rest of us?

The advocates of separate software pricing imply that a hardware-software manufacturer should pay for its software development only from revenues derived from the sale of

software. Such a policy on the part of the developer would be in the greatest interest of those who benefit from separation of pricing, since it minimizes the hardware-only price and maximizes the software price.

The software development cost for a given machine type is (or, at least, it should be) more a function of what the marketplace expects of software for that machine type than the number of machines actually sold. Thus, as a general tendency, the smaller a manufacturer's volume of a machine of a given type, the larger is the percentage of its software-plus-hardware price which must be devoted to software. Consequently, when the edict comes to separate the pricing of software and hardware the lower-volume manufacturers may have to charge more for their software. This could have two consequences. First, it could force the smaller manufacturers into a hardware price war against IBM, a war they cannot, in the long run, win. Secondly, it could lead consumers, other things being equal, to prefer machines which will run IBM software. Independent software houses will concentrate on developing proprietary software for 360's because of the larger potential market; this concentration, which favors the 360 owner, is already quite evident.

These two consequences, hardware price competition with IBM and a user tendency to buy IBM-compatible equipment, would be particularly effective in the small-system market where hardware profit margins are tighter and volume differences between small and large manufacturers are greater. The long-term effect of software price separation would therefore be a tendency toward standardization of hardware characteristics around the 360, particularly in smaller machines. Technically speaking, this may be a good thing, but it would probably be accompanied by the demise of several manufacturers. The net effect, then, would be to strengthen IBM's position in the small-system market.

If the federal government takes advantage of separate software pricing in its system procurement practices, one effect will be to discriminate against those smaller manufacturers who have a relatively large share of government business. All the self-defeating incentives which I have discussed will be felt most acutely by these firms. Of course, there is plenty of reason to believe that the most articulate government spokesmen do not speak for the big money. The recent Phase Two fiasco attests to the pervasiveness of the Linus Blanket Effect.

Even so, the government seems to have a reasonable argument that a multiple hardware purchaser should not have to bear the full price of software for each of the machines purchased. After all, it is argued, that portion of the revenue due to software is pure gravy after the first machine; why should the taxpayer support this exorbitant pricing?

The philosophical problem of volume discounting is sticky enough in the relatively simple case where the replication cost of an item is dominant. It has been justly pointed out that when large and small purchasers of the same goods are in competition, the volume discount discriminates against the small purchaser. This discrimination exists in still another form in the software market.

In the case of software, the ordinary small user finds himself in competition with the government and other large computer purchasers regarding the share of the manufacturer's total software development cost which each should underwrite. This total cost is fixed; the present pricing arrangement causes it to be borne by each user in proportion to the number of systems he buys. With volume discounting the big customers will pay less and the small ones will pay more.

The fourth and final confusion which I shall discuss is between software and customer technical support. The critics of today's integrated pricing argue for separate pricing of software but when they expand on this argument and talk about unjust distribution of costs, they refer sometimes to "software" and sometimes to "support." The term "support" as commonly used refers to the assistance provided by a vendor, usually in the form of skilled manpower, as a part of the sales and installation process. Support is generally charged to marketing cost and is not, in my judgment, included in the estimates of software cost which I made above. Support costs vary from customer to customer, being largely a measure of what a salesman feels is required to capture an order.

What is the nature of support? Almost exclusively, support is help provided to a user in designing and programming his particular application, and in making sense of the software he gets. Consequently, in the presence of separate pricing, support is most reasonably provided by an independent contractor or by the suppliers of system and application software. It is inconceivable that the computer manufacturer should provide software support as a part of selling hardware if, after software pricing is separated, someone else is providing the software.

Now we can begin to see a consequence of separation of software pricing of real significance to the industry: it could change the nature of computer system marketing. After software prices are separated, the computer manufacturer will not be in a position to provide support to a customer who does not buy his software, and he will probably refuse to do so. The user electing to buy software separately will then be confronted with the choice of buying system components and assembling them himself or of finding a prime contractor to do the system integration which was previously offered "free" by the manufacturer. With any sense at all he'll seek help. The most obviously qualified source of help will be a software vendor who also offers himself as a prime contractor.

The major significance of separate software pricing, then, is that it promises to drive a wedge into the marketing relationship which now exists between the user and the computer manufacturer. The wedge is labeled "prime contractor" and the role is most probably occupied by the software houses. The computer manufacturers will probably attempt to get into (that is, maintain their share of) the systems integration business and it will be interesting to see how they fare. What will happen within Manufacturer X, for example, when its prime contracting/marketing organization discovers that its proposals are competitive only when they employ Manufacturer Y's disc drives?

summary

I have attempted to explore the economics of software by organizing my discussion around the following four common confusions: the cost-price confusion, the confusion that software costs as much as hardware, the design-reproduction cost confusion, and the software-support confusion. In the process I have arrived at the following conclusions.

It appears that software cost does not now contribute to a large fraction of the price of a System/360; it is probably less than 3.33% on the average. Software costs are sensitive to economies of scale, however, and attempts to distribute software development around to non-manufacturers will tend both to raise the price to the user and to discourage the manufacturer from undertaking certain products and services.

It appears that separation of software pricing and the volume discounting which this implies will help software houses and large users, but will discriminate against smaller users, smaller manufacturers, and those manufacturers who concentrate on serving the federal government. In the long run it appears that separation of software pricing would be a major step in a sequence of events which could ultimately reduce the computer manufacturers to the role of component vendors. ■

sign here

LEGAL ASPECTS OF PROPRIETARY SOFTWARE

by ROBERT B. BIGELOW

The legal problems of proprietary software depend to a large degree on the viewpoint of the person who is looking at it. The people who have these problems include the programmer, the programmer's employer, the person who may contract with the programmer's employer to develop the program (this could be the manufacturer or user) and finally the public, which is divided into two subsets, the government and the citizenry.

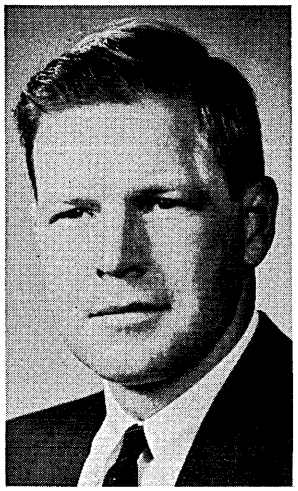
To complicate matters, we have not so much an undefined product as a product whose definition keeps changing all the time. Software can be considered from several levels. It can be simply the program, as it appears in a deck of cards or on a reel of tape. It can be this plus the research effort which has gone into an over-all study of the problem. Look, for example, at all the programming for a time-sharing system—this is software. But the individualized customer programs—a subset—are marketable commodities in and of themselves—as is the executive routine—as, may be, the documentation.

And there is a constantly changing relationship between hardware and software. Again, in the time-sharing field, as the problems of the security of data become more important, what has been software is now built into the hardware, and we have a developing concept of a hybrid personality called "firmware" (see DATAMATION, January, 1967).

protection against unauthorized use

The legal aspect of software, which has been the subject of most of the discussion to date, has been *the protection* of *the program developer's proprietary interests in the software against unauthorized use.* This topic breaks down into two facets. The first deals with the *law of intellectual property, primarily expressed by statute in Patent, Copyright and Trademark laws;* the other is that *developed by common law*—non-statutory methods—*including the law of trade secrets, unfair competition* and *the law of contracts.*

The statutory basis for patent and copyright protection comes from Article I, Section 8, Clause 8 of the Constitution, which provides that "The Congress shall have Power . . . to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." Under this power, Congress enacted the Copyright Law, which, in its current version, gives the author or other copyright owner exclusive control for 28 years of the right to reproduce the form of expression. (But it is not a violation of copyright to express the same idea in other words.) Under the Patent Law, Congress gives the inventor the exclusive right to control the use of his invention and the methods embodied therein during the 17-year period the patent is in force. Because of these essential differences, copyrights are registered and the fight comes only after the registration, whereas in patents, the patent is applied for; the Patent Office searches through the records as to whether the application meets the criteria of: (a) not already in-



Mr. Bigelow practices law in Boston and is interested in the law/computer interface. He is a member of the American Bar Association's Committee on Electronic Data Retrieval, the Boston Bar Association's Committee on Automation, the American Management Association, ACM, and DPMA. This article is based on a paper given at a recent AMA meeting.

vented, and (b) not obvious, and then issues the application. Patents which confer a real monopoly can be attacked before issuance and after.

In May, 1964, the Copyright Office decided that computer programs could be registered if certain requirements were met (Copyright Office Circular 31D). These included: (1) the elements of assembling, selecting, arranging and editing—in other words, the literary expression—going into the compilation of the program must be sufficient to constitute original authorship; (2) the program must be published with the regular copyright notice; (3) the copies deposited for registration must, at the least, include reproductions in a language intelligible to human beings; in any case, where the program or its publication was in machine-readable form, something more, such as a print-out of the entire program, must be deposited.

The Copyright Office took no position on whether the program was a "writing of an author" and thus copyrightable, or whether the reproduction of the program in a form actually used to operate hardware was a copy. But the Copyright Office, stating that it has a policy of resolving doubtful issues in favor of registration, decided to allow the registration of computer programs under such conditions. Between the issuance of this ruling in May, 1964, and the middle of 1967, only about a hundred computer programs were registered for copyright.

copyright revision

The Copyright Revision Bill which has passed the House of Representatives and is currently pending in the Senate (H.R. 2512) appears to include computer programs as copyrightable material in the definition of the subject matter of copyrights. Section 101 defines a *literary work* as a work "expressed in words, numbers, or other verbal or numerical symbols or indicia, regardless of the nature of the material objects, such as books, periodicals, manuscripts, phonorecords, or film, in which they are embodied." Section 102 states: "Copyright protection subsists . . . in original works of authorship fixed in any tangible meaning of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, whether directly or with the aid of a machine or a device."

However, there is opposition to permitting copyrights of computer programs on the ground that it would be unlawful to use the program in a computer without the permission of the copyright owner, and this would delay the development of computer technology. This view has been advanced particularly by the Interuniversity Communications Council, commonly known as EDUCOM, which is much worried about the possibility of monopoly control of software for automated processes.

This group feels that authorizing the copyright of programs would give protection similar to that afforded by patents, but without the safeguards and limitations that surround the patent. EDUCOM claims that had the right of copyright with respect to programs been clear in the past, so that program preparation had "been constantly carried out under the threat of infringement actions charging plagiarism of existing copyrighted programs, it is doubtful whether the growth of programs and programming techniques of recent years would have been possible."

The proponents of copyright protection have their advocates, too, who claim that copyright protection would encourage program owners to make the programs generally known to the public instead of keeping them secret, that it would encourage other people to invest in the development of new and better computer programs, and that, in self defense, computer manufacturers, no longer able to get a free ride, would be compelled to create better programs than some of them are providing for the public today.

This dispute is but one of the many reasons that copyright legislation is now stalled and may not be enacted this year. George Cary, the Deputy Register of Copyright, in testimony before the Brooks Committee, did not believe that EDUCOM's worry is substantial. The case of *Baker* v. *Selden* decided by the Supreme Court in 1879 said, "the copyright of a work on mathematical science cannot give to the author an exclusive right to the methods of operation which he propounds, or to the diagrams which he employs to explain them, so as to prevent an engineer from using them whenever occasion requires."

Applying this to the current problem, Mr. Cary stated, "if you had a copyrighted program, which somebody finds it necessary to use, such use is not an infringement; but if somebody is writing a book or is preparing a series of programs, and copies this particular program to put in his book along with other explanatory programs, the court under this concept would find that to be an infringement" (Hearings on Data Processing Management in the Federal Government, July, 1967, p. 170).

But even if copyright may not be clear protection for programs, the developer of proprietary software should not overlook the usefulness of copyright protection for manuals, directives, advertisements and documentation. Registration of these items, coupled with the user's contractual commitments not to disclose the program, can provide some protection to the software proprietor.

patent protection of software

The constitutional authority for this statute is the same as for copyrights. But the approach is different. You will recall that in copyright the mode of expression is protected. In patents, the procedure or machine is investigated and found by the government to be new; when the patent is issued, the owner has the sole right to control the use of the procedure or machine. The general approach of the Patent Office has been that computer programs are not patentable because they are not methods or apparatus, but rather mathematical processes or formulae.

The Patent Office has some practical problems. First, they don't have too much information currently on prior art, at least in the field of programming. Secondly, they don't have the personnel to research patent applications for programs, and they can't afford to hire them. However, Patent Office Group 230 has established sub-class 340-172.5 relating to data processing. In this sub-class, there are 118 categories, number 73 of which is entitled "Micro-Programs (Software)." There are believed to be about 75 patent applications pending in this category.

In August, 1966, the Patent Office issued "Guidelines to Examination of Programs" (Patent Office Gazette, Vol. 829, p. 441), which stated that a patent could be granted to a program if it could meet the requirements of either a "process" or an "apparatus." But, officially, no one has yet succeeded. These guidelines were the subject of a public hearing in Washington on Oct. 4, 1966. The hearing was well-attended primarily by opponents of program patenting.

Proponents included Bell Laboratories, which felt that patent protection would encourage public disclosures of programming techniques. Proponents of patent protection of programs also feel that such protection would encourage the development of software houses and discourage the production of standard package programs by computer manufacturers. These standard packages do not turn out to be all things to all men.

It is interesting to note that BEMA argued against patent protection at the hearing on the guidelines, though IBM was silent. BEMA's reason, however, was that if programs could be patented, manufacturers would have to adopt much more restrictive agreements to indemnify customers against infringement. And it should not be forgotten that patents, which are a legal monopoly, have often been used to establish illegal monopolies. That may be one reason the

Department of Justice opposed program patenting at the guideline hearing.

Be all this as it may, the Patent Office, in April, 1968, issued a patent for a forward oscillating sort to Martin A. Goetz, vice president of Applied Data Research in Princeton; this patent appears, at least to a non-patent lawyer, like me, to cover a computer program. But, in mid-June, Edwin L. Reynolds, the first Assistant Commissioner of the Patent Office, when asked about the Goetz patent, stated, "We do not think a program is patentable."

In the spring of 1968, there were pending in the Court of Customs and Patent Appeals some five cases which to some degree concern the patentability of computer programs. Decisions in some of these are likely by mid-summer, and may give more guidelines.

new patent legislation

Currently pending in Congress is a new patent reform bill introduced by the Administration. In fact, currently pending in Congress are several different patent reform bills. The Administration bill S.1042 follows the recommendation of the President's Commission on Patent Reform, by specifically providing in Section 106 that "A plan of action or a set of operating instructions, in whatever form presented, to cause a controllable data processor or computer to perform selected operations shall not be patentable."

Section 106 has been opposed by just about everyone who has talked to Congress and probably will not be enacted. In hearings at the end of January, representatives of the American Patent Law Association, the Electronics Industries Association, the American Chemical Society and the National Small Business Association, as well as several individuals appeared in opposition to this section, even if they expressed no opinion on the patentability of computer programs. At that time, the Patent Office threw in the towel and stated its current position as follows: "We have taken the view that computer programs are not patentable under present law, and we shall continue to deny applications for patents on computer programs *per se*. It is our opinion, however, that there are substantial difficulties in finding adequate definition for computer programs and that it may be premature to enact legislation at the present time. For this reason, we would recommend that a section excluding computer programs as patentable subject matter not be included in any patent reform legislation."

trademark

A third statutory method of protection which may be applicable in certain situations is trademark protection. One well-known computer man, Calvin Mooers, is registering for trademark protection the acronym TRAC for a family of programming languages he has developed. He states, "In connection with TRAC, I have taken specific protective action by (1) delegating to my organization, Rockford Research, the authority for the development and publication of authentic standards and specifications for TRAC languages; and (2) adopting TRAC as the trademark and service mark which publicly and authentically identify the languages, the standards, and any computer services offered in connection with these standard languages, whether offered by me or by licensees. These actions preclude others from publicly identifying deviant language dialects or services by the trademark TRAC, or by any misleading combined forms such as 'Improved TRAC' or 'NU-TRAC.' I believe this approach directly serves the public interest by providing users with explicit standardization and compatibility, together with a means of accurate identification of the computer service facilities offered to them."

But the enforcement of a trademark can be a very expensive proposition, and subject to many defenses. The same can be said about claims of copyright and patent infringement. If, as the Patent Office claims, a program is only a mental process, how does one get inside the infringer's mind to prove the infringement? If the mode of expression in a program is protected by copyright, how much of a new program must be original to avoid infringement? The difficulties and delays of such litigation can exhaust the assets of a small company. Even where the rights seem clear, the software proprietor should consider all the costs—out of pocket, lost time, tied-up capital and attorney's fees—before he goes to court. He might do better to forget the infringement and spend his time in developing new software which he can peddle at such a cheap price that no one will steal it.

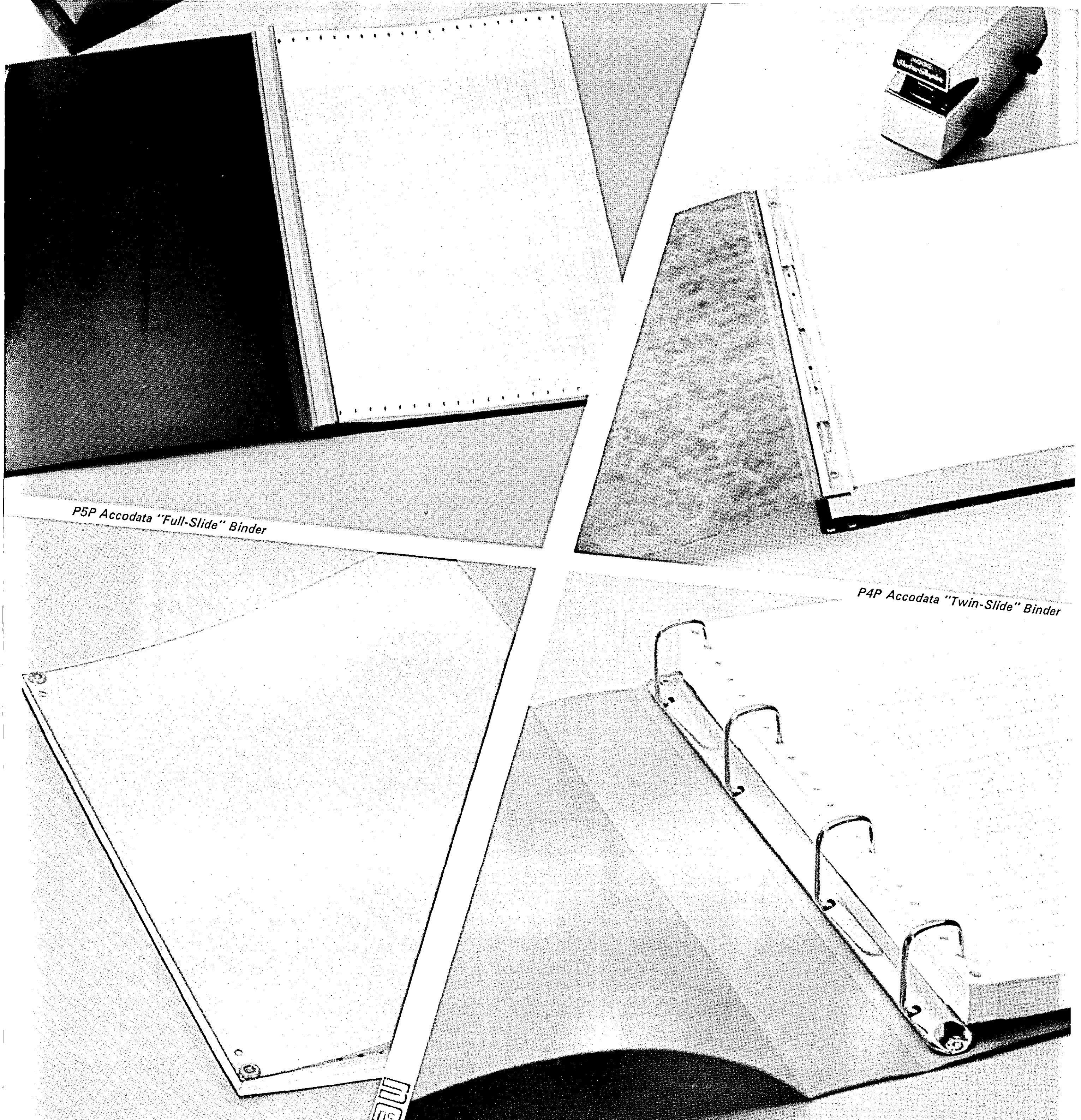
Let us turn to possible methods of protecting software against unauthorized use when the methods do not rely on federal statutes. There are two basic approaches, one through the law of what is known as unfair competition—you can't play dirty in business—the other, through the law of trade secrets. To some degree, these are allied.

trade secrets

To deal with trade secrets, this contemplates, as Larry Boonin, counsel for Auerbach, so deftly put it, "it is a secret and . . . it relates to trade" (Joint Committee on Continuing Legal Education, *Law and Computers in the Mid Sixties*, p. 240). A more general definition is that of Milton Wessel: "A trade secret is any confidential formula, pattern, device or compilation of information which is used in one's business and which gives the owner an opportunity to obtain advantage over competitors who do not have it." I commend to your attention Wessel's article in the Harvard Business Review for March-April, 1965. Despite a great deal that has been written in this area since then, it is still the leading paper. He gives six tests to insure the validity of the trade secret: (1) Is the program really secret—is access limited and are records kept of all disclosures? (2) Is the program really valuable? (3) Was the program developed and owned by the company—as opposed to an individual employee programmer? This is particularly important when the employee ceases to be one. (4) Was it difficult to develop the program? In other words, how much did it cost? (5) Has the program been copied? This goes to the question of proof of infringement and modifications. And (6) is it fair to protect the program—or is the owner being more unfair than the person he claims was unfair?

The unauthorized use of someone's trade secret subjects the user to a law suit for damages. In some instances it can also be a criminal act. For example, a recent Massachusetts statute, which became effective in March, defines the term "trade secret" to mean "anything tangible which constitutes, represents, evidences or records a secret scientific, technical, merchandising, production, or management information, design, process, procedure, formula, invention or improvement." Whoever steals or gets such a trade secret by false pretenses or copies with intent to convert to his own use and whoever buys or sells such a trade secret commits larceny and can get five years in jail. Furthermore, he may have to pay the person or corporation not only for the damages resulting from his act, but double damages as a penalty.

In the field of unfair competition, which has been called the "Book of Rules of the Business Game," we are talking about the man who cannot obtain satisfactory protection of his product by statutory means. These people look primarily to the courts of the various states for protection against a competitor appropriating to the competitor's use the fruits of the businessman's hard work. They argue that the federal patent and copyright laws do not prohibit the states from



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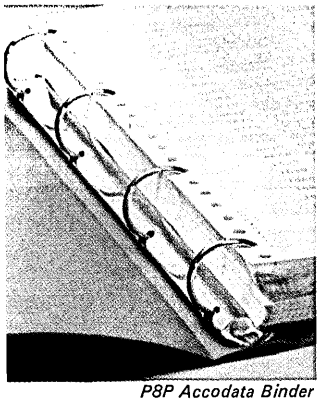

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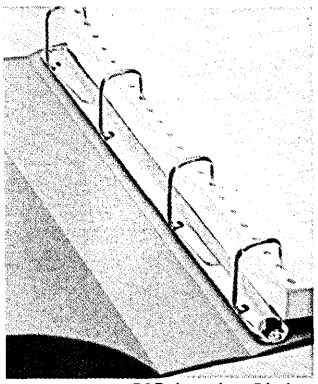

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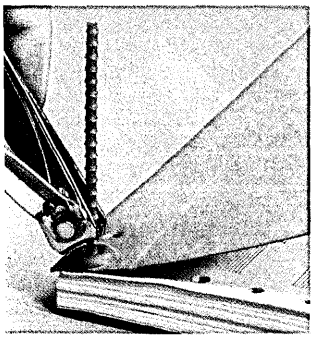

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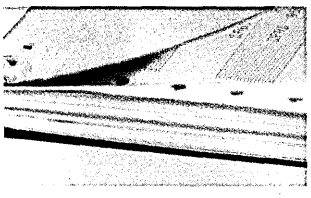

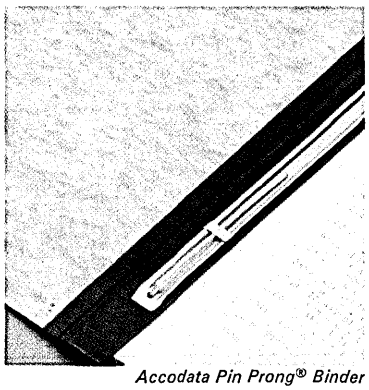

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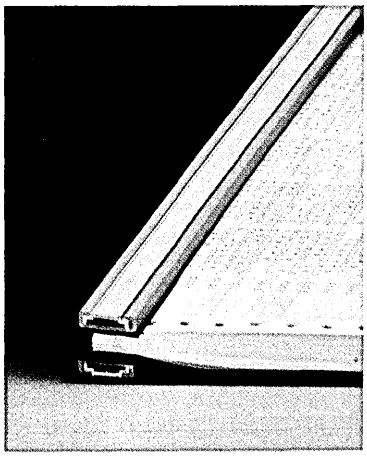

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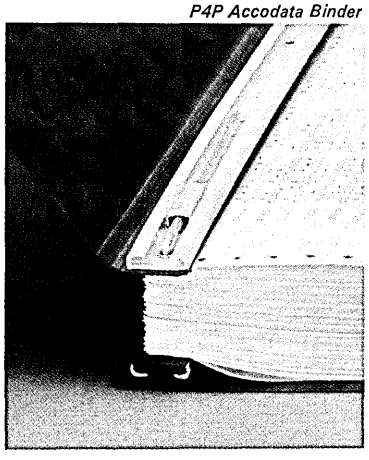

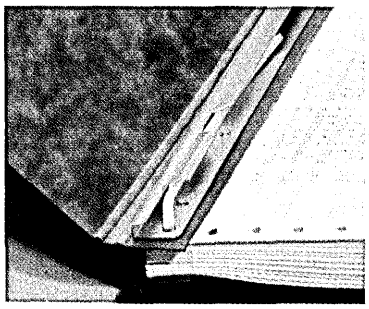

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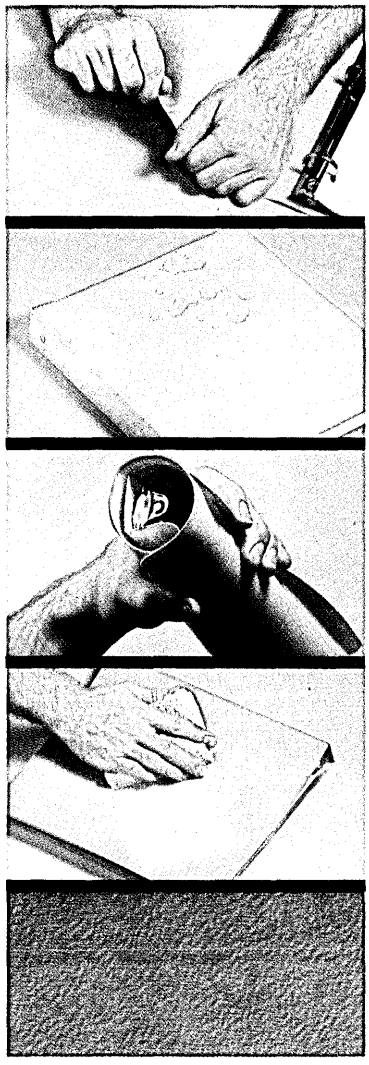

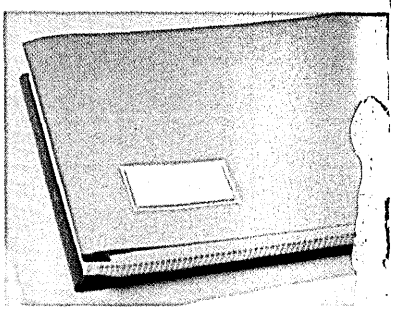

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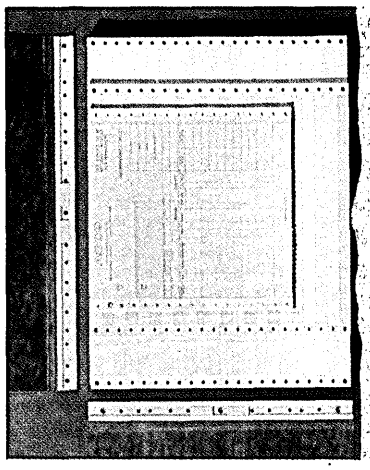

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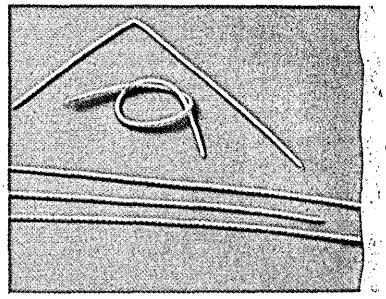

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helping the businessman. The defendants argue that it is in the public interest to promote freedom of information and competition.

The law of unfair competition developed in favor of the businessman over the years. But in 1964, the Supreme Court held "that when an article is unprotected by a patent or copyright, state law may not forbid others to copy that article. To forbid copying would interfere with the federal policy . . . of the Constitution and in the implementing of federal statutes, of allowing free access to copy whatever the federal patent and copyright laws leave in the public domain." The Supreme Court cases have recently been interpreted by one of the higher federal courts to limit very seriously the law of unfair competition in any sort of intellectual property. To quote: ". . . in view of the federal policy of encouraging intellectual creation by granting a limited monopoly at best, we think it sensible to say that the constitutional clause extends to any concrete, describable manifestation of intellectual creation; and to the extent that a creation may be ineffable, we think it ineligible for protection against copying . . . under either state or federal law." In other words, if you can't get a patent or copyright on it, anybody can copy it, unless by their contract they have waived that right.

There is now pending in Congress a bill to establish a federal law of Unfair Competition (S.1154). This will authorize a civil suit against a person who wrongfully discloses trade secrets or confidential information, who misappropriates quasi-property not otherwise protected by federal law, or who acts contrary to normal and honest business practices (Section 7). The enactment of this statute, which is supported, with modifications, by the American Bar Association and the American Patent Law Association, might well help software developers.

And it should be realized that the constitutional authority under which the patent and copyright laws have been enacted is not exhausted. It may be desirable to enact a specific statute dealing with protection of software. Such a statute could preserve to the program developer that protection which will encourage him to develop and to improve, but could guarantee to the user the right to use the program.

One possible approach is the compulsory licensing of programs which have monopolistic protection. In the patent field, this approach has become quite common in court decrees, particularly when the compulsory licensing requires a reasonable royalty. In the copyright area, compulsory licensing is required by statute for phonograph records and the royalty is determined by statute. Such compulsory licensing might also avoid another possible evil: the use of statutory protection to suppress competitors' programs. One of the reasons the well-known Hartford Empire Company obtained patents was to block the development of machines which could do the same job by alternative means and to obtain patents on possible improvements of competing machines so that they could not be improved.

The arguments favoring proprietary rights for programs are strong. The availability of people who can write programs is far exceeded by demand, and the demand is increasing faster than the supply. When programs cannot be protected by statute, they must be protected by secrecy. And when programs are not freely disclosed, they are not as likely to be improved by use. Secrecy does not follow the Constitutional plan for intellectual property. It does not "promote the Progress of Science and Useful Arts."

Currently, the best protection of proprietary software seems to be a contract between the supplier and the user. There are several things which should be covered in any contract for software. Where a program is to be developed by an application company for the user, the contract should specify, in addition to such important items as the price, the time schedule (particularly important for the user), the purpose of the program, the documentation required, the on-site assistance to be rendered by the software house, and, above all, the ownership rights in the program.

The standards of performance which the software is to meet should be clearly spelled out for both the user and the developer, and the developer should be required to correct all errors found. So far as I know, there have been no cases on failure to meet contract specifications on software, but two cases have been decided dealing with the problem of hardware supplier's failure to live up to the terms of its contract. In one, decided in New York, the Federal Reserve Board spelled out in some detail what it was to get. The hardware supplier was unable to produce; the damages were over a quarter of a million dollars (*U.S. v. Wegematic Corporation*, 360 F2d 674). In the other case, the contract, at least the contract which the court discussed, was based upon the language in the proposal made by the hardware supplier's sales representative. This proposal really blew the manufacturer's horn. The court was not sympathetic and allowed the buyer to rescind the entire contract (*Sperry Rand Corporation v. Industrial Supply Corporation*, 337 F.2d, 363).

Particularly if the program is of the process control type, where a failure to meet specifications could have dangerous results, the user may be liable to someone who is hurt, without that person having to prove negligence. You've probably all heard of cases involving exploding soda pop bottles or cars which lose a wheel. There is a distinct trend in the law to dispense with the requirement that a person injured under such circumstances prove how the defendant was negligent. I think we may expect to see this doctrine applied when computer programs are operating and something blows up. The contract should cover this liability, and both parties should attempt to obtain insurance coverage against such an event.

The contract should also cover the developer's liability for the infringement of the rights of others. While the developer's own rights in software against unauthorized use are not clear, it is perfectly possible that in developing the program he might infringe a copyright or a trade secret, especially if in developing the program, he uses someone who has been under a restrictive agreement with another software house.

Particular care should be paid in all contracts to documentation. Unless the program has good documentation, it is, as a practical matter, very expensive to update. Furthermore, if it ever becomes necessary to prove in court that the program worked the way it was meant to, incomplete documentation may be enough to keep the program from being admitted as evidence. And from failure to get the program admitted, the case could be lost.

Program contracts should also include times for debugging and testing and the user should make sure that the software he is asking for will operate on his equipment. It is frequently advisable to have software delivered some months earlier than hardware in order to allow familiarization by the user's personnel.

Particularly important in software contracts are provisions for penalties. As you all know, software has been notoriously late. California is putting a penalty clause into all of its contracts for hardware and software. It is reported that IBM has signed a contract with California to provide software which must "show substantial conformance to the [manufacturer's] specifications" with penalties for failure to meet such specifications on time (DATAMATION, February, 1968, p. 121). This type of clause will become quite

common, not only in governmental procurement but also in acquisitions by sophisticated users. And into the bargaining equation will go the heavy economic weight of the user as compared to the light weight, comparatively, of the software house.

When the software is not developed exclusively for one user, the contract should specify that the user does not get an exclusive right to the program. The contract should also cover the user's rights to improvements made by the software developer, the user's rights to make modifications, and the developer's right to improvements made by the user.

When software is leased or rented, rather than sold outright, the contract should carefully spell out the reservation of proprietary rights, such as they may be. It should include requirements on the user which will help the owner enforce his proprietary rights. These would include agreements that the program be logged every time it was run, that the proprietor have the right to audit the user's records with respect to this software and other programs, an undertaking by the user not to copy the software or to let anyone else copy it, and a requirement that the program be maintained in the tape or punch card library in its original form and be available only upon signed receipt. The developer should also be sure that the lease contemplates his right to assign it as security for a loan, as may be done with hardware.

When software is leased to the federal government, particularly to the Department of Defense, the lessor has to be very careful. Basic government policy is to abolish the concept of proprietary rights in anything supplied to the government. Defense Procurement Circular #6 has enumerated several categories in which the government would have unlimited rights, including (1) data resulting directly from the performance of research, developmental or experimental work specified by the contract; (2) data necessary to enable others to manufacture the items or perform the processes that were developed under government contracts (except data developed at private expense); and (3) manuals for installation, operation, maintenance and training.

These are some of the matters which should be considered in contracts for proprietary software. But as a practical matter, the best protection for the software developer is to deal with an honest man, give him a square deal, and trust him. And, as Robert Head has noted, it's only common sense that a buyer will not give away a product he paid good money for.

tax aspects

Even in the software field, taxes must be considered. There is a good argument that developmental costs for software should be treated as an expense item. Accountants who have looked into the problem have defined software to include the justification study, the feasibility study, the systems work and the training of personnel, as well as the actual programming. In other words, everything related to the installation of a computer system, except the hardware costs. Obviously, these costs can be considerably higher than the actual hardware outlays, especially if the hardware is rented. From the user's point of view, the price or rent of a proprietary program is but the visible portion of his software costs. There is some useful precedent going back as far as 1925, and including outlays for efficiency systems, management surveys, revisions of accounting systems and so on, to indicate that proper tax treatment, at least from the user's point of view, would be to take all software costs as an expense of doing business in the year in which they were incurred. (See Falk: Tax Considerations Affecting Bank Computers, Bankers Magazine, 1966; Bigelow, Computers and Taxes, DATAMATION, August, 1967, p. 60)

It has also been suggested that software development costs should be treated in the same manner as research and experimental expenditures. Certain expenditures of this nature can be treated either as expense or as a capital item to be amortized over a period of not less than five years. Once the choice is made, you have to stick with it. Research expenditures include amounts paid to others for research work, so that it can be argued that the user who has a software house develop a program for him can treat it as a research expenditure. One caution on this approach—the expenditures have to be in connection with an existing trade or business, so if you are planning to go into the business of developing your own software, don't try to claim development costs as research and development expenses.

From both the user's and the manufacturer's points of view, hardware is tangible personal property which has a useful life of more than one year. It is depreciable, tangible, personal property to which all the depreciation rules for tax purposes apply, and for which an investment tax credit may be taken. The interdependence of hardware and software, and the growing problem of deciding where the line is between the two, gives weight to an argument that software development costs should be treated the same as hardware for tax purposes, at least from the user's point of view. The investment credit is available for depreciable tangible personal property which is used as an integral part of a manufacturing operation. "Integral part" is defined to include cases where the property is "used directly in the activity and is essential to the completeness of the activity." A computer program which is used for process control would seem to fit this requirement. Users of such standard packages should argue that the package is depreciable, tangible property and that they should get the investment credit as they do with purchased or leased hardware.

If a developer can get statutory protection for software, the tax treatment may depend on what kind of protection he gets. For example, if the statutory protection is a patent, it is treated the same as R & D. But if the protection is copyright, the money spent in development is a current expense, while the cost of getting the copyright is a capital investment subject to depreciation. And if the protection is trademark, cost is a nondepreciable capital investment unless the taxpayer makes a specific election to amortize the cost when he files his return; if he doesn't so elect, he's lost the cost, from the tax point of view, forever.

When it comes to litigation against infringers, the tax law gets really complicated. If the suit is to protect your patent or copyright, the government will claim it's not an expense, but a capital investment—unless you can show the suit is for lost profits. But if you claim lost profits, your recovery is probably taxable as ordinary income. However, the money you get for damage to your good will is non-taxable to the extent it doesn't exceed your undepreciated costs. The tax result may well depend on how you word your complaint for infringement! (For a general discussion of these aspects, see CCH, Standard Federal Tax Reports, 1968, #6.)

In other words, before you commit yourself on a software contract, or on a means of software protection, talk to your tax man. He may save you a lot of money.

programming contracts

A final legal aspect of proprietary software which we should consider is the contract relationship between the developing company and its employed programmers. Where the product is developed by a team, the individual employee has comparatively few rights. But what of the situation where the product is developed by a full-time employee, on his own time? One company in Boston has a problem of just this nature right now. The product in question is an exceedingly valuable program which the company, which is not in

the program development business, nevertheless hopes to be able to peddle. But the employee who put in a great deal of his own time on the problem wants to make some money too. The answer is clearly a written agreement between the employer and the employee covering these questions. Such a contract should also cover relationships between the employer and the employee after the employee leaves.

To cover relationships while employed, the contract might well include (1) an agreement to disclose all intellectual accomplishments of interest to the company, whether made on company time or the employee's time, if the discovery is capable of being used by the company, (2) an agreement to execute such assignments and other papers as the company may request to give it appropriate rights in such discovery, and a representation that there aren't any such discoveries at the present time—this latter can be very useful in avoiding arguments later.

To protect the employer's property rights, the contract should provide that the employee will keep confidential information secret forever, whether related to the company, its programs, products or possible uses. He should also agree that if he leaves he will not, without written consent, take with him processes, formulae, and so forth relating to the company's operations or its experiments. It is often advisable to include an agreement that while he is employed, he will not, without specific permission, engage in any other commercial pursuit.

Turning to contractual arrangements after the employment is over, most agreements of this type which have come before the courts dealt with people agreeing not to set up a business such as a restaurant within a certain geographical area. In the software field, geography is irrelevant. If you want a noncompetitive agreement, I suggest you do it on a time basis. For example, when you hire a man, get him to agree that for three months after he terminates, he won't engage in any activity which competes in any business which the company is engaged in at the time he leaves, and that during the full year after he leaves, he won't compete *directly* with the company in any such business. Time limitations which are reasonable will be upheld. But the courts won't deprive a man of his livelihood forever.

Even without a contract, if it can be shown that the ex-employee made unauthorized use of information which he received from his employer, he can be enjoined from using it and made to pay damages. To take a prosaic case, the milkman who walks off a job, goes to another company and takes with him his list of customers can be forbidden to use that list. However, if he sits down and makes up a list from memory and then goes and solicits these people for his new company, it may be okay. Similarly, if a programmer walks off with the program, you can get him for it. But if he is good enough to recreate the program from memory, you weren't paying him enough.

One item you may wish to include in a programmer's contract is an agreement that he will, after termination, upon payment of an amount specified in the contract, come back to work for you for the limited purpose of helping update programs on which he worked. I have not seen this in any contract, but I commend it as an approach. With the difficulty in updating programs, such a clause might pay off.

These have been a few of the legal aspects of proprietary software. To sum up: currently the best protection for developers against unauthorized use is through contract; new statutory methods of protection could improve both protection and dissemination; and both developers and users should talk to their lawyers before they sign their first contract. ■

satisfied

SOFTWARE PACKAGES: USERS SPEAK OUT

The user of a software package is often a pioneer; not only is he frequently contracting for a new program, but he sometimes finds himself negotiating with a new company. While the increasing development of software packages by many firms makes the obvious point that there is considerable interest in packaged programs, enough time has not passed, in most cases, for the effectiveness of these programs to be carefully evaluated. Users' reactions, of the type that make fiscal impressions on the suppliers, will take a few more years to be registered.

In the meantime, in an attempt to discover some general attitudes toward packaged programs from the user's point of view, DATAMATION staff members interviewed eight companies representing users of nine programs. Although the companies differ as widely as that small sample allows, the objective was not to present a statistically accurate cross-section of users, but rather to record the experiences of selected companies in acquiring and implementing programs obtained from outside sources.

The interviews followed an outline designed to elicit a description of the company and its requirements and goals, as well as its selection methods, the conversion and implementation process, production and maintenance provisions, and what plans and suggestions the company would have regarding future acquisitions of additional packages.

The names of the interviewed companies will not be disclosed in this article. For this survey, specific identification of individual users was not considered an important factor in the appraisal of the packages, and the promise of anonymity encouraged some frank responses.

Four banks were among the interviewees. These include Bank A, a medium-sized New England bank with deposits of $260 million, 28 branches, about 900 employees and a dp system consisting of two 65K 360/30's (soon to be replaced by two 128K /40's) and a 240-million-character 2314 disc cluster. A substantial part of this bank's workload comes from its commercial service center which sells software as well as machine time, and employs 19 full-time programmer analysts who also maintain the bank's own software.

A number of banks are among the clients of the service center; for this group, Bank A obtained CILS (Correspondent Installment Loan System) in September '67 from McDonnell Automation. Installation began last November, and the package was operational by January '68. The system is now being used by five correspondent banks.

Midwestern Bank B has deposits of $800 million and a dp installation boasting two /30's, two /40's, and tape and

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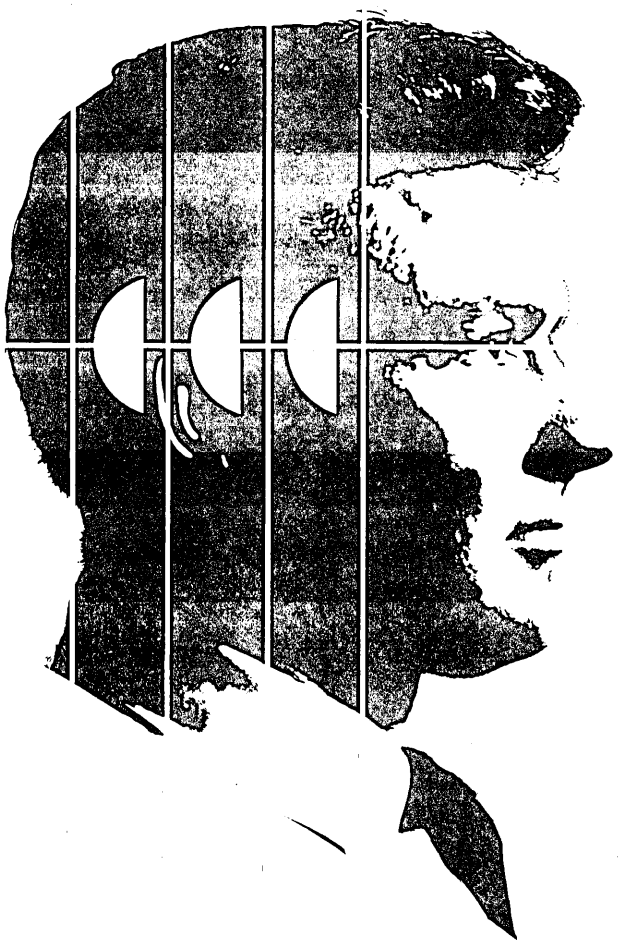

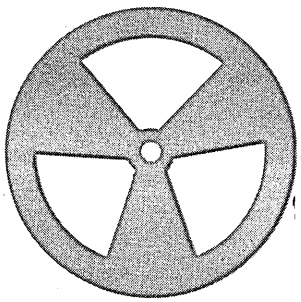

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disc files. In August of last year this bank purchased McDonnell's $12K Installment Loan Accounting package to use for its own operations. The system was installed and was fully operational by October '67.

Bank C has deposits of nearly $8 billion, about 10,000 employees, and 150 branches in the New York City metropolitan area. Its computer system includes a 256K /40 with eight multi-disc drives, a 100K 7074, six 32K /30's with two discs each, and "several" 1400's. Two /50's are on order. The applications cover the full range of banking jobs: personnel record keeping, demand deposit accounting, stock transfer, loan accounting, and personal trust accounting. Software support is provided by 100 programmer-analysts. This bank has had its own in-house programming and system design capability for about six years. The only package from an outside source that it has purchased is GRS (General Retrieval System). GRS has been operational about a year; it was acquired from Information Sciences, Inc., for about $10K, to include in personnel record system.

Bank D is a large many-branched California bank; among its 13 computers are a /65, a /40, five /30's, and two B300's. It is a user of ADPAC, a general purpose commercial language for 1401's and 360's developed by Applied Data Systems, and leased to the bank on a 99-year contract for $15K plus $1K/year for maintenance. ADPAC was installed and operational "three or four" months after the order was placed; the bank has been using it for about eight months.

A second ADPAC user interviewed is a railroad with two /65's, a /40 and a 7074; and 140 people on its dp staff (15 of whom do nothing but work on OS). The very first user of ADPAC, the railroad had it installed—for $15K—in 1962 on an IBM 1460. Since then, it has been installed on the 360's and the '74 for another $15K—representing a total investment of $30K with an ongoing maintenance fee of $1K a year.

One of the first users of Informatics' file management system, MARK IV, is a restaurant franchiser with 992 units in operation. The company wanted a system that would be broad enough to keep track of all business data in the franchises; it ordered MARK IV in January of this year, paid $30K for it, and the system was operational in a little over six months.

Two very large companies with offices throughout the country complete the sample of users. One, a department store headquartered in Chicago, has annual sales of $1.8 billion, and a dp installation that includes a /30, a /40 and a 50, with tapes and discs. The store is a user of Computer Sciences Corp.'s Payroll System; purchased for $15K in March '67, the system was delivered in June '67, and was operational by the following November. The system is currently handling 6,000 paychecks, and plans call for an increase to 20,000 in the "near future." It is expected to take several years to include all 90,000 nation-wide employees in the system.

An electronics manufacturer with installations in many locations is a user of several packages. In addition to the programs mentioned below, this company is also now evaluating 15 different file management systems. The selected package will be leased as an interim system; by early next year, the company expects to have developed a file management system for its own in-house use, and for use by the parent company.

Among several packages this manufacturer was the first to use is DETAP, a decision table preprocessor developed by Information Management, Inc. The system costs $14K/year. It was installed and operational about a week after the order was placed; DETAP has been in use about six months.

The company was also one of the first users of Computer Sciences' EXODUS software. Operational for nearly two years now, EXODUS I translates 1410 autocoder to 360 BAL; EXODUS II, which translates 1401 autocoder to BAL, has been installed a little over six months. By using the system throughout the parent company, the manufacturer got a special price of $51K for the two versions.

AUTOFLOW, a flowchart generator from Applied Data Research, is a third package implemented by this user. The basic system, which flowcharts assembly language programs, leases on a three-year contract for $4,200, and is renewable at $800 a year per location. COBOL and FORTRAN options add $2,100 in costs for three years, and can be renewed at $300/year. The company is currently using AUTOFLOW with options at six locations. There is no price break for multiple locations, but the user, in this case, does get some additional capabilities without charge: Speedpack, for fast I/O for tape or disc; and Chart/COBOL and Compress/COBOL operations to develop high-level language flowcharts. Normally these options go to users at a one-time charge of $900. The firm has been using AUTOFLOW for over two years.

selection

Once there is an evident need for a special purpose program, a company is confronted with a "make-or-buy" decision. Major considerations affecting this decision are the availability and talent of in-house programmers, the economics of "do-it-yourself," and the urgency of the need for an operational program. Among the companies included in this survey, most frequently mentioned as the deciding factor was the immediacy of the need. In one case, that of the restaurant franchiser, development of an in-house system would have taken three years; the purchase of a package resulted in an operational program in six months. And Bank A purchased McDonnell's CILS because a client bank needed a system that would be operational in three months.

Past experience with other packages profoundly influences a company's selection process. Bank A bought its first applications package from another bank on the strength of a hotelroom presentation; the result has been, according to the bank, "a real mess." Documentation was poor and the technical support non-existent. Most of the original package had to be rewritten by the bank's staff; Bank A had somewhat naively assumed that the program—written to provide doctors with an automated billing system—could be easily adapted to other applications. This did not prove to be the case. As a result, Bank A has adopted the policy of purchasing software only from companies devoted to that purpose, and the bank's procedure for evaluating software is quite thorough.

When the immediate need for an installment loan accounting system presented itself, Bank A first checked several sources (including the American Banking Assn.'s ABACUS listings, and the *ICP Quarterly*) to see what packages were available. Several possibilities were rejected because they required "unsuitable" equipment, were still under development, or employed unfamiliar programming languages. McDonnell's CILS was the only package that survived this initial evaluation.

The bank's dp manager and a programmer analyst then went to McDonnell's headquarters in St. Louis where they watched a live-load demonstration of the program and from it obtained a rough measure of throughput time per transaction. The bank's dp delegation then checked their own file record specs against the file definition written into CILS. They questioned a user in the area, became relatively famil-

iar with McDonnell's organization and operation, and met its technical staff. They insisted that one member of the staff who developed the program come to New England to provide technical support if and when the bank decided to purchase the program. "These people are particularly valuable," says a Bank A spokesman; "not only do they have an intimate knowledge of the program, but they are usually willing to discuss any compromises or omissions that occur along the way." A month after the visit to McDonnell, the contract was signed.

Bank D, who suffered from "a terrible experience with RPG," became as cautious as Bank A. Its dp manager conducted a six-month study comparing BASIC, ADPAC, COBOL, and RPG; the bank then chose ADPAC after deciding it outperformed the others in the test. The bank was also impressed by the enthusiastic comments of other users, and the minimal retraining needed for the staff who had previously been working with RPG.

comparison criteria

The majority of the companies interviewed compared several packages before reaching a final decision. The extent of the comparisons, however, varied considerably with the company. The restaurant franchiser that uses MARK IV "checked out ADPAC" and decided it was too slow to program; the store investigated only those packages that were randomly brought to its attention.

The electronics manufacturer, as might be expected from a company with a very large in-house dp staff and sophisticated installations in several locations, has a definite selection criteria: Specifications are drawn up in detail and given to the purchasing department. The purchasing department searches the market, selects the available packages that sound appropriate, and sends the specs to the vendors with a request for bids. When the bids are returned, the dp manager and his staff evaluate the proposals.

When purchasing Information Management's DETAP, the company surveyed only one other contender: TRILOG. Using 36 parameters and eight or nine benchmark programs, the company discovered the two programs were practically even. But TRILOG's decision table package was a module in an entire file management system; since this was more than the company needed, and encouraged by IMI's reputation, DETAP was purchased.

The company particularly stresses the importance of benchmark programs. When the differences between two packages are not obvious, and in order to conduct as thorough an evaluation as possible, this company runs benchmarks that introduce problem errors.

Two users described selection procedures involving no comparative evaluations. Bank C, which uses Information Sciences' GRS program in a personnel system, received a brochure from ISI just as the necessity for such a system was becoming evident. Anxious to get an operational system, and convinced of the effectiveness of ISI's approach, the package was purchased.

Perhaps the most unlikely episode in the selection story is the railroad's. Its dp manager reports that he didn't know he had a problem until Applied Data Systems' president Peter Harris convinced him of it. The manager couldn't contact any other ADPAC users because he was the first; he didn't check out any other programs because he didn't know of any. The manager did the technical evaluation himself following a demonstration. Deciding factor in purchasing ADPAC: "Confidence in Peter Harris."

The extent to which modifications in the various packages were necessary is dependent on the special requirements of the user. In instances of major modifications, most users in this sample purchased the package with the foreknowledge that the software would have to be tailored to their specific applications.

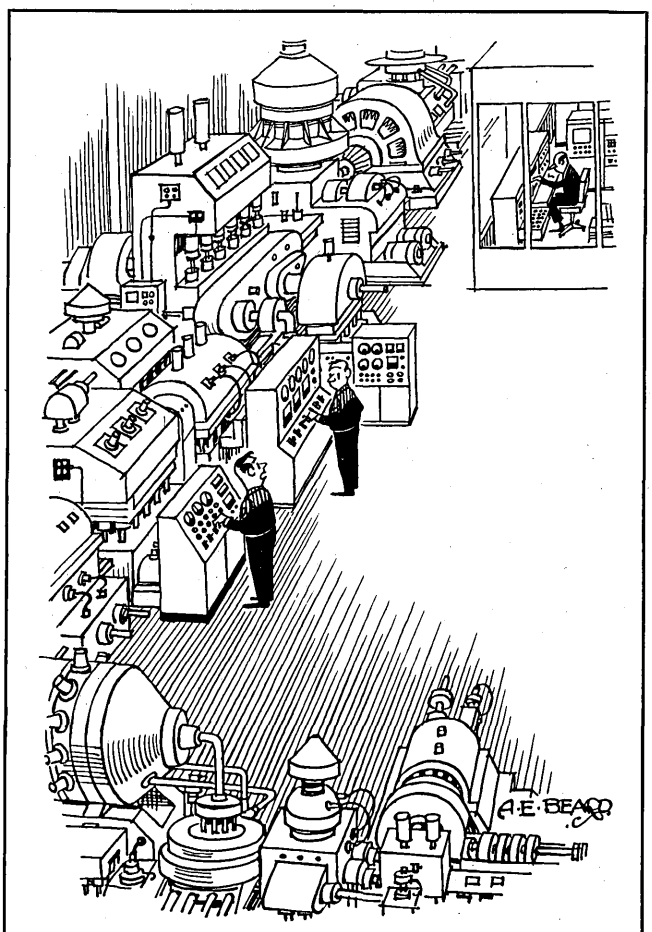
As an example, the prospective client of Bank A's service center was a bank with branches; the package, McDonnell's CILS, was not capable of accommodating branch banks. An agreement between user and vendor allowed Bank A to modify the basic program (at a cost to the bank of $2K) to accommodate banks with branches; in return, Bank A gained the right to market the "new" package. This example suggests the possibility that users, by investing in additional development, could get a return on the cost, and perhaps even some profits on the investment, by marketing the revised program.

The store, which purchased CSC's Payroll System on the basis of CSC's reputation, realized in advance the extensive modifications the dp staff would have to make; because of these in-house changes, the store did not demand or expect much conversion or implementation support from the supplier.

Another alternative is presented by the case of Bank C, which procured ISI's GRS package. The bank states that although it could have adopted a "Dutch burgermaster" attitude (the supplier alone is responsible for delivering a fully operational system) it preferred the "English empiricist" approach (bank and supplier learn together). This method proved effective.

ISI's program deck "worked perfectly the day it was delivered," according to a Bank C source. Nevertheless, it took more than six months to perfect GRS—primarily because the initial specs underwent several changes that the bank regards as more or less unavoidable: The bank's personnel department was unfamiliar with data management systems, and the supplier was unfamiliar with the special characteristics of the bank's personnel record system.

None of the interviewed users report significant difficul-



"Ever wonder what we make here?"

ties in making the programs operational on their equipment configurations or with their operating systems. One of the few comments relating to this point is from the railroad: in its installation, ADPAC went into operation on DOS and TOS in a "short time," but the data processing manager noted that it took a year to be completely operational on a full operating system because of the "complexity" of third-generation operating systems.

Additionally, Bank A criticized McDonnell's CILS' lack of a programming option that would permit file transfer from tape to disc; as written, CILS provides only for tape-to-tape processing. The bank will have to convert disc when its present /30's are ultimately replaced by /40's.

vendor support

The importance of on-site installation and training support offered by the package suppliers is, as indicated to our interviewers, directly related to the sophistication of the user's staff and equipment, and the complexity of the program.

The department store, after modifying its package considerably, used only 40 hours of the 100 hours of on-site support offered by CSC.

The electronics manufacturer, representing a giant account to any vendor, reports, not surprisingly, instant and excellent support from both Applied Data Research (AUTOFLOW) and Information Management, (DETAP). Not much training was necessary with the implementation of either package. AUTOFLOW was introduced to programmers in a half-day seminar; DETAP was presented by the dp manager in a two-day course to 25 representatives from the firm's various locations.

The ADPAC users, Bank D and the railroad, in their continuing enthusiasm, described vendor support as "beautiful." The bank has had over 60 programmers trained by Applied Data Systems; a six-weeks' course for a few was held in the time between the order and the installation, and a three-to-four months' course was held later for the remainder of the staff.

Both of these companies have had previous, and disappointing, experiences with IBM support—or lack of it. The bank, before its divorce from RPG, once had 27 IBM people on its premises "and no one knew about it"—presumably, they had little contact with the bank's dp staff, and therefore did not aid significantly in the implementation process. The railroad, which uses an IBM MFT freight location program (and has an in-house staff, as previously noted, of nearly 140 programmers), mentioned it would appreciate more on-site assistance. The program involves 120 people who handle 22 million pieces of freight data a day, and operate two /65's and a /40. When interviewed, the dp manager stated that the complexities of the program on a third-generation system are too much for the console operator; because of the lack of higher level technical support, the program has not produced results once in the last two months.

Bank C noted that, in its case, coordination of the support was difficult because Information Sciences did not assign one person to the project who was thoroughly familiar with all aspects of it. Also, the bank had to supply much of the training required for GRS. In addition to teaching its employees how to prepare GRS input data and how to use the output, the bank also wrote one of the three manuals used in this training effort. ISI's training support consisted of two manuals and an afternoon orientation meeting for department managers whose operations would be affected by GRS. This session was conducted by a technical representative who remained on-site during the entire period the program was being refined into an operational package, and who was described by the bank as "extremely helpful."

The bank's dp manager suggested that if the personnel department (the department most affected by this application) had realized the real character of the change to be wrought by GRS, the clerical training period (which was three sessions, each lasting a few hours) would have been longer, the material would have been presented in smaller bites, and the trainees would have received more opportunity to ask questions and practice the new procedures.

Some users have easily implemented the packages in their operations. Bank B, which uses McDonnell's Installment Loan Accounting Package, did not use the on-site support offered; training was minimal and accomplished through manuals.

Personnel training for the franchiser's MARK IV program was only two days of classes, but the company had participated in the applications design of the system.

Bank A, however, because it modified its CILS program extensively, conducted the bulk of the necessary training itself. A representative from McDonnell did hold an orientation session for management, but the detailed, working-level instruction was provided by the bank's senior programmer-analyst. He held three sessions, each lasting over two hours, spread over a three-week period. The texts consisted mainly of a manual written by the bank; this was supplemented by two other documents supplied by McDonnell. The bank considered testing its trainees, but dropped the idea, fearing that those who received poor grades would become discouraged; there also was the possibility that the grades would create friction among the trainees.

file conversion

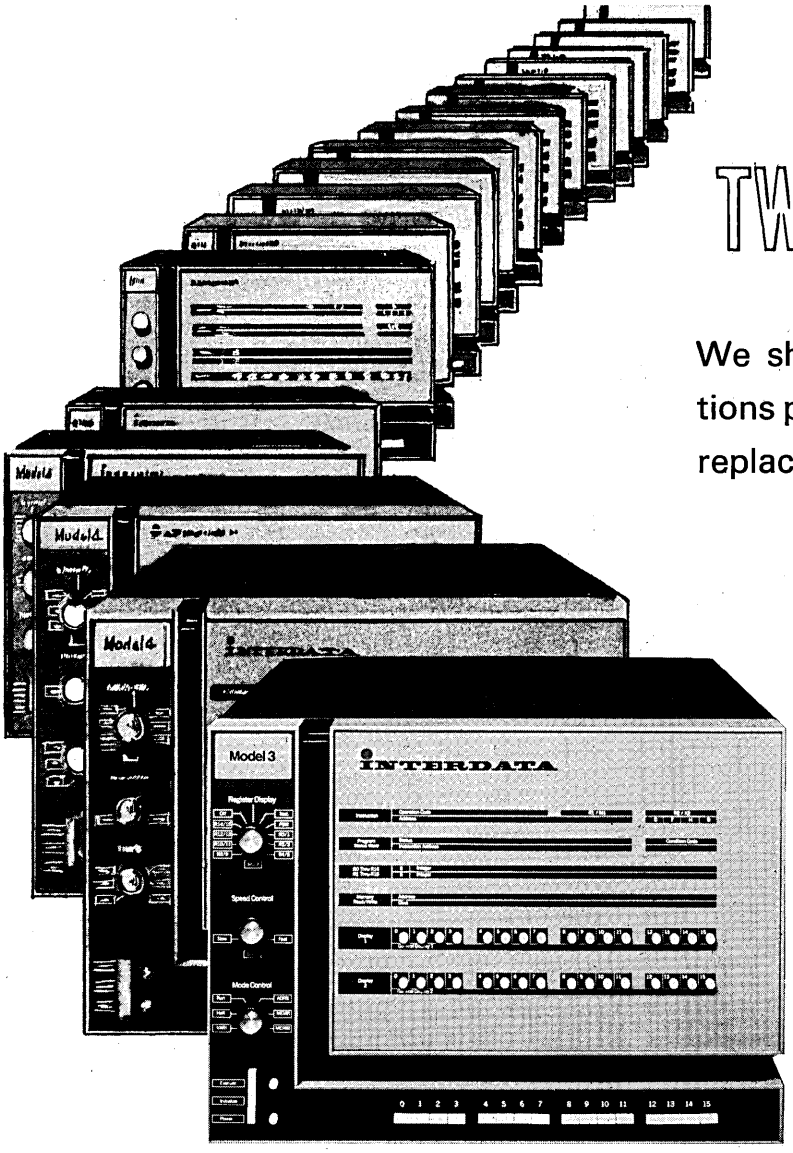
Problems that may arise when preparing new data or modifying old data in order to implement a software package can be an added expense to the user, as well as presenting—sometimes critical—delays. With an inexperienced or busy staff, the time and money invested in unanticipated reprogramming efforts can represent a serious economic loss.

To avoid this situation, Bank A suggested a few guidelines that a prospective user should consider before purchasing a package. First, the bank's spokesman stated that a user should make sure the package is compatible with his operating system, and that the contract makes the supplier responsible for upgrading the package if additional releases of the user's operating system are issued between the time the package is ordered and the time it is installed.

Secondly, this user emphasized the importance of the buyer knowing enough about the language the program is written in to feel confident that he can make in-house changes. ("No matter how good the program is," said Bank A's dp manager, "the user will end up doing some of the work.")

File layout, he continued, is a crucial consideration. It should provide space for expansion, as well as room for all presently needed data. Bank A's own experience with McDonnell's CILS is instructive on this point. The file, as defined in the McDonnell program, contained 50 blank positions on each record—each capable of holding one alpha or two numeric characters. Subsequently, the bank added some data not specified in the program: branch bank code, zip code, and a lengthened name and address code. Without the original room for expansion, these changes would have required considerable reprogramming.

The conversion at Bank A took two months to complete; although the dp manager reported that the installation went "extremely well," the bank did have to write its own conversion program because the one offered by McDonnell was considered inadequate. The two-month period to convert and test the files, however, proved to be the average



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amount of time allotted to that procedure by all the users interviewed except the railroad and Bank B. Using ADPAC and McDonnell's Installment Loan Accounting packages, respectively, neither of these companies found any file conversion necessary.

The department store underwent several anticipated file conversion with its CSC payroll package, because some second-generation payroll files were involved in setting up the new system.

Few of the interviewed users experienced any problems with the actual installation of the packages. The department store, with a /30, a /40 and a /50, found the payroll package "a true third-generation system." The store did report some problems with tax routines, and a longer run-time than it had expected. (In the future, it plans to more carefully estimate the run-time.)

From the first, Bank B's Installment Loan Accounting package ran well. The bank was disappointed only with the report generation, believing the program in this aspect did not fully use the possibilities offered by 360's. In evaluating future programs, the bank plans to look for improvements in the generating of reports and more effective use of spooling.

The users were also questioned on the quality of the documentation—systems, program, operations, users' manual, etc.—that was supplied with the system, and if it was sufficient for the user to make modifications or correct bugs himself. Generally, the response to these questions was favorable. The food franchiser noted that the explanation of error messages was a good part of MARK IV's documentation. Bank B, which described McDonnell's documentation as good, found it was capable of doing its own debugging, as did Applied Data Systems' two ADPAC clients, Bank D and the railroad. The store reported CSC's system and instruction documentation on the payroll package was good; but because it was the first user of this package, the program documentation was a little late for its purposes, and control procedures were "practically void."

"You see, Chief, the communication explosion will make your people and my people electronic neighbors."
©DATAMATION

Bank A was "very satisfied" with McDonnell's documentation and support on CILS, although it had to write a substantial part of the training manual itself. The bank, which modified the program extensively and arranged the marketing agreement, and has substantial in-house programming capabilities, did not depend heavily on McDonnell support.

Bank C, which worked closely with Information Sciences to develop GRS for its own purposes, had to supply some of the documentation itself, but considered this "unavoidable." The manufacturer, which found CSC's EXODUS documentation to be "poor," was pleased with the documentation provided by Applied Data Research on AUTOFLOW, which included general information manuals, information on operation, and job control cards for various computers.

The questions referring to the vendors' on-going maintenance support revealed differing arrangements. In the case of ADPAC, an additional fee for maintenance is added to the cost of the package. Information Management's contract with the manufacturer requires IMI to maintain the DETAP program for one year, and to continue to update the system until all promised features are incorporated. Applied Data Research will correct any bugs in AUTOFLOW that are its fault, as does McDonnell in its installment loan package contract with Bank B.

Bank A suggested that there should be an open-ended contingency section in the contract that establishes responsibility for breakdowns after acceptance. The bank's dp manager stated that although most suppliers will reprogram if presented with "satisfactory proof" that the problem was their fault, this proof should be defined, and the buyer should receive, in writing, a commitment from the supplier as to how soon he will respond when called, and the technical competence of the person he will send.

The users were finally asked how the system performed in production, and if it had met their original expectations. Their responses indicate that only a few problems were encountered. The department store discovered that its payroll program had great difficulty handling cash vouchers; Bank B had to modify the report generator on the installment loan accounting package, although the package did perform well in all other aspects in production.

The pleased restaurant franchiser remarked that 15 minutes after an Informatics' representative put the tape on the machine, MARK IV was installed in his system; also, before the six-month deadline for an operational system had expired, the franchiser had already developed eight applications for its five divisions.

Success was also experienced by Bank A: in the seven months it has been using CILS, no bugs have developed. And the manufacturer described AUTOFLOW and DETAP as "running well"; it also finds performance on EXODUS I and II good. EXODUS I reportedly does 75-85% translation; II, 80-90%.

The only major production woes were Bank C's. Despite all the work that went into programming, documenting and training, its GRS was still less than perfect when the system went into operation. During the following six months, said the dp manager, "we had to contend with up to 100 pages of error messages a week." Operations didn't suffer as much as this statistic would suggest, though, because the old system was being operated in parallel with the new one. No extra people were hired to service the two systems, however, and as a result, there was less time avail-

able to debug GRS, and the job took longer than it might have under other circumstances.

After the first six months of operation, the GRS error load was down to a dozen pages a week or less. Bank C and vendor Information Sciences did the debugging of GRS jointly, and the bank commented that it is satisfied with the help it got from ISI. It also feels that the work it put into the system was justified because the system has produced substantial improvements in operating efficiency, and, Bank C believes, will produce even greater benefits in the future. "We have barely begun to explore the program's capabilities," remarked the dp manager.

So, we asked the eight users in our sample, do you feel you got your money's worth? Suppliers of software packages and prospective users will both be encouraged to know the response to this question was a unanimous "yes."

suggestions

Most of the users agreed that they would be willing to consider purchasing other software packages if and when the need arose. An exception was the department store; it stated that it now would be more economical to write necessary programs in-house, unless a program could be found that would require no modifications of any kind. The store recommended that package buyers "rent" a representative from the supplier who has an intimate knowledge of the purchased program to work with the user's team until the program is operational.

When asked what advice it would have for companies considering purchasing software from an outside source, Bank A suggested that no package should be purchased until the buyer has seen a live demonstration, preferably on his own equipment. Also, this user noted that it is in the buyer's interest to haggle over the acceptance period—i.e., the time that elapses between package delivery and package payment. About 30 days is a bare minimum; 60 days, said the bank's dp manager, is probably attainable if the purchaser asks for 90 to begin with and doesn't give up too quickly. The bank concluded by stating that it preferred to do business with a package supplier who operates a service bureau. This gives the supplier experience with problems at the application end, and may provide him with a better understanding of a specific user's operations—information that can be used to hone the program into a better product.

Many recommendations were offered by the electronics manufacturer, the most experienced package user in the sample. It advised a prospective buyer to survey the market and assign personnel who understand the problem to conduct a systems analysis of the available programs. Attention should be focused on performance of benchmark programs; training, maintenance and documentation offered by the vendor; and experience of the people in the vendor firm. The manufacturer also suggested that the company advertise within its own firm to encourage employees to use the program (when applicable, as with AUTOFLOW). Finally, this user issued a warning about certain generalized packages that are marketed: users should be careful to see if these programs were developed for second generation equipment and then updated. If so, some inefficiencies may be present.

Bank B added that while it definitely plans to consider the purchase of additional packages, it intends to exercise more caution in future evaluation processes, particularly when examining the documentation. "Know what you need and want," summarized the food franchiser's dp manager, and then—"compare and go." ■

A USER LOOKS AT SOFTWARE

by ARTHUR C. NESSE

It was only two or three years ago that the word "software" began to have any meaning in normal business parlance. About that time, we began spending staff time and money at Ford Motor Company to investigate the relative merits of software available from various computer suppliers. When money is spent, it is usually necessary to develop some type of definition of the activity involved. I remember, with some embarrassment, one definition of computer software. It went something like this: "Software is the computer programs which the computer supplier builds into the equipment so that the equipment will accept application programs developed by company programmers to do company work."

As of a few years ago, this definition of software was valid for virtually all computer installations servicing the commercial or business user and for most engineering-oriented installations as well. Management lives with the idea that software is an accommodation the computer supplier provides his customer when the customer selects his particular machine.

Computer users now realize that software is 50% or more of the bill for a computer. There are more meaningful differences between software systems than hardware capabilities and software thus deserves a far more critical and discerning analysis than the hardware itself. Moreover, it deserves attention not simply in computer selection but in the design and implementation of each major computer application.

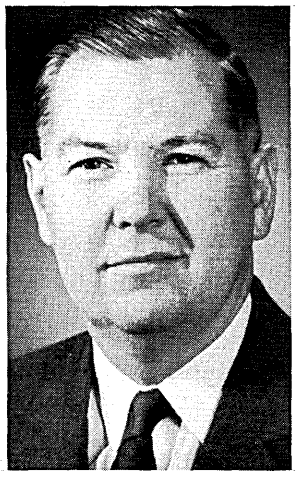
Let me illustrate the supplier-to-user relationship on software by an analogy. Each year, Ford-U.S. buys some 20,000 or so reels of magnetic tape. We are now in the process of attempting to select a supplier to provide the magnetic tape requirements. To the surprise and chagrin of Purchasing, it is all but impossible to develop a set of technical specifications for magnetic tape, obtain competitive bids, and buy quality-monitored tape from the lowest qualified bidder. The potential suppliers are so close to the computer environment that they insist on including in the price of the tape the services of analysts to evaluate the quality of the present tape, to establish tape library procedures, and to provide continuing "guidance." Some suppliers want to provide magnetic tape on a rental basis. Most of the proposals include fairly elaborate provisions for testing, cleaning, recertifying, etc.

My comments on magnetic tape only show that in the presumably sophisticated world of computer users, a set of objective standards for magnetic tape has not been developed. Our friends in Purchasing who are working with us think it is high time computer people catch up with the people who make paper boxes, electrical wires, or universal joints.

You may be thinking at this point that the relatively orderly relationship which we at Ford are moving to in magnetic tape procurement is a pattern for future user-to-supplier relationships on computer hardware and software. Perhaps we do aspire to it, but the number of problems involved in what superficially appears a simple matter of tape selection are trivial compared with the problem of establishing relationships in buying computer hardware and software on an equivalently specific level. This does not mean that some degree of order is not emerging.

changes ahead

The software-oriented data center or similarly advanced user will soon be in a position to specify and buy advanced hardware to its software specifications. These operations will be able to update and adapt software to new equipment without obsoleting application programs. The converse of this relationship has, of course, existed for years—that is, software is specified and purchased for a particular configuration of computer hardware or for a family of compatible hardware.



Mr. Nesse is manager of the computer planning and control department, systems office, Ford Motor Company. He has been active in various aspects of computer work there since Ford installed its first large-scale computer in 1956. He has a BA from St. Olaf College and an MBA from the Harvard Business School.

It's no longer news that computers are the fastest growing segment of American industry and software is the fastest growing sub-segment of the computer business. The value of computer shipments in 1966 was less than $4 billion. Looking ahead, we are told that the market for computers will be $10 billion, perhaps by 1970. In the 1960's, hardware represents approximately 60% of the value of computer shipments. By 1975, the Stanford Research Institute tells us, the value of the hardware component in computer shipments will decline from 60% to about 30% or 40%, and the value of software will grow to the complementary 70% or 60%. From other sources, there are serious estimates that in the early 1970's the value of hardware as a percentage of the value of computer shipments will represent as low a dollar factor as 10% to 15%.

In my story about buying magnetic tape, we noted that Purchasing objected to the service tie-in value of perhaps 10% to 20% of the total contract price for tape. Their objection was that a service ingredient in any business relationship should be identified and bid separately if at all possible. When computer hardware and software relationships are better understood, it is improbable that Ford or any other large company will be willing to spend about ¾ or more of its computer dollars for software obtained as a service appendage to a computer hardware selection.

Computer users will all accept the generalization that computer supplier-to-user relationships are changing. In order to develop a skeleton around which to build a meaningful thesis, I decided to go back to the classics. Aristotle's analytical technique was built around making a set of observations and, having made these observations, he had a passion for classifying them. The essence of his procedure was first to ask questions or observe data; from this he hoped to discover some general theory or set of classifications or meanings which would explain or, in his words, "rationalize" the data.

Towards the rather monumental task of trying to rationalize an inherently irrational subject such as software, I intend to propose a number of questions and offer some answers and comments on each. If the classifications and comments bear any fruit—that is, if they do indeed rationalize software in today's computer world—my hope is that this document might be found on dusty book shelves some years from now alongside one of Aristotle's lesser-known, but nevertheless important, works. The Aristotle work which may best relate to today's software world is a compendium of life and practice in early Western history appropriately titled "The Customs of the Barbarians."

Without defining or classifying software except to exclude application programs, we improve our understanding by discussing some basic questions.

Who pays for software? The answer—the user. Consciously or unconsciously, directly or indirectly, the user pays for software.

Who specifies software? First we have the computer supplier. Within the supplier's organization you have the push and pull of professional software experts, hardware experts, and marketing or sales people.

Next we have the government, both as the largest user and a user slavishly given to writing down contract terms and conditions. Governmental agencies and semi-governmental agencies such as USASI are important in setting definitions and standards. Finally, the beleaguered user may have some say on software specifications indirectly, in most instances, through supplier user groups. The user, however, will usually have his say on specifications only if he develops it himself or buys it from a software house.

It's worth noting that the people who decide what software specifications should be will not necessarily implement software. Software is implemented (produced if you will) by the supplier, by colleges and universities, and by software companies on contract with either a supplier or a user. Then, too, the user may do it himself.

Who "debugs" software? Self-evidently, the implementor should "debug" his software. He may be the one who is supposed to debug it, but the one who *really* does the job is once again the one who ultimately pays for it—that is, the user.

Who maintains software? Here the answer is the supplier, the software company, or the user, but not necessarily the implementor. As to software maintenance, software is like babies. It seems that every red-blooded computer man from operator and programmer to systems manager wants to conceive it. Like babies, however, it is very, very difficult to find somebody who wants to maintain it or take care of it. If you want to draw the analogy one point further, I would say that most software is born prematurely. A premature birth can grow into a living and thriving member of the community if kept in an incubator. Unfortunately, some excellent software dies an untimely death because it is born so early that no amount of incubator care can enable it to sustain the initial exposure to the world.

What does the user look for in software? Most users would agree with the following items in approximate priority order—comprehensibility, operability, enhancement without adverse feedback on existing standards and practices or reprogramming, and finally, computer efficiency of applications programs.

Somehow it ought to be possible to develop software in such a way that, when the software is changed, it does not feed back to obsolete existing applications programs. Particularly, it should be possible to develop new operating systems without requiring the user to spend time and money to adapt existing work to new software. When working applications programs must be modified in order to achieve the performance offered by new operating systems, the users have a very legitimate complaint against the people who supply the software.

Ideally speaking, once the user has an application program that runs and accomplishes its objective, he should be free from having to adapt and modify his program for any changes in supplier software. One reason for the establishment of software activities by users is to make an effort to insulate the applications environment from the vagaries of software as developed by suppliers or by software houses.

classes of software

Keeping in mind the objective of looking at software from a number of points of view, we now arrive at the point where it is necessary to differentiate among various classes of software. I propose five general categories: Interface, Utility, Hardware Control, Nonprogrammer Systems, and Standard Application Packages.

For each of the general categories of software, it is worthwhile to look again at the general questions as to who specifies, implements, and maintains each.

Interface Software. This includes the assemblers or compilers necessary for interaction between the applications programmer and the computer hardware. In general, these routines are written by software experts familiar with the hardware and are coded in machine language. There is a trend for such software to be written in a higher-level language, possibly a specialized language for software. Nevertheless, even a high-level language designed for writing software still requires some type of machine-level "handles" to act as interface to the hardware.

Assemblers and compilers basic to a computer will probably always be the basic responsibility of the computer supplier. This does not mean that the software that the supplier releases becomes the software which the user chooses to adopt. For commercial applications, Ford has a subset of COBOL for its particular environment. This subset is com-

pleted for machines of 65K and under and goes under the title of FOBOL 1. We are developing a subset of COBOL for large-scale machines. This is called FOBOL 2. It is only a small step between specifying a standard subset of COBOL and developing significant extensions of COBOL particularly useful to Ford's environment.

The reason for Ford action on COBOL compilers is to attempt to minimize the use of clumsy or inefficient statements and to preserve a reasonable degree of machine independence between suppliers. In one case, it required the change of some 300 statements to convert a COBOL program from one computer to another. This program was not developed to FOBOL specifications. We went through the 300 changes, however, and found that only four changes would have been required if FOBOL standards had been adhered to.

We see a new relationship emerging between the computer supplier and the computer user. In the past, the relationship has been between the supplier's systems engineer or software specialist and the applications programmers. In other words, the systems engineer trained the applications programmers and provided the service, assistance, and advice necessary to develop and install productive applications programs.

When a company starts to develop subsets of a programming language and applies this to a number of computer suppliers, it automatically transfers the technical relationship with the suppliers to a special group of qualified systems programmers within the user's environment. I believe this is a fortunate development—as much for the computer suppliers as for the companies that use computers. The establishment of technically competent groups within a user's environment to interact with computer suppliers places the training and communication burden where it belongs—that is, within the company. It frees the supplier of a significant amount of time and cost as well as responsibilities which are difficult to acquit.

The function of establishing standards and providing training for applications programmers is one that is taken on very grudgingly by users. Nevertheless, the testing and acceptance of software offerings, the establishment of software standards, the development of good programming and documentation practices is something which the user cannot and should not deputize to the supplier.

Utility Software. This classification includes such items as sorts and merges, table manipulation, input/output routines, and some general-purpose communications packages. Here, I imagine suppliers in the computer business have some rather difficult trade-offs to meet. An adaptable and generalized utility routine can be written in a high-level language. However, this flexibility usually cannot be preserved without sacrificing the competitive throughput capability of the various utilities. Particularly damaging is the fact that a large amount of machine comparison benchmark work is based on utility routines, usually sorting. Therefore, compromises in the speed-performance of the common utilities often will place one machine at a disadvantage vs. another machine.

As users, we feel very much on the spot in making reasonable judgments of the value and productivity of the utility routines available. In general, comprehensibility and usability are more important than a profusion of offerings. The necessity for multiple weeks' training of specialists to comprehend the various packages is definitely a negative factor.

In the "utility" family of software, I believe the role of the supplier will diminish. I believe we will see utility routines developed by users for their environment. For many standard offerings, we are told to expect "firmware" rather than "software." Someone has projected that inexpensive and dependable hardware with built-in programs will replace troublesome software for many common functions such as input/output control, sorting, merging, etc. As time goes by, users and software houses will develop utility routines for a particular environment which are more simple to use, more efficient as to machine time, and better documented than general-purpose utility routines available from the computer supplier.

Hardware Control Software. This includes the so-called executive and operating systems. We already see extensive cutting and choosing by user technical groups and extensive user adaptation of the operating systems provided by the computer suppliers. If such systems could be built modularly to facilitate the pruning of non-relevant functions by users, it would be helpful. Even for relatively standard communications functions such as line control, the user remains pretty much on his own. Adaptation of so-called standard communication packages may often cost more than a new development from scratch.

In general, the investment in hardware operating systems is probably too great to expect fundamental development by users who run their own equipment. In the operating systems area, though, we will see a cutting and trying and adaptation continually applied to general-purpose offerings. Accordingly, the maintenance functions of the operating systems, I think, will inevitably become a part of the user environment with only the developmental and general-purpose responsibility continuing with the supplier.

Software in this category affects the user intimately; it may actually dictate the method of operation in the shop and may help or hinder the design of application programs. It also is perhaps the most demanding of the user in terms of training and computer knowledge. I don't know if it's harder to develop a compiler or an operating system or if any generalizations apply. If, however, operating systems are the hardest to develop and maintain, it's a relevant item that this is the area where the user is most on his own.

Nonprogrammer Software Systems. Through new families of software systems, people are gaining the capability of using a computer without the necessity of learning how to program. In general, a programming language such as BASIC, conversational FORTRAN, report generators, and many so-called data management systems for storing, retrieving, and classifying information are intended for use by nonprogrammers. There is little doubt that in the next couple of years we will see extensive use of large-scale computers directly by nonprogrammer users.

At Ford we have one of the largest time-sharing systems in the country. The system is serviced by some 200 terminals located throughout the United States and some are connected overseas. While this was developed specifically for problem solving rather than for data processing, the acceptance and use in the administrative and financial environment has been impressive.

Ford has also purchased a commercial data management system and literally hundreds of nonprogrammer employes are learning to use the computer directly with only a few days of training.

The forecast of a $10 billion computer market which I referred to earlier was accompanied by the estimate that equipment for multi-access use of computers will be $6 billion out of the $10 billion market. The projection also showed that the greatest growth in the multi-access market will be for business and financial management purposes.

There is little in the multi-access computer environment which will erode the systems already in operation. We can assuredly look forward to an increase in conventional batch processing work for many years to come. Terminal orienta-

tion—or perhaps we should call it the multi-access environment—is essentially a brand new method of computer use. The installation of multi-access time-sharing terminals did practically nothing at Ford to slow the growth of batch processing work of a scientific and engineering nature. I believe that the same pattern will develop in the business environment. Just as the engineer or engineering analyst is able to go to the console to call out standard programs or to develop his own programs in order to solve a particular problem, the financial analyst and clerk will be able to use the computer for large areas of work not suitable with present techniques.

The principal growth in easy-to-use English language programming is probably going to come from the data centers at the large companies and from commercial data centers. Computer suppliers who can place their machines with the leading data centers will undoubtedly have a significant advantage in placing their machines with users.

As nonprogrammer types of software come into day-by-day use, software will finally become fully user-oriented rather than machine-oriented.

Standard Application Software. We can look back as far as 10 years and see very significant efforts to develop standard-purpose packages for such items as accounts payable, accounts receivable, payroll inventory, etc. Few of the efforts have lived up to their advance billings. Some major efforts are continuing today for inventory, insurance companies, reservations, etc.

Usually, projects to extend programmed applications between divisions in a company or between companies have been very, very disappointing. This is because the extent of nonapplicability to a particular activity has been too great, general-purpose applications consume too much computer time, or the programming economies gained by use of the general-purpose package have been too small. The transplant of applications packages has an important role to play within a company. It may also have an important role to play between companies, but only for a limited number of specialized applications.

Except as a sales tool and for specialized areas, the standard applications are not expected to be an accepted function for the computer suppliers to develop, install, and particularly not to maintain. There is, however, an important role in this area for internal systems activities in a large company and for the independent data centers which are in a position to develop and sell proprietary packages including operational computer service.

where we are going

User-Supplier Relationships. In smaller companies, the application programmer still faces the computer supplier's systems engineer. The systems engineer advises him of the language to use, the operating system applicable, programming techniques, utility programs to select, etc. The role of the computer supplier has now changed in the larger companies. In the larger companies, the supplier's systems engineers face a systems programming group, or at least a technical interface group which reviews the software offerings, the hardware offerings, and makes the decisions for a group of applications programmers. We thus see the supplier systems engineer usually removed at least one step from the applications programmer.

In the scientific and engineering environment, we have already reached the point where the user controls and, to some extent, develops software. Computer programmers, except for those full-time in software work, are only incidentally experts in coding the computer; they are generally mathematicians, statisticians, or engineers with computer capability to give advice and assistance to the problem-oriented user. As time goes by, we can expect to see a similar trend among commercial and business users.

Thus we arrive at the rather unsurprising conclusion that the user who pays for software will increasingly assert his rights to call the tune in development. Little by little, the more advanced users will grow unwilling to pay for software and hardware as a common lump. They will buy the two separately and selectively based on local requirements and economics. What the advanced user does today, we can expect the rest of the industry to do a few years hence.

Advanced Systems. The key items in virtually every major new systems plan are two—communication and mass storage. In automotive systems, when a customer orders a car, it becomes the immediate and direct concern of a host of activities—the sales forecasters, the assembly plant, the in company and outside suppliers, the dealer, the distribution group, the accountants, the finance company, and even those who follow up on customer satisfaction and take care of warranty costs. The hierarchy of relationships which, of necessity, is sequential in nature, has been greatly speeded up and rationalized by computers. We have had considerable success in "integrating" the work—that is, building one system so it feeds a derivative system, etc., on down the sales, production, and distribution cycle.

In automatic system development the so called "data bank" approach offers the possibility of establishing a single record for the initial transaction on a vehicle and appending to this base record all of the informational requirements of various organizational components affected. On-line status inquiry throughout the entire cycle is conspicuously desirable. This data bank approach is relatively simple to conceptualize, but infinitely difficult and expensive to implement. For this reason we will see, and we are already seeing, these individual areas of the vehicle cycle being built into a series of related data banks. Despite the difficulties involved, the trend of large-scale systems development lies in the general direction of data banks and hardware and software with on-line inquiry and retrieval capability.

The communications-oriented data bank systems evolving from current batch systems are planned and implemented by the professional systems expert and the programmer together with hardware and software support. The volumes of data and high cost involved dictate such action. There is, however, a family of commercial computer applications which are the equivalent of the engineer's problem-oriented environment typically solved by the user directly with a time-sharing console. This area has potential for computer use relatively untouched by the typical batch data processing environment. Commercial business time-sharing in an interactive mode calls for new software, particularly in data handling capability, new terminals, extensive communications, and provision for data storage and retrieval. It's the next computer frontier and the commercial data centers are racing to see who gets off the starting line first.

We will see conversational COBOL or its equivalent. We will see inexpensive but powerful terminals with capability to balance and edit computer input, store and retrieve data and interact with a central computer with no programming capability whatever required of the user. We will see the data management systems which store and retrieve information from computers—essentially by posting forms and following instructions. We will be able to store and retrieve information in computers, combine totals and develop analyses by doing nothing more complicated than the analyst must do to develop a spread sheet and operate a key driven calculator.

Someone said after being first on the list to use a new software package, "I've had my last first." There will be many software "firsts" in the next few years. Each computer supplier, each software house, and each user will be driven to a series of firsts within his own environment. Those who are afraid to take their turn are already going backward. ■

COMPUTER COSTS IN CANADA

where it goes

by V. W. RUSKIN

Many helpful tabulations of computer hardware features and costs are available, as are surveys on computer use and costs, which involve opinions or subjective judgment, or are restricted to a small select group of manufacturers. The author has long believed that there remains a need for objective and basic statistics about all types of computer users' costs, staffing and utilization. This belief was reinforced when it was found that large (over 50%) differences in costs and staffing can exist even between similar-sized companies in the same industry, undertaking similar data processing applications.

A comprehensive survey of computer users' costs, staffing and utilization was therefore initiated by the author last fall. The survey was conducted by the Industrial Engineering group of the Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada. The University also contributed the computer time necessary for detailed analysis of the results.

Some 2,000 questionnaires were sent to a cross-section of North American edp users. The information was requested on an anonymous basis, and the questions were specific enough to uncover costs of equipment and staff by industry, size of company, type of applications, hours of use, etc.

results as bench marks?

In view of the large sums expended on edp, top management of many companies would dearly like to know how their edp costs, staffing, and extent of applications compare with those of similar organizations undertaking similar applications. The question is: Can a survey really provide a meaningful yardstick? The author believes that, while comparisons with survey results cannot by themselves indicate anything either good or bad, they can serve as flags, just like budget variances, and lead to *explanations* of relevance to management. At best, a higher than average cost may be easily explainable in terms of the increased benefits obtained from a wider range of computer applications. A lower than average cost might be explainable by outstanding efficiency but, on the other hand, perhaps the explanation lies in failure to implement potentially profitable application areas.

To make the survey more meaningful, results were sorted by country, by industry, by annual sales or revenue, by number of customers or accounts, and by other relevant factors.[1] To provide a measure of the actual "spread" experienced, the survey results show a lower quartile, a median, and an upper quartile, where practical.

Costs and staffing will naturally be influenced by the extent of the edp functions and applications undertaken, and the survey therefore includes application areas. It cannot be expected that the cost of advanced and specialized computer applications used by different companies would be comparable. On the other hand, standard accounting or standard commercial applications could be fairly comparable between similar companies. The detailed analysis of survey results therefore also includes a proration of each

[1] However, sorting is deliberately limited in such a way that all results will remain anonymous, so that no company can be identified on account of its unique size or position.

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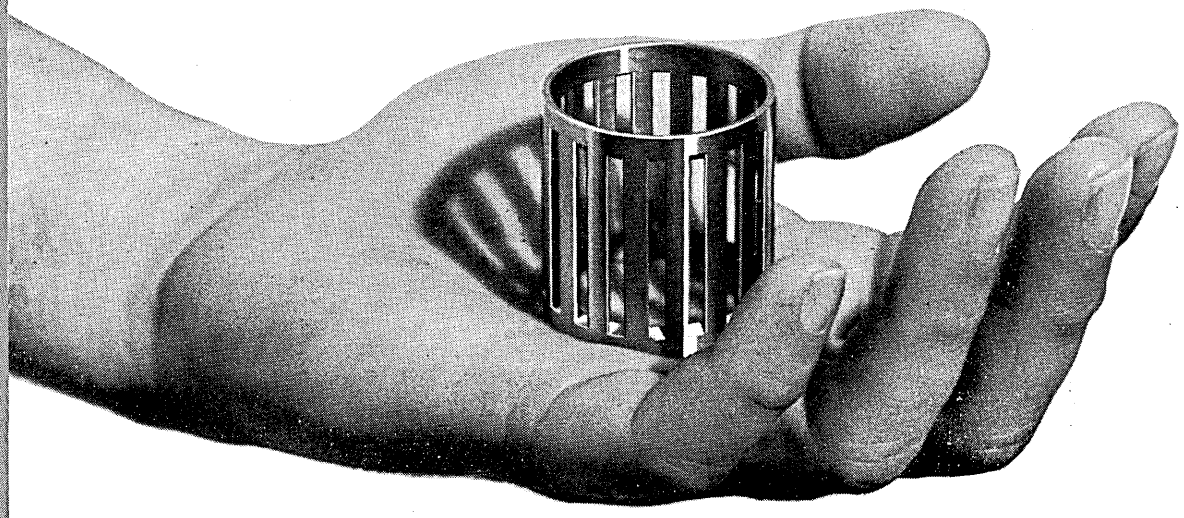

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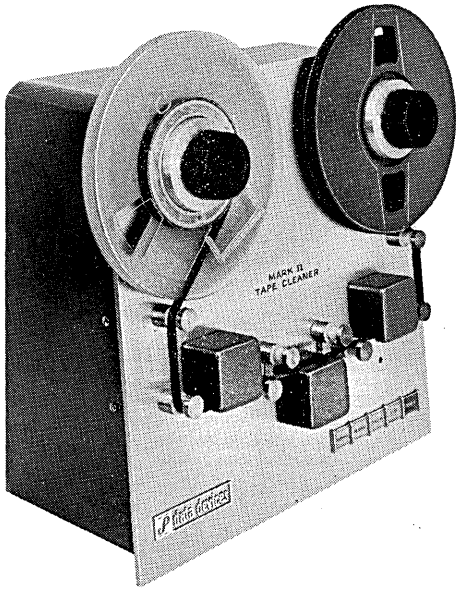

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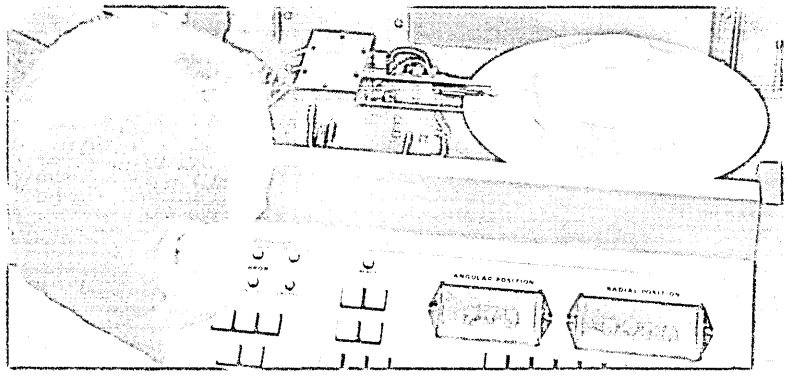

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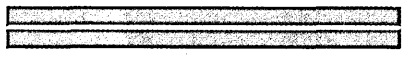

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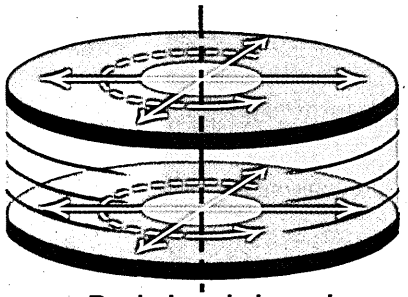

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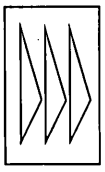

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company's edp costs in accordance with hours it spends on standard accounting applications processing in an attempt to develop some kind of edp cost bench mark for standard accounting applications.

survey forms used

The survey forms used were designed for computer tape sorting and analysis. Hundreds of different types of analyses are possible, but the key analyses cover seven main topics:

1. Location
2. Industry
3. Company size: Revenues, Customers, Employees
4. Direct edp costs
5. Number of edp staff
6. Application areas
7. Equipment.

In addition to the quantities shown on the survey forms, the following items are computed for analysis:

Equivalent annual cost of purchased equipment[2]

Breakdown of edp cost components, in dollars and percentages

Breakdown of edp cost components in terms of edp cost per $ million sales (or revenue)

Breakdown of edp cost components in terms of edp cost per customer (or account)

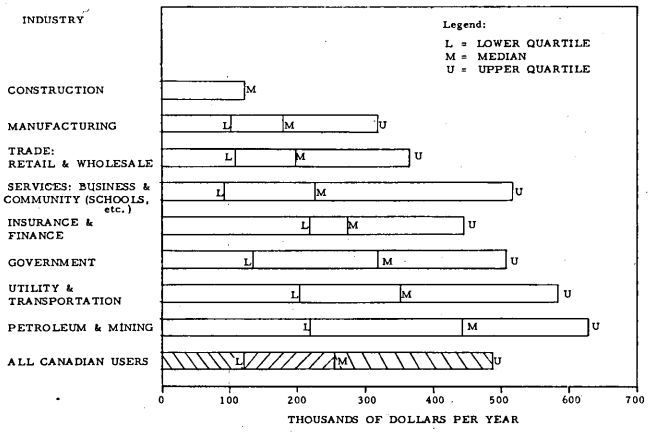


Fig. 1 Direct edp cost (equipment, staff, materials and other) by industry.

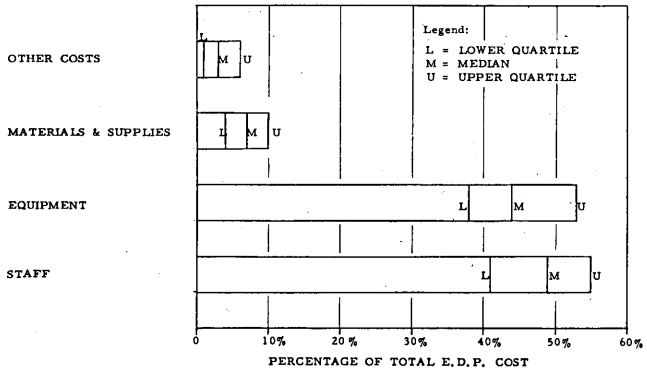


Fig. 2 edp percentage cost breakdown.

Percentage of users reporting different applications or types of equipment

Prorated cost of each application per $ million sales. This was obtained by prorating of total edp cost per $ million sales for each company, according to the percentage of the total hours used by each company for processessing each application.

The survey was originally confined to Canada, where in 1966 there were about 1,000 computers used by about 800 organizations, each of which was sent a set of forms. The response was excellent. Replies from over 200 companies were received.[3] On a statistical basis, the results can therefore be expected to be representative of three quarters of all

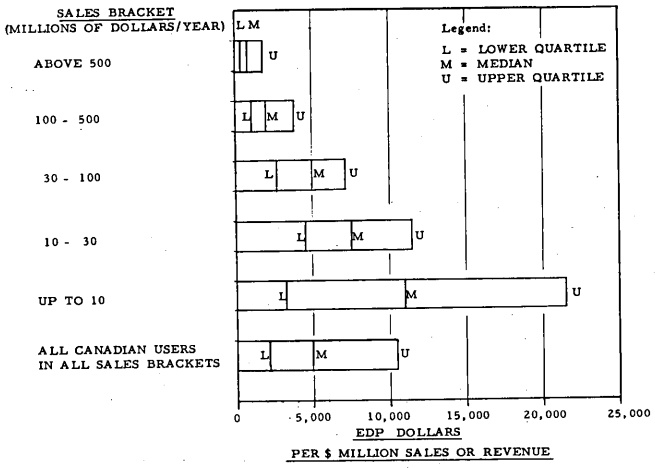


Fig. 3 Direct edp cost (equipment, staff, materials and other) per $ million sales or revenue.

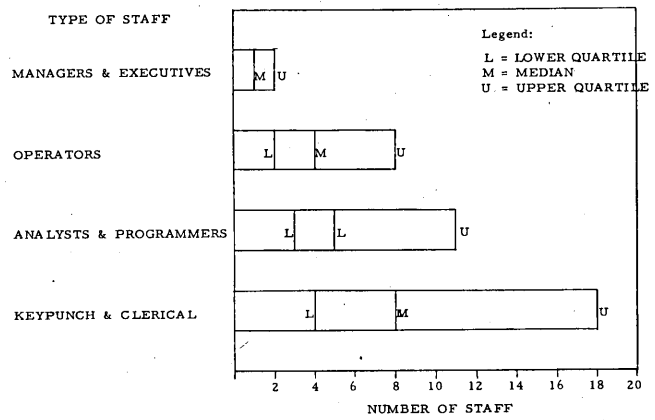


Fig. 4 Staff numbers by type.

Canadian computer users, with a 95% level of probability.

We received many letters endorsing the concept of the survey and numerous requests for detailed results. A number of companies also submitted helpful criticisms and comments, from which it appeared that the two-page survey form was somewhat too elaborate, and that the application areas surveyed were oriented a little too much towards manufacturing. These comments will be considered in any future surveys.

need for u.s. survey

The survey was next extended to the U.S. to get a meaningful comparison between Canadian and U.S. users. Also, it was believed that U.S. computer users would find the U.S. survey results helpful in providing factual and objec-

[2] Purchased equipment costs have been converted to an equivalent annual rental, using a discounted cash flow method with a 6% interest, and a 10% resale value at the end of a five-year life.

[3] A total of 394 computer survey records were obtained from Canadian computer installations, because many firms had several separate computer installations. Each separate installation was treated as a separate record, and another record was created for the company total in cases where a company had more than one computer. Not all companies completed every item of the questionnaire, and this accounts for the different totals of records shown in the detailed analysis of various items.

tive statistics about edp costs, staffing and utilization in the U.S.

Earlier attempts to compare Canadian with U.S. users had been handicapped because no really comparable data was available. In 1967 the Canadian Institute of Chartered Accountants made a survey of the computer application areas of 56 of the largest Canadian investor-owned corporations, including organizations other than manufacturers. They then compared it with a U.S. survey involving 33 U.S. manufacturing companies, which were selected on a quite different basis, sales growth and return on investment, rather than mere size. It is doubtful if such a comparison between U.S. and Canadian companies, selected on entirely different bases, can really be meaningful.

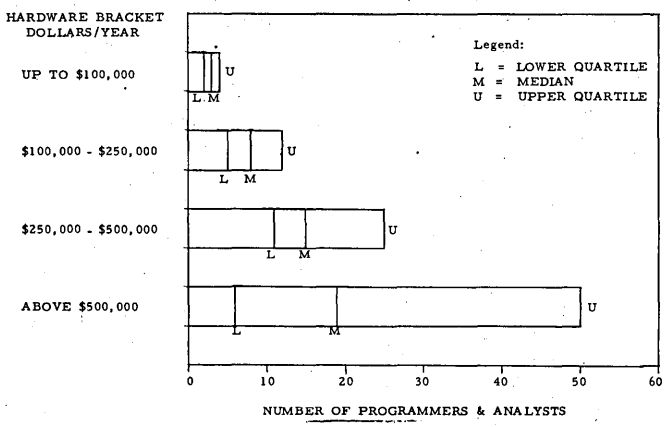


Fig. 5 Number of programmers and analysts by hardware bracket.

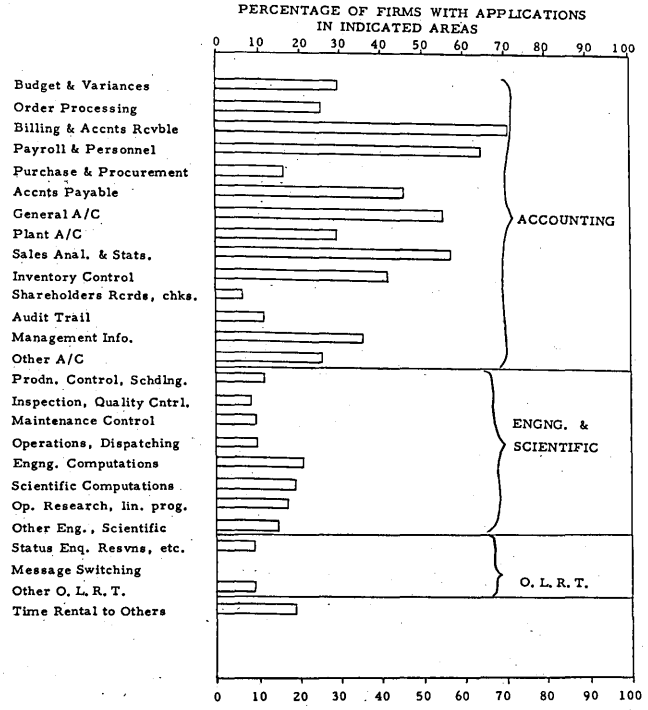


Fig. 6 Application areas.

Further, no one can be sure of the assumption, implicit in earlier U.S. surveys, that the edp costs and practices of the industry leaders are appropriate bench marks for the average U.S. company. To what extent would edp costs and practices, entirely suited to say General Motors or IBM, still be appropriate if applied to the average U.S. company, especially one that is not a manufacturer? More basic statistics about a representative cross-section of U.S. computer users would aid in answering that question.

The present survey should also be helpful to the average U.S. computer user. A bench mark used in earlier U.S. surveys was the direct edp cost per $ million sales. An overall average of $5,600 was quoted in a recent survey of 108 leading manufacturers, whose sales volume varied from under $50 million to over $10 billion. However, our survey shows that the edp cost per $ million sales goes down rapidly with increasing company sales volume, as might be expected from economies of scale. It may therefore be misleading for U.S. companies of widely differing sales volumes to use the same $5,600 industry average as a bench mark.

In short, a great deal more basic and objective statistics about computer users' costs, staffing and utilization would be of value to the average North American company or organization, especially one that is not engaged in manufacturing.

summary of canadian results . . .

The results of the survey and analysis of Canadian users are summarized here. They may be of general interest since our replies to date from U.S. users seem to indicate generally similar patterns, although it is too early to be sure.

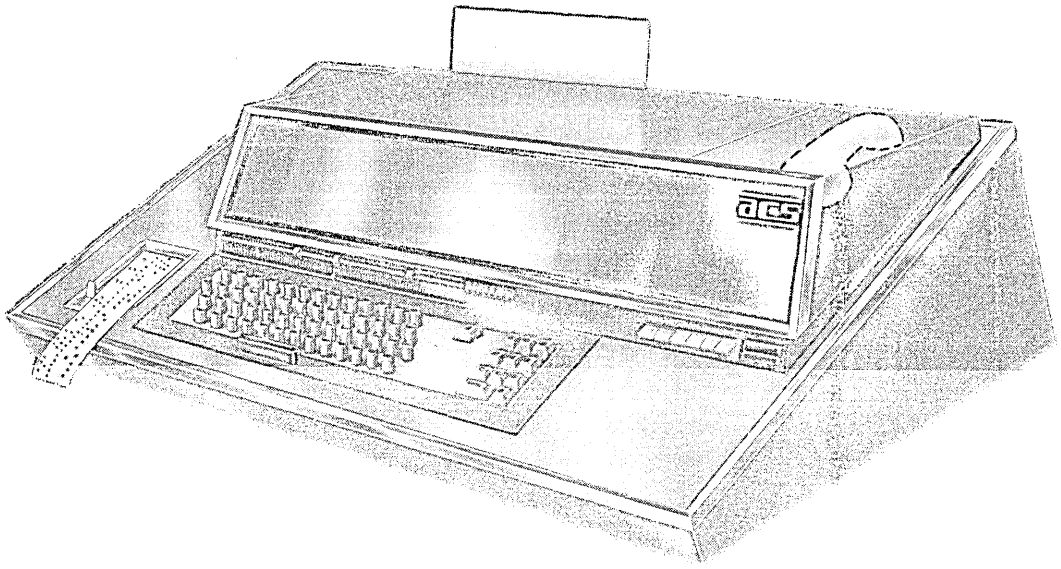
The survey data has been subjected to detailed computer analysis in over 150 different ways, or combinations thereof, e.g., by type of industry, by number of customers, by dollar sales or revenue, by total costs, by equipment costs, etc. Space limitations permit showing only summarized results. (Detailed results for Canadian users in various industries are available in booklet form from "Computer Survey," Dept. of Mech. Engineering, Univ. of British Columbia, Vancouver, B.C., Canada.)

direct edp costs

The direct yearly edp costs (equipment, staff, material and other) are shown in Fig. 1 for various industries in Canada. The median edp cost is greatest for the petroleum and mining industry, and least for the construction industry. The median edp cost for a Canadian computer user is

Table I: Yearly edp cost per customer (or account); all canadian users

# Customers or Accounts	Lower Quartile $/Cust/Year	Median $/Cust/Year	Upper Quartile $/Cust/Year
Above 100,000	0.70	1.80	2.50
10,000 to 100,000	3.40	8.90	13.00
1,000 to 10,000	24.00	45.00	66.00
Average for all customer brackets	2.50	15.50	37.00



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about a quarter of a million dollars per year. Since there were over a thousand computer installations in Canada in 1967, it appears that well over a quarter of a billion dollars per year is being spent on edp in Canada.

Fig. 2 shows the percentage breakdown of edp costs into equipment, staff, materials, and supplies, and other. (These costs do not add up to 100%, because a company that has median equipment costs does not necessarily also have median staff costs, etc.) Staff accounts for around 48% of the total edp costs, and exceeds equipment, which is a close second at 44%.

A useful bench mark for analysis is the edp cost per $ million of sales (or revenue) for companies in different sales or revenue brackets. Fig. 3 shows that the median edp cost per $ million sales decreases rapidly with increasing company sales or revenue. The median edp cost per $ million sales, for a company with over $500 million sales, is less than one-tenth that for a company with under $10 million sales,

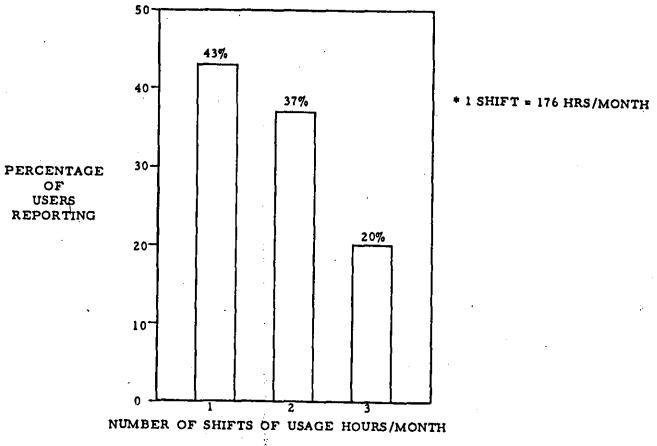

Fig. 7 Number of shifts (by hours/month figures).

obviously due to economies of scale for larger installations.

Analyses were also made of the yearly edp cost per customer (or account) for various industries, and for various numbers of customers. The results for all Canadian users are shown in Table I, and again show the effects of economies of scale.

further results

Fig. 4 shows the number of staff, by type, for all Canadian edp users. Production and operating staff (operators, keypunch and verifier operators, clerical and managers) account for about 70% of the total. The balance of 30% is made up of analysts and programmers, i.e., the software staff.

Fig. 5 indicates how the number of analysts and programmers grows with the hardware cost, i.e., with computer size. Surprisingly, it appears that there are no great economies in relative software costs as computers get larger.

The percentage of companies reporting the use of various types of applications was analyzed and combined into an application profile, as shown in Fig. 6. Similar application profiles were drawn up for each industry. Obviously, most Canadian computer users still have a long way to go to full computerization of various business functions.

The percentage of computer users working one, two, or three shifts is shown in Fig. 7. For the purpose of drawing this chart, it was assumed that one shift represents 176 hours per month.

Fig. 8 shows that over one user in ten reported having online real-time systems.

Fig. 9 indicates that one in five companies reported the use of an outside service center as well as their own computer, presumably because their own computer has insufficient capacity for scientific and engineering programs, or is overloaded.

Fig. 9 also shows that a substantial number of the companies utilizes outside kypunch services and outside contract programming.

conclusion

This paper summarizes the results of a searching survey of Canadian computer users' costs, staffing, and applications.

The survey in the U.S. is still continuing but unfortunately the rate of response has been disappointingly slow, as compared to the high rate of response in Canada. Editorial

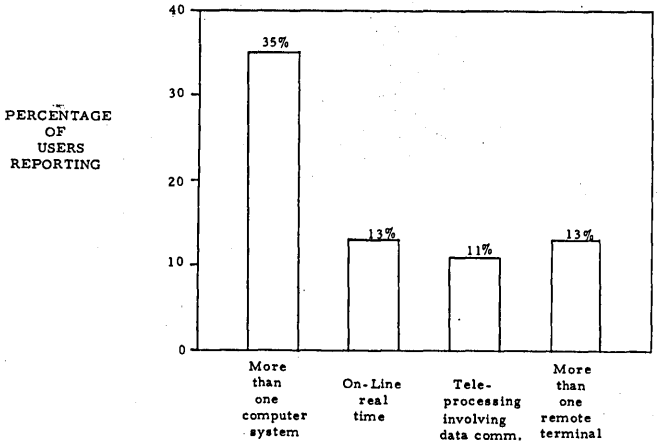

Fig. 8 Percentage of users reporting.

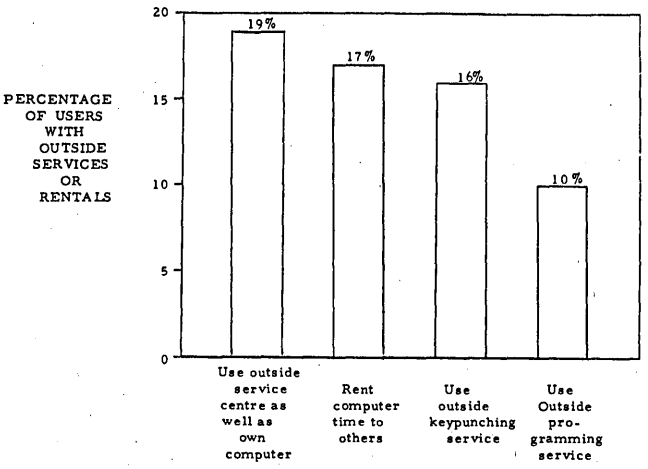

Fig. 9 Percentage of users with outside services or rentals.

mention by DATAMATION of the survey in a December 1967 news item provided a helpful boost, but we still do not have enough replies for the size of sample desired.

DATAMATION has kindly offered welcome and helpful additional support in facilitating the mailing of 1,000 additional computer survey questionnaires to a small cross-section of its readership. Hopefully, the appearance of this article will persuade a large percentage of the recipients to respond to the questionnaire in the interest of providing the first opportunity for North American computer users to get objective and detailed information on costs, staffing and utilization in various types of industries and organizations.

The results of the U.S. surveys will be published when the analysis is completed. ■

PROGRAM QUALITY ASSURANCE

for big, statistical, analytical jobs

by ARNOLD D. KARUSH

Statistical and analytical programs are essentially an embodiment of a model representing some aspect of the real world. The answers they provide are only approximations to the true values of the system being modeled. Thus any error degrades their usefulness by creating either undue confidence or pessimism in the model's validity.

Quality assurance involves the continual monitoring of the operating program or system for the purpose of detecting possible or actual problems, the resolving of potential problems, the verification of the output, and the assurance of good communication between the designer, programmer and user.

The large, sampling type, statistical and analytical programs that are discussed in this paper are generally characterized by:

1. Large quantities of input data.
2. A complex structuring of the input data.
3. A preponderance of contractive and inferential data transformations with only a few one-to-one transformations.

A *contractive* transformation occurs when, using a formal algorithm, a single value is used to represent a set of values. An example is the use of the mean. The mean is derived from, and represents, all of the values in the set.

An *inferential* transformation occurs when, using either algorithms or heuristics, an implication can be derived from a set of values; the implied fact is then used in further analysis and the original values are discarded. An example is the determination of the heading of an aircraft from a mass of radar data.

A *one-to-one* transformation occurs when one set of values is converted into another set, both sets containing the same *number* of values. An example is the conversion of octal numbers to their decimal equivalents.

This discussion of quality assurance is divided into three parts. The first part deals with the specific characteristics of this kind of program and then proceeds to examine reasons for degradation of quality and to describe some quality-control techniques.

Four problem areas will be distinguished in the first part: input data, processing, output data, and communication.

The second part of the discussion is concerned with four techniques which have an overriding effect on the degree to which the quality can be controlled. These techniques are reproducibility of the input data; recording capability; reduction capability; and output of the monitoring function.

The third part considers the question of cost effectiveness of quality control.

input data

The input data used by this kind of program is characterized by quantity and complexity. There are large volumes of data to be manipulated and often a great many program decisions to be made in preparing the data for processing. More specifically, there exist the characteristics of:

1. Repetitiveness—the data is blocked into logical segments each of which can be continually repeated.
2. Logical interrelationship—the ordering of blocks of data and individual datum with respect to each other.
3. Temporal interrelationship—the ordering of data by time, particularly where data are arriving on more than one I/O channel or where blocks of data each refer to the same time period.
4. Complex input format—the data may be compressed in order to make their transmission as efficient as possible. It may be coded or scrambled for security or redundancy reasons.

Because of the input data's complexity, and the correspondingly large potential for error, the user must concern himself with the quality of the data. A technique to assure quality is that of continually monitoring the input data for certain kinds of problems. Areas to monitor for are:

Temporal Organization. The temporal organization of the input data is subject to error because of problems within the input system. Errors may be due to tapes being out of sequence, I/O channels not functioning correctly, and events not all reaching the computer in the allotted time interval. When the data are coming from only one channel, time sequenced, all that has to be checked is the correct temporal ordering of the data and, if applicable, a minimum amount of data in a specified interval. However, when more than one channel is being used simultaneously, it is necessary to check that all data for a given time interval are available and that data from two different intervals are not processed together. All input data should be identifiable with respect to time, and maximum use of these time keys should be made by the program in order to assure correct processing.

Physical Organization. The physical organization of the input data is also subject to error because of problems within the input system (e.g., noise, tape problems, hardware

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failure). Added to this complexity, however, is the fact that the input data are often compressed or encoded for such purposes as reducing the storage space required, or providing for redundancy. Thus the program must often reorganize the data within the computer for efficient processing. A redundant number of control items should be provided within the input data for directing the program in the data reorganization. This redundancy is useful because it allows the program to extract a maximum amount of information from degraded data. The program should be designed to make use of the most efficient set of keys first, to expect a variety of types of degradation including the destruction of the beginning and end indications of a block of data, and to use secondary keys where necessary and possible.

Logical Organization. The logical organization of the input data may be disrupted because of the previously mentioned errors in the input system, and also by logical errors in the devices (e.g., a computer program, I/O control unit) which produce the data. Such problems can be caused by missing blocks of data, blocks with incorrect identifications, an excessive or insufficient number of blocks, blocks that have an incorrect length, etc. The program should be coded with a list of parameters describing the logical organization of the input, and it should verify this organization for the data it reads.

processing

It is during the processing of the already prepared input data that most errors or potential problems can be detected. There may be problems with the program code, numerical analysis techniques, program design, or design specifications. Frequently the errors and problems can be uncovered by program self-checking features, that is, monitoring.

The decision of what to monitor is a function of the nature of the variables and the type of processing.

Statistical Processing. This involves the contractive processing of data. That is, the reduction of a large mass of values to a set of relatively few values, this set presumably being representative of certain aspects of the original values. In performing this kind of processing it is often necessary to use numerical analysis techniques to manipulate the large volume of data and the possibly complex calculations. The intermediate results of arithmetic calculations should be monitored for values of an incorrect magnitude. A value which is unexpectedly large or small can degrade the ultimate result. It also suggests that an error may exist. The arithmetic error detection circuitry of the computer should also be monitored.

Logical Processing. There are two types of analyzing that may be performed. The first is called inferential. It involves analyzing the data in order to infer specified characteristics about the environment which generated the data. Monitoring should be performed for unexpected or improbable results. The second type of analysis determines the logical path which the succeeding processing will follow. These logical decisions should be designed to take into account all possible results. It is not safe to assume that particular conditions will never exist; faulty design is often manifested by unexpected conditions.

Ordering of the Variables. The variables may be unordered, string ordered, or tabular ordered, the last two being the more common. With string ordering, all the values for one variable appear in sequence. With tabular ordering, the values for all of the variables describing a particular event are grouped together, then the same variables are grouped with new data for another event. Thus the logical relationships among data for a particular entity can be checked. For example, the correctness of the ordering of data for an entity in tables and arrays of different structures can be validated. Also, the relationships between data for all entities can be checked. For example, in a list-ordered structure the threads should all begin and terminate at proper points. Thus it is clear that any inherent ordering of the data can, and should, be used to check structure of the data.

Values of Critical Variables. Another quality control factor involves the values of certain critical variables. The program can check whether these variables exceed their expected bounds. The variables should be selected on the basis of how serious a problem would be caused by their containing erroneous values. Intermediate values, particularly counts and the number of entries in tables, should be monitored continually. The tables are particularly important as an excess number of entries can result in other data being destroyed. An excess value for a count datum, or for the number entries in a table, is a good indication that errors or inadequate design exists.

Logic Dependency of the Variables. The interpretation of the meaning and/or coding of a variable may be dependent upon the value of other variables. The monitoring process can determine when there are incorrect values for such variables by using the available logical relationships to look for logical incongruities.

output

The degree to which the output can be verified is highly dependent upon the complexity of the arithmetic and logical calculations and on the quantity of the inputs. The kind of program that is under discussion is characterized by a high degree of complexity and quantity. Thus, several techniques may be necessary in order to verify the output.

The simplest technique is to have available a standard set of representative inputs for which all of the correct output values are known. Then it is a relatively straightforward matter to compare the program's output against the standard output. This requires an input data recording or simulation capability in order to repeatedly input and process the same data.

There may be other programs that operate on the same set of data as the object program and which are known to be working correctly. If they output data which is the same as, or related to, the object program's output, then comparisons of values can be fruitfully made.

When data with predetermined values can be input to the program, it may be possible to perform some of the program's calculations by hand on the same data and then compare both sets of results. This is generally very time consuming.

The previous three techniques all involve comparison with known values. Many times, however, there are no known values. In this case, the only way to verify the output requires a thorough knowledge of the system being modeled and of the algorithms in the program. Two techniques for verifying the output are suggested here.

The first involves knowing the magnitude of the output values. This can be derived from previous rough analysis of the expected input values plus the knowledge of the system and the algorithms. Values that exceed expected boundaries may be viewed with suspicion.

The second technique requires the manipulation of the inputs or input system in a controlled manner so as to be able to predict variations in the output. By observing the direction and magnitude of change in the output values, one can determine if the program is behaving approximately as intended.

The purpose of programmed monitoring of the output data is to provide an automated method for examining the reasonableness of the final values computed by the program. *(Continued on page 65)*

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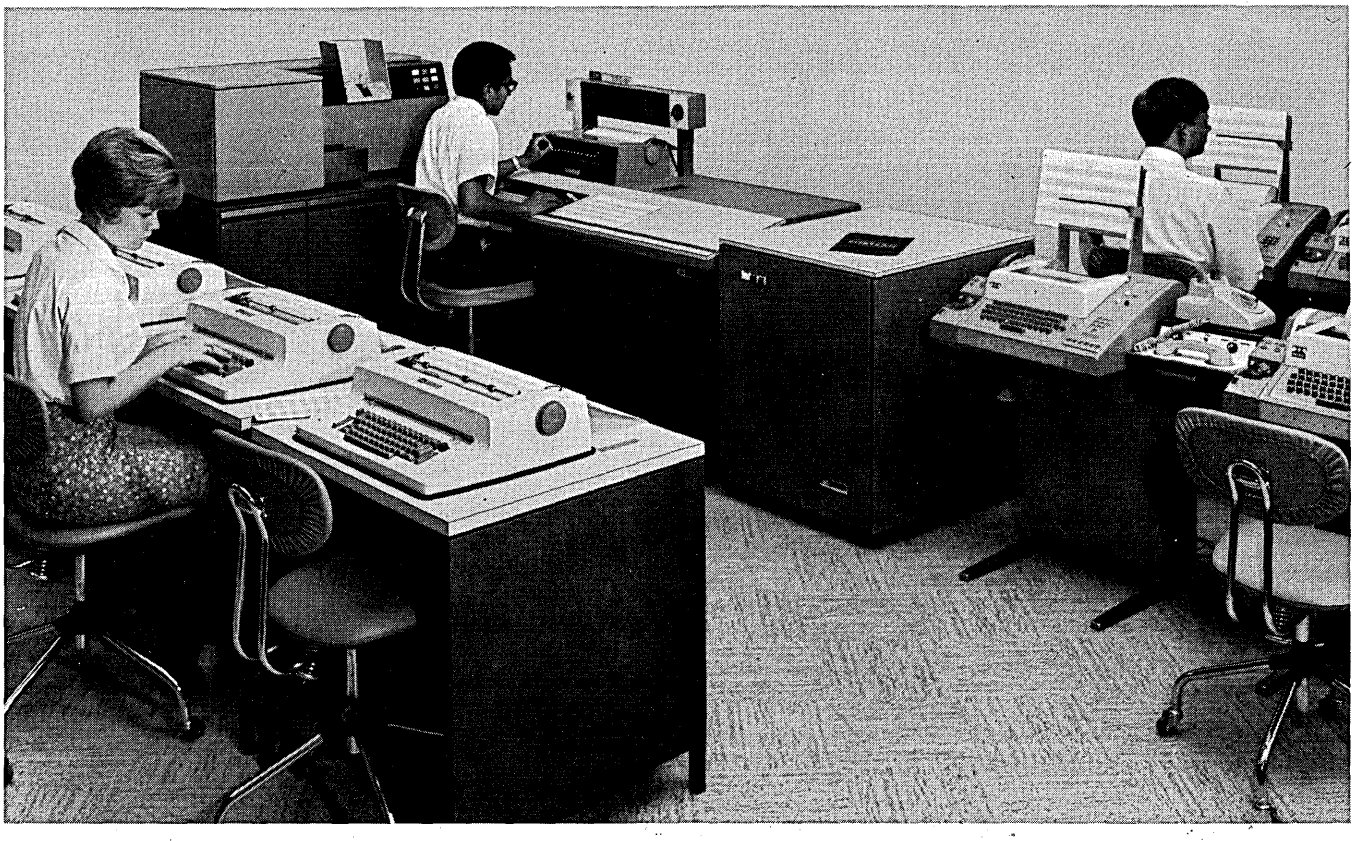

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There are certain characteristics of the output data that can be automatically monitored in order to warn the user of a potential lack of validity in the results. All output data that can take on a range of values should have its bounds specified by parameters within the program. The program, then, can bring to the user's attention data that exceed these bounds. The program should also be aware of nonexistent data. This is important when a datum is used in an equation, as its absence or zero value is not immediately apparent to the user.

Particularly when performing statistical calculations, there is often an implicit requirement that the sample values be of a certain range and quantity. The program should incorporate checks to determine when data fall out of that range and when the size of the sample is too small. It is desirable to make use of statistical techniques which utilize the sample size to determine probable error.

communication

Problems that are caused by inadequate communication are evidenced by the programmer incorrectly implementing the design and by the user misunderstanding the output. In order to minimize the errors caused by inadequacy in this area, there must be standards for communication from designer to programmer and from programmer to user. An understanding by the user of exactly how the program implements the design specifications enables him to better understand the meaning and implications of the output and to participate in the monitoring of possible problems. Such standards also provide for efficient feedback to the programmer and designer.

The information to be communicated by the designer should include:

1. Description of all equations.
2. Error tolerances and magnitude bounds for numerical values.
3. Explicit descriptions of how measurements are to be made.
4. Explicit definitions of logical algorithms.
5. Statement of the order of processing operations where this is not obvious.
6. Descriptions of program monitoring.
7. Descriptions of input data format.
8. Descriptions of output data format.
9. Control card specification.

The document from the programmer to the user should describe how the program implemented the design specifications, particularly where the programmer had to refine or modify the design specifications. It should include a detailed explanation of how each output datum, or component of such, is computed. This involves describing the input data used, any unusual conditions involved in its processing, and the order in which decisions are made. This kind of information will enable the user to determine if the design specification was implemented meaningfully and whether there should be design changes.

In summation, the design specification document begins with assumptions about what information is desired and then describes the characteristics of this information and how to compute it. The programmer-to-user document describes how the programmer achieved the design requirements.

In the previous discussion, four problem areas for quality control were distinguished. These are input data, processing, output data and communication. There are several programmed techniques for aiding in the quality control of the first three areas. Reproducibility of the input data is a requirement for verifying the correctness of the input. Data recording of the program's own tables must be done to resolve processing problems. Data reduction versatility is highly desirable for reducing the effort of interpreting the recorded data. The existence of a monitoring function is necessary for finding problems that involve errors in transient data.

It is essential that the program be able to process the same set of data more than once. The input data that have already been recorded and input to the program in their recorded state present no problem. Otherwise, one of two techniques must be used to obtain reproducible input. The first is to have the program record the data while the data are being read. For example, a block of data would be read from the input medium; then, while the data are being processed, they would also be written onto a tape. This requires only a little additional time if an extra I/O channel is available. Of course, a playback feature must be incorporated into the program in order to read the recorded data as live inputs. The second technique is to provide simulated inputs to the program. The term simulation as used here means the production of realistic appearing inputs in an artificial environment. This technique implies reproducibility.

There are several reasons for the significance of being able to reproduce the input data. If an error is suspected in the input there is one good way to verify it—by examining that input data. It is usually cheaper to do this than to rerun the program with modifications to look for the error if it occurs again. It is desirable to be able to rerun the job either for an additional copy of the output or because the program had been given incorrect instructions (e.g., erroneous control cards). To be able to compare a modified program's output with a standard output provides the most thorough way to check out corrections or changes to a program. This requires reproducible input.

data recording

In order to determine the cause for many of the problems that will occur it is desirable, if not a necessity, to have a data recording and data reduction capability for the program itself. This means that the program is able to record the data it uses and produces while performing its operational function. It is not actually necessary for the program to record the data physically. Instead, the program may select that data requested for analysis and then allow the data reduction function to process the data while the operational program pauses.

A determination by the program of when to record data can be based on three criteria:

Time oriented. The program can record during some specific time period or time intervals. Since most input data for the type of program under discussion is absolutely or relatively time ordered, this kind of orientation provides for a sampling of the program's responses.

Entity oriented. In many input systems the data is ordered by separate but related entities. For example, in an airline reservation system each flight may be considered an entity. Both the input data and the program's data that refers to that entity could be recorded. Thus problems can be resolved with respect to a particular entity instead of having to resolve them by examining cross sections of data.

Function oriented. Generally, programs are divided into separate areas, either logically or physically, based on the various functions which must be performed. Often there are problems which can be isolated to a specific function but not to a specific time or entity. For this reason it is desirable to have the capability of recording before, during, or after a function has completed operation.

The question of what data to record must be considered because the recording, and the corresponding data reduc-

tion, can be a costly process. The simplest, and generally most useful, solution to the problem is to record table blocks or blocks of core memory. More specialized techniques involve recording particular entries of tables and individual items of tables.

data reduction

Once the data for checkout of a problem has been selected or recorded, it is then necessary to process it in some manner to be readable. The simplest, but least useful, form of processing yields an octal or hexadecimal printout of the data. For any large amount of recorded data such a printout is very difficult to work with. It is preferable to have a data reduction capability that converts the recorded data into the items of information it represents. This involves the printing of titles to identify such facts about the data as time, location, table name, and item name and the conversion of the binary values into the coding they represent, such as decimal or Hollerith.

Data reduction may be performed on recorded data after the operational program has run, or it may function in alternation with the operational program. The latter mode presumes a nonreal-time program that can be interrupted at any time. This mode would allow quicker response as there is no intermediate storage of the data to be reduced.

So far, the discussion has implied data reduction with respect to the program's functions. It can be very useful to have a reduction capability for the input data as well. Often, this is the only way to obtain information for solving certain types of problems relating to the content of the input.

monitor output

When the monitoring routines that are checking for possible or actual errors find an error, they must communicate this to the user. The monitoring routines should print a statement about each error onto an on-line I/O unit in order to provide the option of whether or not to discontinue the program run. The message should contain the following information as a minimum:

1. Reason for, or type of, problem.
2. Where, in the program, the problem occurred (core location, procedure, etc.)
3. The value of the data word(s) that caused the problem.
4. If the processing at that point can be associated with a logical entity, then state the identification of that entity.

If the program is operating on prerecorded data, the more serious kinds of problems should cause the program to halt in order to give the user an option whether or not he wants to continue the job. It is generally not a good idea to halt when processing live data as some data may be lost while the program is halted, thus further degrading the program's output.

cost effectiveness

The cost of installing quality control features in a program can be very high, ranging from 10% to 30% of the basic program's cost. There is also increased cost in running the program as the monitoring features can add 5 to 15% to the running time. However, balanced against this are three important benefits that accrue to a program with extensive quality control features. First is the increase in checkout speed and decrease in undetected errors. Second is a reduction in program maintenance. And last—an intangible but still important consideration—is the greater confidence felt by a user of the program. ■

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by D.V. BOLTON

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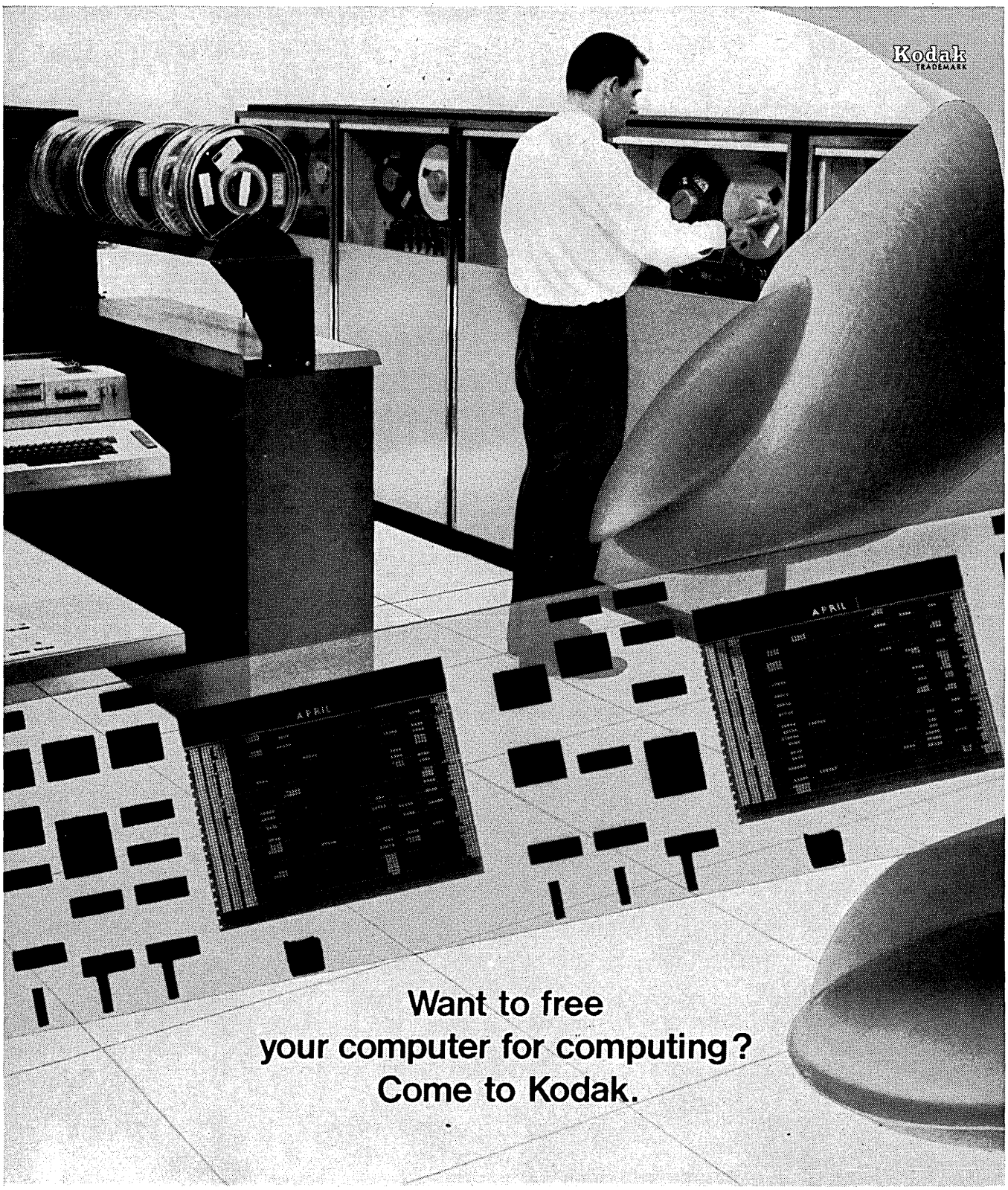

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RELEASE DUE FOR FEDERAL DIRECTIVE ON ASCII USE

A directive telling federal agencies when they should begin using ASCII for information interchange, and as a file code, was in near final form at press time. It should be released this month.

The provisions were applied to "all computers and related equipment configurations brought into the federal inventory, and (to) data systems developed by or for government agencies, on or after July 1, 1969." Actually there will be some impact even before then because many systems to be installed in fiscal '70 are being planned right now, and these plans may have to be altered. "If a great deal" of alteration is necessary, though, says one of the drafters of the directive, the agency may be allowed to delay its conversion to ASCII and proceed with acquisition and installation of its new system largely along the lines previously planned.

As we reported last month (p. 19), users with existing dpe will be allowed some time, after they acquire new gear, to convert their present files to the ASCII code, mag tape and paper tape standards. Likewise, they will not have to begin using ASCII as an information interchange code immediately. The latter change will have priority over the former but, in both cases, the directive will also say that use of ASCII "should" occur by the time reprogramming and file conversion of the old system have been completed. This means that a replacement computer can be installed and go into operation before the user switches to ASCII. It also means that an augmented system—i.e., one in which older equipment continues to handle part of the workload for a prolonged period of time—can operate for quite a while without being converted.

The directive will allude to this situation by saying that, in an augmented system, "the use of the standards may have to be deferred." The only user who will be expected to use ASCII at the time his new system goes into operation will be the one who "has no existing tape files or program libraries which prevent use of the approved federal standard."

Drafters of the directive apparently are bending over backwards to soften the impact of the new standards on users and allay industry fears. The most dramatic evidence of this in the document will be a disclaimer of any intention to standardize internal cpu operating codes. The specific language isn't known, but probably there will be references to the future development of code-independent processes and to the ease and low cost of translating ASCII into a variety of interal codes, and vice versa, at the I/O interface.

The directive will also disclaim any intention of standardizing for the sake of standardization. It will recognize that use of existing non-standard systems should be continued as long as such use is economically advantageous. That attitude should help many users win permission to delay their adoption of ASCII. Agency and department heads will be able to plan reprieves, largely on their own, which should also help.

But users won't be allowed to take their own sweet time. Department and agency heads, while given authority to grant waivers, will have to coordinate such plans with NBS before putting them into effect. They will have to be able to demonstrate that a proposed delay will have "minimal effect" on the interchange of information with other systems, and that the delay will also avoid "continuing cost or efficiency disadvantages." Even then, the user may be overruled if NBS decides that delay will cause serious harm to the standardization program.

While ASCII standardization will probably proceed slowly, it is intended to be all-encompassing. Besides federal government agencies, a number of others will be encouraged and/or required to adopt the standard ultimately—notably, state and local government, plus all the organizations encompassed by BOB circular A-54. The latter group includes many government contractors, universities, commercial service bureaus, software and systems consultants.

"It is becoming increasingly difficult to distinguish between information which will always remain inside the originating installation and information which may now or later be needed elsewhere," the directive will point out. QED, when an agency converts its machine-readable files to ASCII *all* of them will have to be converted.

extra character approval

Users who need characters other than those in the standard ASCII set will be able to obtain them through use of "variations," "expansions," and/or "subsets" of the standard ASCII family of symbols. These alternate or extra character sets will have to be registered with, and be approved by, the National Bureau of Standards before they can be used. NBS, by this monitoring, hopefully will be able to minimize "proliferation and confusion."

Basically, a "variation" from the ASCII standard set is obtained by lifting out some of the standard characters and using the related bit configurations for other characters. A variation could be used by an agency, for example, that had no need of alpha characters, but did have a need for Greek symbols, in addition to the numeric, graphic, and communication control symbols in the standard ASCII set.

An "expansion" utilizes the 128 spare positions in the basic ASCII bit configuration. The code, as approved by USASI, accommodates a total of 256 characters, but only 128 were specified. The extras can be made recognizable to a machine by recording a "one" in the b_8 position. For the standard ASCII character set, a "zero" is always recorded in this position.

An example of a "subset" is packed numerics. Here, a portion of the standard ASCII set is recorded in an 8-bit format, but different logic is needed to read and write the data.

All three alterations of the basic ASCII code will be available to users with special needs, provided they can show that the need is substantial and genuine, and provided the modification doesn't hinder the maximum practical use of the standard ASCII code and character set.

—PHIL HIRSCH

(Continued on page 70)

WHILE OTHERS LEASE — LEASCO BUYS, BUYS, BUYS

As of June 30, Leasco Data Processing Equipment Corp. announced nine-month revenues of $20,830,500, up from $10,043,979 for the comparable 1967 period. About 850 people then worked in the company, which has domestic and European subsidiaries engaged primarily in computer leasing and information services.

Between then and early September, the ambitious four-year-old firm had slipped its acquiring tentacles around three software firms grossing over $8 million (total) and a cargo-container leasing combine doing almost $10 million a year—and was topping these off with a tender offer for majority stock ownership in the $350 million Reliance Insurance Co., founded in 1820.

These were moves designed to give Leasco a giant start into financial services, while providing inexpensive capital to its leasing and other operations; to bolster its already extensive information and software services here and abroad; and finally, to add a new dimension to its leasing activity via the growing and Wall Street-touted cargo-container business.

These are the salient statistics on the acquisitions, which include Reliance, Operations Research Inc., Information Development Co., Institute for Electronic Administration, N.V., and the container combine, CTI-Container Transport International Inc., Container Leasing Corp, and Express Forwarding and Storage Co.:

the line-up

Reliance Insurance Co., Philadelphia. Leasco hopes to obtain 51% of the stock through the tender offer, which was to end Sept. 10 but may have been extended. This meant at least 2,750,000 shares, as Leasco already had almost 20% before it made the offer to Reliance shareholders. Reliance directors initially vehemently resisted the offer, although Leasco says that differences have been ironed out and is confident of its success. If this is accomplished, Leasco will attempt to gain all outstanding voting stock. Reliance has seven subsidiaries in property and causalty and life insurance (ranked 24th in 1966 in fire and casualty). Four other subsidiaries are engaged in premium financing, real estate, or serving as agencies for the insurance firms. The exchange is for one Reliance common share for one Leasco common and one-half warrant.

Operations Research Inc., Silver Spring, Md. Privately held, the 240-man firm is being bought for 67,000 shares of Leasco common stock. Revenues for 1967 were $5 million. Capabilities include management information and control systems, programming planning and budgeting, simulation and analytical models, value engineering and operational analysis, econometric and cost analysis, and human factors research studies. Offices or personnel in 30 locations, worldwide.

Information Development Co., Los Angeles. Privately held, the 60-man firm made over $1 million in '67, is being bought for 20,000 shares of stock. Its forte is languages, compilers, operating systems, and real-time application packages. Offices in San Francisco, Boston and Philadelphia.

Institute for Electronic Administration, N.V., Rotterdam. The 90-man firm is the largest software (business packages) and service bureau operation in Holland. It grossed $1.7 million in '67, $250K earnings, and is being bought for $2,321,300 and 4,383 Leasco shares.

CTI-Container Transport International Inc., Container Leasing Corp. and Express Forwarding and Storage Co., New York. This combine grossed $9,850,572 and earned over $900K in '67, is being bought for 265,000 shares.

one big, rich family

The new additions and existing subsidiaries of the parent Leasco firm are very much entwined, according to Henry A. Sweetbaum, executive vice president of the Great Neck, N.Y., corporation. Reliance, with "redundant funds" because of its investment activity, would provide capital for leasing and other services and for more acquisitions. It is also the base for more financial services, which Sweetbaum said would include areas "like banking, mutual funds." (Leasco last year had begun and then canceled efforts to buy a Long Island bank, but it seems that did not end activity in this area.) In a trade-off, Leasco's computer-leasing company may extend services to the financial and container subsidiary; but more immediate, its software and consulting services, under Leasco Systems and Research Corp., will be made available to them.

ORI and IDC will be absorbed into Systems and Research and give much more shape to corporate plans for software and software/computer leasing activities. Sweetbaum sees Leasco providing "all computer services": problem definition and analysis, software and application package development, writing of system specifications, providing equipment on a lease basis, installation, and facility management and operation. ORI, he says, will provide the problem definition and analysis capability; IDC, the software system development.

Documentation Inc. and Fox Computer Services, acquired last year, make up most of the current 700-man subsidiary (over 1,000 with the purchases). Doc Inc. brought library science talents, including computer-based information storage and retrieval, and the small Fox group specializes in simulation and modeling programming, the implementation complement to ORI's activity. The subsidiary has also built up in several application areas, with banking as a prime target, along with law, engineering, biomedicine, and economics. Dr. Fred Hammer, president of Systems and Research, is a financial services specialist (formerly with Bankers Trust) and has a 14-man staff for this area.

(This seems to mark considerable progress for Leasco, since 350 of the Doc Inc. staff has been devoted to one NASA contract, the operation of the Technical Information Center, College Park, Md., which has brought $4 million annually. That was almost half the revenues for the subsidiary last year. This contract went up for competitive bid this year, and at writing two firms, Leasco being one, are left in the running. But revenues are going up, as Leasco should announce about $14 million for Systems and Research as of year end, Sept. 30, and $1.4 million in earnings. Thus the contract, which does not provide high earnings, is less important. If the ORI buys are concluded in time, add $6 million to the gross.)

The business-applications oriented Dutch company, which will operate as one of the subsidiaries of the European holding company, Leasco Systems and Research N.V., brings the international software staff to 140.

getting together

Relative to leasing, Sweetbaum notes that many of its leasing customers are also software customers because of the coordination between the leasing subsidiary and Systems and Research. (True of many firms in this field.) The firm has, however, begun plans for development of total packages, in which it will configure a hardware system with "black-box interfacing" and program packages for special applications.

The software group will also be in-

volved with the time-sharing subsidiary set up this year. (The first system will be installed later this year.) Sweetbaum notes that Leasco sees its time-sharing future in the marketing of data banks and packages for specific application areas.

Since Leasco is also operating software and leasing subsidiaries abroad and plans to share all the corporation's talents in these areas, it now faces the problem of coordination. Toward that end, one solution is the current development of a computer-based personnel management system to locate capabilities needed for projects. Leasco Systems will establish regional offices and use the 11 leasing marketing offices, as well.

And since Leasco Systems and Research alone now has over 1,000 people (with additions plausible), the firm faces the problem of holding on to its professionals in this "turnstile industry." Toward that end, Sweetbaum says the firm has bought 100 acres in Tysons Corners, Va., for the Systems and Research headquarters, which will in effect be a campus (designed by college-campus architects), with tennis and squash courts and a swimming pool. For a company that's just over four years old. . . .

—ANGELINE PANTAGES

THE CARTERFONE CASE AGAIN — IT MAY BE TOO EARLY TO REJOICE

AT&T's new tariff—permitting the direct coupling of independently manufactured terminals to the public telephone system through independently manufactured modems—may be far less of a concession to on-line dp users than it appears to be.

As one expert puts it, "Ma Bell hasn't surrendered; at most, the company has retreated, slightly. I expect their lawyers to counterattack soon—probably by demanding higher rates." The counterattack may have begun already.

Last June 26, Southwestern Bell sent a letter to a major on-line dp user announcing that his monthly line charge was being raised 50%. "Computer usage has come to a point where on-line or real-time use is a reality," the letter explained. "We (have) found that this new use of our exchange service is unique" because it involves "extremely long holding time and heavy usage." Southwestern Bell felt an additional line charge was needed to "provide you the service required" and to "adequately compensate the telephone company for the expansion of services necessitated by this unique service."

On Aug. 7, the data processor wrote back and said, in effect, that Southwestern Bell's interpretation of OLRT as a "unique service" was in itself unique, because such systems have been a reality for quite a while. The company refused to pay the higher rate without further justification. A week later, Southwestern Bell retreated, by withdrawing the proposed rate hike "for reconsideration." But the carrier added that "a new tariff will be filed with the appropriate state corporation commission in each Southwestern Bell area and will affect lines terminating directly from the telephone central office into a data set which interfaces to an on-line computer."

According to another source, Southwestern Bell has since filed for, and won, such a rate increase in Arkansas and Kansas; at press time, the company reportedly was preparing to request a similar change in Oklahoma and Texas intra-state tariffs. Meanwhile, Mountain States and New York Bell affiliates were said to be considering like moves in Colorado and New York, respectively.

divide and conquer

An executive of the dp firm that corresponded with Southwestern Bell was asked if there might be a connection between that proposed rate increase and the tariff changes recently unveiled by AT&T. "Of course there is," he answered. "Bell frequently uses its operating companies to get higher rates into a number of intra-state tariffs; then, when enough territory has been conquered, the company goes to the FCC and asks that the interstate tariff schedule be brought into conformity."

Another dp industry source reported he has a letter from AT&T which states that the headquarters office encouraged Southwestern Bell to file for higher charges, as a pilot test, and is observing the reaction carefully.

AT&T's top brass told a rather different story late last August when they appeared at a press conference and announced the proposal to lift the foreign attachment ban.

Board Chairman H. L. Romnes and President Ben Gilmer explained that Ma Bell was proposing a new "data access arrangement," under which independently manufactured terminals could be coupled electrically, inductively, or acoustically to the public telephone system through a "protective device" and a "network controller." The data communications user would pay $10 to have the protective device installed, and $2 a month for service. The cost of the controller would be included in his monthly line charge.

This reporter then asked both executives whether line charges would be increased. The answer: "no." When Romnes and Gilmer were asked if AT&T planned to increase line charges in the foreseeable future to reflect the expense of the controller, the answer was the same.

Even if interstate line charges aren't raised, the proposed tariff probably will disappoint many telecommunications users. For it doesn't necessarily carry out the mandate which the FCC issued in its recent Carterfone decision.

That decision said, among other things, that "a customer desiring to use an (independently manufactured) interconnecting device . . . should be able to do so, so long as the interconnection does not adversely affect the telephone company's operations or the telephone system's utility for others." Ma Bell has now responded with a proposal that leaves its lawyers and engineers with virtually as much power as they ever had to decide when such interconnecting devices generate adverse effects.

Under the proposal, an independently manufactured modem can do the modulation-demodulation performed until now exclusively by a carrier-supplied data set. But the protective device and network controller would continue to regulate all other modem functions—signal frequency and amplitude, opening and closing of the line, and dialing of the circuit needed to connect sender and receiver. Both devices are to be supplied exclusively by the Bell system, and no one else apparently will have any say in their design.

let us do it

Romnes and Gilmer emphasized this point at the August press conference. The telephone network must be protected against cross-talk and other hazards, it was explained, and AT&T doesn't feel that this responsibility can safely be farmed out. Romnes was asked whether Western Electric, Bell's manufacturing arm, would supply the two devices as original equipment to independent terminal and modem makers, so that these firms might simplify their circuit designs, improve

equipment reliability, and possibly reduce costs to the user. Romnes said this idea was impractical because it would create "maintenance problems."

In view of AT&T's attitude, it is at least possible the company will overprotect its network if the proposed tariff is implemented. That, in essence, is what Ma Bell has done until now by banning all foreign interconnections to the switched network. And that is one of the things the FCC was trying to stop when it ruled in favor of the Carterfone.

The chief result of such a policy probably will be to hinder design of faster, lower-cost modems. No independent is going to invest in equipment for the switched network which is incompatible with the protective device that stands guard over the user's communications port. So, whoever controls the design and manufacture of that device occupies a strategic position. While the acceptable frequency band and signal strength undoubtedly will be broadened ultimately, this development will occur only as fast as AT&T wants it to.

A major independent modem manufacturer believes Ma Bell will be "reasonable." He argues that "they have excellent engineering talent and are as interested as any independent in advancing the state of the art." But he admits that if Bell decides to be unreasonable, because of a desire to squeeze additional profit from its existing modem inventory, users and independent equipment makers will have trouble proving injury to FCC or to a court.

Independently manufactured terminals now available for use in switched network service offer only "somewhat" faster speeds and "somewhat" lower prices, says our source. So, if the proposed tariff goes into effect next month, as seems likely, it will not increase users' data transmission capabilities dramatically.

sample changes

The kind of improvement that can be anticipated is suggested by a comparison of Rixon's PM24A modem, which is rated at 2400 bps, and sells for about $2400, with the Bell 201C; it's sold to independent telephone companies for $2200, rents to Bell customers for $75-80/month, and is rated at 2K bps. Rixon's FM18, rated at 1200 bps, sells for $400-600; the comparable Bell unit, the Model 202, moves data at approximately the same speed, but sells for $700-900 to other phone companies and rents for $30 a month to users.

The fact that independently manufactured modems can be sold to the ultimate user, while Bell insists on renting, should—says our source—give the independents a way of widening their market share significantly, if Western Electric doesn't change *its* no-sale policy. Bell also may be able to hold on to much or all of its present market by offering better or lower-cost maintenance. Another problem is that "the phone company can sometimes change the characteristics of a communication line to erase certain shortcomings in their equipment. The independent doesn't have that option."

The sources we talked to agree generally that the FCC will approve the AT&T proposal. Most felt that the commission would amend its Carterfone decision to eliminate the conclusion that "the (foreign attachment ban) has been unreasonable, discriminatory, and unlawful in the past." AT&T has threatened to take the whole decision to court if this portion isn't stricken, because the original language opens the door to expensive lawsuits from equipment makers, and makes the outcome of Carterfone's pending lawsuit against AT&T almost a foregone conclusion.

The FCC decision dealt explicitly with only one kind of system—mobile radio—and left up in the air the question of how the commission feels about the foreign attachment of other customer provided communications systems. As Gilmer explained at the August press conference, "this matter involves serious and complex problems which go beyond those involved with the connection of terminal devices . . . and requires much more consideration by both the industry and the regulatory commissions." It is likely that independent equipment makers will argue that if the switched network can be adequately protected, right now, against the excesses of a mobile radio system, it can also be protected, right now, against the same sort of threat posed by other customer-provided communications systems. —P.H.

ACM SESSION ATTACKS PROBLEM OF PROGRAMMING MANAGEMENT ECONOMICS

It would seem that the world's longest session deserves the world's longest write-up.

In a laudatory effort to offer a continued and intensive attack on one of the computer industry's most pressing and stubborn problems, SDC's George Weinwurm organized for last month's ACM Conference an all-day, three-part session on "Managing the Economics of Computer Programming."

What this means, it turns out, is managing programmers and programming efforts economically. Weinwurm feels that in our industry "the state of the art of management is far behind the technical state of the art," and that the gap is widening. The session did little to refute these allegations.

brandon strikes

Dick Brandon kicked off the prepared speeches with a long and bombastic attack—Weinwurm characterizes Brandon as the William Jennings Bryan of the computer industry—which can be summed up in these words: We are doing a lousy job of selecting, training and managing programmers in a technology which is moving too fast to allow us to develop better ways of doing these things.

His paper—minus many witticisms, two attacks on competitor Charles Philip Lecht, and a characterization of DATAMATION as a fascist (conservative in its attitude toward edp) publication—is available in the Proceedings, which is also missing Brandon's inspired solution for programming management problems: "combine the ACM, SPA and DPMA into one effective organization," which would administer a significantly funded research effort.

Carl Reynolds, who has survived the overseeing of large programming projects at IBM and the presidency of a large software house, talked briefly, quietly and to the point. In essence, Reynolds feels that "there is no *fundamental* difference between . . . managing the development of computer programming systems and . . . managing comparable developments in any other technology . . ." What is needed to achieve sensible management in our industry, Reynolds, concluded, is, first, a knowledge of the programming technology; second, commitments based on that technology and "not on the needs of the outside world . . . and not on the unreasonable hopes of starry-eyed experts;" third, "schedules based on physical events, and on numerical descriptions of the products that are being produced . . ."; fourth, assessment of "the status of the project against a well-developed plan . . . before attempting to understand what is wrong and what ought to be done about it"; and, "finally, one must do something about the trouble one finds."

Carl Clewlow, head of the committee which produced the significant

(Continued on page 77)

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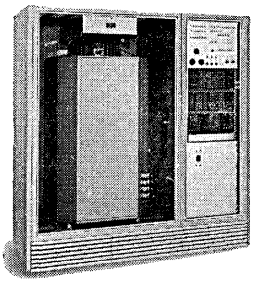

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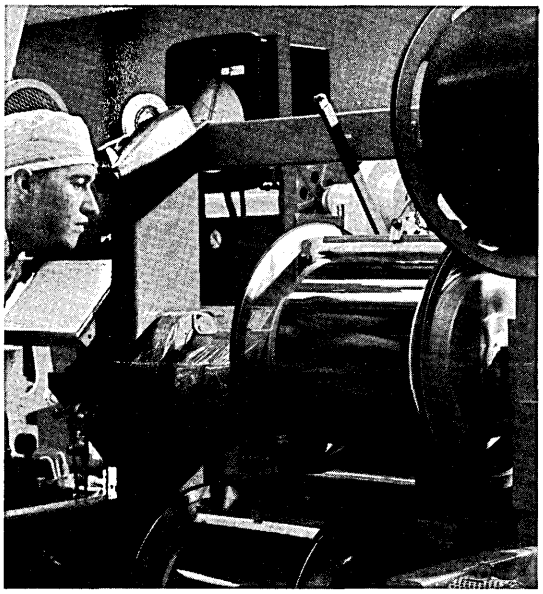

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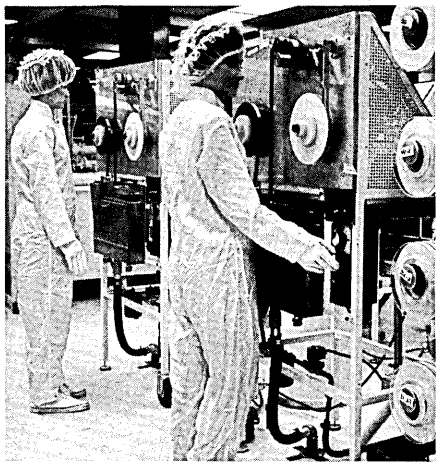

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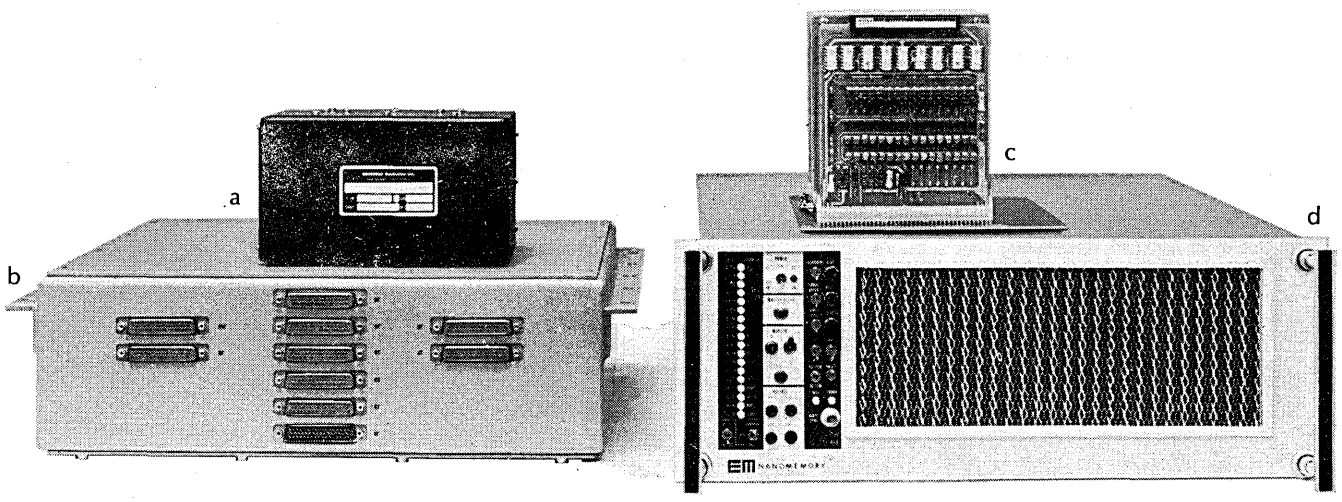

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EM electronic memories

study of federal adp which led to the Brooks Bill (he's now with the DOD), isolated one of the key problems at his huge (1,300,000 employees) computer-oriented agency, which last year accounted for over 70% of the 90,000-plus adp man-years in the federal government. By 1972, Clewlow estimates, he'll need 10,000 programmers. But to get them, he'll have to hire 23,000.

marginal applications

Clewlow attacked some of the approaches which have led to problems in the past, such as increasing the utilization of computers by adding marginal, uneconomical applications, and the "mirage measurement" which equates programming efficiency with the time spent on the program, forgetting the computer times required by the programs produced by different individuals.

He outlined some possible solutions to the programming manpower problem, including the pooling or exchange of computer programming resources, "buying into" ongoing computer program developments, centralized systems design and programming, and common or standardized codes or abbreviations. And he summarized several Navy projects—a description and classification of computer and programming jobs; a basic programming knowledge test; a computer position profile; a prediction of success in programmer training using data collected over 3½ years from 20 classes; and a systems analysis test.

After lunch, IBM's Al Pietrasanta stated that available rules for estimating system development costs are inadequate . . . primitive at best. Underestimation, a normal occurrence, is usually due to leaving out some factor, and he stressed that "the problem of resource estimating of computer program system development is fundamentally qualitative rather than quantitative." He noted that, "As systems grow larger, there appears to be a disproportionate increase in the man-years required for development." (Parkinson's Law?) It's a mistake, he noted, to extrapolate small systems requirements to large systems.

by the book

Dr. Edward A. Nelson of SDC described a planning guide, a general project reporting and control system and a cost estimating handbook developed by SDC for the Air Force, and which have been "widely distributed to government agencies and also to a number of private corporations." General observations drawn from the development of these documents includes: (1) cost data should be collected during the project; (2) useful estimating relationships should have "a comparatively narrow focus, e.g., on specific languages and/or applications; (3) "All permanent programming organizations should collect cost data on their own operations;" (4) "The basic structure" of the handbooks and the reporting system developed by SDC "could be used without modification by any computer programming organization." But he advised "some adaptation" of the material, and urged "extreme caution" in applying numerical cost estimation from SDC's research.

Dr. Harold Sackman, also of SDC, stressed human factors and the need for systematic scientific studies of the computer users, and what comprises excellence in programmers. He reviewed the literature of man-machine communication and outlined a conceptual framework for research including methodological, normative, behavioral and social effectiveness areas.

In the final session, BOB's Joe Cunningham and AEC's Herb Schwartz conducted a prefabricated discussion summarizing the main issues of the preceding papers and panel discussions. Some of their conclusions: education is technically oriented, toward the doer, not the manager; there's a plethora of published materials on the subject of programming management. What we need is a bulletin (abstracting service?); management in this field is different from others but we think it's up to the rest of the world to understand us; there's a great need for research into the information using process as well as the programming and programming management processes.

In his summary, Weinwurm thought that one of the reasons it is "so difficult to get a handle on the problem is that it exists on different levels, involves communities of people who don't talk to each other very well. The problem has not been looked at in its totality."

building on tradition

But, he said, "There are traditional management techniques and we would be better off using them." But we must translate these techniques into the context of the computer programming manager *for* the manager. We must validate these techniques for edp; we must do a better job of training and disseminating available information . . . we must do more *re*training; and we must try to learn from our mistakes in an organized fashion. This need for empirical standards calls for an institutional framework, which could start with SHARE and GUIDE, "which cut across the entire computer community." To support the necessary research, Weinwurm thought that it would not be unreasonable to assess 1/10 of 1%, a sum which would be enough but which all could afford.

Finally, said Weinwurm, "We must work jointly, not let small groups dictate to us; we need a focus for work of this kind; and we must begin now."

Each of the other speakers had one last crack at the audience and each other, but we'll spare you; all of the papers and most of the off-the-cuff witticisms will be available—after editing, hopefully—in a book which will probably be available next year from Brandon/Systems Press. —RBF, AD

COMPUTER APPLICATIONS EXPLAINS ITS PROBLEMS, PLANS FOR CHANGE

Computer Applications Inc., one of the oldest and largest firms in the software field, has gone off in several different directions this year. It has made six acquisitions since January, primarily in the publishing field. Its professional software services division has been troubled by executive turnover. And its earnings report (fiscal '68, ending Sept. 30) will show an increase in gross sales from $33.9 million to about $48 million, but a dip in earnings from $.58/share to around $.50/share, primarily due to development efforts, relocation of a subsidiary, and stock dilution.

The reasons for the difficulties, says CAI vice president Howard Morrison, are, first, that the firm has been willing to pay the price of innovation and growth in this and other fiscal years—and the expected upward trend in earnings in 1969 will bear this out. Its executive and management turnover, which occurred primarily in the northeast region, can be attributed to several factors. Two are the Wall Street money available to support new companies in the software field (two groups of CAI employees from the N.Y. office formed new firms this year) and the sheer mobility of the programmer force, particularly in the New York area.

But more important, while not denying that there have been troubles in the northeast, CAI counters that the face of the software industry is changing, and it is reorganizing to meet the

(Continued on page 81)

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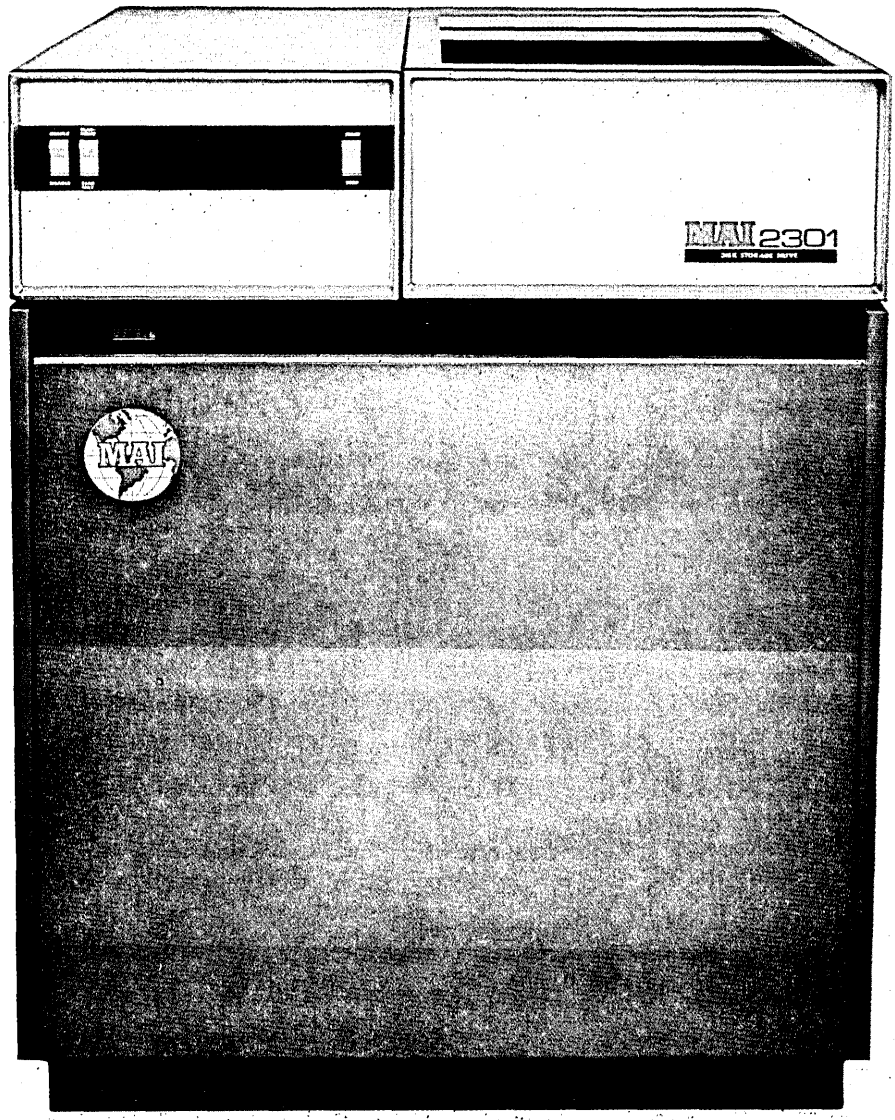

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CIRCLE 31 ON READER CARD

demands of this change. In effect, says Morrison, CAI has been a company built on programmers and now is building up to be a company managed by managers, strongly staffed by applications specialists, and with a professional marketing force.

The new organization chart at the 3000-employee firm which is now taking effect, provides a better picture of its direction. Under president Jack DeVries and new executive vice president Mark Channing, the divisions will break down into information sciences, information processing, graphic arts and publishing, and market research. Formerly, each of the regional heads for software services and heads of the subsidiaries reported to DeVries, but now will report to the divisional vice presidents.

Current software and consulting services will fall under the 1100-man information sciences division, made up of the northeast, south central, and western regions, each with several branch offices. This includes the May acquisition, Management Software Development Corp. A special research and development group, the systems design division headed by vp Harvey Dubner, will report directly to DeVries.

The information processing division, under vice president and CAI founder Joseph Delario, will consist of the acquired service bureaus, including Electronic Business Services, Inc., Peninsula Tabulating Service, Inc., and Suburban Data Processing Center.

The yet unnamed graphic arts and publishing effort will consist of New Era Letter Co., Inc., Medical Audits Inc. (both direct mail firms), New Era Lithograph Co., James Gray Hooven-Nahm, Inc. (both lithographic and supporting services), and the publishing firms acquired in the last year: Wm. Penn Publishing Corp. and affiliates, Triton Press, Inc., Paris Book Center Inc., and affiliate, and Arlington House and two affiliates. New Era Lithograph will do all the printing for the CAI and other publishing houses; much of this activity is becoming computer-based. It was the movement of New Era Litho from a New York location to a Long Island printing plant purchased from Weyerhaeuser that helped put a dent into CAI earnings this year, said a CAI spokesman.

The market research group will include Home Testing Institute/TvQ and SPEEData, Inc., a 250-man subsidiary formed by CAI three years ago for computer-based analysis of grocery product movement. SPEEData has probably been most responsible for keeping CAI earnings down to the 2-3% level in the last few years. Several millions have been poured into this and because it has not yet operated nationally, it has not yet shown a profit. (It has actually been in business one year.) This is one of the "innovation" areas CAI feels will begin to pay handsomely, however, probably by third quarter '69. CAI expects that with new public offerings (SPEEData will get $4 million from a CAI offering and then go public itself), this subsidiary will go nationwide and attack a market that currently runs up to $50 million a year, according to Morrison. This subsidiary offers edp services which trace and report grocery product movement from manufacturer warehouses. This is different—and more effective, says CAI—from the services of the biggest firm currently in the field, Nielsen ($20 million annually from this activity), which audits the grocery stores themselves.

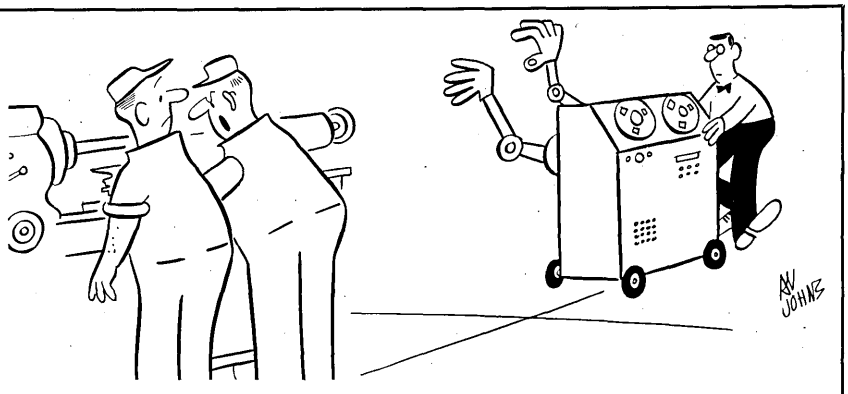
Morrison expanded on how CAI's software services are changing. He readily conceded that the proliferating new firms have intensified competition for contracts, which makes the CAI reorganization and emphasis on specialists in management, marketing and applications more important. Prime example of CAI's effort is the recent hiring of Mark G. Channing, executive vp, who will be in charge of the firm's financial system. He was one of the Ford "whiz kids," says Morrison, "the best financial management in the auto industry."

CAI is also hiring applications specialists and placing them at various management levels. Several will be on the corporate level to help determine over-all direction of the firm in their areas and will be available throughout the information sciences division. Others will head up subdivisions within ISD. In marketing, the 225-man New York office, which Morrison says never had a professional marketing force but relied on "bright programmers," now has seven people devoted only to marketing. And other offices are following suit.

CAI has marked three areas which will be major activities in the next 10 years, says Morrison: banking, education, and urban systems. The firm is already working in each, and is one of the few "profit-oriented companies in urban systems." In education, CAI realizes that edp-based efforts are in the R&D stage, but intends to "pay the price of admission." A small but important contract for CAI is one in which it is developing a curriculum of computer-aided courses for the School of the Deaf at Gallaudet College. Its Washington office, run through an acquisition, is the strongest in education, and New York is building up for it.

Another effort beginning is the hiring and training in-house of CAI employees to meet contract needs. It seems, too, to be an effort to cut down on the "here today, gone tomorrow" habits of the programmer nomad. This will be particularly important in New York, which Morrison calls "job-shop town." CAI also plans more education seminars for its customers.

Among the firms which spun off from CAI this year was Wellington Systems, headed by William Lucas and several other CAI people. Because some of them came to CAI as a group and signed a contract prohibiting two or more from going into competition with the firm, Computer Applications has now obtained a court order enjoining them from going after business with an "extensive list" of CAI clients for one year and from raiding the CAI staff further. This, says CAI, is the first action of its kind in the software field, and the firm intends to make it stick. The other offshoot, Bradford Systems, headed by ex-CAI vps from the northeast region, is not affected by any legal action. —A.P.



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that you'll want to live with a long, long time

Some computers come and go. And when they go, you're out of luck if you own one and want to extend the system to keep pace with your expanding needs.

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For more information about the Series 16 family and some of the ways Honeywell computers are being used, write: Honeywell, Computer Control Division, Framingham, Massachusetts 01701.

Honeywell

COMPUTER CONTROL DIVISION

news briefs

SERVICE BUREAUS GROGGY BUT GAME IN BANK FIGHT

The service bureaus see a glimmer of hope in their fight to keep banks from expanding unchecked in the SB business.

The reason is an August ruling by the U.S. Fifth Circuit Court of Appeals which said that an insurance agency association could indeed sue a commercial bank for its insurance operations—a reversal of a lower court decision. (Comptroller Saxon and Citizens & Southern National Bank vs. Georgia Association of Independent Insurance Agents Inc., et al.) Two district courts have already denied service bureaus the right to sue commercial banks and the Comptroller, but one decision is in appeal and the other may be.

ADAPSO director Jerome Dreyer says that the hope is the successful insurance appeal will help in the bureaus' appeals. If not, the apparent dissent over "standing" (the right to sue) in suits against bank expansion may stimulate the Supreme Court to review the matter. It's significant that Justice Homer Thornberry, nominated to the Supreme Court, made the insurance appeal ruling. But also important is the fact that the ruling drew on a specific statute barring commercial banks from insurance agent activities in cities over 5,000. The service bureaus do not have a clearcut law to argue with.

SCHOLARSHIP INFORMATION COMPANY WANTS A BUYER

Turns out a young man needs more than a good idea to make a million in the computer field.

Last year, David Christmann III, then 24, had hopes of providing scholarship information to students through a computer data base. By January, his firm (North American Educational Computer Services) had 10,000 aid items (5,000 scholarships) in the data base, over 5,000 applicants for the service, and a debt running into several hundred thousand dollars due to poor management. The young exec was bought out for a reported pittance by the investors, who are hoping to sell the company. (A few inquiries were processed, money refunded on the rest.)

Actually, software firm Mandate Systems, Inc., developed and, as a result of nonpayment, owns the whole software system. Though willing to cooperate with the investors in a sale, Mandate has meanwhile set up a subsidiary, Scholarship Search Corp., which has continued to improve the system and data base. (A fairly complete base would contain 750,000 scholarships.) The New York firm will, for $20, provide a search and computer-generated letter to the student, listing details of 10 to 30 scholarships for which he is eligible.

Market potential for such a system is indicated by the two million students entering college each year.

CDC, CCC MAKE IT LEGAL; ACQUISITIONS ACCUMULATE

The marriage of Control Data Corp. and Commercial Credit Corp. has been formally blessed by stockholders representing 79.5% of CCC's and 85% of CDC's shares. During the annual meeting at CDC on Aug. 15, president William Norris also said that the 7600 was in the wings. (It is now expected to be announced by the end of the year.)

The merger brings into the CDC family the subsidiaries of CCC, including Contract Information Processing Corp. (former child of CCC and RCA). It is too early to tell which way the data center company will go; there is an escape clause in their contract that should either parent become involved with a competitor of one it was free to get out.

However, the planning for the data centers had not gone beyond the first center, which was to be at Baltimore, and no hardware or property is yet involved. While RCA reported to one source that it expected to deliver the Spectra 70's, CDC reports that obviously one center would not be of

CHAIRMAN, GUESTS, AND CAMELS AT ACM LUNCHEON

As general chairman Richard Blue opened the luncheon program at the national ACM conference in Las Vegas, he heard the curtains part behind him and "a mooing sound—or whatever it is that camels do." A plan for the camels, appearing in a Las Vegas show, had come up earlier at the conference when a group of colleagues suggested that he ride one to the lunch and he declined. The next day, however, the group reconvened—without Blue. And in the best traditions of American business a committee was formed, with subcommittees on Slogan Selection and Printing, Camel Procurement and Transportation, and Interface with Stardust Hotel Management. Project Camel implementation is shown above.

much use without the other 29, for which no plans yet exist. CIPC can be entirely sold to RCA, but more likely CDC will buy out RCA's 40%. Preliminary talks between the two companies have been cordial.

Just as this merger was consummated, CDC announced that it would purchase the Business Forms Group of Victor Comptometer and also acquire Printed Circuits, Inc., through stock.

Business Forms will bring CDC an expanded line of dp supply products (including multi-part forms for high-speed line printers), 850 people including 135 field salesmen in a nationwide sales organization, and manufacturing plants in six cities.

Printed Circuits, Inc., will provide circuits for CDC computers—including the supers—and for open market sales. PCI is billed as one of the nation's leading suppliers of multi-layer printed circuit boards to the computer and aerospace industries.

Other acquisitions this year have been the Data Processing Systems Div. of SCM Corp., which brought the Typetronic machines; Pacific Technical Analysts, Inc., with offices in Honolulu for consulting and analysis service; Electronic Accounting Card Corp., fourth or fifth in punched card production. There was also an attempted merger with Electronic Associates, Inc., which aborted.

During the past five years CDC has picked up a variety of companies to complement its activities and products. One of the earliest—an attempt to break into the business data processing area—was the Computer Division of Bendix Corp. and its hardy little G-15, which was widely used. In 1964 came TRG, Inc., and subsidiaries, adding communication, sonar, radio and navigational systems. Data display equipment and data collection were brought in by acquisitions, respectively, of Data Display, Inc., and the Data Systems Operation, Stromberg Division, General Time Corp. Scanners came through Rabinow Engineering. Other companies: Control Systems division of Daystron, Inc., now producing systems for power, chemical, petroleum, and steel industries; Computech, Inc., Glen W. Preston Associates, Howard Research Corp. and subsidiary; Commercial Computer Division, Librascope Group of General Precision, Inc.; GPI Computers Canada Ltd. and Computing Devices of Canada, Ltd.; Automatic Control Co.; Ultimate Systems Corp.; and C-E-I-R with its American Research Bureau, Automation Institute of America, and Automation Institute of San Francisco, Inc.

Foreign operations were supplemented with the acquisition of Waltek Ltd., Hong Kong manufacturer of computer memory components; Samaraughi & Co., S.p.A. (now Control Data Italia, S.p.A.) operating data centers in Rome, Milan and Genoa. CDC also has 96% of Electrofact, N.V., a Dutch company which makes and sells measuring, recording and control devices and systems for industrial processes, and makes CDC magnetic tape units for Common Market sale.

ELECTION COMPUTER ISSUE: BULLETINS OR BALLOTS?

The computer will play two distinct roles in the upcoming national elections: It will be involved in the actual vote counting process in numerous election districts across the country; and it will be utilized by the various news media, as usual, to analyze incoming returns from key areas in an effort to spot trends and predict final results. It is in these two discrepant roles that computers may develop an information lag, because in key areas where the vote-counting computer is used, it hasn't been able to provide the snap tallies necessary to the vote-analyzing computer.

There are many computerized voting systems that will be operating election night, including Cubic Corp.'s Votronics, which counts paper ballots; the Coleman Vote Tally System; Diamond National's Datavote, a card-oriented system; and IBM's Votomatic, which is the most extensively used (and whose name, we understand, is being changed to Voter Recording Device), servicing 62 election districts from Maine to Calif. The system involves a card punched with a stylus to indicate the voter's choice. All the systems expect to improve their November performances over the primaries, although a one-shot, real-time, on-line situation can't be anything but nervous-making.

IBM's 62 districts, for instance, function independently in terms of vote gathering and dissemination of information. Thus, any snap tally arrangement would have to be worked out between the news media and the district. IBM says it has little or no control, and some of the 62 are cooperating with news media and some are not. Regarding the snap tally, so essential to network reporting, Raymond Lee, registrar of voters in Los Angeles, testifying at an Assembly subcommittee hearing into the reasons for the vote-count delay in the Calif. primary, said that he had been informed prior to the primary by the state attorney general that snap tallies were illegal, an opinion later modified. Plans now are to attempt some form of snap hand tally at 2% or 3% of L.A. county's precincts to accommodate the news media and politicians who don't want to go to bed thinking they're president and wake up discovering they're not.

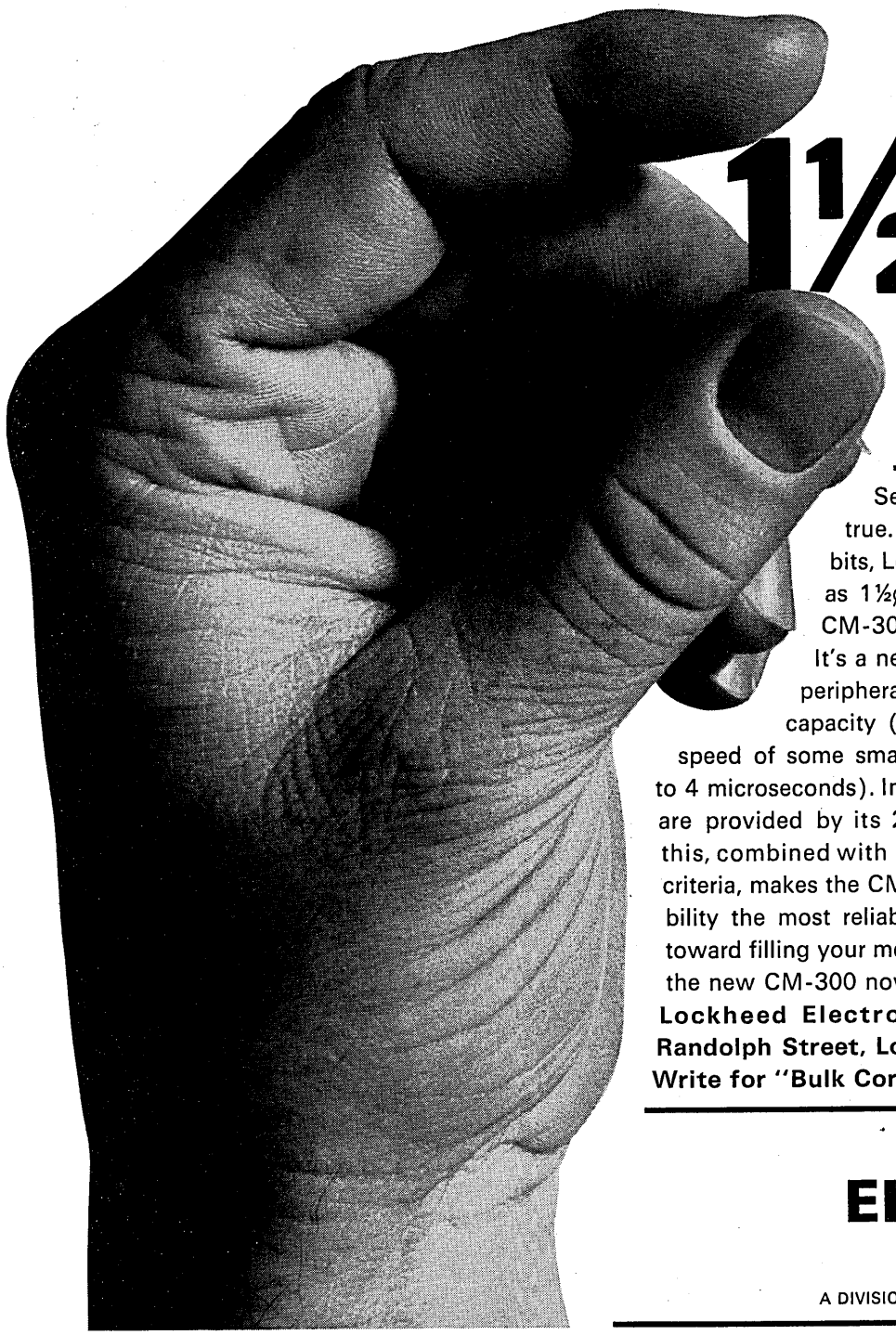
IBM will have some 90K Votomatic machines and 100 computers in operation election day and will increase the number of card readers to count the votes, the number in Los Angeles going from 11 to 20. Accelerated collection procedures, utilizing more personnel and better routes to counting centers, will be used. Precincts will be closed more promptly and election officers will be given more precise education on the handling of write-ins, which will be counted in the precincts (DATAMATION, July '68, p. 93).

The three major networks and two wire services, AP and UPI, have set up a non-profit pool called News Election Service (NES) to collect and transmit vote data on election night to the five members. NES will have seven regional centers throughout the country each equipped with telephones, two Tally card transmitters, keypunches, high-speed paper tape units and Teletypes. At another location in each region, close to the center, will be a rented (for that night, from a service bureau or user facility) 360/30 for analysis of local results and substantiation purposes. It will use the punched cards from the center, which will be hand-carried to it after the data has been transmitted to New York and the two Associated Press 360/40's NES will use at AP headquarters. The system is duplexed, with one /40 doing all I/O and the other, receiving the same data, going on-line only in the event of failure. It is a multiprogramming, real-time system using software developed or modified by Programming Methods, Inc., N.Y. Two IBM 2703 communications systems at AP will handle the incoming and outgoing lines to the other four members of the pool.

NES will not do data analysis, which will be undertaken by the networks and services on their own computers with the basic data provided by NES. This data will come from NES reporters stationed at 125,000 precincts around the country who will ask voting officials for results when the polls close and then call the tally into the regional center. There, a worker will take down the precinct number, the level or type of election, and the tabulation on forms that are then keypunched and verified. The cards are inserted into a Tally card transmitter and the data is sent over high-speed lines to the 360/40's in N.Y., which will take in data and generate reports minute-to-minute, every ten minutes, etc., depending on the varying re-

(Continued on page 89)

Lockheed's new bulk-capacity memory system costs just a little bit a bit.



Seems a bit hard to believe, but it's true. Based on 1 million words at 32 bits, Lockheed's CM-300 costs as little as 1½¢ per bit. □ Lockheed built the CM-300 to fill the memory system gap. It's a new class of random access, EDP peripheral storage system. It couples bulk capacity (up to 32 million bits) with the speed of some smaller systems (full cycle time—2 to 4 microseconds). Inherently high operating margins are provided by its 2½D, 2 wire organization. And this, combined with Lockheed's worst-case design criteria, makes the CM-300's peripheral storage capability the most reliable today. □ Take the first step toward filling your memory system gap. Inquire about the new CM-300 now. **Write: Memory Products, Lockheed Electronics Company, 6201 East Randolph Street, Los Angeles, California 90022. Write for "Bulk Core Memories."**

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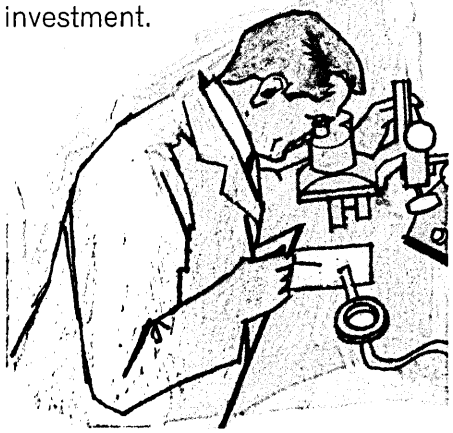
What is "Scotch" Brand 777GP? A new Guaranteed Performance computer tape designed specifically for use on third generation computers—an extension of the high reliability "Scotch" Brand 777 Computer Tape except that it does not require roll-by-roll certification.

***What performance can I expect from 777GP?** With 777GP there are no read errors. In this critical area you will receive the same long term reliability as with certified "Scotch" Brand 777 Computer Tape. (For detailed specifications and performance characteristics ask your 3M representative for specification sheet M-CL155.)

How can 3M assure such performance? Because 3M's exclusive binder formulation has eliminated oxide re-deposits that cause read errors, and today's third generation dual-gap head computers now compensate for minor tape flaws with no loss of data. In addition, 3M's advancements in manufacturing technology have reduced minor tape defects to the point where roll-by-roll certification is no longer a valid investment.



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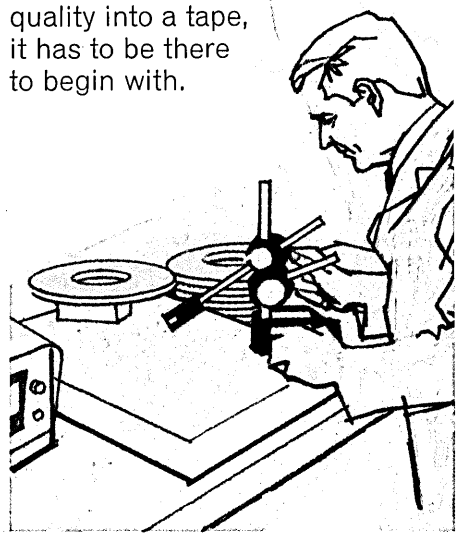

For what performance capabilities is 777GP recommended? 777GP performs at all bit densities to 1600 bpi (3200 fci).

Is "Scotch" Brand 777 certified computer tape still available? Yes, for those who feel the added cost of certification is warranted because the information being recorded or stored is irretrievable and even the remotest chance of a write-skip cannot be risked.

I'm interested in trying your new "Scotch" Brand 777GP Computer Tape. What do I do now? See your 3M representative. Or write: Market Services Department, Magnetic Products Division, 3M Company, 3M Center, St. Paul, Minn. 55101.

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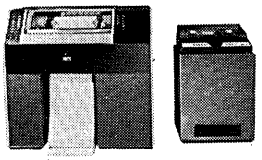
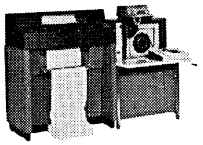
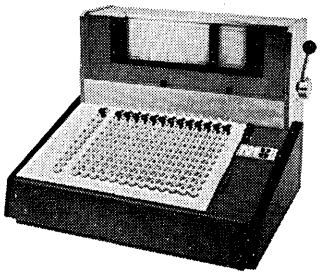


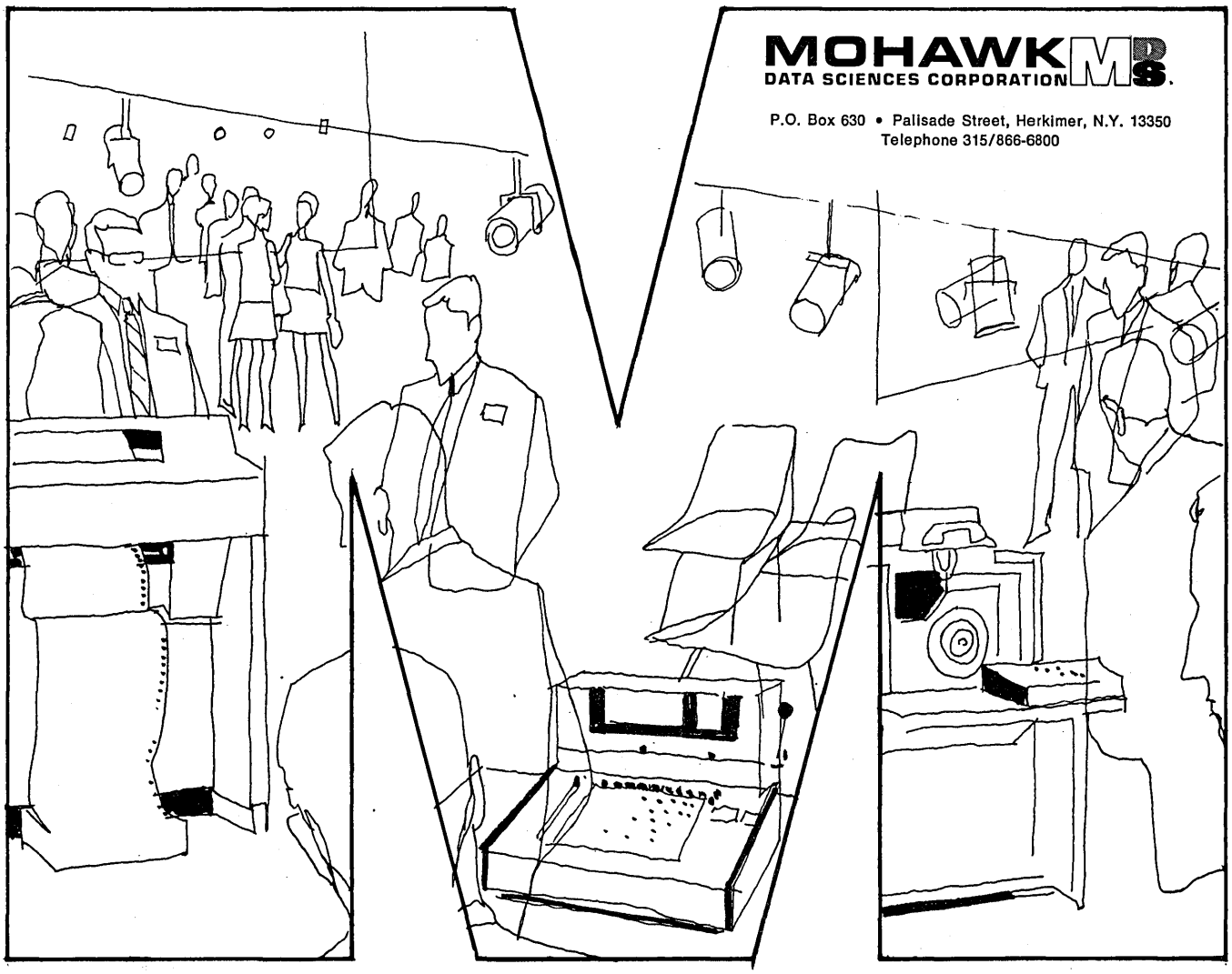
MDS 7160 High-Speed Line Printer and Magnetic Tape Handling Unit



MDS 1320 Buffered Line Printer and 6403 Data-Recorder, with data transmission



Data Input Station for MDS 4400 Source Data Gathering System



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quirements of subscribers. From transmission of data to the networks, it will be computer-to-computer communication. Reports will also go back to the high-speed paper tape units at the regional centers, each unit earmarked for a specific Teletype that will be on-line to a Teletype at the local news services and TV and radio stations. Thus, some of the reports will be tailormade for a particular region, as well as serve as a basis for national totals.

This will be the first time the system has been coordinated nationally via a computer operation, although it was working on a limited basis for the primaries. Programming Methods says the national election software has been debugged since June and exhaustive tests will be run until November. They are aware the election date can't be held up because software delivery slipped.

The prospects for quick, efficient gathering and reporting of the election results look good. In the meantime, town officials of Arlington, Mass., have thrown out computers after two election tries because they said they were too costly, didn't save time and were disliked by the voters. They want to have a paper ballot they can call their own.

FIRE FIGHTERS HELPED BY COMPUTER DISPATCHING

Two pilot studies for computer-aided fire fighting are being done by the Forest Fire Lab of the U.S. Forestry Service, Riverside, Calif. The first involves automatic dispatching of fire-fighting equipment and has already started on a limited basis. The other is a probability forecasting program to determine how many men and what equipment will be needed for various sections of a fire. The lab is using the Datel 3021 terminal linked to Allen-Babcock's 360/50 in Los Angeles (on a regular time-sharing customer basis) for both projects.

The automatic dispatching system is not yet 100% operational, but has already been used to advantage. In addition to keeping an equipment inventory, the computer recommends the fire company which should be sent and computes the shortest route to the scene of the fire. For crews not familiar with the area, directions to the location are also given. In a recent fire, the dispatcher, finding the engine company he wanted to send was at another fire, started another company rolling, but the computer came up with a better answer—the dispatcher immediately sent the computer-recommended company, and it got there faster.

Dispatchers can communicate with the computer in a conversational mode —an addition to the original program— in which they simply type on the keyboard in English to report the location of a fire, ask for a status report on equipment, make changes in the inventory, etc. This eliminates the need for extremely experienced dispatchers, who had to work mainly from memory. Another by-product of writing the program was that it forced the Forestry Service to analyze travel time throughout San Bernardino County— and it was found that in several cases fire companies had never been dispatched to locations which they were actually in the best position to serve.

Next step will be the automatic dispatching of fire-fighting aircraft to fires, and eventually—hopefully—the same for fire-fighting personnel.

This August the automatic dispatching cost the Forestry Service $125 for the terminal and around $3800 for cpu time (ten hours). The lab feels this is too high a price, but the project is in the development stage, and a program optimization study should be completed by next May which will get the costs down to $1,000 a month, a reasonable figure, according to Ernest T. Tolin, who is in charge of computer services at the Forest Fire Lab.

The second study is in "fire intelligence," or probability forecasting. This would enable the computer to analyze the fuel type involved, the terrain, what type of equipment the Forestry Service wants to use, and generate a printout on how much equipment, or how many men, are needed and the percent of chance of containment of the present fire if these recommendations are followed. In this case, the terminal could be mounted in a trailer and sent to the scene of the fire, where phone wires would be tapped to get onto the computer. The program is completed, but the lab is still waiting for an opportunity to test it. It seems that you can't just go to any old fire and set up operations. They're waiting for the "ideal fire."

Ultimately they hope to do a fire spread model, but it's quite a way off. This program would analyze fuel types, terrain, weather conditions, etc., and predict fire spread, possibly as far as five or six hours in advance.

The studies are being financed by the Dept. of Agriculture fire research fund and grants from the Calif. State Div. of Forestry.

CRITICISM, KUDO FOR PROGRAMMING SCHOOL

The names and places have been changed to protect a national programming school that has only one rotten apple in its barrel of franchises that we know of.

Last month, DATAMATION received a carbon copy of a letter from Mr. Agonia to the state's attorney general about the unethical activity of a programming school. Mr. Agonia explained that his son had taken the school's programming aptitude test and passed. He could not, however, enter the course until he had received a high-school equivalency diploma. The helpful school salesman urged the young man to make a $200 downpayment for the course, as an "incentive," and assured him that it would be refunded if he did not achieve his equivalency diploma. The father also signed a paper which the salesman said would simply verify for his office that he had made a potential sale.

For some reason, the young applicant did not achieve his diploma and his draft deferment was coming to an end. When the father called to request the refund, it was refused, even though the son was not eligible to take the course. Mr. Agonia then enlisted the aid of a lawyer, who also contacted the school. It turned out that Mr. Agonia had signed a contract (albeit unknowingly and he never got a copy) so he had no legal recourse. The resourceful man, however, wrote to his local attorney general, Better Business Bureau, and friendly computer magazines.

This office contacted the corporate headquarters of the school and was assured that if the facts were correct the money should be returned. The result is that Mr. Agonia's son received his refund and the sales office of this franchise reportedly received a corporate visit. Unfortunately the director of this franchise did not choose to take the matter well as he wrote these confusing, unprofessional comments in his letter:

"We do not recall nor do our records indicate any advice from your attorney regarding a change in your son's draft status. We do recall a phone conversation with a voice, a day before . . . was scheduled to start his course on July 9. The voice purported to be you said . . . would not be starting because he had failed the test necessary to obtain his high school equivalency certificate. We requested a statement in writing since we found it difficult to reconcile that statement with the high degree of aptitude evidenced by his test mark here. We are pleased to finally have the true facts, and to know that . . . is not stupid, as the voice led us to believe."

Whatever the case, the school took funds from an ineligible student. The moral of the story: any student or ap-

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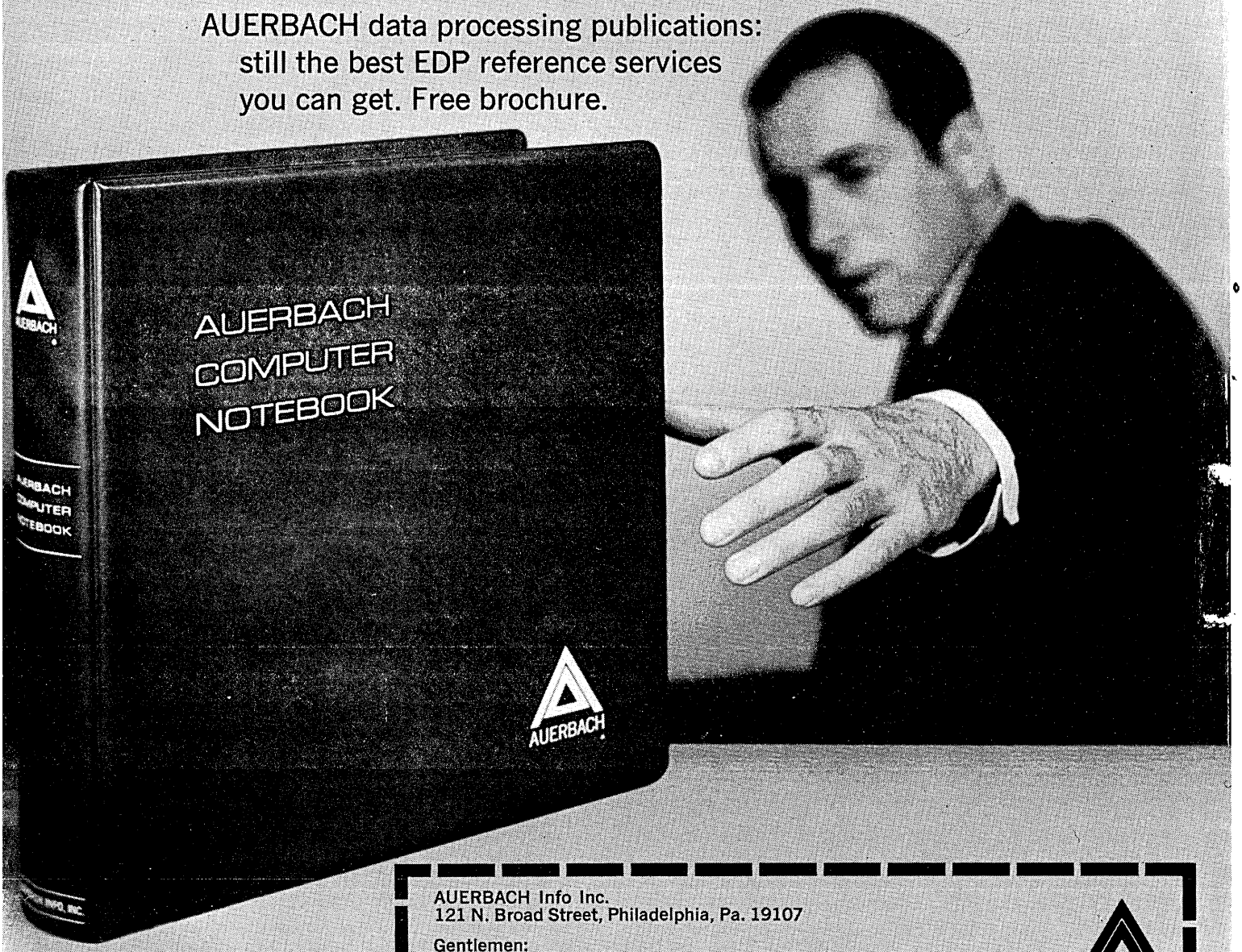

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plicant to these schools who feels he has a justified complaint should approach the school's corporate management, and failing that, should then go to the press and consumer fraud agencies.

FINDING A PLACE TO PUT THE MONEY

What profitable to do with those big monthly rental receipts pulled down by computer leasing firms other than bank them against the day the mortgages fall due?

A Dallas concern, Data Automation Co., has hit upon a novel scheme, one that may allow their rental money to do double duty—if it works as planned. Data Automation is acquiring KBK Investment Corp., a factoring firm located out in the oil lands of west Texas, where it assists in financing oil field exploration and drilling—at rates of return up to 3% a month. In addition, some of KBK's more successful clients have migrated north to Alaska where oil is also found in large quantities, leading KBK to establish offices in Anchorage.

It's a good, secure business, according to DAC prexy Jim Devlin, who also anticipates yet another benefit from the KBK association. "We plan to develop a generalized software package to optimize a factoring firm's investment program, which we'll use first at KBK and then make available to other investment companies," he said. The package, perhaps the first developed for the field, will be developed under the guidance of a new DAC senior executive from a major investment firm who has a programming background, unlikely as that sounds.

DAC is not putting all its financing eggs in one basket, however. It recently negotiated a $1.5 million line of credit for its disc pack leasing program with a Dallas bank and $6 million for general leasing use with a Chicago investment firm.

ACM UTILITY SESSION—AT&T IS WATCHING AND WAITING

After the session on "Computer Service 'Utilities,'" at the ACM national conference, a man approached speaker Michael A. Duggan and said, "I thought you had left the Justice Department."

The rhetorical question—Duggan is now at the University of New Hampshire—was a fair one: Duggan hit hard at Ma Bell in his talk, indicating that AT&T has the capabilities (in its Electronic Switching Station) and perhaps the inclination to go into the computer service business. It's a move that Duggan obviously deplores.

The alternatives he sees facing the computer utility industry include: "(1) a give-away to AT&T; (2) limit it to the communication carriers—AT&T, Western Union, ITT, RCA, and GT&E; or (3) allow a free competitive market to shape the industry, at least for the foreseeable future." Duggan obviously hopes that FCC policies will help the utility industry evolve under the impetus of free competition.

There were few clues as to how the Federal Communications Commission will approach the development of such policies—except, perhaps, gingerly—in a talk delivered by Ernie Nash of the FCC at the same session. Nash reviewed the role of the FCC and repeated some well-known facts: "The line of demarcation between edp and communications has begun to obliterate; the users are not certain what they want and the common carriers don't understand all their technology can offer; there will be more data traffic than voice in two years".

Nash noted that the FCC's tacit approval of Western Union's SICOM market information services (see Dec. '67, p. 68) indicates that they view it as a communications, not data processing, service. But he also pointed out that if WU broadens the service—or if, specifically, WU adds a fourth computer to the service—the tariffs would be subject to review and probable rejection.

At session on Data Communications the next day, Nash gave a special report on the status of the FCC inquiry . . . at least that was the title. He apologized for the legal machinery required to establish procedures, and he indicated that computer folk have not examined closely enough the alternatives to the regular services of the common carriers . . . the 890-megacycle microwave system, for instance.

At the "Utility" session, Nash indicated that the FCC has awarded a contract to Stanford Research Institute to evaluate the replies to the FCC inquiry. So what was billed as a battle between the computer and communications industries may boil down to a skirmish between consultants SRI and Booze, Allen & Hamilton, which did the bulk of the work in preparing the response to the inquiry of the Business Equipment Manufacturers' Assoc.

Nash concluded by acknowledging that the communications/computer confrontation was "a gnawing question"; he hoped that the FCC would be able to "nurture progress," but noted that the FCC "cannot sacrifice the reasonable requirements of all concerned." Which might be interpreted to mean that neither side can expect a clear-cut victory.

The panel discussion which followed did little to shed light on the problems of the utility or to offer any solutions. Einar Stefferud of SDC noted that the problems are political, not technical; "All we have to do is decide what we want to do," he said. What is needed, he said, is a common addressing scheme which will allow all computers to use one monopolistic regulated network. And he feels that the future shape of the utility industry will be oligopolistic—with many large suppliers and many small ones.

Dave Farber of RAND (and formerly of Bell Labs) answered Duggan's charges by indicating that ESS "is not really capable of providing a competitive computer service." But he admitted that the technology available to Bell would allow it to offer a competitive service "at many levels." The fact that Bell is on the verge of going into the picture phone business could lead to "a very large service" involving touch-tone phones and displays in homes, coupled with broadband capability plus programs and local and large central computers. The big question is whether Bell knows how to market such services. Farber's answer: small (home) computation services, yes; large computational services, no.

Jim Babcock, a computer utility service pioneer, took time to defend the Bell system. As a user over the past three to four years, Babcock has noted more responsive service at local and national levels in trying to solve particular problems of remote terminals of all kinds.

The first phone company acoustical coupler will be available in the first quarter of '69, said Babcock, "which is better than the speed with which IBM is making available a working copy of OS/360." But what is needed, said Babcock "—and if the phone company doesn't provide it, someone else will—" is "a way to switch files. The future of the computer utility lies in access to large data bases." And Babcock wouldn't mind seeing ESS provide him with this capability.

INSTANT EDP COMPANY APPEARS IN DALLAS

By pulling together its edp activities into a subsidiary of LTV Aerospace, Ling-Temco-Vought, Inc., has created overnight a rather sizeable software/service firm.

The new company, Computer Technology Inc., combines the computer people and equipment from LTV Inc., LTV Aerospace and the latter's subsidiary, Service Technology Corp., which brings to the marriage a handsome dowry of an $80-million backlog. STC, which will operate as a subsidiary of CT, provides systems site manage-

"Mylar" is the computer tape base that moves the data that moves S&H merchandise

"Accurate inventory control is an absolute must in our business," says Allan Vesley, Director of Information Systems for The Sperry & Hutchinson Company.

"With nine regional distributing warehouses, over 800 redemption centers and more than 50 million pieces of merchandise, we have earned consumer confidence through our policy of rapid redemption. Our computer program makes this possible. And it's reassuring to know that most of our critical information is stored on computer tapes of 'Mylar'* polyester film."

Mr. Vesley is assured of high-quality tape because much of his worrying is done *for* him . . . by computer-tape manufacturers. These tape manufacturers concern themselves with sophisticated coating techniques, quality-control testing and base-film selection, so that tape users, such as S & H, get the ultimate in trouble-free tape performance.

No wonder so many manufacturers of analog and digital tapes specify "Mylar" for their film base. Tape manufacturers won't sell—or buy—anything less than the best. That's why today more computer tapes are made by more manufacturers on a base of "Mylar" than any other material.

FILM DEPARTMENT

*Reg. U. S. Pat. Off.

DUPONT MYLAR® polyester film

REG U.S. PAT OFF

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ment for NASA and DOD.

President of the big new baby company is G. W. "Bill" Woerner, formerly vp and midwestern regional manager for IBM's Data Processing Div.

Company HQ will be in Chicago, but most of the 2700 employees and the edp gear will remain in Dallas.

CT kicks off with a 10-year contract to provide data processing services for LTV Inc., LTV Aerospace and another subsidiary, LTV Electro Systems. The charter calls for providing a full range of computer-related products and services to the computer field.

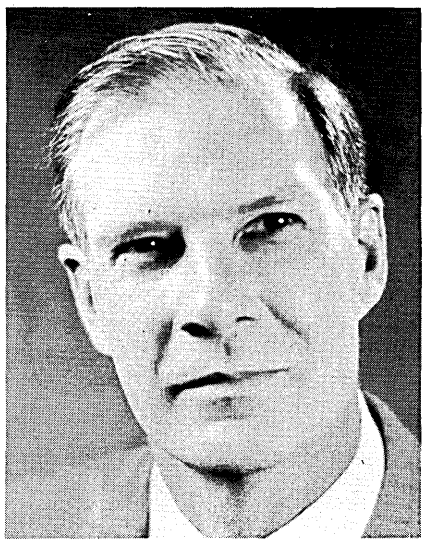
At the moment, LTV Inc. holds 27% of the shares in CT; 70% will be held by LTV Aerospace Corp.; 3%, by management. A public offering is planned for the near future, details of which are not yet available.

LTV Aerospace is kicking in $10 million in cash to help the new company get rolling.

HAMMING RECEIVES TURING AWARD

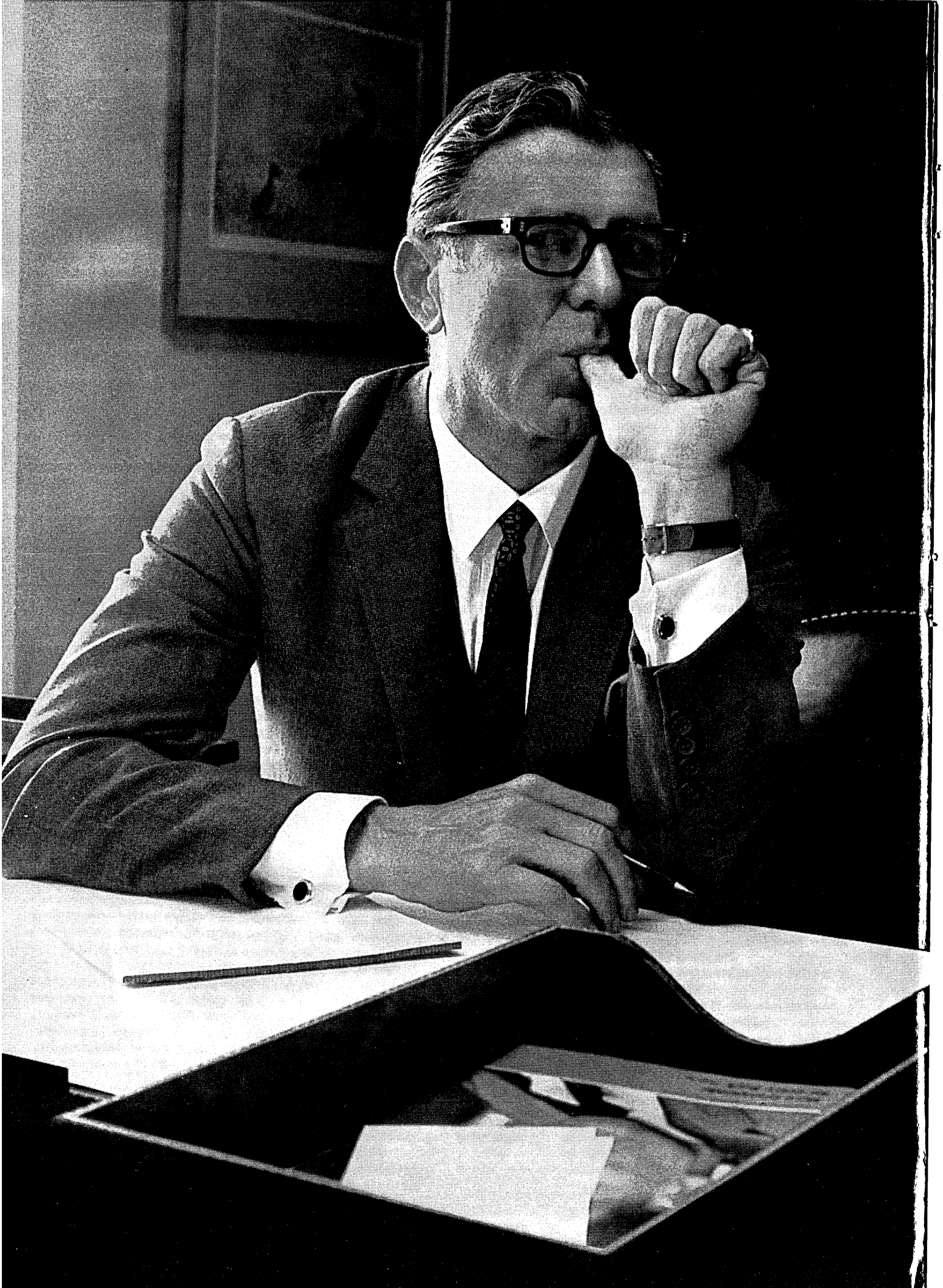
Richard W. Hamming is one of the computer industry's most widely respected authorities. A founder and past president of the ACM, head of the Computing Science Research Laboratories at Bell Labs, he is the author of the widely quoted statement: "The purpose of computing is insight, not numbers."

He is also a practical man. At a Las



Vegas computer conference several years ago a DATAMATION editor approached him and asked, "As a man of mathematics who understands the theories of numbers and statistics which rule this place, what is your theory on gambling?"

Hamming immediately offered the following: "If you find a penny on the



Security is an IBM 1800 computer.

This is an executive. Show him the letters IBM on the front of a computer and he feels secure. Even if the machine behind the letters isn't as good as another one his company could buy.

For example, our SEL 810B is a better computer than the IBM 1800. Judge for yourself:

The SEL 810B is faster—790 nanoseconds versus 2 or 4 microseconds. Are you interested in monitor programming? Why wait for TSX and MPX. The SEL 810B RTX has faster response time and is easier to use.

And Systems Engineering Laboratories can design and deliver custom front-end equipment with the SEL 810B. IBM can't with the 1800.

We can deliver in 90 days. Figure on a year for the IBM 1800.

To top it all, the SEL 810B costs less. In fact, you can buy two SEL 810B's for the price of a typical 1800.

What does IBM have to say about all this? That they're dedicated to service. A noble dedication. But we say a computer is built to perform, not to be serviced.

We know these are pretty brash words. And we expect to be called on them. We invite you to be among the first.

Call us at home collect. Tell us you want to see proof, not just claims. We'll set up a demonstration.

We figure if we spread the word often enough about the SEL 810B, eventually it'll have to filter up through that great big security blanket.

Call Joe Popolo at Systems Engineering Laboratories in Ft. Lauderdale. The number is Area Code 305/587-2900.

Or write P.O. Box 9148, Ft. Lauderdale, Florida 33310.

Systems Engineering Laboratories

See us in Booth 1500 at ISA.

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floor, pick it up. That's the only way you'll stay ahead of the game. But," he added, "I haven't found a penny yet."

The editor fished out a penny and dropped it on the floor. Hamming picked it up and walked away.

So it was no surprise to hear Dr. Hamming offer the ACM and the computer industry some practical advice as he delivered the third annual A. M. Turing Lecture in Sin/Sun City last month.

In "One Man's View of Computer Science" Hamming stressed that "specialization leads to triviality," and to prepare students of today for the year 2000 when they will be at the peak of their careers, the computer science curriculum needs more of a practical engineering flavor than now taught in most courses. At the risk of being misunderstood, he said, he'd like to change the name of computer "science" to computer "engineering," to emphasize that the problem is not "Can it be done?" but is more a question of finding a practical machine or program with a reasonable expenditure of time and effort.

Probably the most important way to produce this flavor of practicality, Hamming said, is to avoid the "black and white mentality that characterizes so much of (pure) mathematics" and to stress the judgment and balancing of conflicting aims that characterize engineering. To change computer science's reputation, he continued, we need to avoid the "bragging and uselessness and the game playing" that the pure mathematicians (of which Hamming himself is one) so often engage in.

Specifically, in the curriculum, he would like to see a strong minor in some field other than computer science and mathematics; more of that "practical engineering flavor" in software training through the development of relevant theories rather than gimmicks; applications to be taught in their natural environments by the appropriate departments (e.g., COBOL in the business administration dept.); formal mathematics courses more suited to the needs of computer science; more laboratory work; and, throughout it all, the imparting of a standard of professional ethics.

COMPUTER USAGE ADJUSTS SUBSIDIARIES' ACTIVITIES

The upshot of Computer Usage Co.'s financial problems with its subsidiaries, Computer Usage Business Services, Inc., and Computer Usage Education, Inc., is the absorption of many of their products and professional staffs into Computer Usage Development Corp.

The reason for the end of these firms as separate entities was two-fold. Computer Usage Business Services had unsuccessfully attacked markets that were new and unknown to the company—edp services for the very small user, and a CUE-developed home-study programming course originally aimed at the general public. Second, Computer Usage saw that some of the developments of these subsidiaries would best be managed and marketed by CUDC and could not justify supporting multiple overheads.

In an interview, Charles Benton, new president and chief executive officer of CUC and CUDC, explained that the firm has always serviced the large industrial computer market. CUBS was faced with the problem of addressing the small individual market. Indeed, he said, "no one has penetrated" this market.

CUC will not give up the packages CUBS developed, such as payroll, but is putting them into the "existing marketing and systems organization" of CUDC. CUDC will perform the CUBS contracts at its centers; some contracts represent many small businesses.

CUE was in a somewhat similar situation. The home-study programming

course has been highly praised in the industry, but even though several hundred people had purchased it, the costs of operating the course, which included computer time for a program written by the student for each lesson, were helping to keep the operation in the red. What happens now is that the home-study course for the public will be licensed. McGraw-Hill is already licensed to use it in its textbook development.

The subsidiary has also developed education courses in edp and management for commercial and government institutions, however, and it is these services that CUDC will offer to its customers. CUE's professional staff will continue to do development work in this area.

The nine-month earnings report (ending June 30), which showed revenues up ($10.7 million vs. $9.9 million in '67), but earnings down ($154,367 vs. $411,603), also stated that CUDC had not done as well as anticipated. Benton said that there was "no one thing that caused it," just "not having the right number of people at the right place at the right time."

"There's a large market for systems analysis and programming," he said. "Our ability to reach that market depends first on people to solve problems, then on marketing capability and management of operations." Benton, who recently joined CUC after Elmer Kubie and Carl Reynolds resigned, could not say what this meant for the specific organization of the firm. But he did note that it would "more directly bring to bear the corporate resources in support of the regional organization." There will be a "growth in management controls" and a "greater emphasis on marketing."

Benton sees CUC as a total information systems firm with these capabilities: systems consultation, feasibility studies, systems design, systems analysis, systems programming, programming, education, facilities operation (turnkey or management).

To shore up each of these areas, Benton said that CUC "will consider buying firms where it augments capabilities and fits the growth pattern," although his comments did not imply that CUC would break its conservative direction and begin a buying spree. CUC will grow in areas like systems programming and analysis by hiring and training in-house, he said. As for systems management, CUDC has its Computer Usage Facilities Management subsidiary. Benton notes that although the government started using outside firms for this service 10 years

AUTOMATIC TESTING PROCEDURE (TESTPAK) consisting of three programs, DATASET Generator, DATASET Printer, DATASET Stripper and necessary job control language techniques designed to interface with and complement each other. The three packages offer an automatic, easy program testing system which can also be used individually as stand-alone utilities. Substantial savings are realized on Computer Time, Programmer Time, Set-up Time, and Application Development Time; and elimination of Operational Documentation.

NOW — TIME SHARING SERVICES, INC., Los Angeles, Calif., is part of CMC and also expands its capabilities with COBOL to COBOL TRANSLATORS, and CUSTOM-DESIGNED SOFTWARE to Client specifications. CMC is developing new software such as SELECT, SORT, and REPORT SYSTEM and a FILE MANAGEMENT SYSTEM.

CMC has eight years of experience in designing and implementing:
ON-LINE and REAL-TIME SYSTEMS for: Airline Reservations, Air Traffic Control, Banking, Central Credit Files, Communications, Command and Control, Information Retrieval, Simulators.
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*A TESTIMONIAL from McDONNELL-DOUGLAS CORPORATION on our AUTOMATIC TESTING PROCEDURE (TESTPAK) . . . Program test time has been reduced from an average of 12 minutes to 1 minute per test. Test turnaround time has been reduced from 48 hours to 2 hours. Programmer retention of individual test tapes eliminated (approximately 40 test tapes per programmer).

CMC offers "total systems capabilities" with its offices at these locations:

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LOS ANGELES
1633 Westwood Boulevard
Los Angeles, California 90024
213/272-1181

COMPUTATION CENTER
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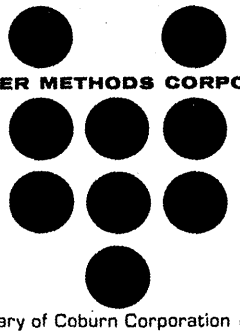
Rockville Centre, New York 11571
516/764-2800



COMPUTER METHODS CORPORATION

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ago, the commercial world is just now beginning to accept it. Other areas CUC is examining include further development of proprietary packages, but in modular form, so that generally applicable parts of a package can be marketed broadly. For each application these modules would be configured with tailor-made modules fitting the needs of the specific customer.

There is also "tremendous room for horizontal expansion," said Walter Johnson, CUC treasurer. CUC branches are now in 20 locations. "There is room for many times that." CUC could use several large offices in Manhattan, and in addition to the large cities, will also go into more large suburban areas.

COLLINS ENTERS COMPUTER HARDWARE, SERVICES MARKET

Plans for entering the computer business on a large scale—both in hardware and with a unique service-center concept—were revealed by Arthur A. Collins, founder, president, and chairman of Collins Radio Co.

Actually, the big manufacturer of communications, avionics, and other electronic equipment has been building digital computers for nearly a decade. Examples are the C-8401 communications processor, the Data Central switching system, and the C-8500 —a 32-bit, 1.2 usec processor that comes with up to 262K core and a host of peripherals, including a smaller "device control" computer, crt terminals, modems, and magnetic card files, as well as the usual printers, card units, discs, drums, and mag tape. Even a small tape cartridge unit is available, for initial program load and diagnostic routines.

But the marketing program for these goodies has been close to nonexistent. Collins had the equipment. And if you happened to know about it—maybe because your company was a customer of theirs for other products—they might sell you some. Penn-Central and Delta Airlines, for example, use Collins computers.

Now, presumably, this is going to change. But the company may have a struggle ahead, not only in competing with the well-established computer makers but even in getting the idea across that prospects should identify Collins with computers.

If bold and novel ideas are a harbinger of success, however, Collins may end up a winner. Consider, for example, their concept for on-line, production/process-control service centers. This scheme envisions nothing less than the actual control by a cus-

tomer of a part of Collins production facilities. A customer might want, say, a certain quantity of an extremely complex circuitboard. He would be able to go to a Collins service center (or be tied into it through a terminal), feed in the specifications, and initiate the actual production of the component at one of Collins' plants in another city.

Does Collins have the resources, especially the money, to carry out these ideas and compete with a line of computers at the same time?

There are some reasons to think they have a chance. Collins is a more-than-medium-sized company. Sales for fiscal '67 were $438.9 million and for '68, just ended, they rose to $447 million—producing a net profit of $13 million. The company employs more than 23,000 people and has big plants in Dallas (corporate headquarters) and Cedar Rapids, Iowa, as well as facilities in Newport Beach and Santa Ana, Calif., and Toronto. They also have nine subsidiaries in other countries.

They have been active in computer control of production processes in their own manufacturing, have facilities for thin-film production, multilayer circuitboard manufacturing, and digitally controlled printed circuit layout. They are also, of course, vastly experienced in communications—including satellite/ground station networks. And the C-8500, as noted above, includes a line of modern peripheral equipment.

An understated news release from Collins says that "sales volume in the computer systems and service area will not fully reflect the ultimate importance of this activity in the immediate future."

Well, there's always room for one more. Especially a modest one.

HONEYWELL'S MICRO SWITCH READIES LOW-COST KEYBOARD

Anticipating the rapid growth of the market for computer terminals in the next few years and trying to hasten the day when they will be cheaper, Micro Switch division of Honeywell is producing a solid state keyboard compatible with existing computers and remote terminals, with a built-in marketing program of de-escalating prices. The keyboards are designed for ASCII code and may also be coded for EBCDIC, Baudot, hexadecimal or teletypesetter systems.

Micro Switch (largest producer of precision switches in the world) has been building, at customer request, specially tailored keyboards in limited quantities of one to several—an expensive process. The solid state keyboard

is MS's answer to a need for a less expensive component; it can be mass produced and by 1970 the price can be brought down to $100—half present prices.

The basic keyboard consists of four rows which provide up to a 69-key array. Keys are arranged in standard typewriter format (with additional symbols and function keys) but may be arranged in any desired sequence. Each key contains a pinhead sized integrated circuit chip (containing a Hall generator, a trigger circuit, and an amplifier) and a magnet. When the key is manually depressed, the magnetic field alters the voltage in the Hall generator. The analog output is converted to digital output by the trigger circuit. The output is then amplified and fed to the encoding matrix.

The keys terminate in one of two printed circuit boards within the keyboard: termination and encoding. The printed circuit board encodes by interconnecting conductors from the two printed sides of the board. One side of

the encoding board has two vertical columns for each key while the reverse side has 32 horizontal rows of conductors. There are 16 possible combinations of a four-bit binary code (four zeroes through four ones). To form an eight-bit code two separate grid systems are utilized.

The solid-state approach is claimed to have some major benefits: low cost, no moving contact, electrical compatibility (voltage and current levels are the same as other logic devices in other equipment), and electrical repeatability (no degradation from aging and circuits do not have to compensate for variations in contact resistance from switch to switch). The keyboard was announced in September and seven units were scheduled for delivery in that month; full production is expected by mid-1969.

The keyboard is envisioned for use in terminals which will be in increasing demand for bank, hotel, brokerage, insurance, and airline industry information. Other fields which will need a growing number of computer terminals are government, education, research, and health, plus the proliferating t-s companies with multiplying customers. The more visionary marketing people at MS see the housewife using an inexpensive terminal hooked to a computer and the family tv set used as the crt for visual output. For information:

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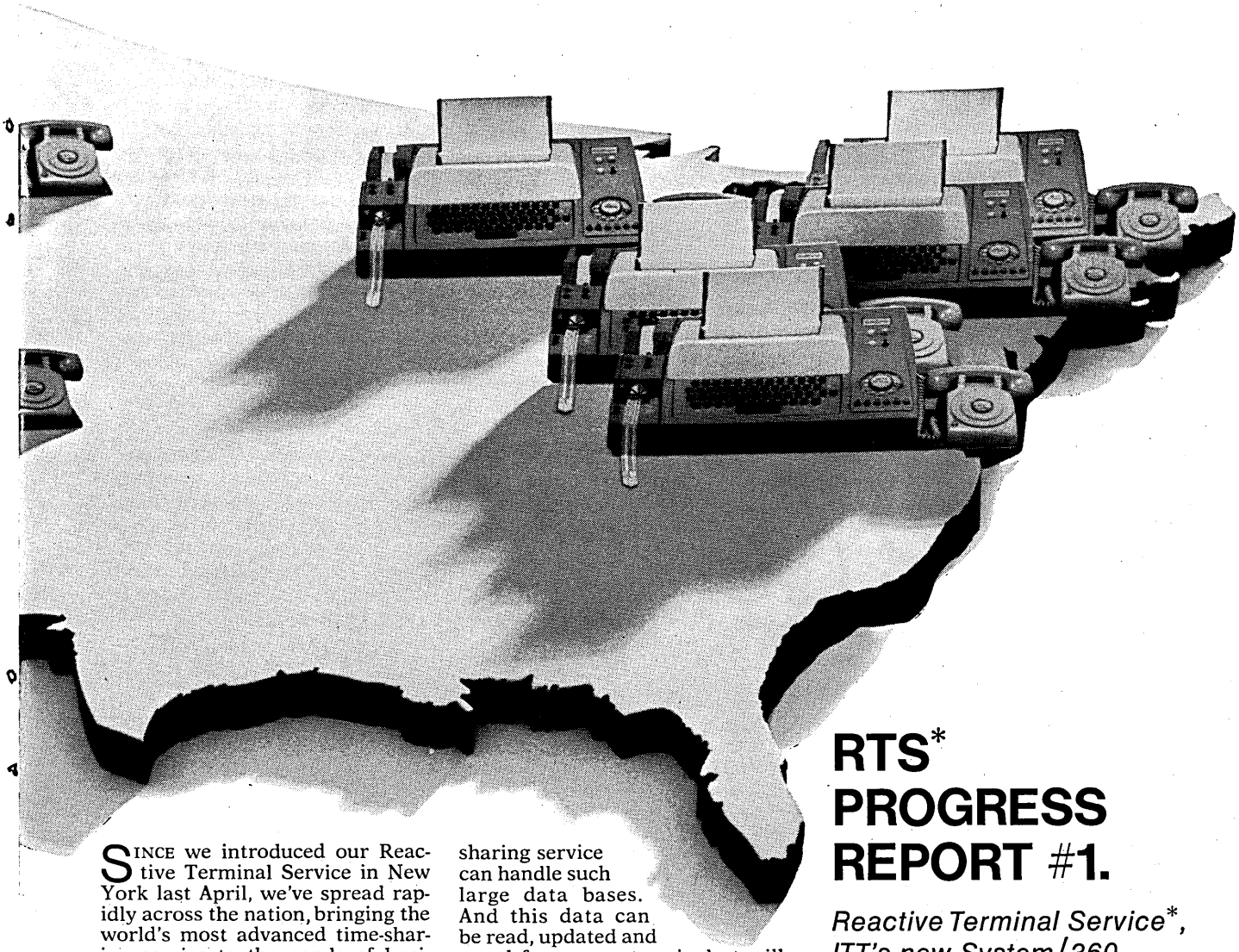
COMPUTER AGE INDUSTRIES ADDS TWO SUBSIDIARIES

Computer Age Industries, Inc., a one-man holding firm started in June by Swen Larsen, a Control Data Institute founder, now has two subsidiaries: Oyer Professional Computer Services, an educational-service firm for "professional groups," residing in a Manhattan penthouse; and Computer Age Institute, programming school, nicely ensconced on an 8½-acre estate in Norfolk, Va.

Oyer, which is headed by ex-Computer Usage Education director Paul Oyer, was formed in June and merged with Computer Age in July. The five-man subsidiary this fall will offer advanced courses in programming, systems analysis and design, and time-sharing to edp professionals; computer courses for non-edp professionals such as engineers, lawyers, and accountants; and various management courses for execs and dp managers. Backing is from "Washington financiers."

WESCON PANEL DISCUSSES IMPACT OF TECHNOLOGY

The final session of the Western Electronic Show and Convention featured a panel discussion on "The Impact of New Technology on Data Communication." It was moderated in firm style by George Gilman of Mitre Corp., and the panel consisted of James Babcock, Allen-Babcock Computing; Dean Gillette, Bell Telephone Laboratories; Richard Petritz, Texas Instruments; Virgil Vaughan, AT&T; Ted Glaser, Case Institute; Merlin Smith, IBM; and Charles Strom, Rome Air Development AFB. From the panelists' opening observations, it was apparent that the impact of new technology on data communication has been, is, and will be great, but there was considerable uncertainty as to how technology will affect the new directions of data communication. Jim Babcock lauded the technological developments that have been the outgrowth of the



RTS* PROGRESS REPORT #1.

Reactive Terminal Service, ITT's new System/360 computer time-sharing service, is now available in NewYork, Boston, Los Angeles, Washington, and San Francisco. San Diego, Chicago, and Pittsburgh are next in line.*

SINCE we introduced our Reactive Terminal Service in New York last April, we've spread rapidly across the nation, bringing the world's most advanced time-sharing service to thousands of businessmen, scientists, engineers and programmers.

Five cities now have our RTS system. And more than 20 will have it before long. (These progress reports will keep you posted.)

RTS is the only time-sharing service that gives you on-line ability to write OS-compatible programs using FORTRAN-G, and also provides unlimited on and off-line program storage, your pick of many terminals, line-by-line debugging capability, and the largest core storage per user offered anywhere by anyone. Basic Assembly Language is also available.

In addition, we have expanded our user work file capabilities to 2.4 million bytes of data storage for each program. No other time-sharing service can handle such large data bases. And this data can be read, updated and saved from your terminal at will.

We have also added an update text editor that allows you to easily and quickly change a single character, or a string of characters, in both data and programs.

What's next is another language —BASIC. (See next month's Progress Report.)

These new features, combined with the backup provided by ITT Data Services' network of large-scale computer centers, make RTS the most versatile and efficient computer time-sharing service there is.

For further information or a demonstration, call, or write, the ITT Data Services center nearest you. Once you've tried RTS, you'll want to put it in *your* next progress report.

ITT
DATA SERVICES

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healthy interdependence between the computer and communications industries. But he stressed the need for a network able to generate a file coast-to-coast, as well as for more sophisticated software for computer-to-(different-model) computer communication.

Virgil Vaughan, in return, commented that there had been very few firm orders to AT&T for switching networks from computer people and, indeed, that there had been a lack of intercommunication between AT&T and computer people, that software was not being provided to assist AT&T in system design.

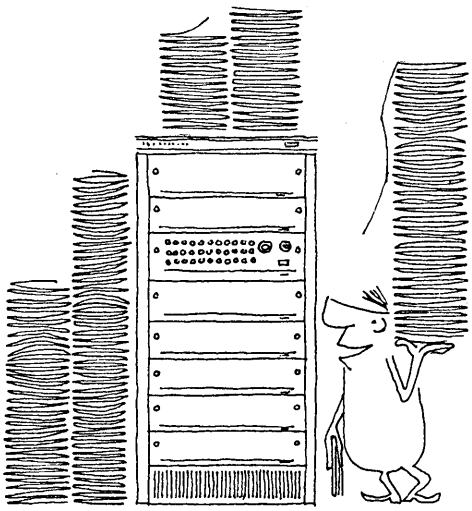
Dean Gillette foresaw a future of private dedicated lines together with commercial networks for occasional users. He also predicted that lasers and satellites will complement microwave transmission, and that coaxial cables for pulse code transmission will be a new development . . . ¼" cable will carry ¼ million voice pulses that will be translated into digital transmission. Richard Petritz dwelt on the effect of LSI, a development that presages not only bigger and better computers, according to Petritz, but smaller, more complex machines that will be used widely in business offices. He saw time-sharing as a function solely for large operations.

In his evaluation of the technological impact, Ted Glaser leavened his remarks with a welcome wit. He said that we're having a data explosion and there just might be some information in it. And that soon one will be able to pick up a phone and call anyone anywhere in the world in 30 seconds . . . and then what does one say? He felt that new companies will be formed to provide transmission lines but that the common carriers serve as efficient clearing houses with better error control.

Merlin Smith asserted that politics and policies have a longer turnaround time than technology advances. He stressed the need for vendor coordination and systems compatibility and agreed with Petritz that LSI would be of value in constructing memory and putting more software into hardware, but said it had been disappointing in other areas. Charles Strom was another who felt that alternate transmission routes are necessary and he emphasized the need to solve standardization problems. He asked the question: Will today's installations evolve into tomorrow's . . . or will they have to be junked?

In the give-and-take discussion that followed, Babcock told how he spends

If you're acquiring data, the 703 can get it for you wholesale.



And that means more of it faster, and with less cost, work and worry. Raytheon Computer's $15,000 703 has system characteristics built-in... 1.75 usec cycle time... 16-bit word ...memory expandable to 32K...byte and word manipulation ...real-time priority interrupt... options like direct memory access, multiply/divide, expandable I/O bus.

Peripherals? Up to 256 including all the conventional high and low speed, mass and non-mass devices plus—from Raytheon Computer only—analog data acquisition instruments like the MINIVERTER®, 100KHz ADCs and a long line of analog and digital IC modules for expanded logic, interfacing and control.

Software? A real-time monitor, an executive, assemblers, debugging aids, real-time FORTRAN IV and SENSOR, a unique hardware diagnostic program that spots malfunctioning IC elements so you can plug in a new one and be back on the air in a few minutes.

About the only other thing you'll need to get a 703 into your system is a call to a sales engineer. Raytheon Computer, 2700 S. Fairview St., Santa Ana, Calif. 92704; Phone (714) 546-7160. Ask for Data File CB-161. In Europe and the Mid-East, write Raytheon Overseas, Ltd., Shelley House—Noble St., London E.C.2, England, Phone: 01 606 8991, Telex 851-25251.

RAYTHEON

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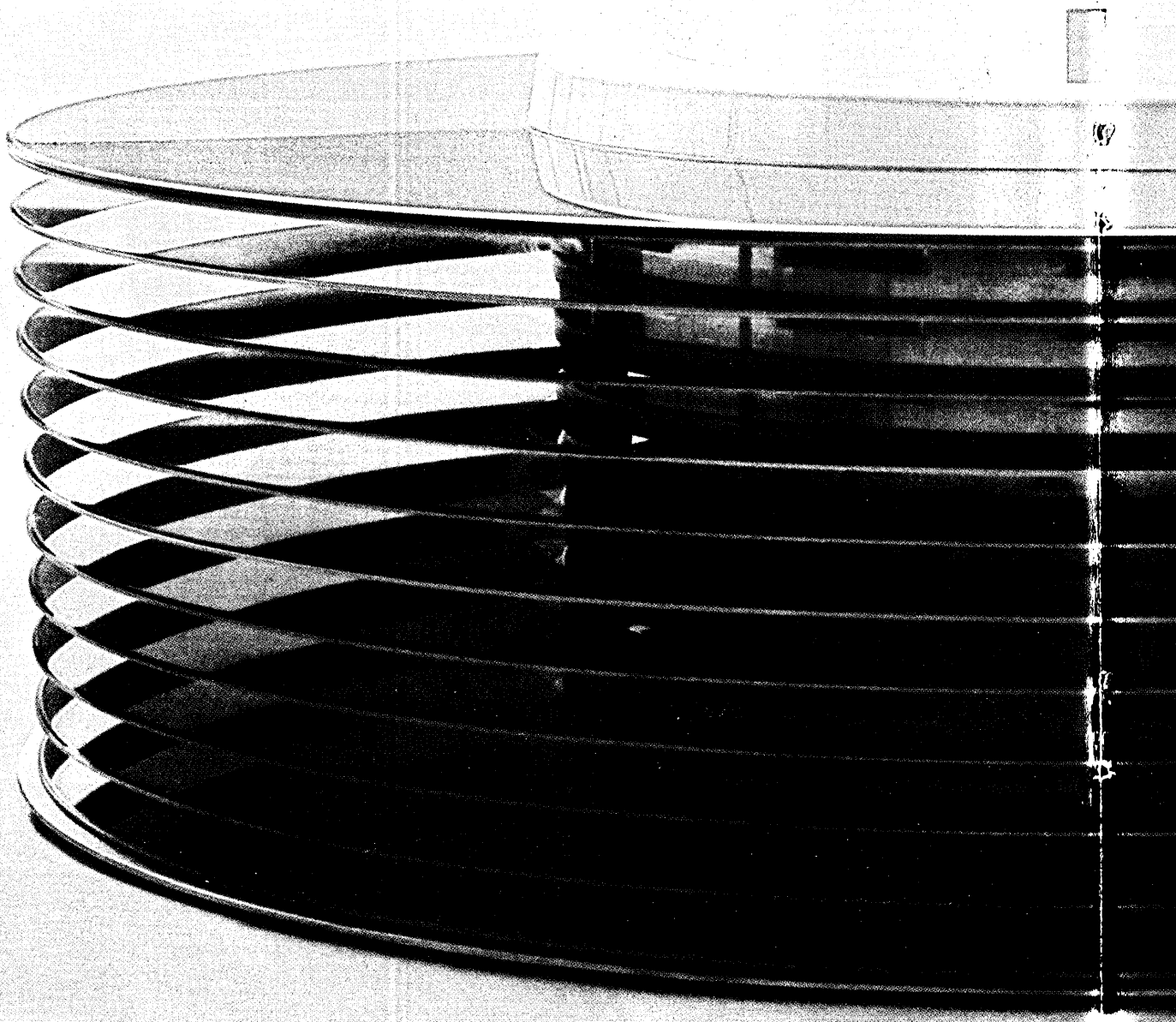

Memorex introduces the M

The Mark VI is a new 20-surface disc pack built to the same exacting standards as the Memorex Mark I.

The Mark VI is fully compatible with the IBM 2314 drive, as well as the new Memorex 660 drive.

In addition, all Mark VI packs are initialized before shipment, with the home addresses and record zeros (this to save you time and trouble and permit immediate VOL and VTOC assignments).

Mark VI has been extensively field tested and is *now* being delivered in production quantities.

C
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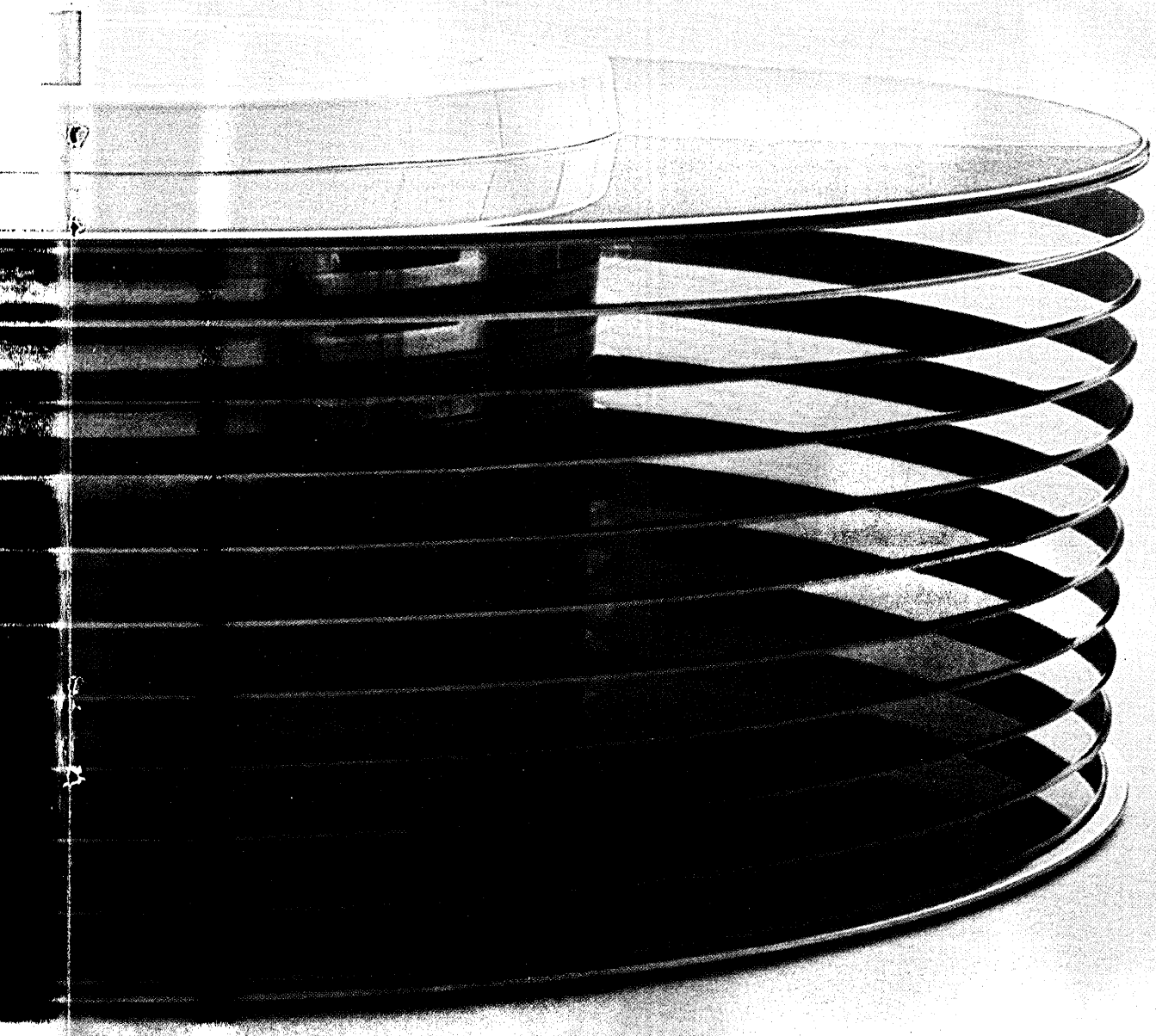
Par

N



Mark VI.

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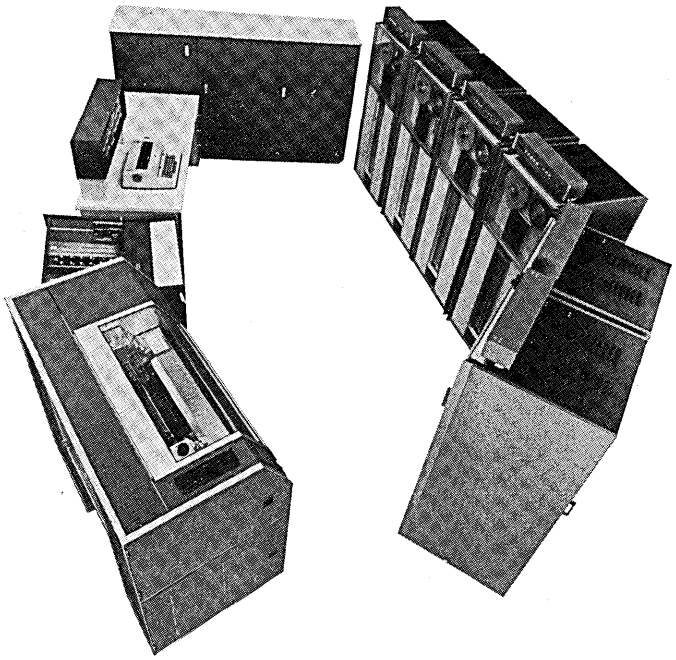
(We're shipping them)



The big operational difference in fourth generation computers is micro-programming. The big user difference is a tremendous improvement in cost/performance ratio over a broadened area of application. Through micro-programming, the user can adapt the logic design of the computer to optimize the system for different types of problems. Machine language independence and problem adaptability make fourth generation computers extremely versatile and remarkably economical. They embody all the technical advancement of third generation machines—and then some.

We shipped the first of the fourth generation computers and have shipped more of them than anyone else.

If talk isn't enough, call Standard Computer.

IC-4000—one of Standard's fourth generation computers. 500 nanosecond control memory compiles up to 4,000 FORTRAN statements per minute—other models offer time sharing—optimized problem adaptation. Full information and documentation on request.

Standard Computer

Standard Computer Corporation, 1411 West Olympic Boulevard, Los Angeles, California 90015 (213) 387-5267

time with Bell telephone installers to teach them a little about programming so they'll understand more about his problems and those of the terminal user. Gillette rejoined that Babcock usually asks for nonstandard arrangements, so the training is necessary. He added that standardization occurs only for economic reasons and that the evolution of switch networks may impose standards. Smith interjected that he wanted AT&T to impose standards but Vaughan answered that the common carrier's role is simply to communicate, not to impose standards.

The questions from the floor centered primarily on the feasibility and availability of the home computer system, the "housewife's set." Smith opined that there wouldn't be much of a market for a terminal that cost over $50, but a housewife user (with a Teletype terminal in her home) in the audience said that if people will pay $300 for a color TV set, surely they will pay comparably for access to a data bank. The question was asked: Will technology broaden the user base in a home environment? Babcock replied that computer personnel, especially in time-sharing companies, were at fault for dwelling too much on the lovely complexities of their business and not explaining the relatively simple applications available to everyone. He predicted home sets in five to ten years. Smith said that to broaden the user base, the data base must be enlarged to include services of interest, to which Petritz responded by asking who's going to take the time and effort to make the data base interesting enough to put terminals into homes. Glaser commented that no one rents a telephone to talk to himself and he advocated a communal data base, with sociological interaction among people as the key factor. There was a question from the floor as to the necessity for the establishment of qualifications for home users. Glaser answered that one by saying that many years ago there had been serious recommendation that licensed users only should be able to open the locks that should be placed on all telephones

NEW DATA COLLECTION SYSTEM INTRODUCED

Another data collection system utilizing a small computer and key-to-disc operation (DATAMATION, Sept., p. 17) was announced recently by Logic Corp., Haddonfield, N.J., with the introduction of its System LC 720, which features IBM interchangeability, multiple-terminal expansion options up to 120, and operating modes that include verify, record, program, size, multicode and double verify. The computer is a Varian 62/i with a 4K word memory, and the data station includes a standard 64-character set with a keypunch layout and a crt that displays characters in English. Displays include last character entered, column number, program number, multicode character, operating mode and tape status. Up to 30 programs may be stored in the LC 720 system at a time, with all programs available to all operators. Price for disc operation starts high at around $110K for a 10-terminal operation, compared with $93K for disc and tape operation offered by the other system (which does not include crt's) and drops steadily in cost with additional terminals to below that of Mohawk Data Recorder and the Honeywell Keytape. For information:

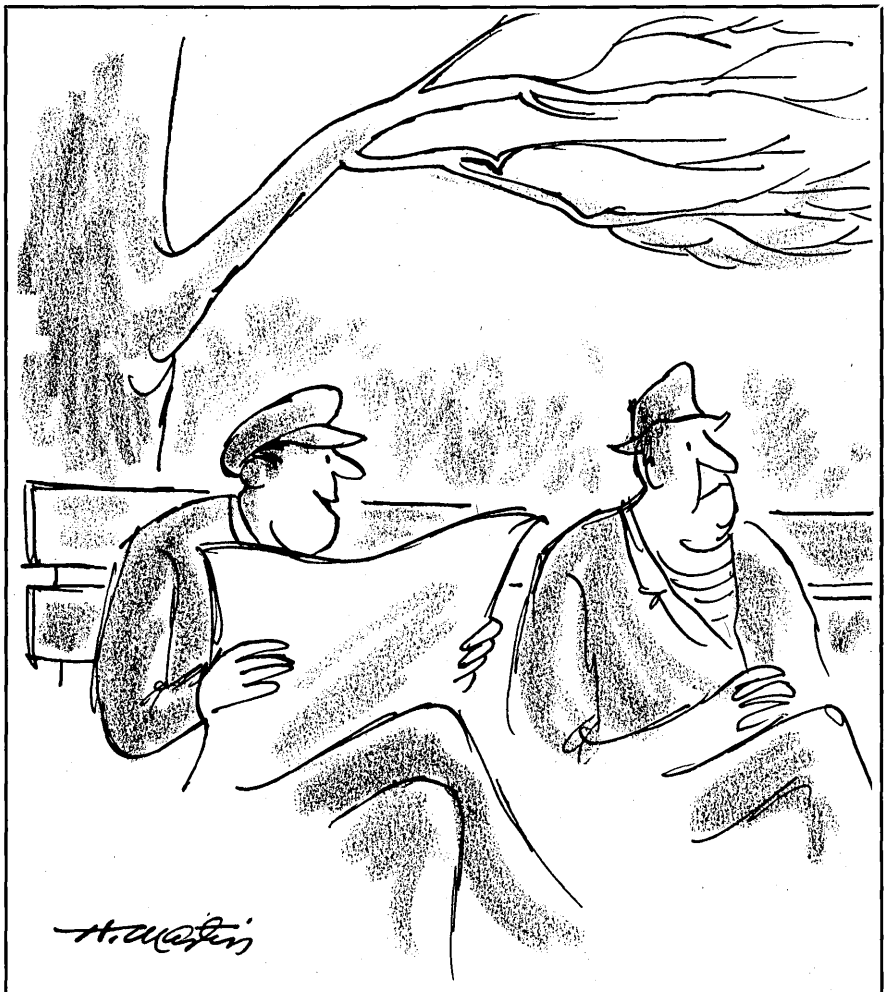
CIRCLE 231 ON READER CARD

DIAGNOSES BY COMPUTER JUST A MEGABUCK AWAY

The American Biomedical Corp., Dallas, until recently Bio-Assay Laboratory, is marching boldly into the brave new world of computer networks, with just a few mental reservations.

A privately held firm, American Biomedical has offered standard medical laboratory services in Dallas and Houston. Its prexy, Clinton H. Howard, looks to the day when his company can offer a computerized diagnostic service to physicians and clinics across the country. The contemplated service would allow doctors to submit comprehensive reports on patient's current illness and medical history to the central computer, which would spew forth the likely diagnosis—at a handsome fee. Teletypes would be used for input/output.

There are a few problems, however. First, the writing of a generalized diagnostic program, a true monster. Second, the acquisition of the necessary computing equipment, and third, the hiring of people. And fourth, the financing of the foregoing. "We're moving carefully in this direction," noted president Howard, "feeling our way. There are no real precedents for us to follow."



"They've got a new machine down there for handling the unemployment checks that does the work of five men in half the time."

QUESTIONS AND ANSWERS ON CAI FROM WESCON SESSION

In a paper presented to the session on "Higher Educational Achievement Through Learning Instrumentation" at the August WESCON gathering in Los Angeles, Martin L. Klein, of North American Rockwell Corp., had some sobering evaluations of computer-aided instruction techniques and results. He maintained that interpersonal relationships between teachers and students go hand-in-hand with education at the elementary and secondary levels, and that no machine can ever replace the teacher, although instrumentation aids will certainly be necessary to educate the 43 million students currently at those levels in the U.S. He noted that motivation is the primary factor in the progress of learning in a computer-structured environment, and he questioned the efficacy of such motivation encouragement from a computer as "It is obvious that you are able to make judgment decisions. Continue in confidence."

Klein contended that there are effective, less costly substitutes for computers and emphasized that with the introduction of technology into the field of education, there are questions needing answers: What values do we expect to receive from our educational system and what trade-offs among the many alternative approaches are we prepared to make? What is the nature of the learning process: what do people want to learn, why do they want to learn it, when should they learn it, and how and where can it best be learned?

Attempting to answer at least some of these questions is the Southern California Regional Occupational Center, a recently formed and now operating organization reported on in the same session in a paper presented by Wayne L. Butterbaugh, superintendent of the center. Established under a joint powers agreement among six unified and high school districts, the center's purpose is to teach high school students, as well as adults, an occupational skill at the job entry level. Students spend four hours a day at their high schools and three hours a day at the center, which serves as an extension of the schools it receives students from. The present curriculum includes courses for keypunch operators, dental and medical assistants, secretarial training, and major appliance repair and welding.

The computerized system is self-instructional, with the student under a "surveillance and detection" monitor that checks his responses. In the event that he produces incorrect answers in a predetermined quantity, the system will stop and an alarm will alert a master teacher who will then appear on the crt and have a dialogue with the student to determine the difficulty. Remedies include repeating a segment of the program, reporting to the counselor's office for re-evaluation, or moving on to another operation and later participation in a customized prescription loop. Upon completing the course, the student is then directed to a hands-on training area, where he continues to be provided with review information, procedural data, and other back-up assistance.

Butterbaugh asked for a united effort from education, industry, labor and the government to realize the potential skills that can turn untrained youth into contributing citizens.

WESTERN UNION'S SICOM GOES INTO OPERATION

Western Union has announced the operational status of SICOM—Securities Industry Communications—with Shields & Co. of New York having completed two months of successful trials handling some 50,000 messages a week.

The system, based on four Univac 418's housed in WU's Mahwah, N.J., processing center, has been in the

making for some time; tariffs for it and INFOCOM were filed with the FCC toward the end of 1967.

SICOM is designed for those financial houses that don't want the trouble or expense of setting up their own systems. Besides forwarding buy and sell orders, it verifies transactions and turns out a daily printout recording activity. Present capacity is 900 stations, with expansion expected as demand increases.

SDC GETS NSF CONTRACT TO EXTEND PLANIT SYSTEM

System Development Corp.'s PLANIT (DATAMATION, Sept., p. 41) got a boost from the National Science Foundation in the form of a $433,000 contract for further development of the system over the next two years.

Devised by Dr. Charles Frye and Samuel Feingold, PLANIT—Programming LANguage for Interactive Teaching—is intended to give teachers a relatively simple means of building up CAI material without requiring thorough computer experience. It has been available only for on-line use from the SDC computer center. The new version, to be written in FORTRAN IV with its own executive routine, will be available to universities and schools for use on their own computers. Sample machines that can handle it are 256K-byte versions of 360's, from mod 40 up, 1108, B 3500 and larger Burroughs equipment, the bigger Spectra 70's and CDC units.

The big attraction is that users don't have to pay anything except reproduction costs of cards and tape, provided that they have programming staffs able to prepare supporting subroutines for the specific computer to be used.

Simultaneous use by upwards of 50 students will be possible with the new version, which will include record-keeping and progress evaluation routines.

An all-day briefing at SDC was scheduled for Sept. 24 to describe the language in detail. For those missing it, Dr. Frye says that a mailing list is being compiled; to get on it, write to him at SDC, 2500 Colorado Ave., Santa Monica, Calif. 90406. You'll get progress reports on the project, user's instructions, and a FORTRAN listing when the new version is completed.

MANY COMPUTER OPERATIONS MANAGERS ARE IN COMA

The first known organization for computer operations supervisors has been formed in the San Francisco bay area.

(Continued on page 112)

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Called COMA, for Computer Operations Manager's Association, it now has 25 members and is headed by Richard Montgomery, operations manager at Stanford Univ. Computation Center. Other officers are from Fireman's Fund American Insurance, Delmonte Corp., and Pacific Gas & Electric.

The goals of COMA are to develop standards of computer operation, provide opportunities for professional development, exchange information on equipment and operations methods, and provide a voice for operations personnel.

WASHINGTON STATE SETTING UP LEGISLATIVE DP SYSTEM

Washington State legislators will benefit from the use of two dp systems during their next session starting Jan. 13.

This May 23 the Legislative Council authorized $148,000 to complete an information retrieval system already in process, and to implement an on-line legislative status system using programs furnished by the Commonwealth of Pennsylvania.

The information retrieval system will give legislators and others immediate answers to questions about Washington state laws and court decisions. It will add each bill passed by the legislature as that bill becomes law.

The status system will provide a daily report of status of bills immediately following the close of the session each day. A few copies will be available at that time for overnight use by key legislators. One copy will go to the state printer who will print 3,000 reports to daily status report, other management reports will be generated from input during each session day.

Historical information will be kept in machine-readable form to print the legislative record, and the system is programmed to keep an up-to-date index on the legislative proceedings.

According to J. E. Kirschner, manager of legislative information systems, a feasibility study of the information retrieval system actually started over two years ago, after Richard O. White, Washington State Code Reviser, and others, became interested in performing law search by computer. The Department of Institutions and the Institutional Industries Commission inaugurated an inmate keypunch training program and made its services available as an economical source for the creation of a law-oriented information retrieval data base. Present keypunch production exceeds 100,000 cards

news briefs

monthly.

All the Revised Code of Washington statutes (one-half million lines of text) will be in the computer's memory banks by Jan. 1, 1969, and at present the information retrieval system is performing searches on a partially completed data base. For the time being, Kirschner's staff is using computer time on a 256K IBM 360/40 at the Washington State Department of Institutions' computer center.

A question to the computer (in most cases, says Kirschner, it will take an attorney to word this properly) will bring printouts of all references, whether as "pointers" (titles or chapters) or complete text.

The search will take less than 60 seconds, says Kirschner. Printout time depends on the amount of text. If you ask for all references to "felony," with material from 125 sections of the code, the printout time would be almost four minutes. The printer has both upper and lower case and produces 450-500 lpm.

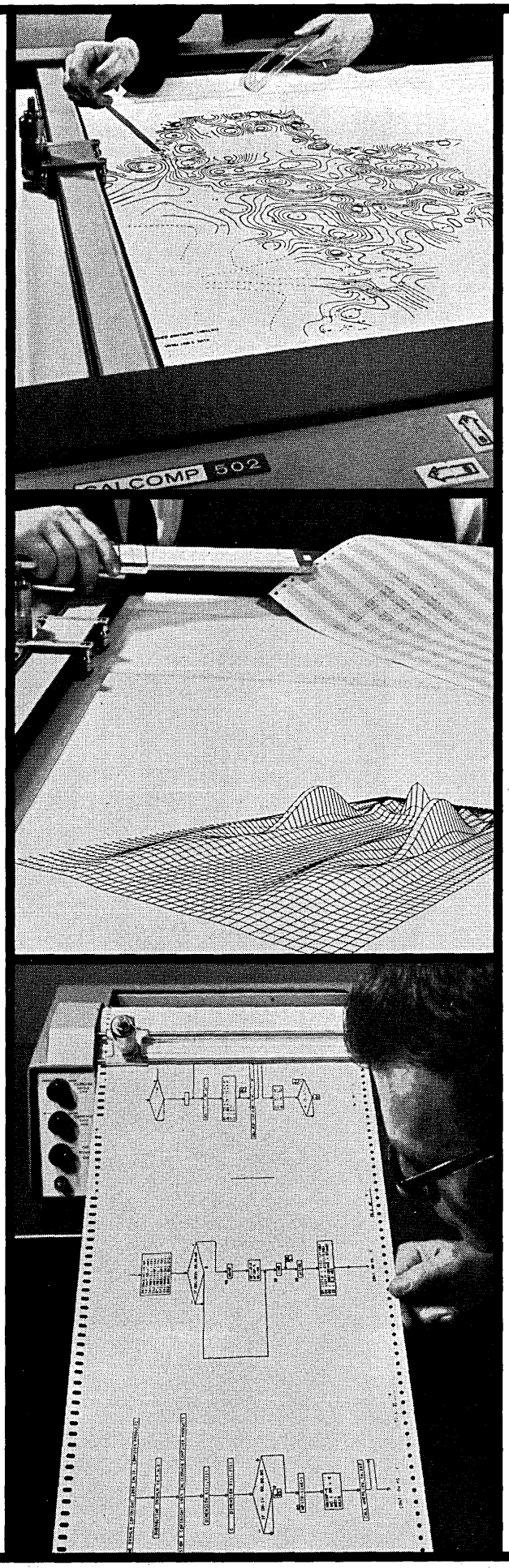
The information retrieval law search system—a document processing system—is run in a batch environment, and consists of about 25 programs.

Both information retrieval and status systems will use an IBM 360/50, on

(Continued on page 116)

3 NEW SOFTWARE PACKAGES

FOR SALE?



CALCOMP GPCP

(General Purpose Contouring Program)

This program automatically plots functions of two independent variables in the form of contour diagrams or maps. Written in FORTRAN IV, it is easy to use, extremely flexible, accurate, economical. It is about 30 times faster than manual and does jobs impossible to do by hand. Used with any CalComp plotter system, GPCP can be applied to such fields as geophysics, meteorology, engineering, biology and medicine.

Now available for a one-time lease charge of.. $10,000

CALCOMP THREE-D

(Perspective drawing software package)

This program is a set of FORTRAN subroutines for use with any CalComp digital plotting system to produce perspective drawings of surfaces. It can also generate stereoscopic views of surfaces, and, with CalComp Model 835 microfilm plotter, can produce animated films. Easy to use, flexible and economical, THREE-D can be applied to such fields as marketing, engineering, toolmaking and designing.

Now available for a one-time lease charge of... $3,000

CALCOMP FLOWGEN/F

(Flowchart software package)

This program allows any computer programmer to automatically produce flowcharts of his program on any CalComp plotting system. An extremely useful tool in documentation of checked-out programs, it is even more valuable during the check-out phase of a new program or a new computer. FLOWGEN/F is fast, time-saving, accurate.

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news briefs

lease time from the Washington State Computer Service Center beginning October, 1968.

A comprehensive system for applying data processing techniques to legislative status reporting and other legislative record keeping, developed by the Commonwealth of Pennsylvania, has been offered to the state of Washington through intergovernmental free exchange, the eastern state to provide the programs needed to run the system in Washington. This offer was approved by Legislative Council action May 23, and the legislative information programs are on the way to Washington.

The status system will be on-line 16 hours per day during the session. Input and inquiry into the system will be via IBM 2260's strategically located in the Legislative Building. Of these, the main input will come from two 2260 stations in the Senate and House chambers. The respective docket clerks will enter the information as the action takes place. Previously, notes of legislative action on bills were put on slips of paper, and, variously checked and annotated, went to the printer at the end of the day.

By the time the Legislature convenes, the two systems will have been set up and tested, and the legislators will have the same information they had before, but so quickly that the nature of their proceedings will be very different.

Previously, an attorney drafting a bill might have needed such information as "What references to 'felony' does the Washington Code contain?"—and had to wait several weeks for a battery of law clerks to do the research. And law clerks might be in short supply during a legislative session. Now that attorney will have his information quickly.

The Legislative Information Systems office will share the computer complex with 18 other state agencies. The two systems, information retrieval and status report, are the first regular data processing service for the legislature. But there is already considerable use of dp by other state departments, and it seems likely integration and coordination of dp facilities will be given more attention by the state of Washington in the near future.

BOSTON FIRM IS DOING REAL-TIME STOCK ANALYSIS

In the offices of Spear & Staff, Inc., an investment advisory service near Boston, price fluctuations of 1200 issues on the New York Stock Exchange are

analyzed in real time by a Digital Equipment Corp. LINC-8 computer. This is said to be the first such application to be accomplished in real time, although many other investment firms have computers.

The LINC-8 is programmed to detect buy and sell pressures and their interaction, and undervaluation in a stock. Output is displayed on a crt, in groups of five stocks. Following the NYSE code name of the stock is its latest price, its trend, and potential for the day; projections are altered as each trade is reported.

Stocks are compared to each other and are checked against past performance over a 35-week period. At the close of trading, the machine establishes market trends for use by the firm in its daily investment bulletins, which were previously prepared bi-weekly. Use of the computer has enabled Spear & Staff to offer analysis service "once reserved for the very wealthy" to accounts as low as $5,000.

EDUCATION OFFICE STUDIES AUTOMATION IN LIBRARIES

The Office of Education of the Dept. of Health, Education, and Welfare is sponsoring 20 research projects during the current fiscal year "to help the Nation's libraries and information centers take advantage of automation and other technological advances in improving their services and facilities." Total cost of the studies will be about $1.8 million. Among the projects are several which directly involve edp.

Two projects were described as "typical": Information Dynamics Corp., Bethesda, Md., will conduct a $74K "Study of the Development and Present Status of Automated Techniques and Procedures in Federal Libraries and Documentation Centers," in an effort to "provide an overview of existing Federal facilities, successes and problems and patterns of development in using automated information systems, and reasons for employing such systems." Syracuse Univ. will undertake the "Development of a Computer-Based Laboratory Program for Library Science Students Using L.C./MARC Tapes" on a $104K grant. Students will be trained in the use of the Library of Congress system for cataloging and classifying library materials.

DYNAMICS RESEARCH ENTERS COMPUTER FIELD

There is a "great need" in areas such as process control, vehicular traffic control, and oceanographic studies for a ruggedized computer which combines the reliability and maintainability found in the military specification machines and the price currently offered in commercial systems, according to Dynamics Research Corp., Stoneham, Mass.

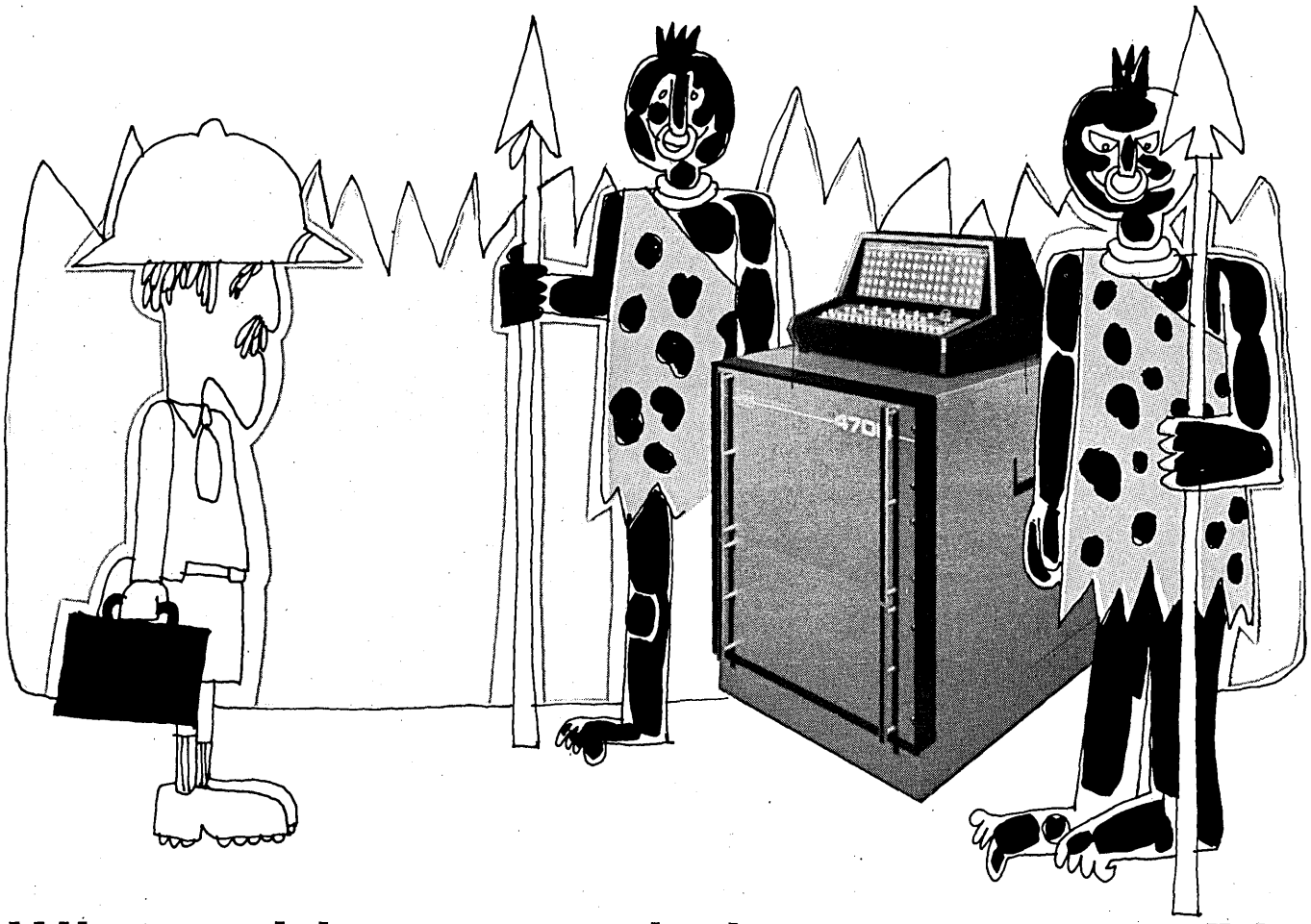
The first computer offering of this firm, the mil/spec DRC-44, with a one-usec cycle time and $39K base price, is aimed at this market. Dynamics Research, a 13-year-old firm in research and manufacturing for the control and measurement fields, began its computer group activity a year ago and is already geared up to provide 17-week delivery of the system.

The DRC-44 is a 24-bit fixed-point system with a storage capacity of 4K-64K words. Built into the system are full arithmetic capabilities, six index registers (expandable), and I/O control for six high-speed data channels and 128 subchannels with a 24 megabit/second transfer rate. The unit can directly address 64K words with three index registers, has multi-level indirect addressing capabilities, priority interrupt on all I/O channels and a 78-instruction set. It can operate in a multiprocessing configuration of two or more cpu's either sharing one memory bank through one I/O bus (with priority sequence) or having separate memory banks and buses for each processor.

Meeting mil specs, the unit has a mean time between failure of 5,000 hours and repair time of 5-30 minutes. The ease of repair is based primarily on the fact that the unit uses only four types of printed circuitboard modules and a total of 37 modules. The basic 4K processor measures one and a half cubic feet and weighs 50 pounds. It withstands temperatures from 32° to 122°F, and humidity up to 95%.

In software, DRC does not have a monitor yet, although it has begun work on it (no delivery date). The firm claims that process control is a unique field for computers: the users generally do most of their own maintenance and invariably require and develop monitors and other software specifically tailored to their application. Available programs include an assembler, and I/O packages such as trace programs, on-line debugging routine, symbolic editor, diagnostic routines and basic mathematical subroutines.

The $39K system is a 4K unit without peripherals. A large configuration is exemplified by this $500K system proposed for railroad yard automation: two 24K processors, two tape units, two card reader punches, two 12 megabit discs, seven crt displays and 10 Teletypes. Standard and process control peripherals are available; DRC is manufacturing interfaces for these de-



Who said you can't buy more 16-Bit computer capability for less than $30,000?

SCC Says you can — and you don't have to be a Dr. Livingston to find it.

Our NEW 4700, 16 bit, 920 Nanosecond Digital Computer is the first small machine with a throughput rate fast enough to handle those tough jobs . . . It costs less than $15,000 for the basic machine.

The 4700 can free a larger system for more important work. It can be the brains behind a satellite communications network . . . a message switcher or a data terminal.

The 4700 can control processes while your engineers check out programs simultaneously. It gives you an economical way out of the communications bottleneck . . . a complete remote capability at a price you can afford.

Compare the 4700 with other computers.

You can spend $30,000 for a 16-bit model that expands from 4K to 32K. The 4700 expands from 4K to 65K.

You can pay $30,000 for a 16-bit machine with a 790 nanosecond cycle time. The 4700 does it in 920 nanoseconds, but it only costs half the price.

You can spend $30,000 for a 16-bit machine and not get hardware double precision and floating point arithmetic. The 4700 offers this option for only $5,000.

Furthermore, we don't know any 18-bit orange that dares to compare itself with our 16-bit apple.

Whatever Your Computer Application — Be Sure You Talk With SCC Before You Buy

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CIRCLE 58 ON READER CARD

vices.

Among competitors are the PDP-9 and process control systems IBM 1800 and GE 4020. It also competes with such military units as IBM's 4 Pi. DRC says it now has orders for three systems from the Navy and delivers one to MIT this month.

NEW YORK GETS GRANT FOR AMBULANCE SERVICE STUDY

The National Highway Safety Bureau of the U.S. Dept. of Transportation has given New York City a $130,000 grant to develop an emergency ambulance service which can be adopted for use in other urban areas of the country.

Through computer simulation studies, the city is endeavoring to devise a system that would routinely determine how many ambulances are needed to provide emergency service, where ambulances should be stationed, what personnel staffing patterns should be at various times, and which hospitals should be designated to receive emergency cases.

The city attracted the grant as an outgrowth of a recent study of emergency ambulance service in which thousands of ambulance runs were simulated on an IBM 360. This work resulted in a plan which is expected to improve the average response time of ambulances on emergency calls by over 20% and reduce by two-thirds the number of calls in which excessive delays are experienced. Among significant findings was the discovery that most efficient use of ambulances would result if they were detached from hospital districts and operated from curbside "ambulance stands" strategically located throughout the city.

MEDICAL LAB SET UP FOR AUTOMATED EXAM ANALYSIS

Check-Up, Inc., the only known privately owned and operated automated medical laboratory, was recently opened by pathologist Dr. John Kevorkian in Southfield, Mich. Check-Up is using an IBM 1800, three 2310 discs, three 1053 printers and a 1443 line printer. When all lab equipment has arrived, the Auto-Analyzer, chemical analyzer, hematology equipment, atomic absorption analyzer, and a three-point ECG machine will be on-line.

Since mid-June, Check-Up has been doing ECG's on a 12-point machine and sending the graphs to Washington for computer analysis. As soon as the new machine arrives, the clinic will analyze the graphs using a computer program developed at the Mayo Clinic.

news briefs

Check-Up proposes to do individual annual medical checkups on a group basis (such as executives or union members) with reports going to the patient's own doctor for diagnosis. The output of the 1800 includes reports covering 65 test analyses (including 12 blood tests and six X-rays). The clinic is modeled on Kaiser's program at the Permanente Medical Group at Oakland, Calif.

Besides Dr. Kevorkian, who is at the clinic full time, consultants—a cardiologist, ophthalmologist, and radiologist—come in part time daily. The company says that it will save patients both time and money on examinations, with the tests taking two hours at the clinic rather than the two to three days required at a hospital for in-patients' scheduling. Costs should be about one-third to one-quarter of manually handled tests. Eventually, with additional medical help, the clinic will be able to handle 300 to 400 patients a day.

EDP AT SEA TRACKS BALLOONS

Honeywell claims that the first general purpose computer to hit the high seas is a DDP-116 used in weather balloon tracking by the Coast Guard Cutter Chincoteague. The system, used with radar, has already reduced calculations on data from the balloons from about three hours to 90 minutes, with further reductions anticipated. The 116 will be replaced by a DDP-516 in January and ultimately the newer machines will be installed on a total of 39 cutters at a cost of $1 million.

Weather balloons are regularly launched by cutters serving as "ocean station vessels" in various parts of the Atlantic and Pacific. Information obtained from the balloons is relayed to the Weather Bureau to aid in compiling forecasts and storm warnings which enable transoceanic ships and aircraft to avoid dangerous climatic conditions. Although balloon tracking has been the primary concern of the Coast Guard thus far, additional applications planned for the computer system include airborne target tracking and fire control, as well as certain shipboard administrative functions.

The Coast Guard has been experimenting with the 116 aboard the Chincoteague for over a year. When a balloon is launched from the cutter, it is tracked by radar to a maximum range of 180,000 yards. A ranging unit sends start-stop pulses to the computer where a range digitizer determines slant range to the balloon. Inputs from

gyro units provide ship's heading, roll and pitch information which together with radar azimuth and elevation angle data from the antenna are transformed into true coordinates. These data and corrections for the curvature of the earth are used to compute balloon altitude and wind speed and direction. Output of this information is produced on a radio teletype tape which is then placed in a sender for transmission to the Weather Bureau.

MIDWEST SPAWNS ANOTHER COMMERCIAL TIME-SHARER

Another midwestern t-s firm, just hatched, is Shared Computer Systems, Chicago—which claims to have gone beyond t-s to its successor, Remote Conversation Computation (RCC). With one B5500 installed and operational in July and another 5500 coming in October (plus several more in the unspecified future), demonstrations of RCC have begun. Gerald J. Haller, president of SCS, left his vp post at Time Sharing Systems, Milwaukee, to start this new company.

Operations at SCS are to be different than the usual t-s company: there will be no written contracts, no initiation of service charges, and no minimum charges. Monthly charges are strictly on actual time used. Three services are offered: conversational, deferred priority, and remote batch. Each service has its own set of charges. Deferred priority means that after a problem is input the terminal is disconnected and the service defers processing until more computer time is available. But any job requiring 10 minutes or less of cpu time will be available within three hours of submission. Results are stored on-line for user's recall.

Languages offered are COBOL 61, Extended ALGOL, BASIC, and FORTRAN IV Level H. The library will have 300 programs and subroutines available for users. The system will allow 40 customers simultaneous use for 14 hours a day.

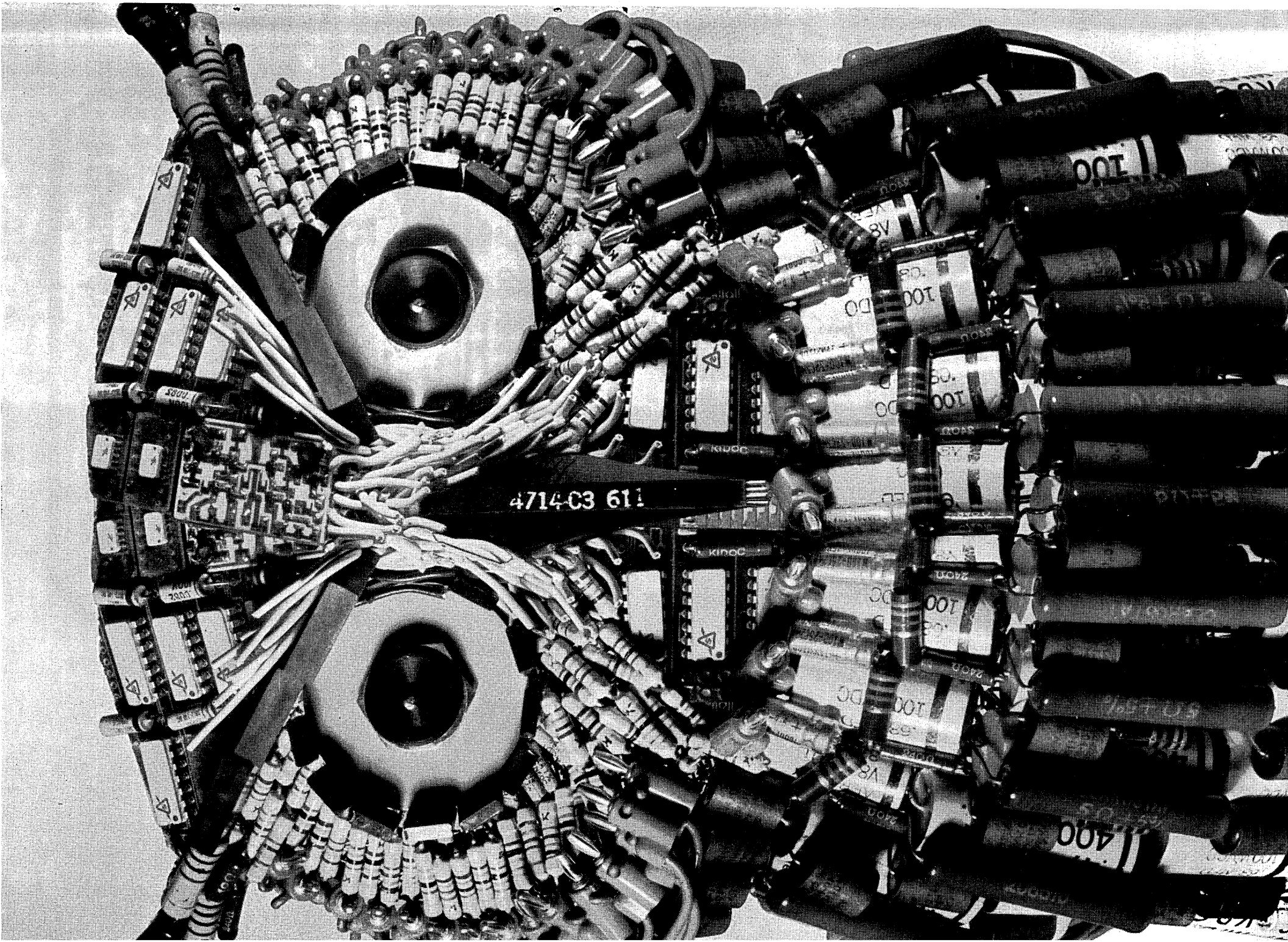
Initially, the firm is using TTY 33's or 35's, but clients will be able to use crt's and other high speed terminals with card readers and line printers shortly.

The first 17 customers are using RCC to supplement their own large systems. By Oct. 1, Haller expects to be able to demonstrate a COBOL syntax compiler which is 99% compatible with 360 COBOL.

GRAY FORTRESS FAILS TO STORM U.K.

The United Kingdom is the only non-Communist country in the Western Hemisphere in which IBM has less than half of the edp market (on the other side of the world, Japan has the same distinction), according to a report prepared by the Scientific, Photographic and Business Equipment Div. of the U.S. Dept. of Commerce and published in *Overseas Business Reports* No. 68-65. British firms have more than half of the domestic market, making the U.K. "the only country besides the U.S. having a large, national, modern computer industry." IBM presently has about 40% of the market by volume, and runs two plants in Britain—one in Scotland, the other in England.

Although Britain ranks fourth in "number of general-purpose digital computers" in the world, with 1700 installed at the end of 1966, according to the *Reports,* it is second only to the U.S. as a manufacturer of computers. International Computers, Ltd., the largest British computer manufacturer, has the biggest slice of the nation's market. ICL is the result of the merger this year of International Computers and Tabulators with English Electric-Leo Marconi. Prior to the merger, ICT


4714-C3 611

Honeywell just added 10 new products to its direct access line. A wise move.

Direct access just became more manageable and less expensive.

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For one thing, it means your computer system can now grow more easily than ever before. Because we've made our direct access increments smaller than ever before. Our disks store as few as 3.6 million characters or as many as 1.2 billion. And they don't require reprogramming when you move up to a larger system.

It also means you can come to Honeywell for a complete line of direct access products manufactured by the people who manufacture Honeywell computers. People who know how to get the most out of any size system.

We think it was a wise move on our part to offer such a broad direct access product line.

It might be a wise move on your part to look into it.

The Other Computer Company: Honeywell

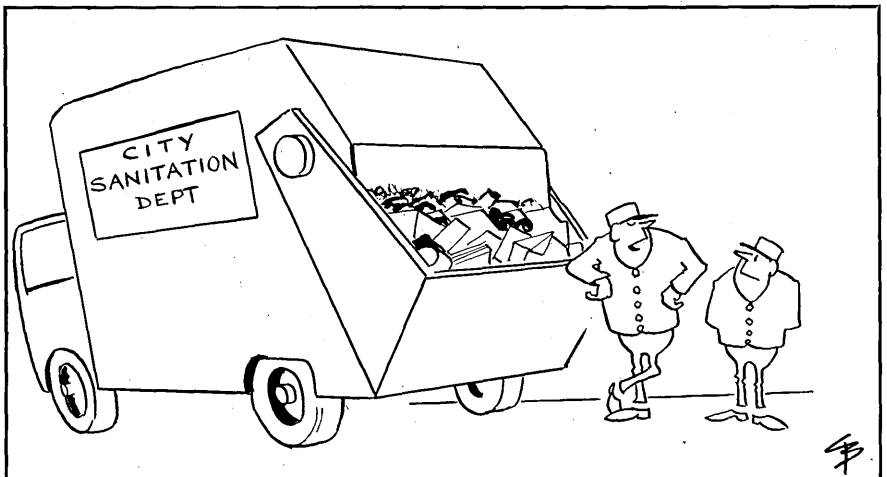
CIRCLE 62 ON READER CARD

had about 40% of the market, and EELM about 10%. ICL has 34,000 employees and anticipates sales of $240 million and an annual expansion rate of 15%. It is the largest non-American computer manufacturer and the fourth largest in the world.

The *Reports* states that total deliveries of computers in 1967, both at home and for export, set a record high of $305.3 million in value, 11% higher than 1966. During 1967, value of computer deliveries increased in each quarter. Notably, deliveries of British-manufactured equipment to the home market increased 30% by volume, while exports went up 12%. ("British made" includes products of American companies manufactured in the U.K.) In contrast, deliveries of "factored computers" (machines sold by firms in Britain which are not the manufacturers—most of this equipment is imported) decreased 15%. Deliveries of factored machines for export decreased 12%. The breakdown of dollar values showed British-made computers delivered in 1967 amounted to $252.6 million in the home market, $88.1 million for export, vs. $203.4 million and $76.8 million, respectively, in 1966. For factored computers, totals were $74.7 million sold in the U.K., $4.1 million exported in 1967; corresponding figures for 1966 were $87.7 million and $4.6 million, respectively.

U.S. companies in the U.K. market include Honeywell, Burroughs, NCR, Univac, Digital Equipment Corp., Control Data Ltd. of England, GE, and IT&T. Of these, Honeywell, Burroughs, and NCR have plants in Scotland, "owing to favorable development and investment terms for electronics firms there." Reports from sources other than the Dept. of Commerce have stated that Honeywell has 5% of the market, and Univac 3%. Also, Burroughs' outstanding year in 1967 has given the company order book value of nearly $100 million, a figure close to that of IBM and ICT. According to the *Overseas Business Reports,* "Honeywell has concentrated its European manufacturing in Scotland and will double production at this plant, from which ten million dollars' worth of equipment was exported to the Continent in 1966." Honeywell is operating an "advanced programming center" in the U.K. which utilizes "good quality European software personnel who can be recruited more cheaply than in the U.S." Honeywell will also be manufacturing Bunker-Ramo display devices in Britain. Burroughs "had a very successful year in 1966 with exports from the Scottish factory up 75% and sales revenue up from $44 million to $57 million. Burroughs plans a $25 million expansion in production facilities in Scotland over the next 5 years, which includes a Board of Trade loan of $8.5 million." NCR has an arrangement with the English firm, Elliott Automation, by which Elliott "supplies central hardware and NCR the peripherals for systems which they both market outside the U.S. They also share software development. This seems to work to the satisfaction of both companies."

Overseas Business Reports is available for 15¢ per copy from the Superintendent of Documents, U.S. Govt. Printing Office, Washington, D.C.



"Just remember, Simpkins, the basic principle of our profession . . . The quality of the garbage out is only as good as the quality of the garbage in."

PAN AM ADDS NEW CRT'S TO RESERVATION SYSTEM

Pan Am has awarded a $1.3 million contract to Stromberg Datagraphics, Inc., San Diego, for installation of 57 SD 1110 desk top crt's at the airline's headquarters reservations office in the Pan Am Building, New York. Delivery of the crt's, scheduled for completion next month, will provide sales agents with access to the PANAMAC electronic reservations complex which serves 161 cities on six continents.

The contract represents the first major order for the SD 1110 and the first use of crt's in PANAMAC. Previously, Pan Am used keyboard terminals only. The crt's have not replaced any of these units, however, but are being phased into the network as it expands. In addition to reservation information, the crt's provide sales agents with displays of flight schedules, information on customs regulations, arrangements for connecting transportation, hotel availability and other information related to air travel.

The SD 1110's are connected by telephone lines to the PANAMAC central computer, and can exchange data at 300 cps, whereas the typewriter terminals are limited to 11 cps. Each crt has a typewriter keyboard and a patented CHARACTRON tube capable of generating 1000 alphanumeric characters. The crt produces its images in single bursts of electrons beamed through a dime-sized disc inside the tube. A stencil, cut into the disc, duplicates the characters and symbols on the keyboard.

IBM AIDS ARABS IN MUMMY HUNT

Sometime this month a computer donated by IBM may unlock the mystery of the tomb of Chephren, an Egyptian pharoah whose mummy has possibly escaped the clutches of grave robbers and archaeologists for over two thousand years. Scientists from the Univ. of California at Berkeley and Ein Shams Univ., Cairo, are using the IBM 1130 in an effort to discover a suspected secret burial chamber in Chephren's pyramid, a 447-foot-high structure believed to have been erected in the second century B.C. The pyramid is known to have only a single, empty vault, in contrast to the intricate passageways found in other pyramids. This has led some archaeologists to believe that Chephren constructed a tomb so cleverly concealed that it has never been detected.

The basis for the present investigation is a technique conceived by Dr. Luis Alvarez of the Univ. of California. Two electronic "spark chambers" are installed in the vault, near the center of the pyramid. The spark cham-

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bers identify both the number and the direction of sub-atomic particles called "muons" after they have passed through the massive limestone monument. Muons constantly bombard the earth, but the fact that the number of muons passing through the stone will vary depending on whether or not there is a void in the pyramid will determine the existence of a concealed chamber.

During a four-month period, the spark chambers have recorded coordinates for some three million traces of sub-atomic particles on tape. The computer will filter out secondary and irrelevant recordings and match the coordinates to develop the angle at which the muons hit the spark chambers and the number of muons which struck from particular directions. Printout will be on a "map" showing coordinates of the interior of the pyramid with the numbers of muons, relative to other areas, which penetrated to the center of the pyramid. Any groupings of high numbers of particles will indicate the location of a previously unknown cavity which may be the tomb of Chephren.

'68 FJCC DEC. 9-11 IN SAN FRANCISCO

In a year seemingly dedicated to intense controversy in and out of the data processing industry, the technical program committee of the Fall Joint Computer Conference, perhaps in exhausted reaction, has announced that the sessions, to be headquartered in the San Francisco Hilton Hotel December 9-11, will be more traditionally structured.

"We have decided to return emphasis to the more formal presentation of related-subject papers," explained Robert Glaser, technical program chairman and a vp of Compata, Inc. "This means reversing the recent trend toward panels and open sessions on controversial subjects." The program will contain approximately 150 papers on familiar topics: resource allocation, time-sharing, numerical control, OCR, OLRT systems, memories, medical dp, management information systems.

Some seven panel sessions are also planned. In addition to discussions on robots, design automation, displays, and process control programming, two sessions will discuss "Human Augmentation Through Computers and Teleoperators," and "A Research Center for Augmenting Human Intellect." A special panel session on the FCC hearings on the communications/data processing interface is also scheduled.

Tours to Stanford Univ., Stanford Research Institute, and Mobility Systems, Inc., will be offered as a part of certain sessions.

The opening session of the conference will be addressed by keynote speaker Howard W. Johnson, president of MIT. Mr. Johnson is a member of the President's Advisory Committee on Labor-Management Policy and the National Manpower Advisory Committee. Dr. Garrett Hardin, professor of biology at the Univ. of California at Santa Barbara, will be the featured speaker at the conference luncheon on Dec. 10. Both men will speak on the impact of computer technology on today's society.

The impact of computer technology on at least one aspect of today's society —as viewed one month after November's general election—will be the subject of a general public meeting on Tuesday evening, Dec. 10, in the Civic Auditorium. Entitled "Information, Computers and the Political Process," the meeting will attempt to explore the ways information and computing machines can improve communications between the electorate and the governmental "establishment." Speakers will be Dr. Robert Hofstadter, Nobel Laureate professor of physics at Stanford; Dr. Emanuel G. Mesthene, director of the Harvard Univ. program on technology and society; Dennis Flannagan, editor of *Scientific American;* Dr. John R. Pierce, executive director of communications systems research for Bell Labs; and Dr. Garrett Hardin, professor of biology, Univ. of California, Santa Barbara.

Over 120 exhibitors have been attracted to this winter's rites, and will be competing for attention in Brooks Hall.

Final credits go to general chairman, Dr. William Davidow of Hewlett-Packard, and AFIPS sponsoring societies: Assn. for Computing Machinery; IEEE Computing Group; Simulation Councils, Inc.; Assn. for Machine Translation and Computational Linguistics; and American Documentation Institute.

• A machine that could build a wall from Los Angeles to San Francisco in three months (how about a wall *around* Los Angeles?) has been developed by M. Kellner & Son Lumber Co. of Fresno, Calif. The 120-foot-long complex is directed by an IBM 1130, which controls the flow of building materials and automatic nailing machines as the wall frame moves along on a conveyor. Besides turning out 20 feet of wall per minute, the 1130 prints up the bill of materials needed for each unit.

• GE may not yet be so big in selling computers, but it has an impressive record in buying and using them. Recent figures put out by the world's fourth largest industrial corporation show it to be the second largest computer user (first is General Motors). The company says it now has more than 300: 15% in the $1000-$5000 per month class; 76% renting at $5000 to $20,000; and the remaining 9% big ones over $20,000/month. They also have about 800 terminals hooked to time-shared machines. All this gear is worth about $160 million, and the company spent $80 million last year for edp, including the cost of 4000 people to take care of the computers.

• Illinois Institute of Technology and nine other colleges and universities began linkage in a computer network in July. The $880K program is a two-year project with a National Science Foundation grant of $632K and is part of the NSF program to explore computer potential in science education and research. The grant will support a cooperative interdisciplinary venture in undergraduate curriculum development. Faculty members in participating institutions will be grouped by academic discipline and helped in curriculum development by leaders who have used computers in six disciplines: biology, business-management-economics, chemistry, mathematics, physics, and psychology-education-sociology. The program is open to other colleges and universities without NSF support. Such participation would have an average cost of $14K for faculty salaries and $22K for terminals, phone lines, computer time and supplies.

• The Association of American Railways and the International Union of Railways (Europe) have appointed a committee on cybernetics which will maintain liaison in the development of "new techniques from the untapped potentials of electronic data processing." American committee head is Robert B. Curry, vp in charge of the AAR's Management Systems Dept. His European counterparts are Dr. Sydney Jones, chairman of UIC's cybernetics group, and P. Schoonjans, senior technical adviser for the general secretariat of UIC.

• Control Data Institute notes that their schools in Dallas and Detroit have been accredited by NATTS, the National Association of Trade and Technical Schools. The approval permits students to apply for federally in-

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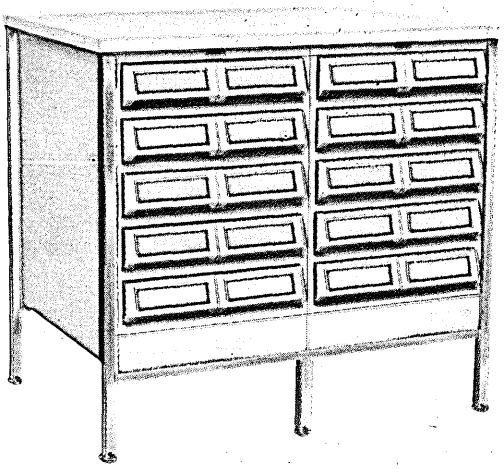

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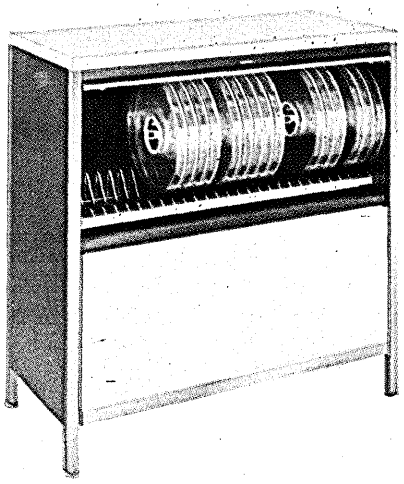

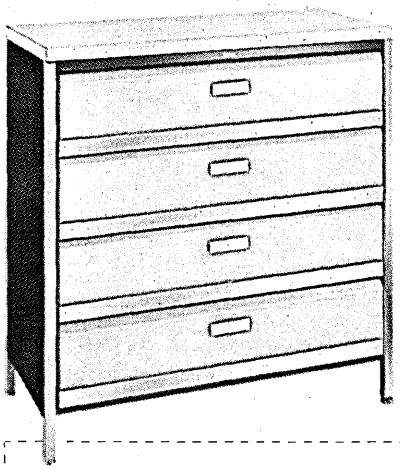

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sured loans under the National Vocational Student Loan Act. Courses offered include programming, and the training is aimed at students with a high school education or the equivalent but without computer experience.

• Applied Data Research has named Centre D'Analyze et de Programmation as its marketing representative for proprietary software programs, including Autoflow, in five European nations. CAP, Europe's largest independent software house, is headquartered in Paris and operates throughout France, Belgium, Holland, Switzerland and England. ADR made its first direct sales move outside the U.S. last January, when Japan Office Supplies, Ltd., was named Far East marketing representative.

• The Conference on Data Systems Languages (CODASYL) has been reorganized to "broaden and improve CODASYL activities and their responsiveness to user needs." John L. Jones, Southern Railway Co., continues as chairman of the executive committee. New standing committees and their chairmen: planning, Warren G. Simmons, U.S. Steel; programming language, Richard C. Kurz, NCR; systems, T. William Olle, RCA. Jones announced that future publications of COBOL specifications will be known as the Journal of COBOL Development, to distinguish it from the anticipated USASI COBOL Standard.

• Systems Engineering Laboratories, Fort Lauderdale, Fla., has entered into an agreement with Kyokuto Boeki Kaisha, Ltd., Tokyo, whereby KBK will market SEL computers, peripheral equipment, and system products in Japan, South Korea, Formosa, and the Philippines.

• The U.S. Army is renting an additional 85 NCR 500 systems to augment the 52 mobile computers being used in Southeast Asia for automated stock accounting. In Vietnam the 500's are used in van mounted data centers assigned to Army logistical units. Of the new order, 52 will be van mounted for use abroad, the other 33 will join the six in the U.S. for similar functions, and training. By 1973 the Army expects to have up to 400 of these systems worldwide.

• The Consumers Power Co., Jackson, Mich., is using an IBM 1800 data acquisition and control system to provide continuous monitoring of over 600 checkpoints on gas pipelines. When measuring devices at the checkpoints show irregularities in gas pressure, density, temperature, specific gravity, etc., the computer alerts technicians at the gas control station, permitting prompt corrective action. The machine is also used to predict demand for gas on the basis of weather reports during the winter months, and is programmed to suggest what steps should be taken to assure adequate gas supplies during cold spells.

• Officers for the 1969 Spring Joint Computer Conference to be held at Boston's War Memorial Auditorium next May 14-16 are: Dr. Harrison W. Fuller, Sanders Associates, general chairman; John E. Ward, Electronic Systems Lab at MIT, vice chairman; Albin A. Hastbacka, Aerospace Systems Div. of RCA, secretary; Brandt R. Allen, Harvard Business School, treasurer. Committees and chairmen are: technical program, Theodore H. Bonn, Honeywell EDP Div.; local arrangements, Charles W. Gardiner, Wayne-George Div. of Itek Corp.; exhibits coordination, David Sudkin, Adage Inc.; registration, Bruce M. Campbell, IBM; printing and mailing, Allen Z. Kluchman, Data General Corp.; public relations, Norman M. Bryden, Honeywell EDP Div. Exhibits manager is H. G. Asmus of AFIPS. Frank E. Heart and Hawley K. Rising, both of Bolt, Beranek and Newman, Inc., are serving as advisors.

• A system for monitoring and analyzing the incidence of tuberculosis and other communicable diseases by area has been developed by the Medical College of Georgia and NCR. The program was written for a 10K NCR 315 and is now operating in one county in Georgia and one in South Carolina. A standard form for patient information is used. New case and contact report lists, by locality, are prepared weekly and sent to field investigators. Action for treatment is begun with computer-written appointment letters. At the same time, the computer sets up schedules for treatment centers.

• Honeywell began construction last month of a 150,000-square-foot plant and office building in Billerica, Mass., to be completed in August 1969. The facility will be used to manufacture, assemble and test computer peripherals, including a new disc drive being announced this month, as well as printed circuit boards and backboards for edp systems. About 600 persons will be employed.

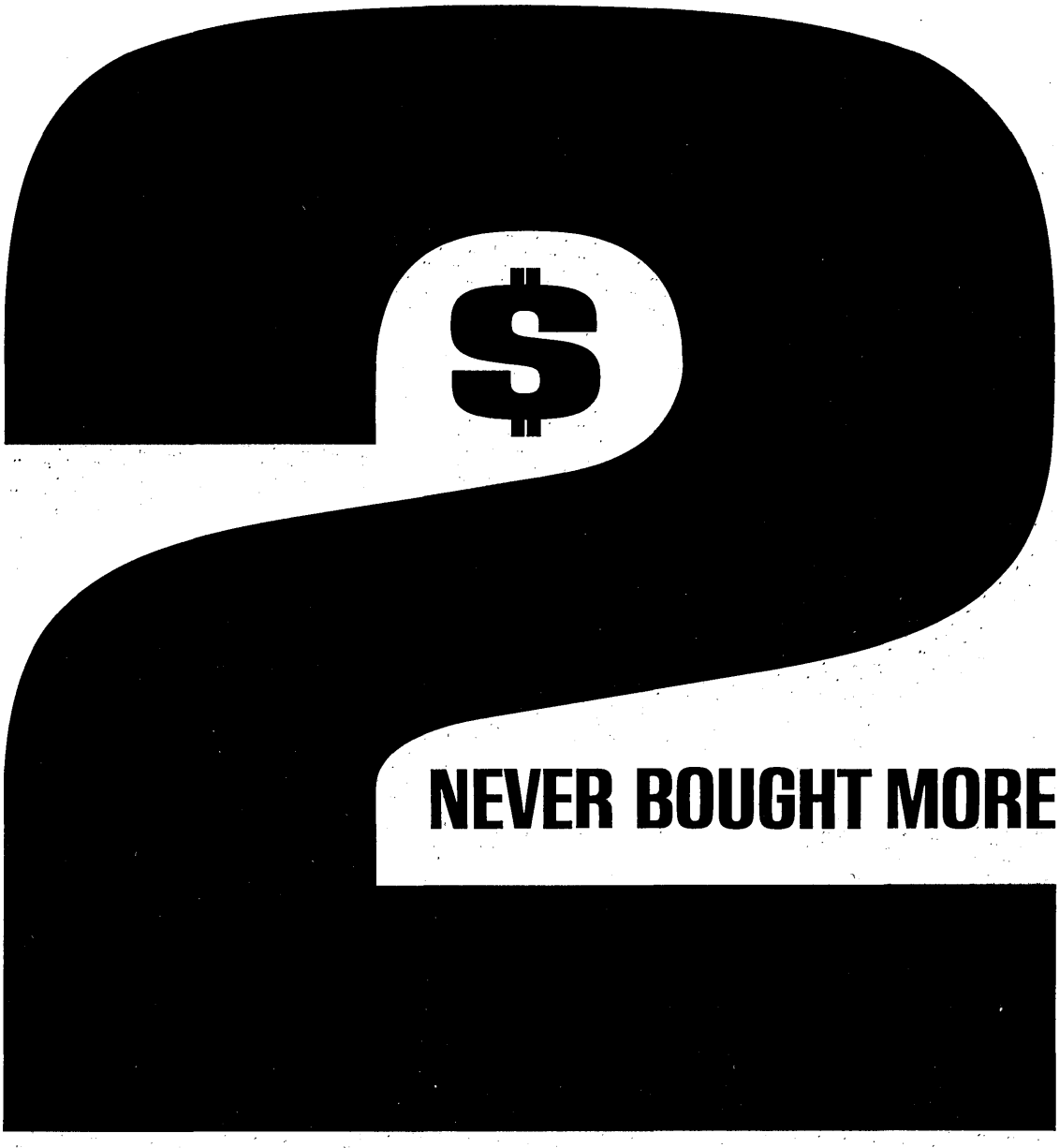
• Digital Equipment Corp. has announced price reductions on memory expansion modules for their PDP-8/S computers. Prices are based on expansion increments of 4K. Expansion from 4K to 8K now costs $3500 (down from $5000). Increases from 8K to 12K, 16K to 20K, and 24K to 28K each cost $2800 (reduced from $4000). Increases from 12K to 16K, 20K to 24K, and 28K to 32K each cost $2000 (reduced from $3000). These variations in price are caused by the necessity of installing an additional memory mounting block with each 8K increment.

• Lever Brothers Company announced formation last month of a data processing subsidiary, Lever Data Processing Services, Inc., which will offer various services, including computer time sales, service bureau operations, edp consulting and recruiting, software and application development, and educational programs. Thomas S. Carroll, president, stated that it would take "several months" to complete planning and organization of the new company.

• Data Processing Financial & General announced its intention to go into the time-sharing business at a bash at its new Data Center Div. installation in Los Angeles August 23. This center is the first of three planned for the L.A. area; another has opened in San Francisco; others slated for Houston and New York so far. The tactically oriented company plans to offer time-sharing through these data centers in a year or so—when a higher volume is being processed, hardware and software for time-sharing is better developed, and after others have done a little more pioneering in the field.

shortlines . . .

Automated Data Sciences Inc., New York-based systems design and programming firm, has acquired Western Data Processing Corp., Mayaguez, P.R., service bureau . . . The Laboratory Program for Computer Assisted Learning (Project LOCAL), Westwood, Mass., has installed five PDP-8/I systems in local high schools to aid in teaching math and science as well as to familiarize students with edp.



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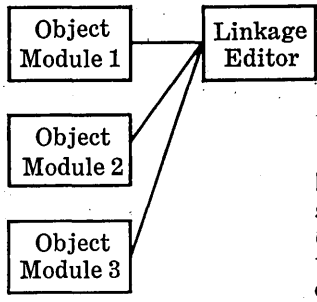
As the new programmers gain skill and experience they use other parts of the language on tougher problems. Most importantly, they learn while doing.



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An altimeter is just one of hundreds of components on every U.S. Air Force plane. Each is a potential trouble spot. The Air Force has skilled mechanics to detect faulty parts on the ground, and it has given them access to a UNIVAC® real-time computer system to locate replacement parts from inventory in a matter of seconds. And, the parts can be delivered to the flight line in about twelve minutes.

The warehouse location, quantity on hand and cost of 65,000 parts is in the memory of a Univac real-time computer system.

When the mechanic orders a replacement altimeter, the computer notifies issue clerks and indicates where it's stored. The computer checks its memory again. This time to see how many altimeters should be on hand. If inventory is now too low to meet expected demand, it initiates a re-order and updates accounting records for Base Level Supply Command.

Multiply that altimeter order by a few hundred an hour and you have a rough idea how much work the Air Force gets out of this Univac inventory system. A total system with forecasting, control and cost-cutting functions built in.

There's a Univac system at virtually every Air Force base. 166 systems to be more precise. All equipment and procedures are the same. Personnel have to be trained only once to use any of them.

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SPERRY RAND

CIRCLE 65 ON READER CARD

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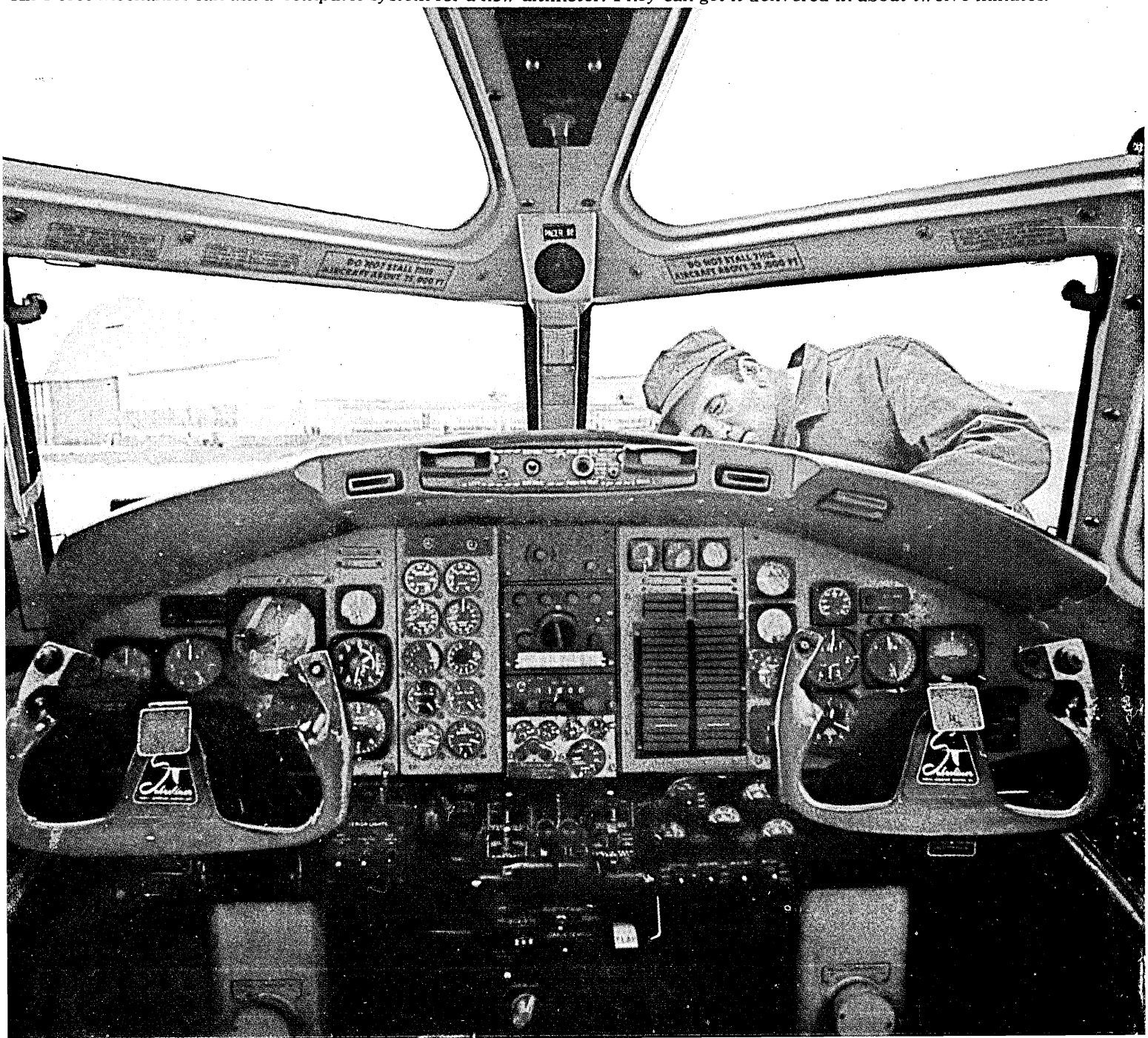
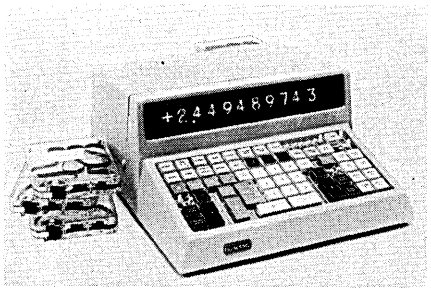
Air Force mechanics can ask a computer system for a new altimeter. They can get it delivered in about twelve minutes.



new products

programming keyboard

The Model 380 Programming Keyboard memorizes operator keystrokes on mag tape and can repeat them as programs of up to 640 steps. The plug-



in mag tape cartridges may be erased and reused or ejected and retained. The device contains keys for all Wang calculator functions and for operation of optional compatible system modules, including optional data storage registers, typewriters, and teletypewriters. Using the output from a teletypewriter, it is possible to read input from the keyboard into larger computer systems. The Model 380 can loop, branch and make programmed decisions, and with its increased number of math function keys, seems to be another advance in building software into hardware. The price of the keyboard is $1,500 and a 246-page program library is furnished free. WANG LABORATORIES, INC., Tewksbury, Mass. For information:

CIRCLE 160 ON READER CARD

small computer software

The Small Computer Monitor (Executive) System is software designed with three basic monitors for real-time and data processing applications with small computers of the DEC, Varian, etc., variety. It is written in BASIC or the assembly language of the object computer with the aid of the company's in-house meta-assembler. The foundation monitor of the three monitors is the interjob processor, which performs basic tasks such as program loading and record keeping. It operates serially and provides the front end function for the batch processor, the second monitor, which operates in a mode grouping several jobs together prior to execution to allow continuous operation. The third is a real-time monitor to provide priority processing of systems tasks in a competitive time-based environment. It is fully compatible with the batch and interjob processors, which can be used in a foreground/background mode. The system permits real-time operation with batch data processing functions running concurrently in the background. The basic price is $22K and delivery is six months ARO. PROGRAMMING SERVICES, INC., Woodland Hills, Calif. For information:

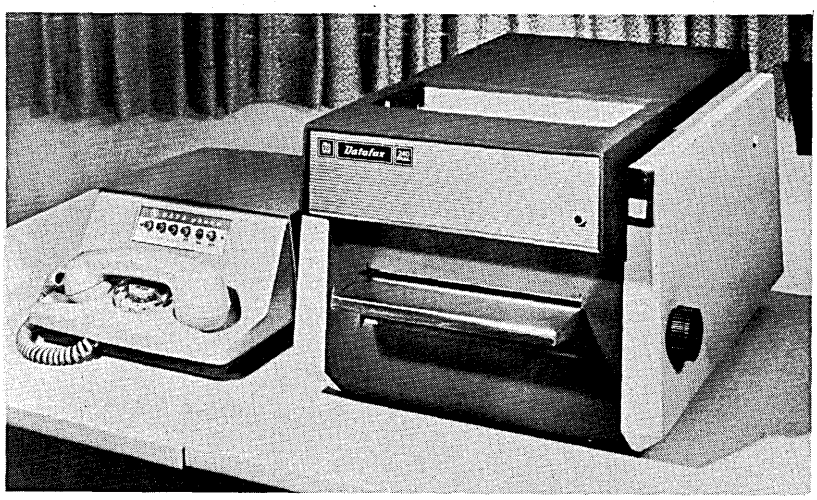
CIRCLE 161 ON READER CARD

general purpose computer

The SPC-8 is a general purpose digital computer with a 4K by 8-bit word memory, expandable to 8K words, with a cycle time of 2.2 usec. The processor includes a parallel adder, three addressing modes, six 12-bit registers, two accumulators, a hardware index register, a priority interrupt system, and a teletypewriter interface. Options include a real time control group, real time instruction set, power fail detection and automatic restart, and more than 30 functional and interface modules.

SPC-8 software provides a one-pass

PRODUCT OF THE MONTH



A facsimile communication device dubbed the "Electronic Mailbox" is a transceiver that can both send and receive graphic information on 8½" x 11" documents over a direct-dial telephone network in-plant or to any location in the U.S. and Canada over regular telephone lines. The copy is produced in 4½ minutes and operation does not require trained personnel as there are no operator controls or adjustments. The analog device is always "on" to either send or receive and is equipped for unattended operation. An accessory document loader will automatically transmit up to 50 documents and an automatic answering feature permits the "mailbox" to receive transmissions when no one is present. The machine holds enough paper to receive 150 8½" x 11" documents without reloading.

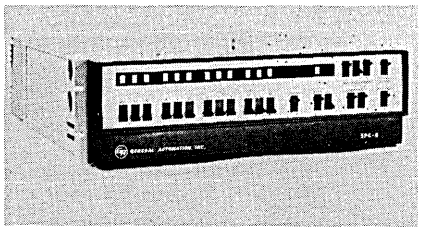
The company anticipates that the widest application of the unit will be in sales order-entry systems, but it has been field-tested for two years in such applications as transmission of engineering change orders between engineering and production departments, signature verification, transmission of bills of lading, crew schedules, and transmission of news copy for editing.

The transceiver will lease for $100-$150 a month, depending on options, and this price, according to the company, is approximately half the rate of existing facsimile transmitter and receiver pairs. Each customer will receive a "dial Datafax directory" listing the telephone numbers of other users, which will be updated quarterly. The equipment will be demonstrated for the first time at the BEMA show in Chicago, Oct. 28-Nov. 1, and delivery will be 30-45 days from that time. DATAFAX CORP., Chicago, Ill. For information:

CIRCLE 162 ON READER CARD

new products

conversational assembler, a basic utility system for correcting and modifying programs, a math package, and computer test programs. The computer



is designed for use in custom data processing and control systems, in R&D labs, and in universities. It is priced at $4,900, with delivery in 120 days ARO. AUTOMATION PROD. DIV., GENERAL AUTOMATION, INC., Orange, Calif. For information:

CIRCLE 163 ON READER CARD

coordinate digitizer

Model PF-10B, "Pencil Follower" Coordinate Digitizer, is designed to convert graphic information into recorded or on-line digital form for computer processing. The system consists of a flat or tiltable reading table, electronics console and an optional output device such as mag tape, paper tape, card punch, electric typewriter or on-line computer. Digitizing is accomplished by bringing a pencil-type cursor to a fixed point in the point mode, or by tracing the graphical information in the continuous mode. The digitizing rate for the continuous mode is from 0 to 50 points per second, depending upon the complexity of the data and the output recording speed. The cursors are free moving with no mechanical linkage inertia and can be interchanged in seconds. Each PF-10B is supplied with a FORTRAN control software package for the common data normalizing functions of scaling, editing, curve fitting and formatting. Prices range from $9,450 for the basic digitizer to $19,875 for a complete system. Delivery is 45-60 days. EDWIN INDUSTRIES CORP., Silver Spring, Md. For information:

CIRCLE 164 ON READER CARD

four disc drives

Honeywell plans production of its own disc drive line and this month announced four models: types 155, 273, 275 and 278. The 155, built for the 110 computer, will handle the single-disc cartridge; the other models, for series 200 computers larger than the 110 and 120, will take the 11-disc packs. The unique feature claimed for these units is a totally electronic read/write head positioner, as opposed to the commonly used hydraulic and electro-mechanical positioners. It is said to afford higher reliability (fewer moving parts) and accuracy and faster access time.

The packs that go with these drives are also new Honeywell products. The single-disc cartridge, the M4010, sells for $90. There are two versions of the 11-disc pack: the M4007, which sells for $600 and has an iron oxide coating that permits "single" density packing of 1,100 bpi, an industry "first," according to the company. The M4008 11-disc pack is a double-density unit that sells for $650.

The 155 drive is a two-spindle unit handling two single-disc cartridges with 1.8 million 6-bit characters storage per disc. The unit has two read/write heads per disc (200 tracks/side), 1,100 bpi packing density, 1,700 rpm speed, 100 msec average "seek" time, 17.5 msec latency time, and a transfer rate of 147,500 cps. The cost is $330 to $370 a month (five year lease to short-term rental); purchase price is $14,190.

The 273 and the 275 each handle the single-density disc pack, which has an 18.4 million 6-bit character capacity. The 278 operates with the double-density pack with over 35 million character capacity, and is interchangeable with the IBM 2314. The 273, 275 and 278 have these common characteristics: 20 read/write heads per pack, 50 msec average seek time, 12.5 msec latency time, and 2,400 rpm speed. Each model has brushes that clean the disc surfaces as operation starts.

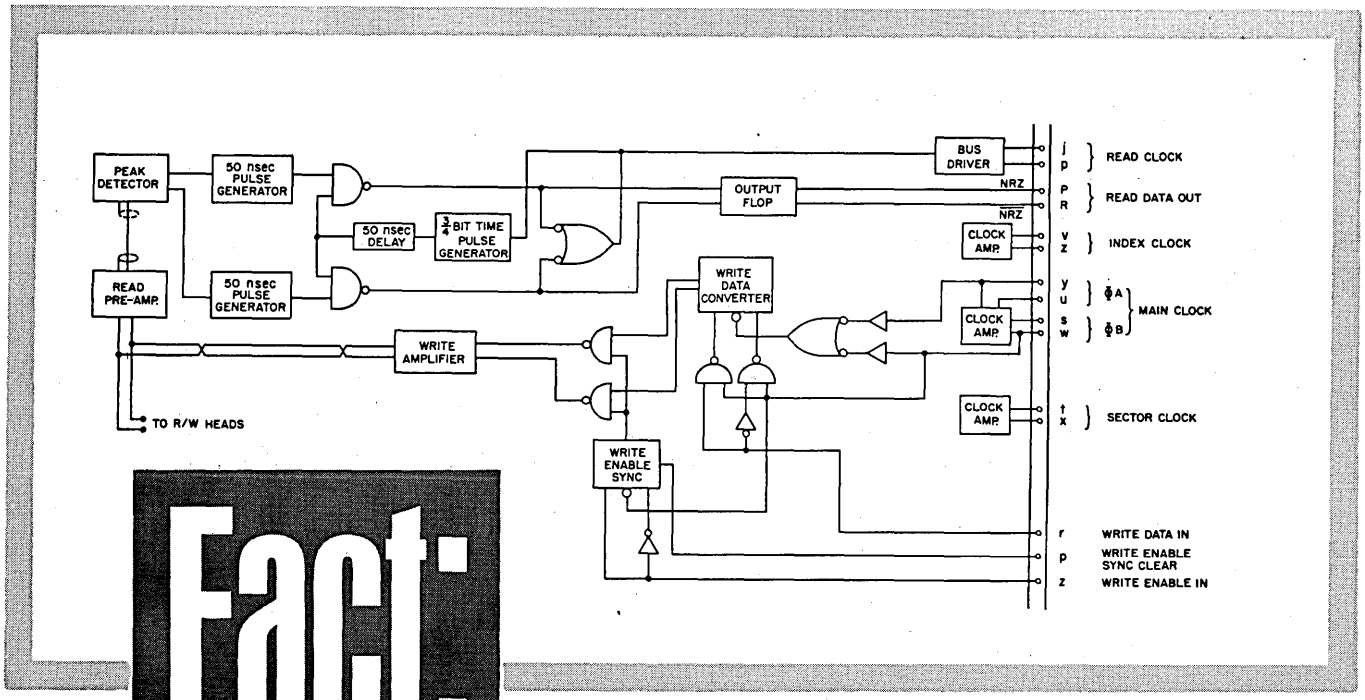
The 273 is a single-spindle drive handling one 11-disc pack. Transfer rate is 208,300 cps. Delivery begins July '69. Cost is $695-775/mo., or $31,500 to purchase. Although the series 200 machines will handle eight of these drives, the 275 or 278 are more economical when the larger capacity is required.

The multiple-spindle 275 can handle up to nine of the 11-disc packs (eight operating, one standby) for a total storage of 147.2 million characters on-line. It has the same packing density and transfer rate as the 273. Deliveries begin the first quarter of 1970. Cost is $3,780-4,235 a month; purchase, $172,200.

The 278 also handles nine packs, but has a double density of 2200 bpi, so that maximum storage is 280 million characters and transfer rate is 416,667 cps. Delivery begins the third quarter of 1970. Cost is $4795-5370 a month; purchase, $218,400. HONEYWELL EDP DIVISION, Wellesley, Mass. For information:

CIRCLE 165 ON READER CARD

(Continued on page 136)



Fact:

A Common Drum Interface has uncommon advantages

This integrated package is installed in each of VRC's standard drum memories. It provides all Read/Write functions, including data conversion to a reliable recording mode, and self-clocking data recovery. You supply NRZ data in, Write Enable and Synch Clear. You get 4 writing and addressing clocks, a data-derived read clock, and NRZ data out at 2 MHz rates.

An equally standard package, also installed within the drum housing, handles track selection. Whether 128, 512 or 1024 tracks, the same modules are used. You supply X and Y address levels at 5 volts. The selection package does the rest.

VRC's common-design concept means your parts and training costs stay low, no matter which drums, or how many drums, you use. It means you can switch from a 2.6 megabit to a 67.5 megabit model . . . or any size in between . . . without changing your interface. And it means the same reliability, backed by the same 1-year warranty, on the *entire* drum. Including the electronics.

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CIRCLE 66 ON READER CARD

new products

disc only computers

Honeywell is bringing down the price of four of its computer systems $300 to $400 a month by offering them with disc control units built in, rather than separate. The Model 110-2 will now be available for $2,275 a month under a five year lease (leasing condition is the same for all four systems) and can be purchased for $102,375. The system includes a 12K memory, integrated disc control unit, two read/write channels, a line printer, card reader/punch, and a type 155 cartridge disc drive. Model 110-3 rents for $2,970 a month and the purchase price is $113,650. It contains all the features of the 110-2 plus a 6-pack drive (CDC models tagged by Honeywell as 259B or 258B). The 120-3 rental price is $3,205 a month and the selling price is $144,225. It has the same drives as the 110-3 with a third read/write channel optional. The 125-3 provides the same features as the 110-3 with third and fourth read/write channels optional. It may be rented for $4,440 a month and sells for $199,800. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 166 ON READER CARD

computer user terminal

The CDC 200 User Terminal for multiple access telephone communication to a central computer ("any standard commercial computer," although the company recommends a CDC 6000 or 3000 Series) consists of a CDC 217-2 entry/display, a CDC 224-2 card reader, and either a CDC 222-1 or 222-2 line printer. A typewriter output station may be included instead of a printer. The entry/display keyboard has a 63-character set and the crt display is a 14" screen with a capacity of 20 lines, 50 characters per line. The card reader is a photoelectric reader with a speed of 333 cards per minute, and the line printers operate at 300 lines per minute in either 80 or 136 columns. The terminal controller and 1,000-character buffer are contained in the entry/display station, and terminal-computer communication is effected by Data Phone or its equivalent. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 167 ON READER CARD

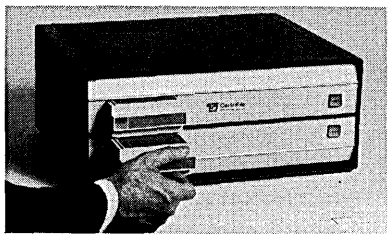
payroll system

CPACS (Comprehensive Payroll Accounting System) is GE's automated payroll processing system for use with the GE-400 computers to accumulate, calculate and report nearly every function of payroll accounting "in a fraction of the former time." The system will process the complete payroll of organizations with a thousand or more employees and will automatically compute tax deductions for 50 states and over 40 local taxes. The system was developed by GE Supply Co. for its own 165 locations around the country. GENERAL ELECTRIC CO., Phoenix, Ariz. For information:

CIRCLE 168 ON READER CARD

correction . . .

Cartrifile is a data systems peripheral, compatible with small computers and data terminal systems, that reads and writes data simultaneously on any two of four tape files. DATAMATION erred (Aug. '68) in describing the tape used by Cartrifile, which combines four tape



transports and their controller in a single cartridge-loaded unit. Each cartridge contains two ¼" computer-grade digital mag tapes, each of which is phase-recorded bit-serially in two tracks, with built-in error correction. The packing density of each tape is 1,200 flux changes per inch, and the capacity per tape is 220K 4-bit words or 150K 6-bit words. Control circuitry also interfaces with 8- or 12-bit parallel I/O and transfer rates range up to 1,200 4-bit words a second. TRI-DATA CORP., Mountain View, Calif. For information:

CIRCLE 169 ON READER CARD

intercomputer couplers

A series of intercomputer couplers recently introduced by the company will permit channel-to-channel communication between Univac computers (models 418, 490 and 1108) and IBM series 360 (-30 through -75), with both alphanumeric and binary data. The maximum transfer rate is approximately 330K bytes per second. The coupler houses the control logic for communication, and in the idle condition continuously searches for an initiating command from either computer. When it is received, the command (write) is stored in a command buffer register. The coupler then determines the availability of the other computer to receive data, and when this is established, requests an output word from the initiating computer. When this is accepted by the coupler, the data is stored in a holding register. Then the coupler control logic gates the data onto the I/O bus lines as soon as the receiving computer is capable of accepting data. Basic price starts at around $33K and delivery is three months ARO. DATAMETRICS CORP., Van Nuys, Calif. For information:

CIRCLE 170 ON READER CARD

disc memory

The M-200 is a head-per-track disc memory system designed specifically for the small computer market. It has a single 12" diameter disc and from 16 to 128 data tracks, with storage capacity from 426K bits to 3,400K bits. The M-200 features 8.7 msec average access time, a plated cobalt alloy surface, belt drive, IC electronics, and three timing tracks. It weighs 65 lbs. and occupies seven vertical inches in a standard RETMA rack. Price for a 3,400K bit capacity unit is $5,600. APPLIED MAGNETICS CORP., Goleta, Calif. For information:

CIRCLE 171 ON READER CARD

tape reader/spooler

The RRS-3000-7½ is a photoelectric punched tape reader/spooler available in unidirectional and bidirectional models equipped with 7½" diameter separable reels. The models include such features as: 15,000 hour, self-cleaning quartz light source; fiber optic distributor and light guides; speeds up to 300 cps, with rewind averaging over 200 ips; and integrated circuits mounted on two pluggable printed circuit cards and providing either DTL or TTL logic levels. Prices are $1,595 for unidirectional and $1,715 for bidirectional models, and delivery is 10 weeks ARO. REMEX ELECTRONICS, Hawthorne, Calif. For information:

CIRCLE 172 ON READER CARD

programming technique

COMPUTRAN is a programming technique that produces COBOL source records in the same format and sequenced in the same logical manner for all programs. It is currently available for IBM 360 systems DOS or OS and requires 32K and two disc drives. The company has announced a second version of COMPUTRAN, due this month, that will produce COBOL data division and procedure division entries. A 45-day free trial is offered. COMPUMATICS, INC., Chicago, Ill. For information:

CIRCLE 173 ON READER CARD

reader/sorter for banks

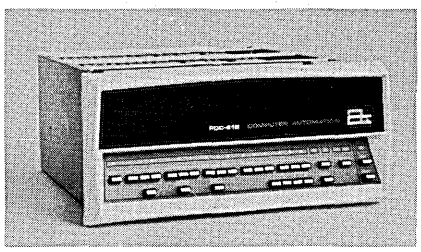
Honeywell will go after the banking market, now dominated by IBM and

Burroughs, with the Type 232 MICR reader/sorter, a device that reads magnetic ink-encoded documents at speeds up to 600 documents per minute and sorts them into 11 different slots (10 accept and one reject). The unit can be operated as a free-standing machine or on-line to any Series 200 computer. The 232 reader/sorter will lease for around $1,200 per month, with a sale price of $56,250, and will be available in January. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 174 ON READER CARD

larger small computer

The PDC-816 is a larger version of the company's PDC-808, with a 4K word, 16-bit memory, and like its predecessor is also designed for reliability, with an 8 usec cycle time. It features multilevel indirect addressing, hardware in-



dex register, conditional jumps, parallel processing, block I/O, and three priority interrupts. Available peripherals include Teletype, mag and paper tape, disc, and modems. The company says the unit undergoes 16K hours of test operation before it is marketed to ensure trouble-free functioning. The price is $11,900. COMPUTER AUTOMATION, INC., Newport Beach, Calif. For information:

CIRCLE 175 ON READER CARD

display panels

The company's new line of plug-in, alphanumeric display panels is for display applications ranging from small consoles to large wall systems. The panels contain one to four 10-module lines with 2.7"-high characters and operating speeds are 10, 15, 80 or 250 cps. The panels interface to keyboards, tape readers, computers, and communication circuits and accept serial or ASCII inputs directly. A standard unit can control up to 1,280 modules. FERRANTI-PACKARD ELECTRIC, LTD., Toronto, Ont. For information:

CIRCLE 176 ON READER CARD

mag tape recorder

The Model 70 digital mag tape recorder is fully IBM compatible and accepts asynchronous data rates from 0-100 cps and synchronous data rates to 2,000 cps. The packing density is 200 bpi, with higher densities optional. Also optional are asynchronous data rates from 0-500 cps, and error-checking circuits. DTL and multifunction TTL IC's are used throughout. The price is $1,950. CIPHER DATA PRODUCTS, San Diego, Calif. For information:

CIRCLE 177 ON READER CARD

laboratory system

The DNA Clinical Laboratory system uses a Raytheon 703 cpu and a mass memory unit with a storage capacity of 6.4 million bits and an average access time of 16.7 msec. Laboratory personnel interface to the system is provided by DNA 20/20 keyboard terminals, which are coded in ASCII, are compatible with ASR 33/35 Teletypes, and can be operated with any standard computer systems communications interface. The input keyboards of the terminals are customized to meet the specific requirements of the laboratory in which they are utilized (such as hematology, bacteriology, chemistry and urinalysis). Since the terminal formats the input message, the operator need not be a trained typist, and no computer knowledge is required for hospital personnel. The system can be interfaced with various types of data acquisition equipment (e.g., spectrophotometers) found in laboratories, and produces from this data, cumulative chart reports, patient inquiries, floor reports, and quality control information. DIVERSIFIED NUMERICAL APPLICATIONS, Minneapolis, Minn. For information:

CIRCLE 178 ON READER CARD

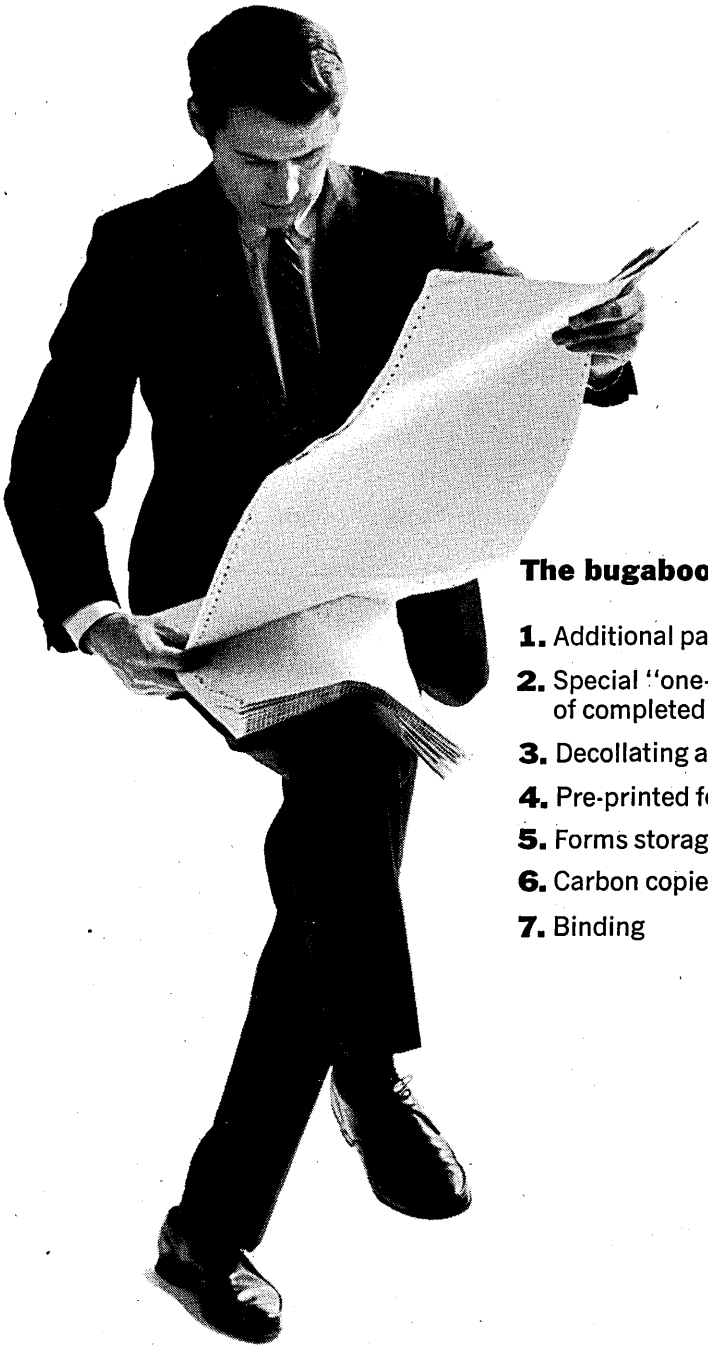
x-y recorder

The Model 530 X-Y recorder will record (on 8½" x 11" or 11" x 17" paper) cartesian coordinate graphs of the relationship between two functions of DC or slowly changing AC voltages. The machine operates at a speed of 30"/second on X axis and 20"/second on Y axis. It has a common mode rejection of up to 130 db. The recorder can also accept ±100 volt reference from a computer or can be switched to internal reference. Priced at $1,190, the unit is available for delivery 60-90 days ARO. HONEYWELL TEST INSTRUMENTS DIV., Denver, Colo. For information:

CIRCLE 179 ON READER CARD

(Continued on page 140)

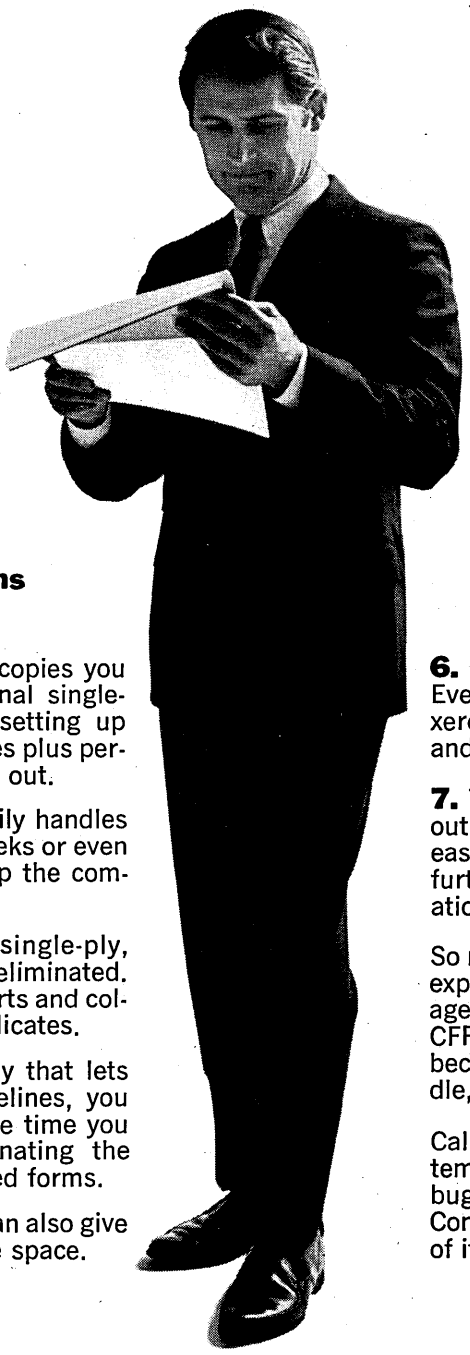
How the Xerox Computer Forms Printer takes 7 printout bugaboos...



The bugaboos:

1. Additional passes
2. Special "one-shot" copies of completed reports
3. Decollating and bursting
4. Pre-printed forms
5. Forms storage
6. Carbon copies
7. Binding

and wipes them out.



How the Computer Forms Printer (CFP) does it:

1. The CFP runs off all the copies you need, off-line from the original single-ply fanfold. Time spent in setting up computer for additional passes plus personnel time involved is wiped out.

2. The CFP quickly and easily handles "one-shots" of any report weeks or even months later without tying up the computer.

3. Because the CFP uses single-ply, decollating and bursting are eliminated. And the CFP automatically sorts and collates copies for you as it duplicates.

4. By using a simple overlay that lets you add headings and guidelines, you can create forms at the same time you are copying printout, eliminating the need for expensive pre-printed forms.

5. Printing your own forms can also give you a large saving in storage space.

6. No more carbons or carbon smear. Every copy the CFP produces is of fine xerographic quality and each is as sharp and clear as the first.

7. The CFP reduces 14⅞" x 11" printout to 11" x 8½" size, making binding easy. The use of pre-punched paper can further simplify and speed up this operation.

So much for the bugaboos. You can also expect enthusiastic reaction from management to the reduced-size copies the CFP produces. They're a lot more useful because they're so much easier to handle, mail and file.

Call your nearest Xerox Information Systems Representative and tell him what bugs you. He'll show you how the Xerox Computer Forms Printer can take care of it.

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new products

data storage system

The Model 7231/7232 Rapid Access Data (RAD) disc file head-per-track storage system is for use with SDS Sigma computers. The unit has a storage capacity of 6 million bytes, and transfer rates of up to 384,000 bytes per second. The 7231 controller handles up to four 7232 storage units, providing a maximum storage capacity of 25 million bytes per controller. Average access time to any segment of the disc is 17 msec. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For information:

CIRCLE 180 ON READER CARD

incremental recorder

The Delta-Corder IIA incremental digital recorder has a straightline tape path design, and provides recording at 200 bpi. The unit has a capacity of over one-half million characters, and uses 300′ of mag tape on a 6″ reel. Standard features include full IBM 729 low density compatibility, and a speed of 150 steps a second. DELTA-CORDERS, INC., Phoenix, Ariz. For information:

CIRCLE 181 ON READER CARD

optical-tape conversion package

The latest NCR Optical Font system, designated 420-739, reads data recorded on optical font journal tapes of cash registers, adding machines and accounting machines, and transcribes this data onto magnetic tape. Rental starts at $1.4K per month, claimed to be the lowest price in the industry. The system consists of an optical scanner linked to a new nine-channel, 800 bpi buffered tape handler with 180 characters of memory and a 64-character keyboard for formatting, tape labeling and file updating. NCR, Dayton, Ohio. For information:

CIRCLE 182 ON READER CARD

card retrieval

The Model RS-460 is a card retrieval, random card file system featuring a code display and selection board on which desired code factors light up upon pushbutton selection and stay lit until erased by a switch. This permits in-depth searching by a variety of descriptive code factors. The wanted cards protrude above the level of the other cards in the trays. The cards are notched along the edges by a punch built into the equipment, and the notches are read by the machine as name or number, or alphanumeric combination. From 1K to 12K cards can be searched simultaneously, and the machine accepts cards of paper, plastic or film in 8″ x 5″ size or variables thereof. RANDOMATIC DATA SYSTEMS, INC., Trenton, New Jersey. For information:

CIRCLE 183 ON READER CARD

11-disc pack

The Mark VI disc pack has 11 discs with 20 recording surfaces and a capacity of over 25 million bits. The pack is designed for use on the Memorex 660 and IBM 2314 disc drives and is interchangeable with the IBM 2316. MEMOREX CORP., Santa Clara, Calif. For information:

CIRCLE 184 ON READER CARD

instrumentation computer

The DIDAC system is a modular instrumentation computer for real-time analysis of random or noisy data signals and provides basic data processing capabilities of either an 800 or 4K word, 24-bit core memory. Specialized signal conditioning, logic circuitry and A/D conversion are incorporated in replaceable modules mounted in the mainframe. The system accepts up to four channels of analog data, and has a 5 usec memory cycle speed with a 10

MHz clock rate. It can sample, digitize, process and store input signals at a rate of up to 100K data samples per second. INTERTECHNIQUE INSTRUMENTS, INC., Dover, New Jersey. For information:

CIRCLE 188 ON READER CARD

facsimile system

The Magnafax 850 remote copier transmits and receives printed material in six minutes via acoustical links with standard (voice-grade) telephone lines. The Magnafax 850 does not require special electrolytic paper to record the copy; the unit can use carbon sets with plain bond paper. When in the receiving mode, the copier can print up to three simultaneous copies; it can also print spirit masters, and Vue-graph transparencies. Compatible with a standard Dataphone, the 850 leases for $65 a month, including service; without the acoustic coupler, it leases for $60 a month. To market this item, the Magnavox Company has created a wholly owned subsidiary, headed by Oscar T. Simpson. MAGNAVOX SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 189 ON READER CARD

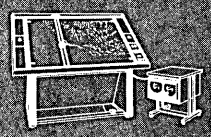
trust accounting software

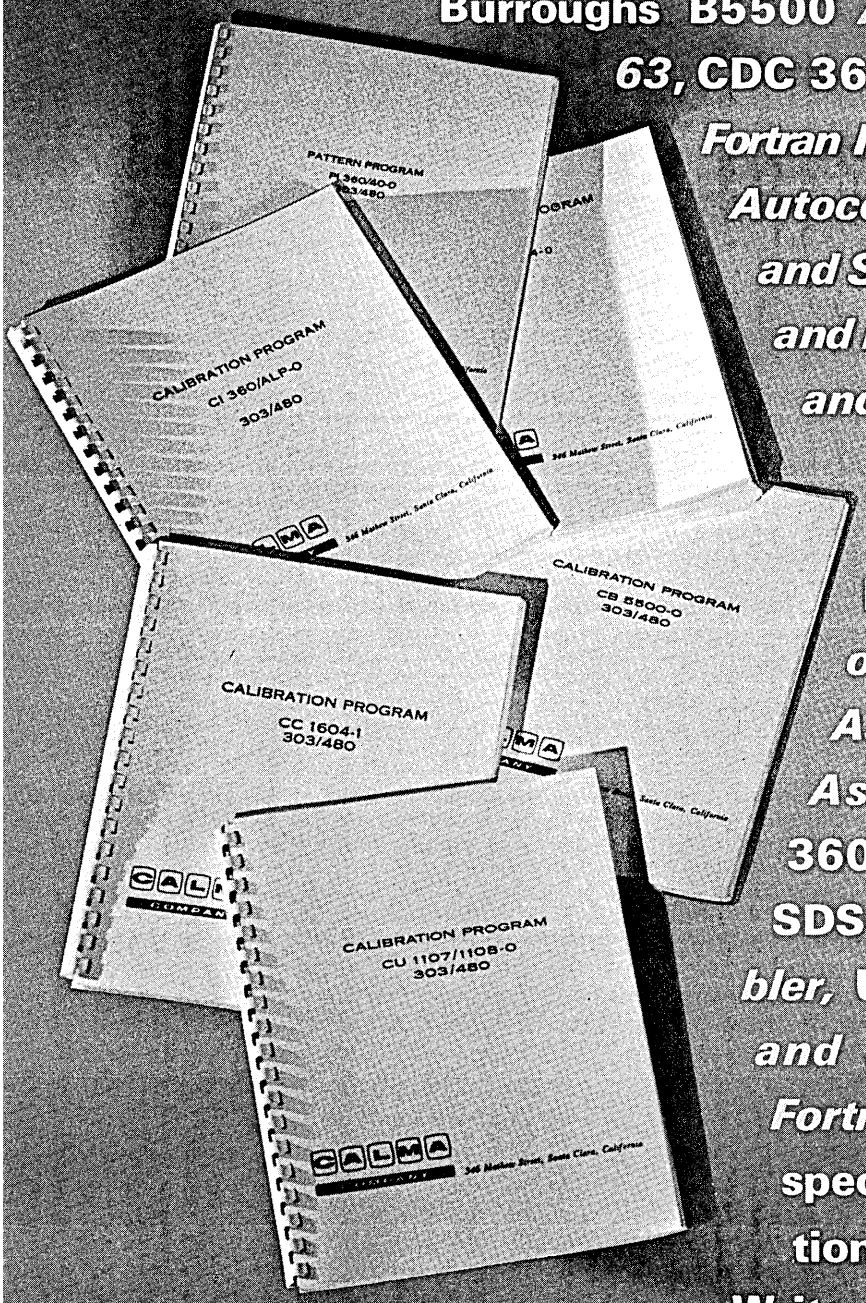
A personal trust accounting system, written in COBOL, is designed to become part of a bank's central information file with remote inquiry terminals, or to stand alone. Features of the system include tickler file reports, real estate bill preparation, check and deposit ticket preparation, account synopsis sheet, estimated monthly income to each account, and statistics for government records. The package presents information in over 60 report formats, has eight master files and standard formatted transactions. Without major modifications, the package is $35K. ARIES CORP., Fairfield, N.J. For information:

CIRCLE 190 ON READER CARD

digital plotter

The Data Interface Plotter Terminal, Model PT-1, is compatible with any Teletype terminal and its telephone coupler and plots data while it is printed on a user's time-sharing terminal. The X and Y data to be plotted are scaled to provide the desired plot size and then printed in columnar format. Thus, plotting can be done in any time-sharing language that has a columnar format capability. A number up to 999 in the first column of the Teletype printout causes the plotter pen to move up to 15″ along the X

When your CALMA Model 303  or Model 480  graphical data digitizer is delivered, you will receive a fully documented program to perform summing, non-linear scaling and other complex calculations on any one of these computers: Burroughs B5500 *Algol*, CDC 1604 *Fortran 63*, CDC 3600 *Fortran 63*, CDC 6400 *Fortran IV and Compass*, IBM 1401 *Autocoder*, IBM 704 *Fortran II and SAP*, IBM 7044 *Fortran IV and MAP*, IBM 7074 *Fortran II and Autocoder*, IBM 7094 *Fortran IV and MAP*, IBM 360/30 *Assembler*, IBM 360/40 *Assembler or PL/1*, IBM 360/44 *Assembler*, IBM 360/50 *Assembler or PL/1*, IBM 360/65 *Assembler or PL/1*, SDS 930 *Fortran II and Assembler*, UNIVAC 1107 *Fortran IV and Sleuth*, UNIVAC 1108 *Fortran IV and Sleuth*. Some special purpose data reduction programs are available. Write or phone for information.



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CIRCLE 74 ON READER CARD

new products

axis, followed by a movement of up to 10″ along the Y axis in response to a Y-column printout of a number up to 999. The maximum length of 25″ on the plotting surface is traversed in two seconds. The plotter is capable of producing block diagrams, flow charts, bar graphs, timing diagrams, step graphs, organization charts and spectra presentations. It is priced under $4,500. DATA INTERFACE CORP., Tarzana, Calif. For information:

CIRCLE 185 ON READER CARD

accounting package

A Fixed Asset Accounting Package, for use on 360/30 and Honeywell H-200 tape- and disc-oriented computers, offers "a wide range" of depreciation methods from which to choose. The package eliminates peak workloads at the end of an accounting period, and allows for long-range projection of depreciation amounts. AMERICAN SOFTWARE & COMPUTER CO., Atlanta, Ga. For information:

CIRCLE 186 ON READER CARD

disc storage system

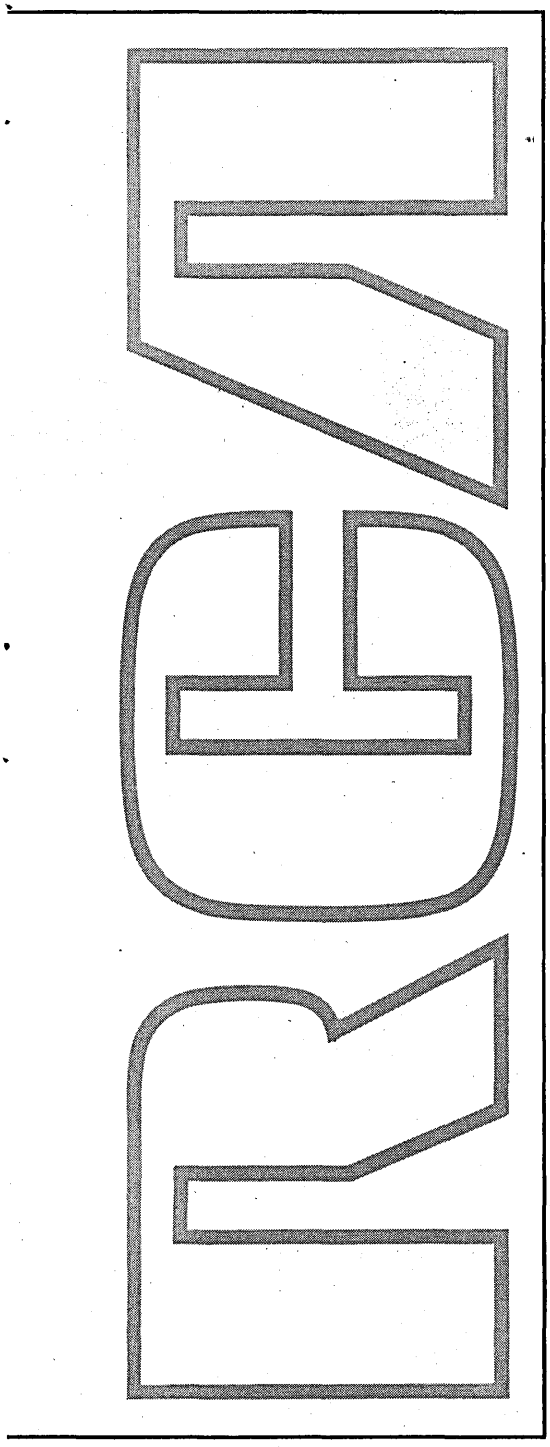
The DSU-8100 is a line of modular disc storage systems that enters a market supplied mainly up to now by Burroughs. It features standard 25 and 50 million bit head-per-track and moving-head disc storage modules that can be randomly combined with multiple drives to provide from 25 million to multibillion bit memory capacities. The "economy" modules, where each head services four data tracks, have a positioning time of 25 msec. The head-per-track modules locate data in 16.7 msec average. Each disc module is contained within its own sealed housing. The DSU-8100 can accommodate up to three computers in a single operational system. COMPUTER PERIPHERALS CORP., San Diego, Calif. For information:

CIRCLE 187 ON READER CARD

digital computer system

The Series 6000 digital computer system is based around the DC-6024 cpu, which is designed for use in simulation, process control and scientific applications including multiprogramming, time-sharing, real-time and off-line uses. The DC-6024 has five 24-bit general purpose registers, a 4K-word memory (expandable to 65K words in 4K or 8K increments), and four levels of priority interrupt. Cycle time is 600 nsec. Add and subtract time for fixed point is 1.2 usec; multiply and

Spectra 70/750 has Number One's beaten by a long sight.



These are the facts. See for yourself.

	Spectra 70/750	2260
VDT's serviced by multiplexor communications controller	48	24
	32	24
Transmission	Full duplex	Half duplex
Thruput (cps) via multiplexor communications controller	4800	2560
	600	240
Screen arrays	9	3
Variable arrays per controller	Yes	No
Character set	96	64
Character generation	Mono-scope	Dot matrix
Non-destruct cursor	No cost	Extra cost
Operator control		
Focus	Yes	No
Line erase	Yes	No
Character insert	Yes	No
Format headings	Yes	No
Split screen	Yes	No
Alphanumeric/keypunch convertible keyboard	Yes	No
Upper and lower case keyboard	Yes	No
Selective override	Yes	No
Characters displayed	1080	960

The 70/750 Modular Video Data System gives you advantages like these.

Versatility. You enter and retrieve data the way that's most convenient, most familiar. By means of a noiseless electronic keyboard that can be used in keypunch or typewriter mode at will. The 70/750 lets you display information in either upper or lower case, or both. You can erase single characters or whole lines. You can insert new data into old; the old text shifts automatically to make room for the new material. And you have the option of an unlimited number of formats and 9 screen arrays to accommodate your standard business forms. None of these important advantages is available from Number One.

Easy viewing. RCA's television leadership has a lot to do with it. Our monoscope tube generates whole letters, numerals and symbols on the screen. So you see steadier, brighter, clearer images than you can get with characters formed from dot matrices or line segments.

More thruput. Compared to Number One, RCA's modular system lets you connect twice as many terminals per controller using a multiplexor; one-third again as many using a communications controller. Our full duplex mode of transmission gives you a data rate that's much faster. That means more work done in a given period of time. And to display special information when it's required, you can override routine work on the terminals you select.

You get facts when you want them. Faster, more efficiently, with greater flexibility. For more insight into the 70/750 Modular Video Data System, call or write your nearest RCA Information Systems office.

RCA

Information Systems

CIRCLE 104 ON READER CARD

new products

divide times are 4.8 and 9.0 usec, respectively; floating point hardware is optional.

The basic I/O unit is an ASR-33 Teletype; the system uses the ASCII code. Standard software for the DC-

6024 includes an operating system, assembler, utilities, and a support library with FORTRAN math functions and hardware test routines. FORTRAN IV is available as an option.

The DC-6024 is the first unit in the Series 6000 computer system, which will later include a line of compatible peripheral equipment. Price of the basic system is $49,500. DATACRAFT CORP., Fort Lauderdale, Fla. For information:

CIRCLE 191 ON READER CARD

1401 simulator program

A 1401 simulator program for 360's simulates 1401 tape systems and accepts 1401 object decks and an "automated operator" command language. The company claims the command language eliminates all of the manual operator intervention required in emulator mode. The package can be multiprogrammed with other jobs. COMPUVISOR, INC., Ithaca, N.Y. For information:

CIRCLE 192 ON READER CARD

printer

The SD 4360 is a 7,000-line-a-minute computer printer that translates digital data into readable text and displays it on the face of a Charactron shaped beam tube where it is photographed on film. The Charactron creates the image by directing the electron beam through individual characters cut in a matrix in the tube.

The SD 4360 printer is compatible with "most" computer-generated mag tapes; it records letters, numbers and symbols at rates up to 30,000 a second (in standard computer page format of 132 characters a line, 64 lines to the page, and 120 pages a minute).

Optional features include a line printer simulator for printing line printer tapes without reformatting, and a universal camera that accepts either 16 mm or 105 mm microfiche. STROMBERG DATAGRAPHICS, INC., San Diego, California. For information:

CIRCLE 193 ON READER CARD

core memory system

The ComRac 150 (Commercial Random Access Core) is a core memory system with a cycle time of 1.5 usec, an access time of 0.7 usec and is available in capacities up to 4K words by 36 bits or 8K words by 24 bits. The memory is packaged in plug-in assemblies and measures 19" by 5¼". It operates in the standard modes of read/restore, clear/write, buffer read and buffer write. INFORMATION CONTROL CORP., El Segundo, Calif. For information:

CIRCLE 194 ON READER CARD

diagnostic monitor

SSTPAC is a stand alone diagnostic monitor that provides on-line diagnostic services for any peripheral device that operates with a System/360. Originally developed for use with crt terminals, the monitor has been generalized to include disc or tape drives, printers, plotters, optical scanners, audio response devices and other 360-compatible devices. PROGRAM-

MING SCIENCES CORP., New York, N.Y. For information:

CIRCLE 195 ON READER CARD

paper tape verifier

The CPV 700 keypunches, verifies and duplicates paper tape and is available with 10-, 44-, or full 67-key keyboard. The unit can be equipped for any tape code, including ASCII and six-channel typesetting. Both punch and reader are bidirectional for error correction. Display lights on the keyboard show the last code read or punched. The unit sells for $4,500. COMPUTER PRODUCTS, INC., Seattle, Wash. For information:

CIRCLE 196 ON READER CARD

multiplexor

Cashing in on the growth of the time-sharing business, Rixon has introduced a new model in its line of multiplexors for general dp applications. The model TDX time division multiplexor permits simultaneous transmission of up to 24 independent channels of data over single 3 KHz voice-grade telephone circuits. It can be configured for 8, 12, 16 or 24 channels operating either at 110, 134.5 or 150 baud. TDX complies with all EIA computer interface standards; control signal error protection is implemented with time diffusion and parity techniques. RIXON ELECTRONICS, INC., Silver Spring, Md. For information:

CIRCLE 197 ON READER CARD

process controller

The VIDAR 5206 D-DAS (Digital Data Acquisition System) collects data from 1 to 1,000 data points such as thermocouples, strain gages, flow meters, load cells, and pressure transducers, and then analyzes the data, formats reports, and sets control outputs as needed to adjust devices, processes or production equipment. The system can recognize dynamically changing test conditions and modify its own operational modes automatically. A software package for a wide range of automatic measurement tasks is supplied as standard. Prices start at under $30K. VIDAR CORP., Mountain View, Calif. For information:

CIRCLE 198 ON READER CARD

programmable clock/calendar

The Model 1130 Programmable Clock/Calendar is used with the IBM 1130 to log job complete time, nonproductive time, and downtime. It reads hours, hundredths of hours, month, and day into core. A normal paper tape read program is used to read the clock/calendar. Eight characters are required: four characters for time; four for date. Date and time are also displayed in bcd on the front panel of the clock/calendar and each character can be set to the proper starting time by pushbuttons. The clock/calendar uses AC power and automatically corrects for 30-day and 31-day months and leap year. CHRONO-LOG CORP., Broomall, Pa. For information:

CIRCLE 199 ON READER CARD

tab reader

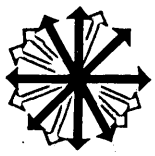
The Sealectrocard 51 x 12 tab reader supplies 612 bits of information from a standard 80 x 12 IBM punched card. It features an electrical lock-out that prevents closure of the contacts before a card is fully inserted and properly oriented, and is designed to prevent lint and dirt from impairing reliability. SEALECTRO CORP., Mamaroneck, N.Y. For information:

CIRCLE 220 ON READER CARD

interface hardware

Interface hardware will connect a DEC PDP-8L or -8I to an IBM 360 multiplexor or selector channel directly, without use of special IBM peripheral equipment. DAYTON SCIENTIFIC, INC., Dayton, Ohio. For information:

CIRCLE 221 ON READER CARD



system spotlight

This is one of a series of descriptions of new computer-based systems of general interest. The equipment discussed is already installed and operational.

Information for the series is compiled by Compata, Inc., consultants in digital systems, logic design, and applications programming.

photo-composition telephone book printing system

Times Mirror Press, Los Angeles

computer and peripherals
Raytheon 725Z
Raytheon 725M
Photon, Inc., ZIP 901 photocomposer
SC-1080 Magnetic tape units
Bryant 10256 Magnetic Drum
IBM Selectric typewriters
Tally 424 paper tape reader

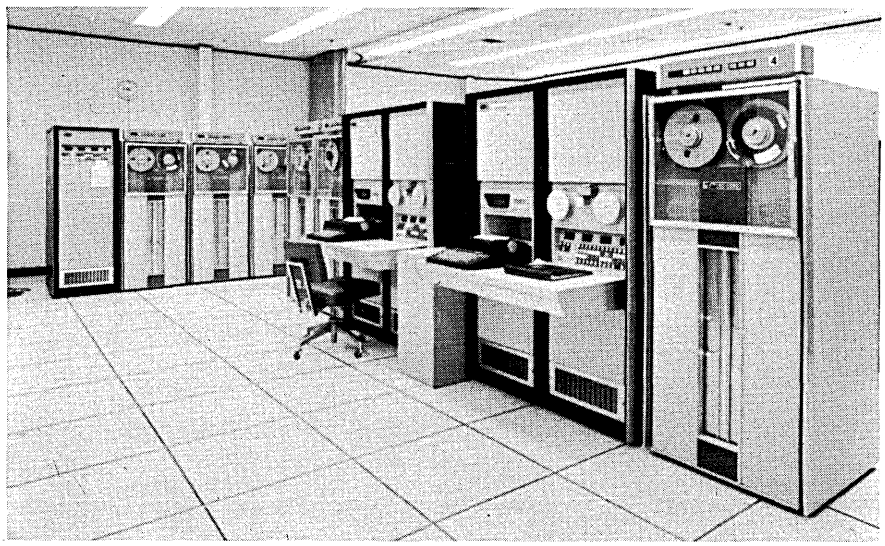
application

At the Times Mirror Press, a division of the Times Mirror Company, in Los Angeles, a Raytheon Computer is teamed on-line with a photocomposer unit to automatically produce telephone books.

The scheme allows the preparation of 1000 pages, with corrections for photoplating, in about 30 hours. Previously, it required about 80 man-days to reach a comparable state.

The system accepts telephone listings on magnetic tape and produces a life-sized photograph of a telephone book page which is then used in a photoplating process in preparation for printing.

Raytheon 725Z computers, with Selectric typewriters, SC-1080 tape units, and Tally 424 paper tape readers.



The processes of film development and paper mat preparation for offset printing are fast enough to take full advantage of the system's speed.

The basic block diagram is outlined in Fig. 1.

software

In any given area, listing information is typically gathered from a number of different branch offices and recorded on magnetic tape. These data are first processed by an off-line "merge" program on the 725M machine. The function of the "merge" program is to order the listings alphabetically into one directory.

The 725M is also used to make final proof deletions and additions requested by the phone company.

To produce page-oriented listings in preparation for presentation to the photocomposer, three additional programs are run on the 725Z machine. The first program provides line justification by inserting the required number of leader dots between the name-address field and the actual phone number. The second program provides paging requirements. It builds a glossary that determines the number of listings and listing placement on the page. The paging program also performs supporting tasks such as providing page numbers, first and last listings for page indexing and other required headings. The third program is called the "line to ZIP" program. This program moves data from the drum to the ZIP 901 photocomposer. The data is first arranged in a core buffer where each character has a flash position code associated with it. A direct memory access unit is then employed to unload the buffer and present the information to the ZIP 901 working registers.

hardware

There are currently two Raytheon 725M computers installed to handle "merge" programs (see software). The 725M is a 12-bit machine with 4096 words of core. Each machine has a tape controller capable of handling four tape units.

In addition, there are two 725Z computers, each coupled to separate ZIP 901 photocomposer machines. The 725Z computers each have 4096 12-bit words of core and a cycle time of 2.5 usec.

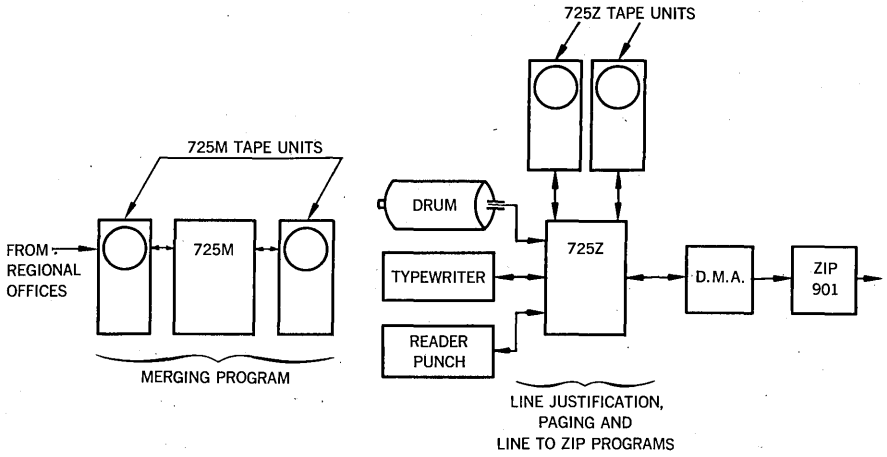
A large Bryant 10256 drum unit serves as auxiliary storage. It is divided into four functional units of 24 tracks each. Tracks are further subdivided into long tracks which are used for data storage and short tracks which are used for program storage. A core resident controller oversees program sequencing.

The 725Z's also have SC-1080 tape units, IBM Selectric typewriters and a Tally 424 paper tape reader.

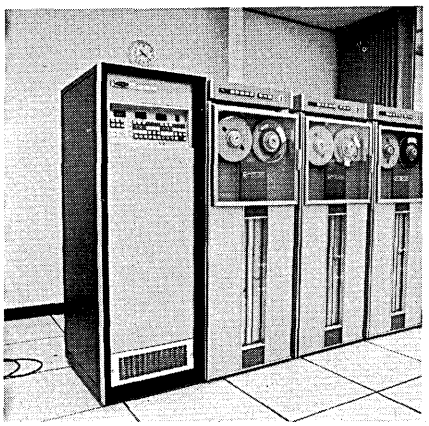
The ZIP 901 photocomposer is built by Photon, Inc., and can be fitted with three matrices of 88 characters each at a single time to provide a 264-character set. Each of the characters of the stationary matrix is provided with individual means of flash illumination. Character images are reproduced on film by a lens scanning the entire film width. The ultimate position of a character on the film is determined by the timing of the appropriate flash illumination circuit. The sequence of characters and the timing of their presentation to the moving lens is under computer control.

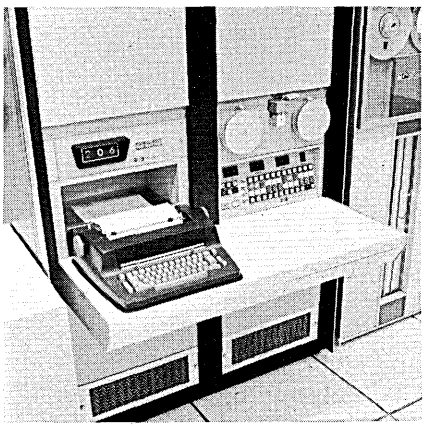
Productivity of characters per second varies according to type style and size and line length. For example: at 30 (6 point) characters per inch and 2.37 (9 inch) lines per second the composing rate is 30 x 9 x 2.37 or 640 characters per second. ■

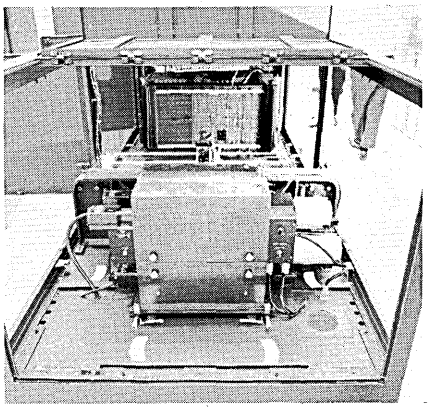
Simplified schematic of Times Mirror Press Photocomposition System.



From top: Raytheon 725M computer; 725Z console; interior view of Photon Zip 901 photocomposer.







Who buys EMR?

The company that needs multiprocessing capability at an economical price.

Everyone uses the computer these days. The engineer, the research scientist, the pure mathematician, to name three. Trouble is, they all want to do their processing at the same time. That calls for a multiprocessing system. Systems with multiprocessing capabilities can be very expensive, as you probably know. You're talking over $500,000 in no time.

Now consider the ADVANCE 6130 system from EMR. For around $300,000 you get all the following: 16K CPU, typewriter, disc, printer, card and tape equipment, priority interrupts, communications controller, A/D converter, and ASSET, our own real time executive, with batch processing and FORTRAN IV. This works out to about 23 cents per minute on a lease basis. That's a real bargain for the fastest *16-bit computer available today, and the only one with multiple asynchronous memory bus structure to give an I/O rate of better than 5 megawords per second.

A well known drug manufacturer will be using this 6130 system in acquiring analog data from 32 lab experiments and converting it to digital values. When experiments are completed, the 6130 calls in application programs to process the acquired data and also continues receiving raw data from other experiments. Simultaneously other departments use the 6130 system to transmit and receive regular business messages from distant IBM Systems. In short, the 6130 system keeps everybody happy—at a price that gladdens the heart!

Interested? Write or call our marketing manager for more information about the ADVANCE 6130.

**Adam Associates "Computer Characteristics Quarterly".*

EMR COMPUTER

EMR DIVISION OF WESTON INSTRUMENTS, INC • A SCHLUMBERGER COMPANY

8001 Bloomington Freeway, Minneapolis, Minnesota 55420 • Phone (612) 888-9581

new literature

PROGRAM COPYRIGHTS: 29-page report discusses the according of copyright to computer programs, reach of a copyright on computer programs, input copying in a machine-language representation, on-demand distributing libraries, computer-assisted instruction systems, computer preparation of derivative works, and property rights in the results of computer programs. PB-178 367. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

AUTOMATIC FLOWCHARTING: Eight-page brochure describes FLOWGEN/F flowchart generator software program which produces ink-on-paper flowcharts from FORTRAN source programs. It takes information directly from program source cards and generates plot commands to drive a CalComp plotter. CALIFORNIA COMPUTER PRODUCTS, Anaheim, Calif. For copy:

CIRCLE 200 ON READER CARD

THE LEASING DECISION: 16-page booklet for 360 users discusses whether a user should rent from IBM or lease from a computer leasing company. Also described is a consulting service for obtaining, analyzing and negotiating lease proposals from third-party lessors. U.S. COMPUTER CONSULTANTS CORP., San Francisco, Calif. For copy:

CIRCLE 201 ON READER CARD

DISPLAY SYSTEM: Eight-page brochure describes Ferranti Argus terminal display equipment for airline reservation systems and illustrates the system now operational for BOAC. DECISION SERVICES INTERNATIONAL, Boston, Mass. For copy:

CIRCLE 202 ON READER CARD

CANADIAN CENSUS: 84-page report lists digital computers in Canada with comparative tables showing each supplier's share of the market on a monthly rental and/or computers installed basis. Other tables of users and suppliers are subdivided to industry, province and city. Cost: $10. THE CANADIAN INFORMATION PROCESSING SOCIETY, c/o The Univ. of Waterloo, Box 484, Waterloo, Ontario, Canada.

CAI SEMINARS: Program describes one-day introductory briefings, management exercises, instructional programming workshops and higher level briefing sessions. Sample issue of newsletter also sent. INSTITUTE FOR COMPUTER-ASSISTED INSTRUCTION, Doylestown, Pa. For copy:

CIRCLE 203 ON READER CARD

SUCH A DEAL: Data sheet describes the refurbished Control Data LGP-30, a low-cost general-purpose desk-size computer for business, accounting, engineering, scientific and educational applications. The stored program 4,096 (32-bit) word machine comes with a warranty similar to a new computer. MUTUAL COMPUTER SYSTEMS, Culver City, Calif. For copy:

CIRCLE 204 ON READER CARD

TECHNICAL PAPERS: Bibliography gives list of over 80 technical papers covering semiconductors, integrated circuits, capacitors, resistors, hybrid circuits, and their applications. All papers listed are available from the company at no charge. SPRAGUE ELECTRIC CO., North Adams, Mass. For copy:

CIRCLE 205 ON READER CARD

OCR FOR BANKING: Brochure describes use of the firm's 915 page reader in banking applications and provides a summary of common data input problems. CONTROL DATA CORP., Minneapolis, Minn. For copy:

CIRCLE 206 ON READER CARD

SMALL GP COMPUTER: Four-page brochure includes photos and performance characteristics for the Micro D computer and its test sets, plus data on options and software. The computer is

new literature

said to be the smallest general purpose machine now in production that is completely free of environmental controls. It is now available for commercial and military aerospace applications. ARMA DIV., AMBAC INDUSTRIES INC., Garden City, N.Y. For copy:

CIRCLE 207 ON READER CARD

DISC FILE SYSTEMS: Four-page brochure describes the company's on-line disc file systems providing storage of up to 850 million characters with an average access time of 170 msec. The systems feature modular design and can be interfaced with almost any computer by using the XLO-1000 controller. BRYANT COMPUTER PRODUCTS, Walled Lake, Mich. For copy:

CIRCLE 208 ON READER CARD

DATA SCHEDULES: 176-page report describes a data collection aid that assists compilers in gathering data essential to an understanding of the present information system within a scientific discipline or engineering field. Included are methods and costs for using the schedules, methods of keeping data current and integrating information across disciplines, and a demonstration of their applicability in the field of chemistry. PB-178 527. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

TAPE PREPARATION: 16-page brochure describes Quickpoint-8 computer-based system for numerical control tape preparation and covers inputing coordinate data, geometric commands, profiling, pattern commands and permanent memory. DIGITAL EQUIPMENT CORP., Maynard, Mass. For copy:

CIRCLE 209 ON READER CARD

DATA TRANSMISSION: Eighteen-page applications booklet describes three systems: The model 2056 is an asynchronous channel in which two- or three-state data streams may be transmitted. The model 3227 is a coherent channel in which two-state data streams may be transmitted along with and in synchronizm with 50% clock pulses. The model 4000 is a synchronous channel in which the clock information is taken from the data set at both ends. These channels supply a majority of the industrial data transmission requirements for use in supervisory control data accumulation, computer linkage and digital telemetering systems. RFL INDUSTRIES, INC., Boonton, N.J. For copy:

CIRCLE 210 ON READER CARD

RECORDING SYSTEM: 48-page programmer's manual describes Series F system which records computer-generated data stored on magnetic tape onto 16mm dry-silver microfilm at speeds up to 20K lpm. The system uses an electron beam that writes directly on the microfilm, forming the latent image. This image is then developed with heat. 3M CO., St. Paul, Minn. For copy:

CIRCLE 211 ON READER CARD

FIBER OPTICS IN DP: Data sheet notes that glass flexible fiber optics can increase reliability in punched tape or card reading systems because long-filament bulbs or delicate miniature bulbs are frequently unable to withstand vibrations in reader/printers. In addition, miniature bulbs are difficult to replace because of the confined area in which they are mounted. Fiber optics pipe light to the tape head from a remote, more rugged light source. CORNING GLASS WORKS, Corning, N.Y. For copy:

CIRCLE 212 ON READER CARD

MULTIPLEX SYSTEMS: Ten-page brochure describes DigiNet 150 data multiplex systems for time-sharing systems which allow t-s centers to take advantage of dedicated transmission lines by multiplexing many simultaneous full-duplex channels onto a single voice-grade telephone circuit. This enables the centers to extend service into distant areas to users not previously served. Systems are available for exchanging data at rates of 110, 134.5 or 150 bps/data channel. GENERAL ELECTRIC COMMUNICATION PRODUCTS DEPT., Lynchburg, Va. For copy:

CIRCLE 213 ON READER CARD

TRANSLATOR: Data sheet gives specifications on the model 180 translator units that can link computers and/or any automated, tape operated, coded communications network (regardless of make or model of the machines, speed differentials, network size, or types of tape), translating between modes at up to 50K cps. The translator can be incorporated into direct-wired local networks, or with far-flung, national/international operations using

Bell system and interconnected communications services. Modules may be added or changed at any time. ADVANCED SPACE AGE PRODUCTS, Alexandria, Va. For copy:

CIRCLE 214 ON READER CARD

DATA SET: Four-page bulletin describes Transidata T201B solid-state data set that transmits and receives data over voice bandwidth leased or private lines at a fixed rate of 2400 bps. SANGAMO ELECTRIC CO., Springfield, Ill. For copy:

CIRCLE 215 ON READER CARD

DATA REDUCTION: Six-page bulletin describes Omega off-line liquid scintillation data reduction system that automatically reduced data from laboratory instruments and provides the laboratory analyst with use of a digital computer without sending raw data to an analysis and programming group for interpretation. The basic system, consisting of two desk-top units, a master control module (equipped with two Teletype 33 tape readers), and electronic module, costs under $6K. BECKMAN INSTRUMENTS, Fullerton, Calif. For copy:

CIRCLE 216 ON READER CARD

DATA CONCENTRATOR: Eight-page brochure describes the Telemux IV data concentrator which compresses data from a number of low-speed communications devices, such as teleprinters or paper tape readers, into a concentrated aggregate for high-speed transmission over a single voice-grade line. DACOM DIV., COMPUTER TEST CORP., Cherry Hill, N.J. For copy:

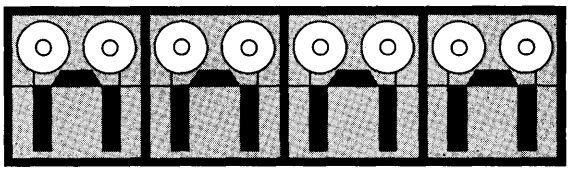
CIRCLE 217 ON READER CARD

CATHODE RAY TUBES: Sixteen-page reference guide describes over 100 different crt's for industrial and military display applications. WESTINGHOUSE ELECTRONIC TUBE DIV., Elmira, N.Y. For copy:

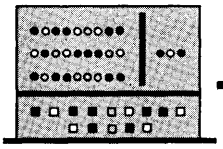
CIRCLE 218 ON READER CARD

ELECTRONIC COUNTERS: Wall chart (2′ x 3′) contains specifications, prices, and list of sales representatives for the company's line of electronic solid-state counters, including bi-directional counters, variable time base counters, pre-set counters, counter-timers, and strain gage digitizers. ANADEX INSTRUMENTS INC., Van Nuys, Calif. For copy:

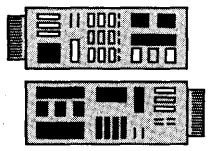
CIRCLE 219 ON READER CARD



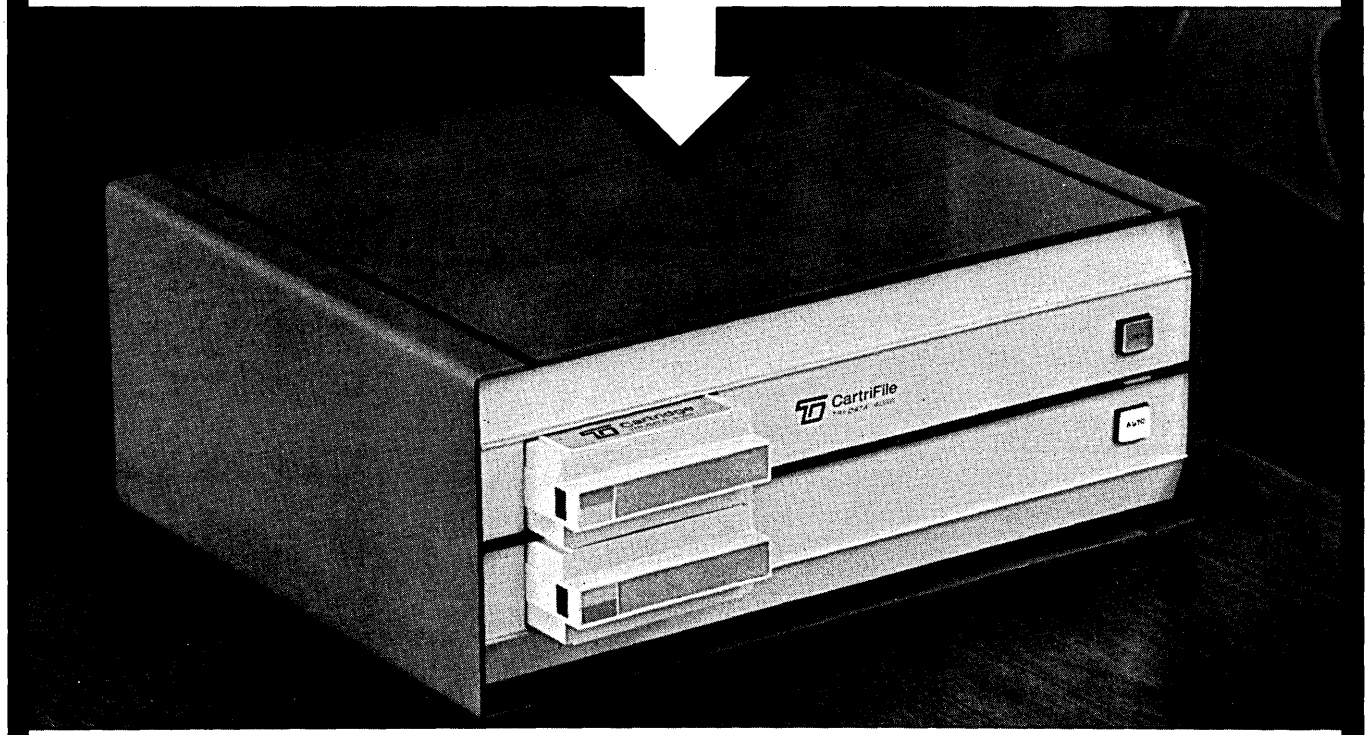
4 DIGITAL TAPE TRANSPORTS



CONTROLLER



READ/WRITE ELECTRONICS



CartriFile
TRI-DATA 4096

4 Mag Tape Transports & Controller

A computer peripheral for program loading, data sorting and data-terminal use

Number of tape units	4 with integral controller and read/write electronics
Number of cartridges	2 — each containing 2 tapes
Simultaneous operations	Data may be written on one tape while data is read from another. Other tapes may be in Load-Point Search.
Capacity of system	600,000 6-bit words
Capacity per tape	150,000 6-bit words in 1,000-character records. Capacity varies with tape length and record length.
Record length	Variable
Word length	Selectable: 4, 6, 8, or 12 bits
Tape speed	10 inches per second
Transfer rate	857 6-bit words/second. Varies with word length.
Inter-record gap	0.2 inch
Start time	15 milliseconds
Stop time	10 milliseconds
Recording density	600 bits per inch
Recording technique	Bit-serial, phase-encoded, 2-track redundant
Error correction	Built-in multi-bit error correction based on redundant tracks and redundancy of phase encoding.
Mounting & size	Desk top or 19-inch rack-mount, 17 x 7 x 13.5 inches.
Price	**$5,200** includes all electronics, power supply and cabinet, two tape cartridges and interface connectors.

CartriFile TAPE CARTRIDGES

File protect	Switch and indicator for each of two tapes in each cartridge.
Tape	Endless loops of ¼-inch-wide computer-grade magnetic tapes, two per cartridge.
Certification	Tapes are tested and certified error-free.
Number of tapes	2 per cartridge.
Length of tape	50 feet 100 feet 150 feet

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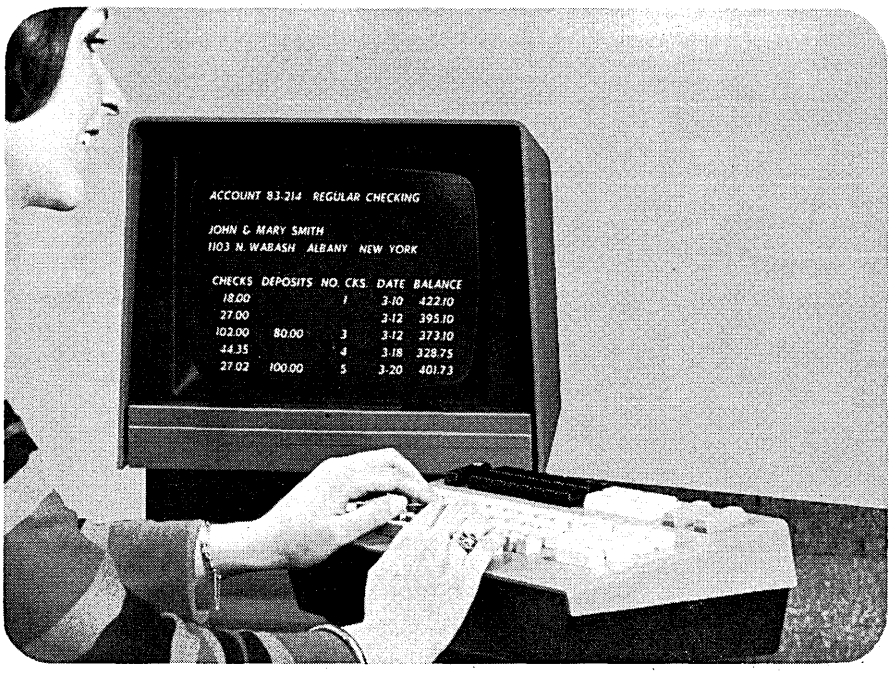
TRI-DATA Corporation, 800 Maude Avenue, Mountain View, California 94040 (415) 969-3700

Data entry/retrieval from any desk in your company



easier, more economical than ever with Bunker-Ramo's new Series 2200 terminals

When key personnel need instant access to computer-stored information, the easiest, least expensive way to give it to them is with a Bunker-Ramo Series 2200 desktop terminal unit.

Series 2200 units are third generation, combining Bunker-Ramo's experience in providing thousands of commercial CRT display devices — more than all other manufacturers combined — with the latest techniques in integrated micro-electronics. They operate with any general purpose computer, including the 360, over any distance.

Compare

No other terminal equipment offers this combination of features:

- **Large screen.** New 12-inch CRT display provides space for 960 characters in any configuration you choose. Formats may be varied automatically to suit data requirements.
- **Modern Electronic Keyboard.** Silent alphanumeric keyboard permits data entry or retrieval by typist or non-typist. Sixteen special program assist keys permit system designer to adapt unit to his company's requirements.
- **Separate Keyboard and Display.** User locates keyboard and display for easiest data entry and viewing.
- **Compact Control Unit.** Integrated circuitry makes control unit size a fraction of others.

Flexibility

A host of features permit the system designer to tailor Series 2200 units to his special requirements. Included are:

- **Tab Key.** Permits operator to enter data in blocks without space-by-space counting.
- **Block-Numeric Keyboard.** Standard 10-key configuration for heavily numeric data.
- **Printer Control.** Where "hard" copies are required, printer can be controlled either locally or by the computer.
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Price

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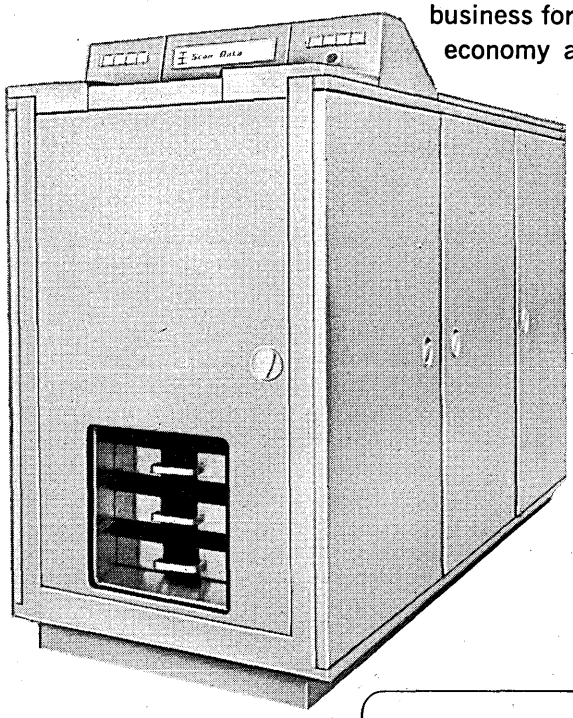

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books

Office Automation in Social Perspective, H. A. Rhee, Basil Blackwell & Mott, Ltd., Oxford, 1968.

This is a book on sociology. The author is a sociologist, not a computer professional; this enhances the book's attractiveness to the computing community because it represents the point of view of an outsider equipped with tools of analysis most of us lack. We rarely have a chance to see the computing profession and the effects of computers through the eyes of such an analyst. The book has both the faults and virtues of the author's academic viewpoint: a tendency to pedantic writing (though this book is by no means difficult to read) coupled with a careful, systematic attitude that minimizes "arm waving" and personal opinions in favor of demonstrable facts. The book contains in its extensive bibliography and references the most comprehensive survey of sources relating to the computer's effect on its users that I have ever seen, and to many it will be worthwhile for this alone. It suffers, however, from the inevitable problem in a book derived from other material rather than from first-hand experience: the author lacks conviction, and is inevitably somewhat out of date.

The book also suffers from the author's academic background, particularly as influenced by the British school of industrial sociology. He does not seem to be at home with the new directions in organizational evolution, and with recent changes in attitudes and motivations of employees. He tends to take the traditional point of view that the office is a discrete, structured social unit changing little and responding to traditional motivations, contrasted sharply with manufacturing and producing elements of the organization. The dynamic and loosening structures, the blurs across traditional organizational lines that are becoming common (to many of us the most interesting aspect of the organizational impact of computers) do not appear to be familiar to him.

Another (forgivable) drawback is the author's evident bias against bureaucracy and the depersonalizing aspect of the computer in the office. He hints darkly that there is a serious incidence of "psychosomatic disease" in organizations with computers, and implies that human relationships no longer matter in automated offices. This will be news to many a computer professional who has broken his lance on the windmill of human relationships, and is somewhat contradicted by the author's own guardedly hopeful conclusions about the eventual support to human fulfillment that may be made possible by the computer.

Since the book is intended for sociologists and lay readers, the author summarizes some of the fundamentals of data processing. He briefly reviews the history of office mechanisms: the typewriter, shorthand, the telephone, adding machines, accounting machines, punched card systems, and computers. These capsule histories are excellent (though sometimes accompanied by debatable conclusions about their effects), and while everyone practicing in data processing ought to be familiar with them and find this part of the book superfluous, I wonder how many of us are familiar with all these areas. (I wasn't.) When the author moves to an explanation of the elements of the computer and of the reasons for introducing computers in offices, his ground weakens a little and his second-hand knowledge betrays him occasionally. For example, he refers to SAGE and SABRE as "very comprehensive simulation systems." These errors are forgivable, though, because it is the author's objective lack of association with data processing that lends value to the book and a few weaknesses of technical fact are insignificant.

The author's view of computing as a profession is very interesting. He feels that the computing business has the necessary characteristics of a profession but has not yet realized them. He says, "The computer elite are beginning to erect collective defenses against the lay world." (I hope some of us are trying to do the opposite!) Another interesting but debatable observation is that professionalism in data processing tends to flourish most when the power of top management is weak. Does this imply that strong managers mean non-professional programmers? In commenting on the fact that economics of computer usage imply off-shift work on the part of programmers and operators, he refers to some studies which indicate that overtime and off-shift work tend to have harmful physical effects. (Hear that, programmers of the world?) The author also cites a very interesting study of programmers in Europe who, over time, apparently lost their interest in being considered professionals and substituted more traditional interests in job security and advancement in the organization.

A large portion of the book is devoted to consideration of the probable

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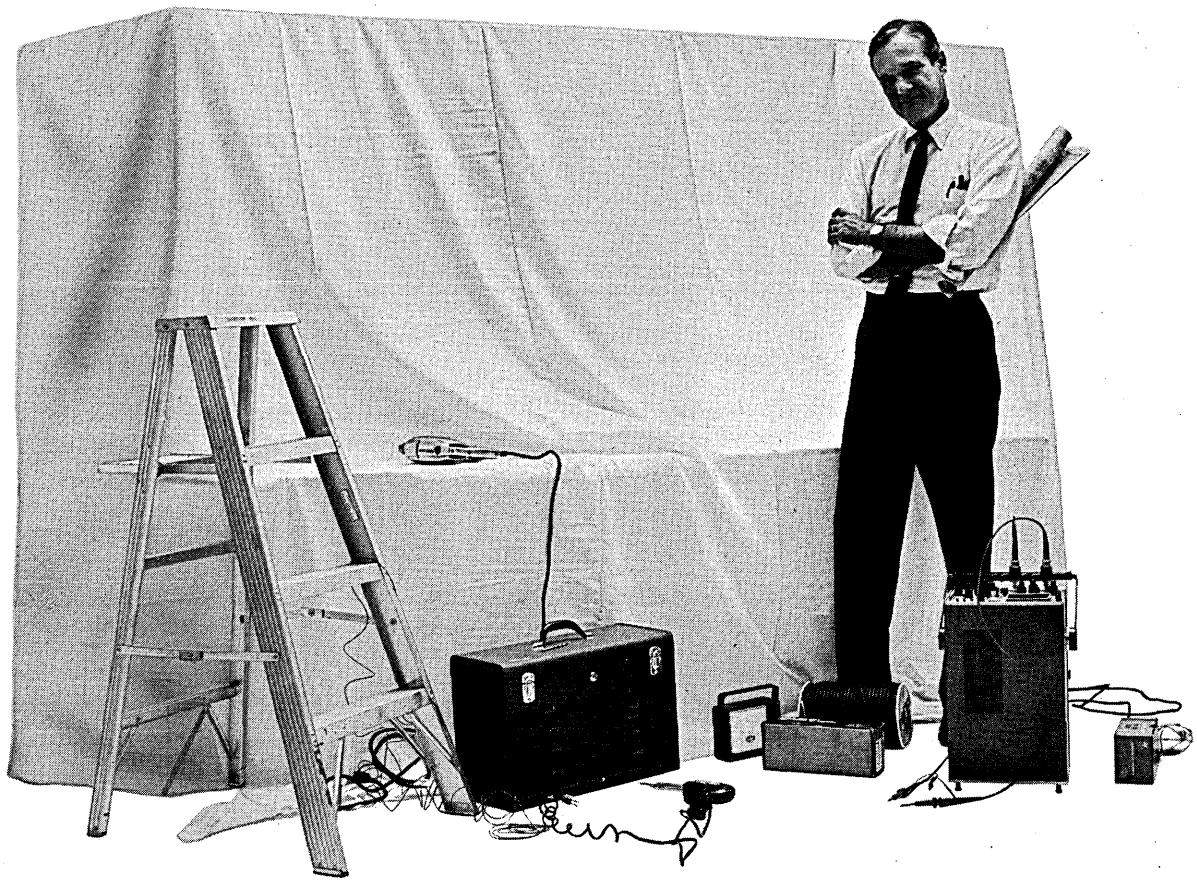

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books

eventual outcome of the "computer revolution." The author argues convincingly that it will be a long time before final outcomes become clear; that computer-based data handling systems are still primitive, and that major social revolutions have never been perceivable until after they have fully matured. It seems that prophets of "office automation" might exercise a degree of humility, and concentrate more on the facts and less on debatable possibilities for the future that lie mostly in the area of science fiction.

While maintaining his attitude of scientific caution, Mr. Rhee nevertheless permits himself a few observations about what seems to be emerging. He is not able to conclude whether organizations are tending to centralize or decentralize their structures because of computers, but believes that the traditional reasons for decisions about organizational structure are changing. He believes that compromises between the extremes of centralization and decentralization will continue, but that they will be reached for new reasons which may be more compatible with the actual nature of the business and the interests of the employees. On the subject of clerical unemployment, Mr. Rhee agrees with most other observers that computers have rarely caused actual layoffs and reductions in force among present staffs, but he also demonstrates clearly that reductions in growth rates of employment are in general dramatic. He is worried that if computers have produced stable rather than growing clerical employment at a time of explosively increasing clerical workload, as the population grows, there may eventually be a severe increase in unemployment due more to the lack of creation of new job opportunities than elimination of old ones. An interesting observation.

Toward the end of the book the author moves into less tangible realms of sociological philosophy, which I found the most interesting and novel part of the book. He suggests that the traditional notion of work as a relatively unpleasant occupation undertaken in return for pay is both a superficial and modern one. In other words, the "puritan ethic" as far as work for pay is concerned has never been accepted by many in the world, and has only recently been accepted by any. He thinks that it is at least possible that the general concept of work may change, that it will evolve toward a more psychologically fulfilling concept. He admits that he cannot tell exactly how this will occur or when, but the viewpoint is both a hopeful and

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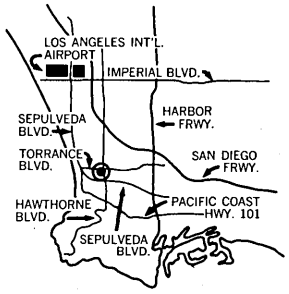

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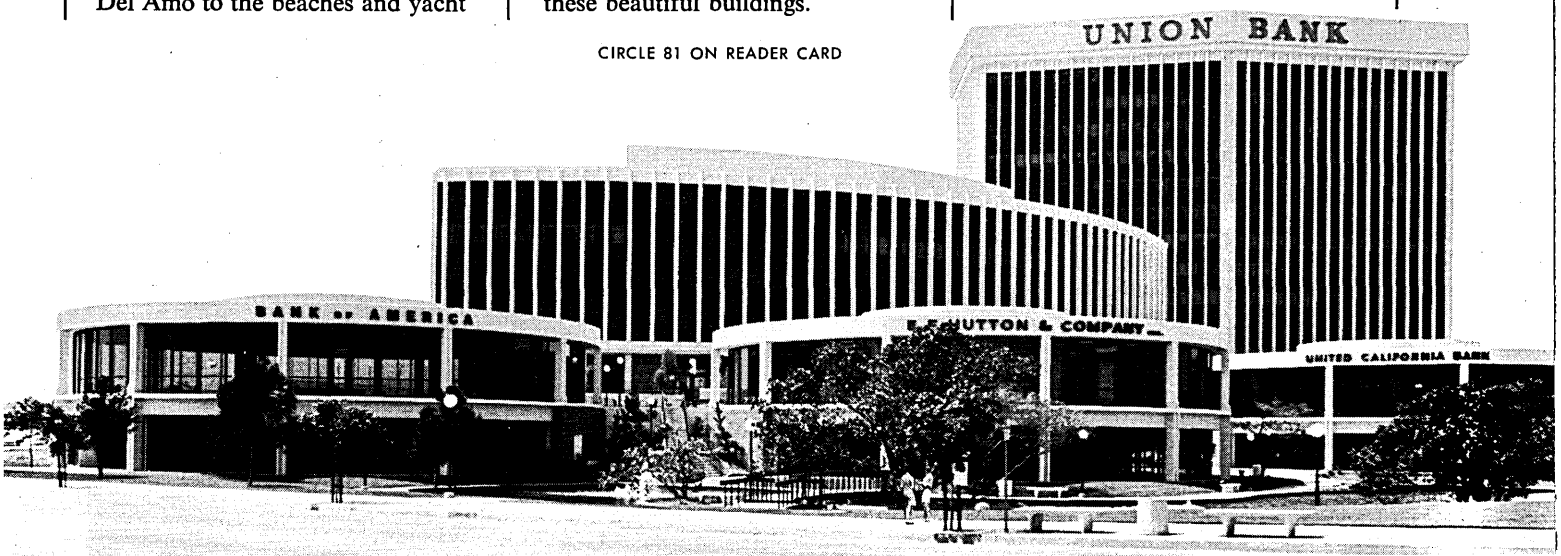

books

interesting one. Is it possible that the occupations of systems analysis and programming, as contrasted with traditional office and factory jobs, may give us some clues to the kind of evolution he refers to?

To summarize, this book is admirable for its carefully reasoned and factual basis, and interesting both for the entirely objective viewpoint it represents toward computing and its practitioners, and for several novel ideas. It contains some guarded pessimism and some guarded optimism which (naturally) preclude any extreme findings on one side or the other. The author, acknowledging this, ends with a clever observation—"In Chinese, the word crisis is written with two characters, one meaning danger and the other opportunity. In this sense, the post-industrial technology of which electronic data processing is a part, represents a crisis." —FREDERIC G. WITHINGTON

●

book briefs

(For further information on the books listed below, please write directly to the publishing company.)

***Introduction to Data Processing*, by F. R. Crawford. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1968. 402 pp. $9.**

An overview of the edp scene in 31 chapters and four appendices, liberally illustrated. The five basic sections (orientation; number systems and computer arithmetic; the computer, its components and functions; stored program concepts; programming systems) are each followed by a glossary.

***Automated Language Processing: The State of the Art*, edited by Harold Borko. John Wiley & Sons, Inc., New York, N.Y. 1967. 386 pp. $12.95**

This book contains a series of 11 articles, divided into three sections: language data processing, statistical analysis and syntactic analysis. A foreword by Anthony Oettinger states: "By focusing on statistical analysis and on syntax [the book] concentrates on the areas in which the most solid . . . work to date has been done . . . it also calls attention to important and beautiful theoretical work."

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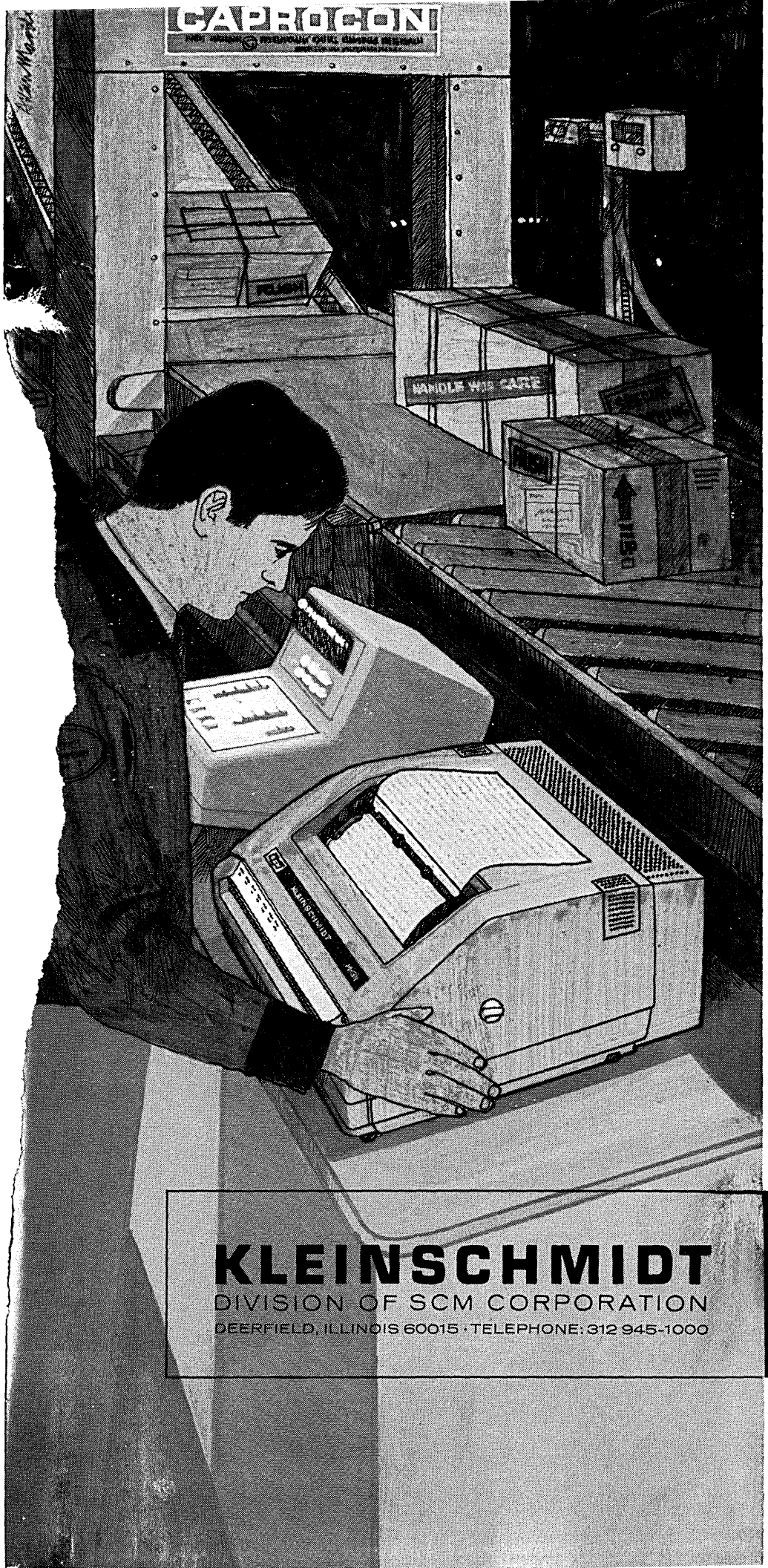

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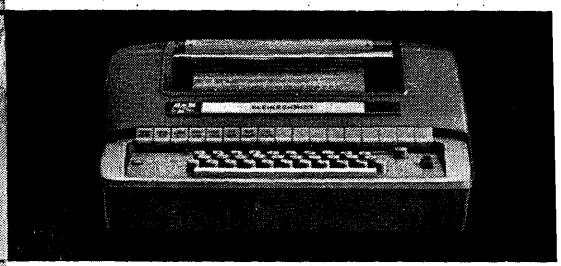

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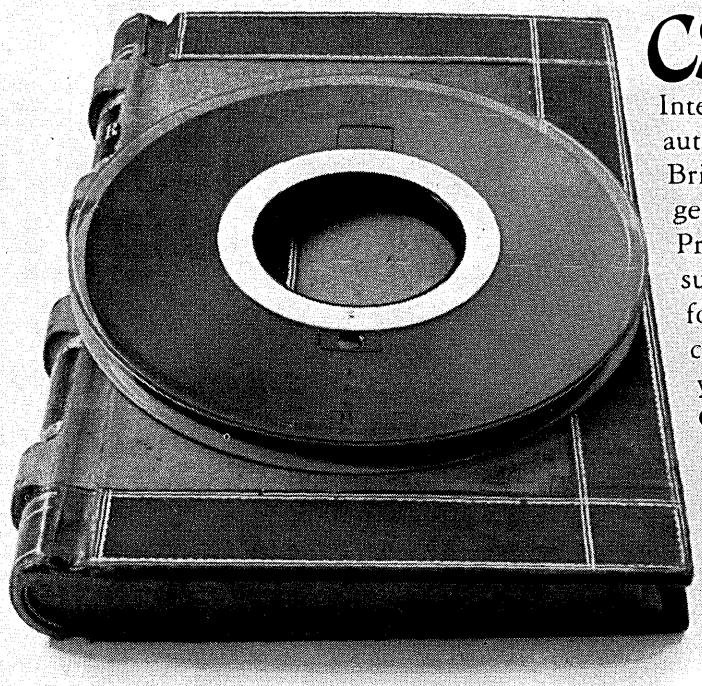

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world report

REACTION TO THE RUSSIAN INVASION

Russia's strongarm tactics against the liberal elements in Czechoslovakia have produced a setback in sales policies for Western manufacturers cultivating the Eastern bloc market. Nurturing of the market behind the iron curtain has been a slow process over the past five years. But American firms such as IBM, Univac and GE (through its European subsidiaries) and the near-at-hand ICT, English Electric and Siemens have steadily gained ground. In spite of the present uncertainties the three U.S. makers put up a brave show at the important BRNO trade fair in Czechoslovakia in mid-September.

The hovering Soviet spectre dampened the ardour of the most enthusiastic salesmen. Nevertheless, the now consolidated U.K. computer group ICL chalked up another $2.5 million worth of orders for more 1900 series and System 4 processors to go to university research and steel industry production scheduling. What worries some sales people is that increased tension will bring about more rigorous policing of the Cocom agreement of the Nato countries about goods banned for export to the east.

Although there is little ambiguity in the Cocom list about the generation age and type of systems which can be shipped, departments responsible for agreeing on export licenses in all governments participating have shown increasing leniency. Stiffer bureaucratic intervention could cut business without difficulty. Forecasts of the value of business expected from the Eastern bloc vary considerably. But one prediction of $40 million total in 1970 was justified by present rates of growth.

SWEDEN WILL GET COMPLEX WEATHER SYSTEM

Early next year Sweden should be ready to switch over to an automated weather watch system that has cost near $5 million to develop. In essence the scheme is to concentrate and process all weather forecasting data from ships, field stations and satellites into two forecasting centres. The familiar isobar charts will be produced automatically on display screens with light pen attachments so weathermen can call up details of special interest for local areas. Facsimiles of maps will be distributed to regular users, such as military, aviation and government organisations. The complete system ordered by the Swedish Air Force Board includes Standard Radio and Telephone communications and display equipment, Facit peripherals and facsimile equipment and Marconi Myriad cpu's.

EE-GEC MERGER BRINGS NEW GIANT

An unexpected merger has been negotiated in the U.K. which will influence the gradual concentration of resources of European computer manufacturing. A group with $2.25 billion sales of electrical, electronics and communications goods is to be formed by marrying English Electric with the General Electric Company (no relation to the U.S. GE). First effect of this combine will be to produce the world's biggest computer process control house with even more installations than the U.S. GE, putting IBM about fourth in the slowly developing art of on-line control.

(Continued on page 167)

COMPUTER CONTROLLED VOICE RESPONSE BY COGNITRONICS

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But the ramifications of this merger are wide and many. It occurred because the $300 million electronics and communications combine, Plessey, made an unheralded bid for the much bigger English Electric. Mutual interests between the two groups include semi-conductor manufacturing, military and process on-line computing, radar systems and video displays. In addition, English has a major stake in electrical generation -- from nuclear reactor design to turbines -- and a flourishing business in diesels. Plessey's strength is in telephone exchanges and associated communications equipment. Each has a stake in International Computer Ltd., ICL. If Plessey and EE had combined, they would have had something like 38% of ICL's equity -- which would just about mean control.

Approval of the new marriage by the government monopolies watchdog is more for the sake of needed concentration in the heavy electrical industry than for computers. But the fact of domination of ICL, as the chosen national computer company, by a components and communications supplier, weighed government men in favour of an English Electric and GEC tie-up rather than one with Plessey.

Sorting out the interests of the two companies will be tricky business. On the computer and communications front, English Electric has in process and on-line military systems the M series of computers, Elliott Automation's 900 series of military systems and Arch industrial units, Marconi's Myriad, displays at both Elliott and Marconi, and the Marconidata range of data transmission systems. GEC has a computers and automation group, which developed some process installations with SDS equipment, and the AEI Automation group, which sells the ConPac range under license from U.S. GE.

The biggest single on-line computer maker left out of talks so far is Ferranti, with the Argus series of micromin machines and displays, who run a close second to English Electric on installations.

The two English Electric companies, Elliott Automation and Marconi, have just picked up a $5 million contract for an early warning defence project. Elliott is providing more 920 micromin processors.

One of Elliott's big successes with the 900 series has been for mobile data handling units for air defence work and portable battlefield computing systems. A new system has been developed with Nato forces. Called Retriever, the idea is to give battlefield commanders a display screen with a communications link to tactical headquarters.

BITS AND PIECES

The Franklin Institute is opening a Centre for Computer Aided Analysis in Europe. It will make available to members programs of an engineering nature or sell programs one-off. Cost of membership is $5000 a year. Twenty-five members are needed as a minimum to give a viable base for the service...ICL has opened a new headquarters in Paris. Sales in France of 1900 series have reached $12 million this year so far, an increase of 40% over last year...At a meeting at Dundee in Scotland of the British Association for the Advancement of Science, Professor Donald Michie, Edinburgh University, proposed a government paid independent inquiry of programming languages to assess cost-benefits. He despaired of PL-I and suggested others as the survey subject.

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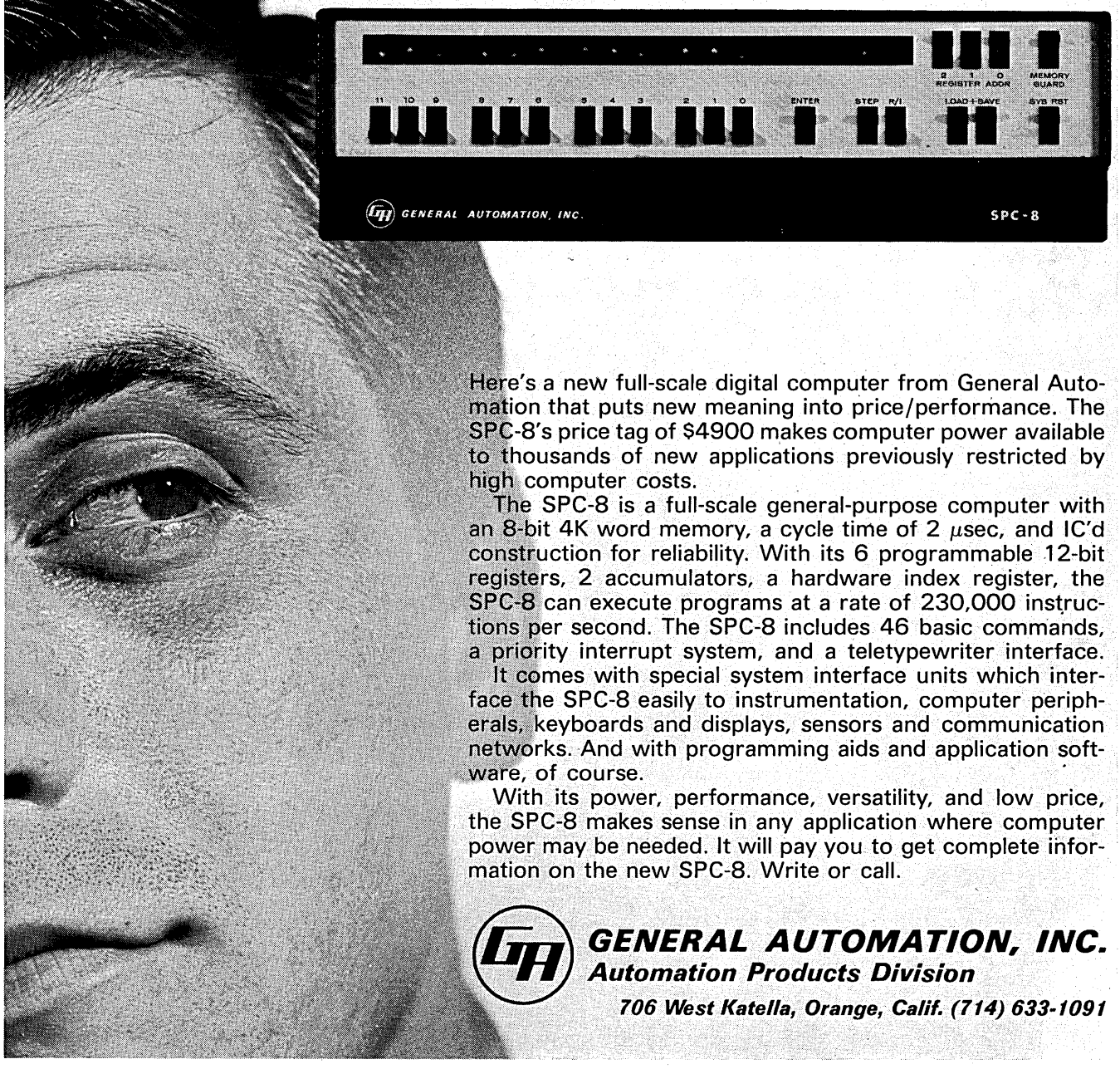

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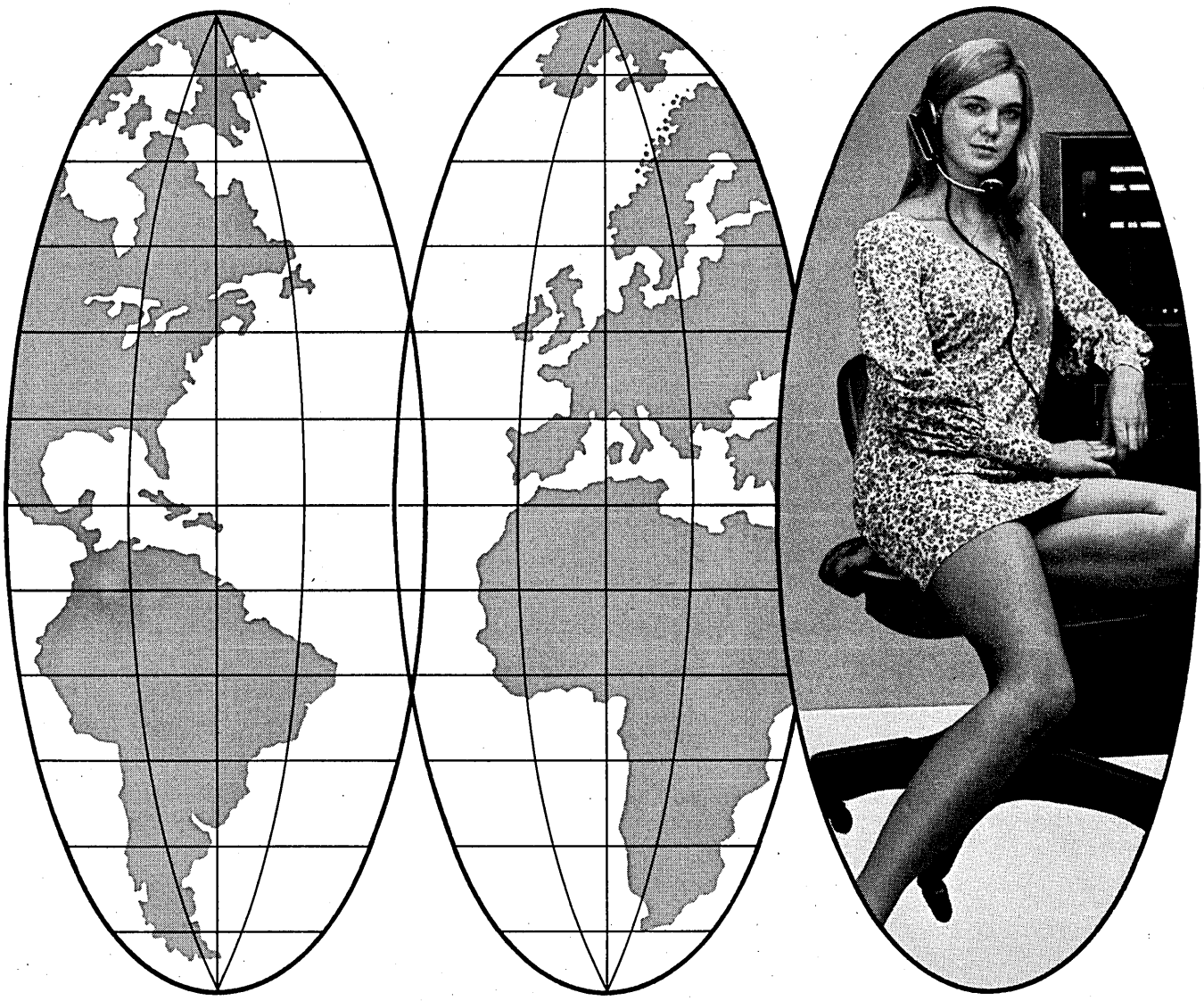

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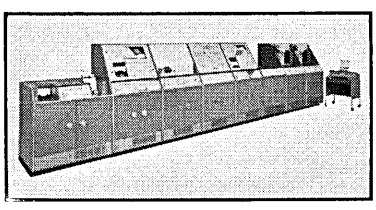

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washington report

COOPERATION ACT LIKELY TO PASS

The Intergovernmental Cooperation Act -- which permits "services in aid" by federal departments to local governments and eliminates some of the friction in federal grants-in-aid programs -- appeared assured of passage this session.

One section of the omnibus legislative package authorizes "technical and specialized assistance" by federal agencies to lower jurisdictions, on a reimbursable basis -- provided this doesn't interfere with "services which are reasonably and expeditiously available through ordinary business channels." The Bureau of the Budget would make the decisions.

NATIONAL ARCHIVES TRIES LASER STORAGE

The National Archives and Records Service has begun a cost-effectiveness study of archival storage systems in an effort to shrink its mag tape library, which contains one million plus reels. The study, due for completion next month, is using the capabilities of Precision Instruments' Unicom device as a model. The Unicom employs a laser-etched aluminum strip with a 30-year shelf life.

ADAPSO-BANK FIGHT MAY REACH SUPREME COURT

Adapso's battle to keep commercial banks out of the commercial service business probably will go to the U.S. Supreme Court for a final decision. The key issue is whether the association has legal standing to sue the Comptroller of the Currency for his ruling that banks can operate dp service bureaus. Earlier, a Minnesota District Court said "no." A St. Louis appeals court will hear the case this month.

Recently, in a related case, an appeals court told an insurance agents' trade association they could sue the Comptroller. So, if Adapso's appeal is denied, the association can go to the Supreme Court and complain that the situation is murky. Likewise, if Adapso wins, the American Bankers Assn. is almost certain to go to the court.

COMPUTER USE PUSHED BY CONGRESSMAN TUNNEY

Language requiring the Agency for International Development to make maximum use of adp, systems analysis, benefit-cost studies and modern information retrieval was inserted in this year's foreign aid bill by Representative John V. Tunney (D.-Calif.). Both House and Senate managers have agreed to accept the Tunney provision. It directs the President to establish a modern management system for A.I.D. The California Congressman offered the same amendment to the 1967 Foreign Assistance Act -- but the provision was dropped by the Senate. Tunney says he plans to introduce similar language to legislation in other areas -- such as education and poverty -- in the next Congress.

DOD TAKES RAP ON TAPE POLICIES

GAO last month criticized DOD for buying additional mag tape without checking existing inventories; for ignoring quantity discount opportunities, and for discarding tape capable of being cleaned and re-used. DOD promised to remedy some of these shortcomings, but GAO's report (B-164392) said DOD should establish a centralized tape procurement program despite recent GSA efforts in the same direction.

CAPITOL BRIEFS:

Norman J. Ream, special assistant to the secretary of the Navy for computer management, was honored at a gala testimonial, attended by top Navy brass and by Cong. Jack Brooks, when he resigned last month. Ream was given the Navy's Meritorious Civilian Service Award...DOD's top computer expert in logistics, Gordon Bowlby, announced his retirement last month...

like to see it in USASI, where each manufacturer only agrees to his own interpretation. The two years of fruitless effort in the USASI Fortran group on clarification proves that."

Cobol-makers are also upset over having to submit to validation tests. These will be in two phases: one to insure that "all elements specified for that particular compiler (level) have been implemented," and the other to insure that the "language elements (features) which have been implemented compile the object code necessary to produce the results intended by the appropriate source language." Phase I will be effective nine months from approval of the standard, the letter said, and phase II, 18 months after.

And there will be much argument over which modules should fall under each compiler level. Level 4, by the way, includes the yet-to-be-approved random processing module.

NBS is also recommending the standard specifications be in the GSA procurement schedule.

3300 FINALLY CRACKS TIME-SHARING BIZ

Zipping onto the time-sharing scene with the first CDC 3300 is Computer Time-Sharing, Inc., Minneapolis-based company formed June '67. Starting with six people, the firm already has 50 employees and (more important) 50 customers since going on-line four months ago.

Software -- exec, assembler, two Basics, two Fortrans, debug and edit packages -- were developed in six months by Com-Share refugees. CTS says its "Fortran IV minus" computes 15 times as fast as the GE 265, five times that of the SDS 940.

The 3300 now handles 32 lines, but 64 have been simulated and 128 appear possible. Another 3300 comes in this month, two more will follow soon. There is a 10-man office in L.A.; NYC is probably next.

SLUGGISH VENDORS MAY MISS OUT ON CRIME MONEY

June passage of the Crime Control and Safe Streets Act of 1968 has attracted little vendor interest. The bill, which creates the Law Enforcement Assistance Administration under the Dept. of Justice, will pass out $ to states (on a population basis), which are to assign it to local police, who can use it to cover 50% of costs of edp and other equipment.

$100 million is available this fiscal year, $300 million next. California has set up a planning board, the Council on Criminal Justice, to help plan spending, but Hughes Aircraft is reportedly the only local vendor showing signs of life so far.

MA BELL RETREATS; USERS FIGHT INTRASTATE RATE INCREASES

"We have no immediate plans to fight the Carterfone decision in court," says a top AT&T policymaker, but adds an appeal is possible "if our legal staff discovers a major, negative impact in the decision." It's still a reversal of Bell's previous position.

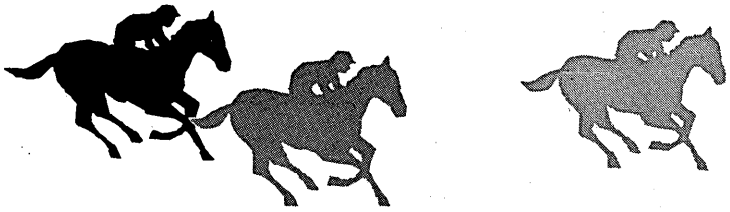
The Carterfone decision, declaring unlawful Bell's ban on foreign attachments, opens the door to damage suits from independent equipment makers. If sued, says our source, AT&T will take the FCC decision to court. But he thinks this will not be necessary. Ma Bell is also keeping its cool about the suit filed against AT&T by Carter Electronics. The grapevine has it that the case will be settled out of court.

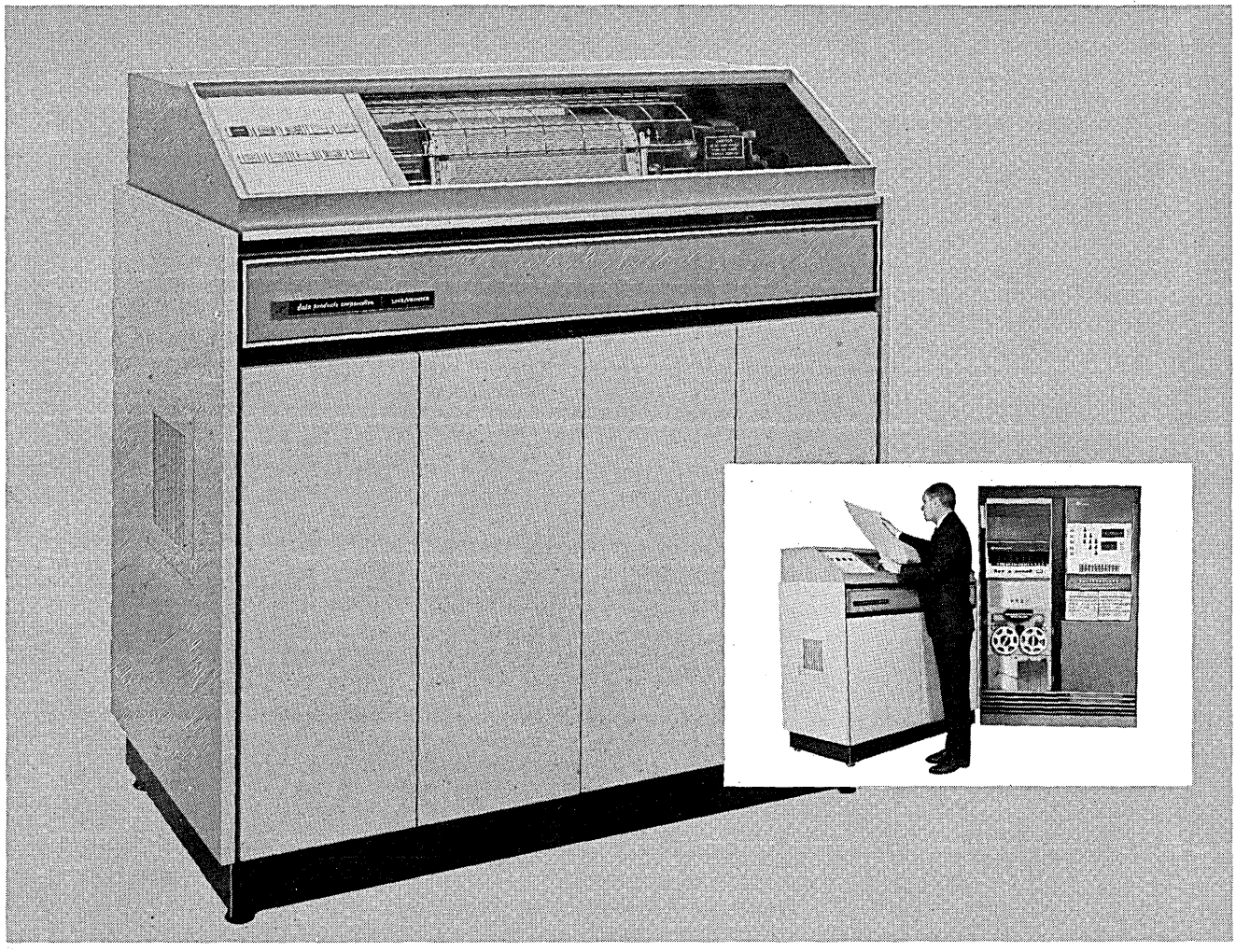
Ma Bell has proposed a new foreign attachment tariff which should remove at least some issues from the battlefield. But new ones are cropping up.

Recent basic line charge increases (from $14 to $21) by Southwestern Bell in Arkansas and Texas have been protested by one major service bureau, which may take its complaint to the FCC. And Mountain States Telephone Co. has established a new "Computer Access Service" category. Line charge hikes are expected

(Continued on page 175)

American Totalisator goes to the races ...and the LINE/PRINTER* goes with them!





■ American Totalisator's computerized Multi-Tote System, incorporating the Data Products LINE/PRINTER, was designed expressly for race track use, to provide fast and accurate recording of all ticket sales... with no margin for error. Within seconds after the close of ticket selling, the information is processed and the LINE/PRINTER prints out a complete record of the dollar value and number of tickets sold in each pool, and an audited report on the price calculations. It has to be fast... and it has to be *right*. To make it tougher, Multi-Tote Systems are often transported from one race track to another, and must be operating quickly, without time-consuming set-up and adjustments.

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soon. This intrastate activity could foreshadow interstate rate increases.

SOFTWARE ASSOCIATION EYES SEPARATE PRICING... SDC, ETHICS, PATENTS

The quiet Assoc. of Independent Software Companies is developing a position paper on separate hardware and software pricing. It's also discussing with System Development Corp. and the Air Force the conversion of SDC to a profit-maker. The 11-firm association wants to make sure the gov't-created giant and any new owner don't form too formidable an opponent. One big question which may be asked: will SDC make publicly available packages developed under gov't contract?

Top project at AISC, though, is establishment of general guidelines for software firms ... business and ethical standards which will help users select and deal with these firms, and improve relationships between software houses. Patent talks are on too.

RUMORS AND RAW RANDOM DATA

Rumors of sharp Mod 30 production cutbacks seem true, thanks to growing popularity of the Mod 25, which offers the cycle time of the 40, more work for less $ than the 30...Photo of the month: GSA's FY '69 supply schedule features a four-colored 7600. We hear there are "several orders" for the "unannounced" CDC supercomputer...A "major improvement" in SCERT V, in the works at Comress, will permit the simulator to run in native mode on any 360 or Spectra 70, regardless of OS, with 131K core and one 2311 disc unit or equivalent. Prices of the improved SCERT aren't likely to increase, but this was not definite at press time. ...Burroughs will evidently go outside for small satellite computers because of fully loaded production facilities. Contenders for the order include Interdata and Scientific Control Corp....Still another small computer in the wings is one out of Philco's Western Development Labs, Palo Alto..."Subject to mutually acceptable procedures and objectives," the AFIPS exec board has expressed its willingness to administer the Computer Industry Martin Luther King Fund...First National City Bank, through its small business investment company, has plunked dough into Computer Resources, proprietary package marketing firm, in return for an option to buy 20% of the firm at a later date...Current guess on the number of IBM users emulating second-generation machines on the 360 is 50%, down from 80% a year ago...Cere/matics, Inc., is a new Encino, Calif., software firm with 12 employees, a $100K backlog. Cere/matics is a contraction of cerebral and mathematics. "Why not?" says president Frank N. Sloff...We hear that the big, prestigious consultant firm of Arthur D. Little may finally go public next year...Bruce Gilchrist of IBM has been named executive sec'y of AFIPS, a new full-time position...DPMA has decided not to apply for AFIPS membership. Their grounds: a feeling of inadequacy... The banking industry's RAND, the Automatic Planning and Technology group of the ABA, has dwindled from eight men to two or three. Some have joined Dale Reistad's new firm, but Gerald Lawry of IBM will head up the group, attempt to beef it up. ABA emphasizes that projects will continue...Wes Powers, pres. of Memory Magnetics, Inc., will head up Athana Corp. following the recent resignation of George Athanus. Athana is here to stay, he says, has 19 reps in 9 U.S. regions and an MMI production capacity of 2000 6-disc packs a month. The price cut (to $300) stays, but Athana is not marketing the 11-disc pack at present, contrary to an August Datamation ad.

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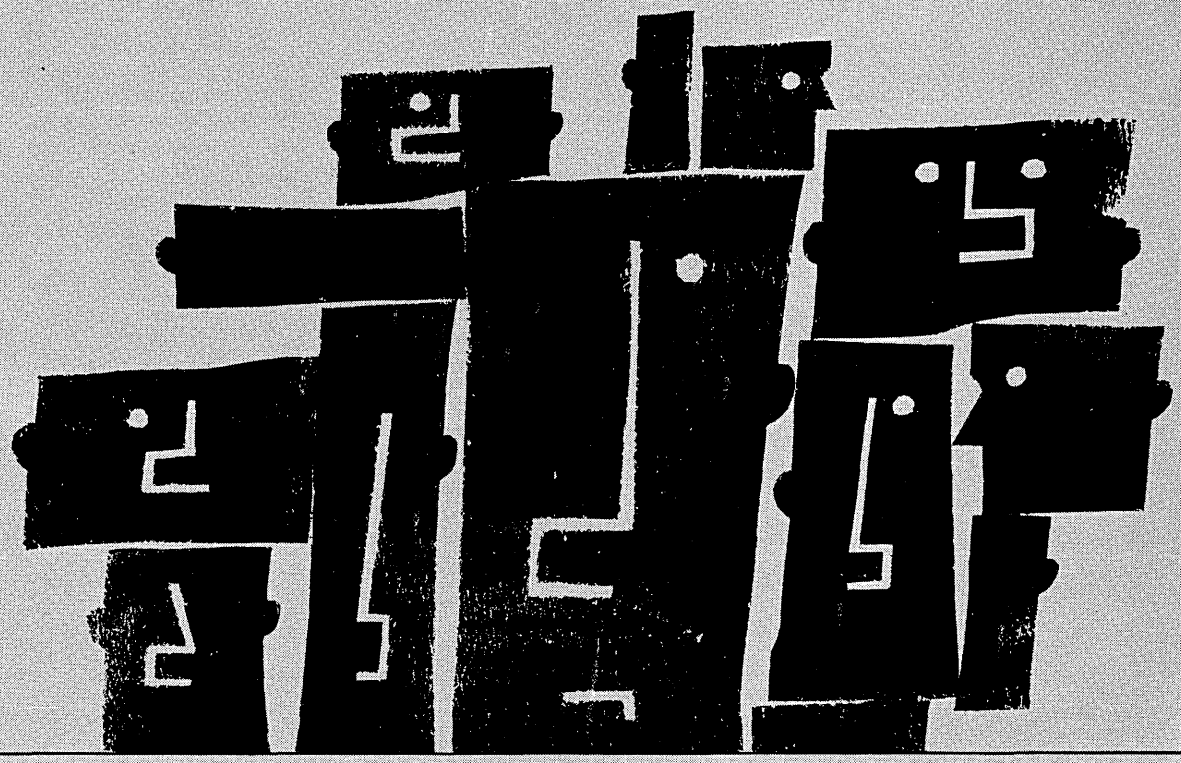

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(Continued on page 178)

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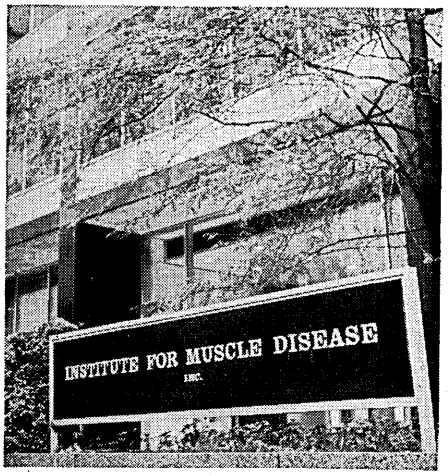

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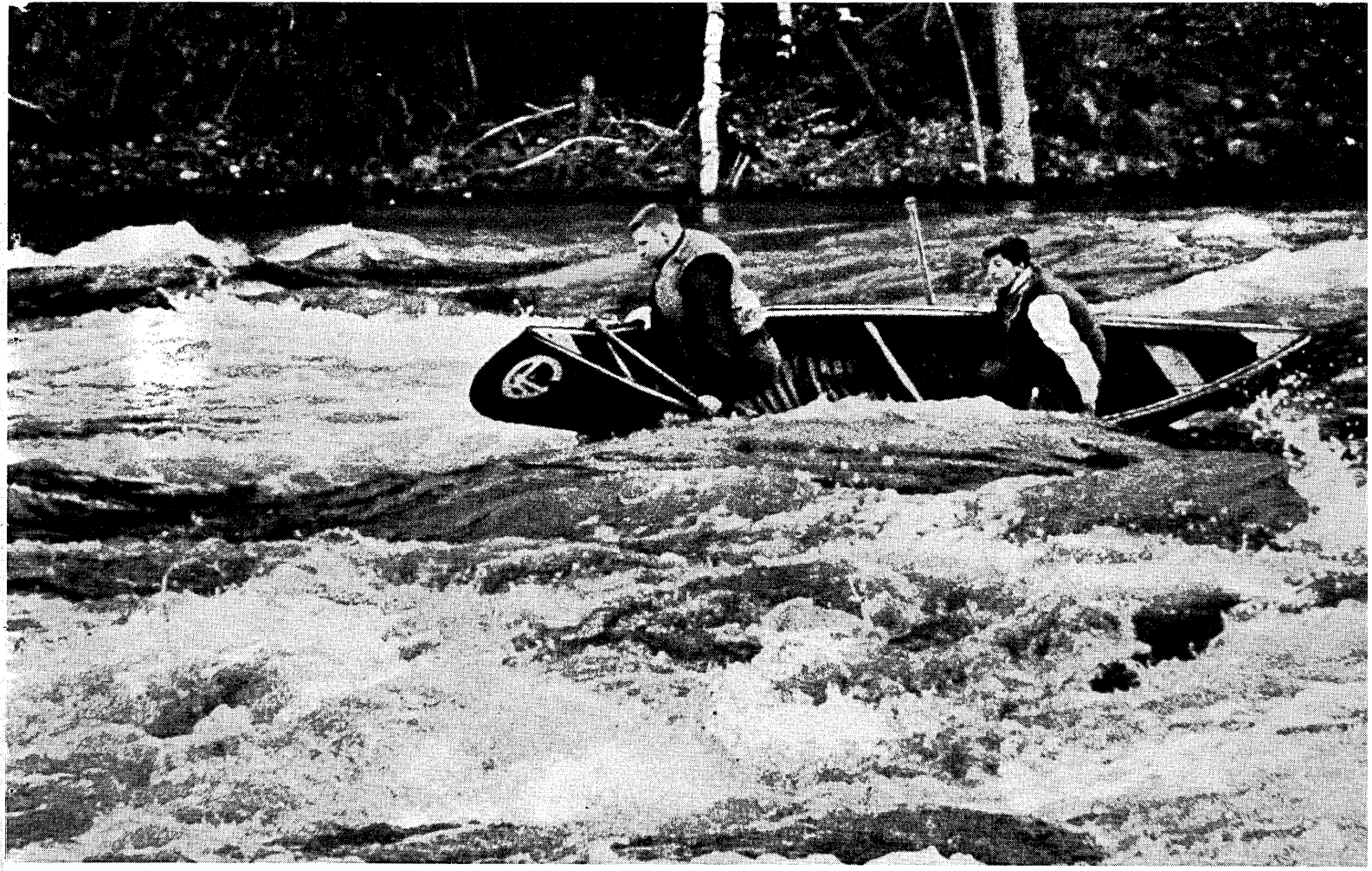

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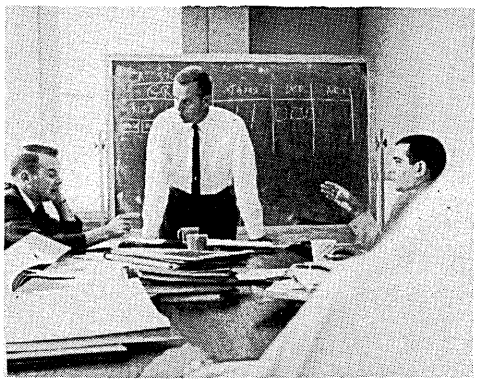

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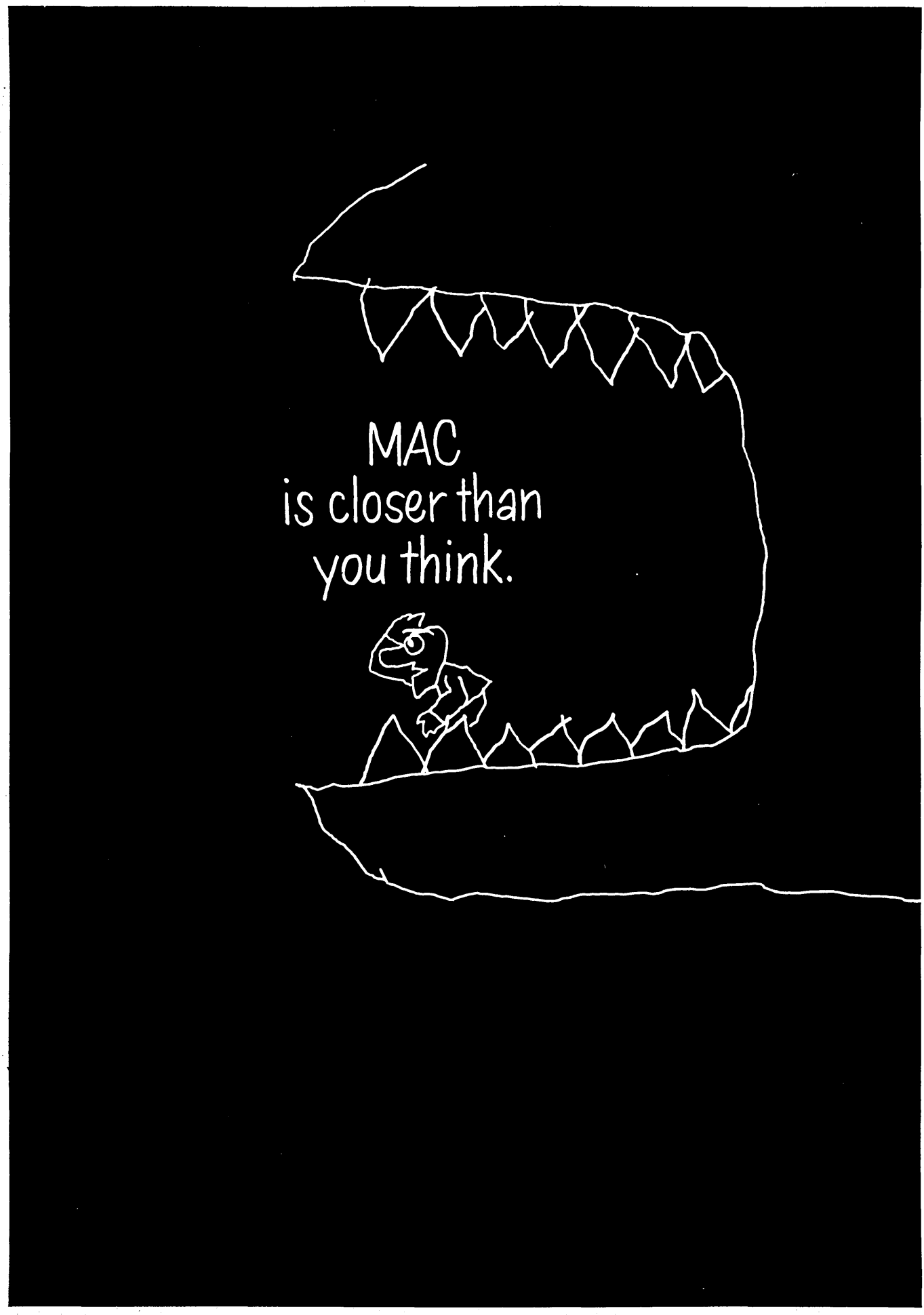
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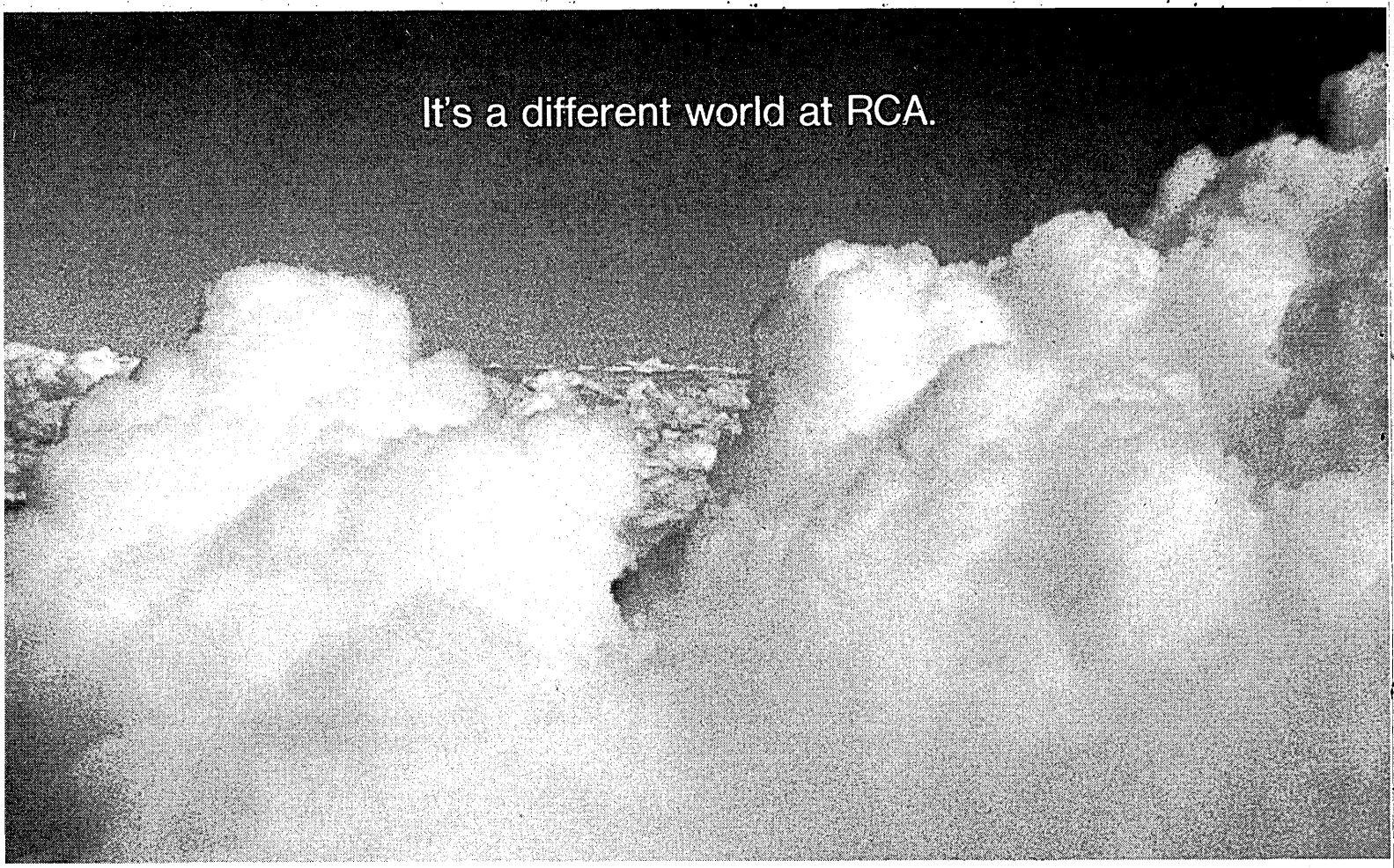

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people

Robert J. Campbell, former president of the Link Group of General Precision Systems, has been appointed president of Friden, Inc., San Leandro, Calif.-based business machines division of The Singer Co. He succeeds **Alan W. Drew,** who has been re-assigned to Singer's NYC corporate office. . . . **Theodor H. Braun** has been elected president of Applied Computer Technology Corp., Los Angeles. He had been senior vp at SDC. . . . **Charles G. Calderaro,** exec vp of URS Systems Corp., has also been named president of URS Co., largest operating unit

within the corporation. . . . **Dr. J. C. R. Licklider** has been promoted from associate director to director for MIT's Project MAC, replacing **Dr. Robert M. Fano** who has resigned to give full time to teaching and research. . . . **Dexter E. Robinson** has been elected president of Auerbach Info Inc. Before joining Auerbach, he was president of the World Publishing Co., Cleveland. . . . **Claggett Jones,** formerly manager of instructional systems marketing for IBM, is now vp, gm of the Eastern Computing Div. of Computing and Software, Arlington, Va. . . . **Robert L. Seaman,** former assistant controller for management information and financial analysis, has been named director of corporate planning for Raytheon. . . . **Prof. Saul Rosen** has been appointed director of the Computer Sciences Center at Purdue Univ. **S. D. Conte,** former director, will continue to head the Computer Sciences Dept. . . . **Col. Robert L. Jones** is the new chief of the EDP Equipment Office at the Air Force Electronic Systems Div., Hanscom Field, Mass. This office is the AF's centralized computer selection activity worldwide. Jones replaces **Col. Sylvester P. Steffes,** who has retired from the service. . . . **Treavor Pearcey,** widely regarded as the father of electronic computing in Australia, has joined CDC, Minneapolis. . . . **Robert H. Glaser** has joined Compata, Inc., as vp and manager of the company's new northern Calif. offices in Palo Alto. He had been vp of CUDC and president of its subsidiary, Facilities Management Corp. He is chairman of the technical program committee for this year's FJCC. . . . **Dr. Donald Reynolds,** formerly director of instructional systems at Texas Christian Univ., has moved to the Univ. of Oklahoma as associate professor and will also serve as vp and technical advisor to the Institute for CAI. . . . **William H. Reuter,** director-corporate systems and methods, has been appointed director of the newly established office of Information Systems Planning for American Express. . . . **Don Knuth** has resigned from Caltech to become professor of computer science at Stanford. He is on leave of absence for the 1968-69 academic year as a member of the technical staff at the Institute for Defense Analyses, Princeton, N.J. . . . **Art Whitmore,** formerly manager of systems planning & development, has been appointed director of management information systems at American Standard Inc. . . . Systronics, Inc., Ann Arbor, Mich., has appointed **Theodore J. Smith** as exec vp. . . . **Norton M. Boothe** has been appointed vp of IBM's Federal Systems Div. to replace **Philip N. Whittaker,** who joins NASA as assistant administrator for industry affairs. Boothe has been with IBM since 1950. . . . **Ralph E. Montijo, Jr.,** ex-director of advanced systems planning, has been promoted to deputy general manager of the Computer Systems Div. of Planning Research Corp., Washington, D.C. . . . A new company, Digital Information Devices, has been formed in Norristown, Pa., and will develop a line of computer I/O devices and man-machine communications equipment. Officers are **Leon J. Staciokas,** formerly with Burroughs, president; **Floyd E. Burnell,** from Univac, vp of operations; and **Otto Morningstar,** president of Data Packaging Corp., chairman of

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the board and treasurer. . . . **Dr. W. Frank Cartwright** has been appointed director of a new combined data and industrial systems office for Philco-Ford's Communications and Electronics Div. He had been director of the former industrial systems office. . . . **Prof. A. Dorodnicyn,** director of the computing centre of the Academy of Sciences of the U.S.S.R., has assumed his duties as IFIP president. IFIP Congress 71 will be held Aug. 23-28 in Ljubljana, Yugoslavia. . . . **Dr. Kurt Eisemann,** formerly technical director with CUDC, has joined Northeastern Univ., Boston, as director of academic computer services and professor of computer science. . . . **Roger J. Kelly** and **Allen J. Flitcraft,** both formerly with IBM, have joined Computer Technology Inc., new computer products and services subsidiary of LTV Aerospace Corp., as vp's. CTI's corporate headquarters will be in Chicago, although the company is a combination of three Dallas-based facilities. . . . **Wen M. Chow,** formerly manager of scientific computing systems for Union Carbide, has been appointed Mead Johnson Professor in Management and head of the department at the Univ. of Evansville, Ind. . . . Hoskyns Systems Research Ltd., London, has announced the appointment of **Geoffrey Pye** as manager of the Software Engineering Div. He will be responsible for all software development and applications programming assignments and for the production of modular packaged software. . . . **Roger R. Crane** has moved from executive vp of the Bedeaux Corp., European subsidiary of Touche, Ross, Bailey and Smart to become group vp of the Wofac Corp., Morristown, N.J., where he will be responsible for expanding the company's services into advanced management systems and develop this service throughout the world. . . . **C. Shelton James,** formerly with Computer Usage, has been named controller of Systems Engineering Labs. . . . **Charles F. White** has been promoted from assistant director to director of EDP for Librascope Group of General Precision Systems. . . . **Paul E. Dittman** is now head of the new Tactical Data Management Systems Dept. at The Mitre Corp. He had been subdepartment head in charge of application of a multi-user, time-shared command and control system to tactical data management operations for the company. . . . **Stanley Y. Curry** has been elected president and a director of CHI Corp., a for-profit computer utility recently organized and wholly owned by Case Western Reserve Univ.

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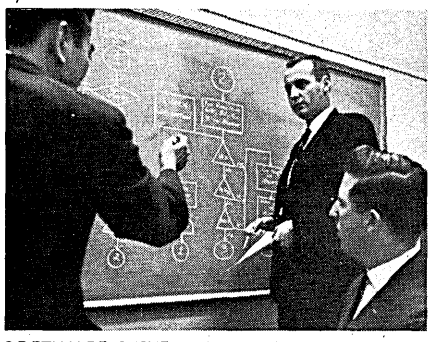

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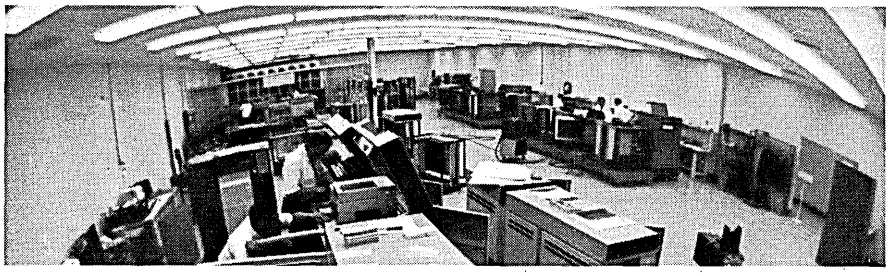

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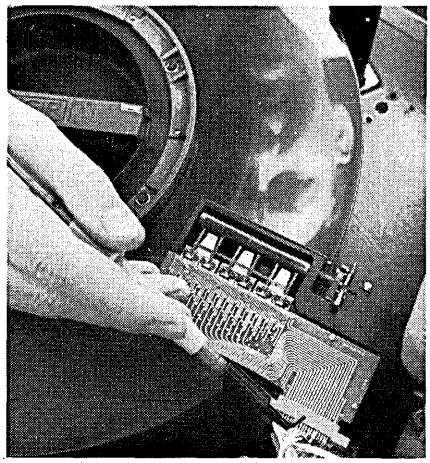

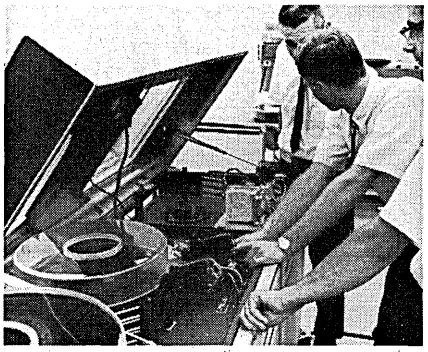

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the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

THE SOFTWARE PACKAGE DILEMMA

"Turn on the blue light, Herm, we have a customer who wants a blue package" . . . or is it a blue customer who wants a standard solution to his specific problem? More than likely, it is an edp user who has now become sophisticated enough to probe for the real solution to his problem.

The arguments for and against the use of standard software programs or packages have been going on for years. Rather excellent cases have been made for both sides; however, it really depends upon what constitutes a package and from what viewpoint one considers its use. Logically speaking, from the supplier's viewpoint, it is hard to put forth a case against selling the same job over and over to create a backlog of revenue for the least technical effort. The user may tend to approach his discussion on the subject a bit differently. Is the user a computer service center entrepreneur whose life blood is dependent upon the package; or is he the operator of an edp facility servicing the requirements of users internal to his own company affiliation? The former, by necessity, must maintain his own system in order to properly handle his client's production work, while the latter is at the mercy of the vendor.

The purpose here is to present the highlights of observation made over the past year regarding the current ramifications of the software package. To begin with, the observations are just that. The author has no particular axe to grind. His organization has tried to acquire a package for resale, is using a package in its project activities, has recommended to its clients what was believed to be one of the better packages and would dearly love to increase its revenue through whatever dramatic iterative means acceptable to the company standards. On the other hand, we should like to face the hard facts of the matter and call a package by its right name and determine its real worth to the agent and/or the patient.

There are packages and there are packages. One type is the relatively inexpensive, ingenious, small, uncomplicated programming aid that offers rather unusual savings in programming time to its user. Packages of this type are relatively simple and easily maintained, understood and applied. Very little exception has been taken by anyone to this variety of package. One of the reasons for favorable response to such a product is that it can be tried at little or no cost to the user prior to purchase. The worth and efficiency can be determined quickly with small contingency risk. This type of package is usually priced at less than $10,000. An example of such a package is Instant COBOL, which cuts print report program writing down from as much as two days to a few minutes. If all we had to contend with was a discussion about programming aids, this article would not be meaningful. No real provocation exists here.

The type that really provokes heated debates and caustic remarks is the standard application package . . . payroll, accounts receivable, file management and report generation, order entry, etc. Our observation has been that the application package approach can be taken with reasonable success by the service bureau. For example, a service bureau that develops a package to be used and maintained by that firm as a basis for computer time services to clients of like classification (insurance firms, banks, stock brokers) can experience excellent revenue and profit benefits with minimum customer dissatisfaction. It is the service bureau or computer service center's responsibility to update and improve the system or perhaps tailor it for a specific customer. This tends to ensure that no one is left holding the bag since it never gets into the hands of the customer. When a program bombs out after many months of satisfactory use, it had better be reconstructed *tout de suite*. The customer can easily sidestep any involvement in the mishap and then do considerably more than merely cry the blues. Thus, we have, through necessity, a program that has built-in maintenance response and one that has been given close scrutiny from marketing, technical and economic viewpoints before design and development. A well designed package used in a properly managed computer service center can yield great satisfaction to all parties concerned. The author watched with envy an operation in the San Fernando Valley recently. Something on the order of 10 remote subscribers were using a program being run on a computer with a locked console keyboard and no operator in sight. A custom programming firm has to keep 20 people busy to bring in the equivalent revenue. It is not all that simple, mind you, but it does make one stop and think.

Now, what happens when one takes an application package of a similar ilk, only more generalized and less shaken down, and then "peddles" it to everyone all over the country for a given price? How well does it fit the situation? How long does it take to install? Who shows up quickly when it "blows" or when a modification or update is required? Is any package worth $30,000? Does the package work? What is its life expectancy? Why this package instead of another? How simple is it to change from one computer system to another? The questions and rather fantastically bold answers go on and on with neither yielding.

Perhaps observation is a more refreshing approach to the question. "What is a package of this type worth?" We have discussed this par-

ticular point with counterparts, clients and potential clients and found that in most cases, we had to be very careful not to side with the package concept for fear of physical altercation. Words came to the surface like . . . "Will not have . . . have had it . . . still don't have it . . . not on the air yet . . . lawsuit . . . inappropriate . . . criminal . . . useless."

The feelings about packages sold to and used by data processing departments of medium- to large-size firms by and large ranged from indifference to adamant opposition. Yes, we did observe feelings of expression in favor of the concept from these who offer them on the open market. We shall continue to observe and probe for a satisfactory approach. Perhaps we are missing a good bet. Then again, perhaps the users are, for good reason, being a bit more cautious with the exploration of the approach. Perhaps some readers would care to enlighten through written comment those of us who are reluctant to take the plunge or do not stand up to be counted one way or the other. We at Marshall Information Services are reaching an opinion . . . unless we can strike upon a concept or situation that is relatively unique and withstands the test of performance and flexibility and unless we have the service to back up the product, we should not consider letting an application package get into the hands of a friendly client.

What this boils down to is that the application package concept per se is not under criticism. It is the way it is being developed, sold and backed up that has caused certain software firms and edp users to shy away from the use of such packages.

In conclusion, it appears that we are still a long way from the day that the application package replaces customized, project-oriented system design and implementation. Each user has his own long standing reporting requirements and constraints. It is difficult enough as it is for a medium- to large-size company to break tradition and policies tied to the past without having these changes dictated by the input requirements of a generalized program. What usually happens is the standard package becomes customized, so we're back where we started . . . "Turn on the blue light, Herm . . . ".

—W. E. NIEMOND

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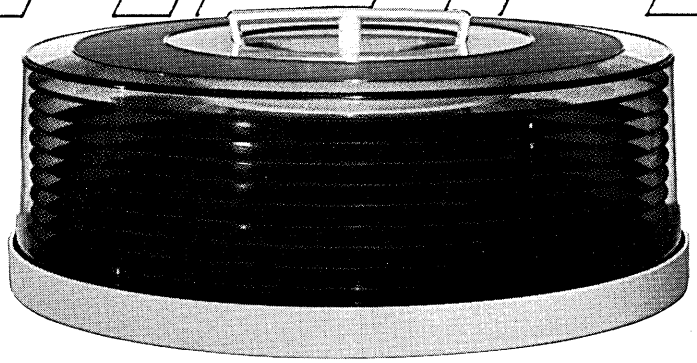

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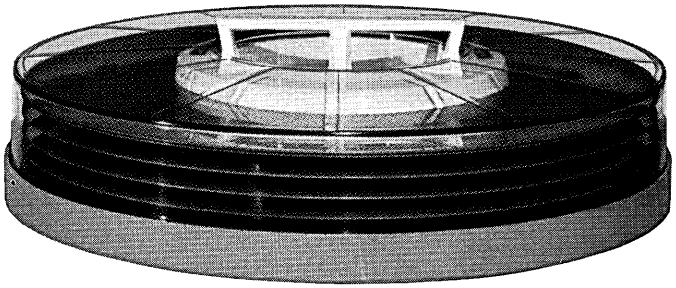

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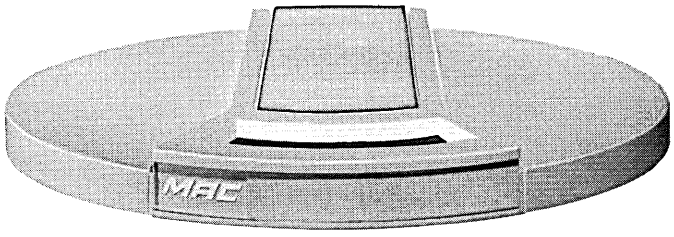

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