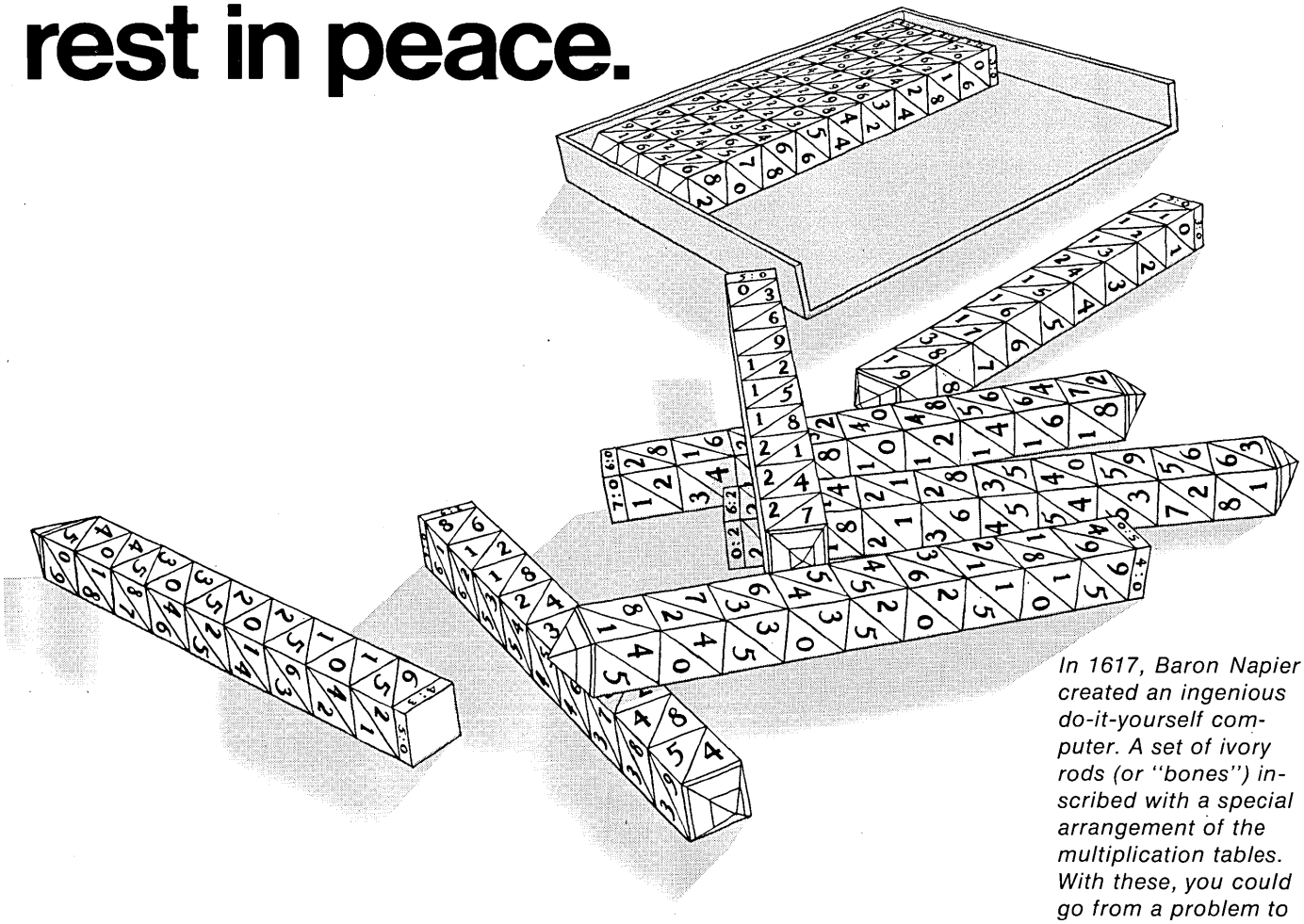
DATAMATION®

69

August

TIME SHARING

May Napier's bones rest in peace.



In 1617, Baron Napier created an ingenious do-it-yourself computer. A set of ivory rods (or "bones") inscribed with a special arrangement of the multiplication tables. With these, you could go from a problem to a square root faster than man had ever gone before.

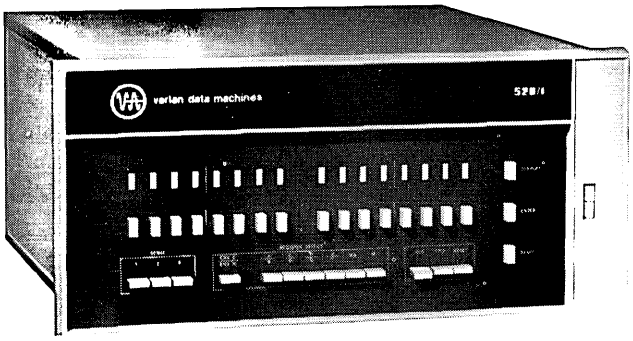
They taught previous computers a trick or two. Which brings us to Varian Data's 520/i.

The 520/i was designed to tackle dual programs for the price of a one-track mind computer.

That took some doing. Such as handling arithmetic functions in 8, 16, 24 or 32 bit lengths within the same program—with precision changeability at any time.

Hardware includes two 32-bit accumulators, two 16-bit index registers, two program counters and two overflow registers. Plus eleven interrupt lines. And its 1.5 μs memory is expandable from 4K to 32K bytes.

The price of our paragon? Just $7,500. Considerably more than Napier's bones—and considerably less than any comparable computer. Why not write for your brochure today?



varian data machines

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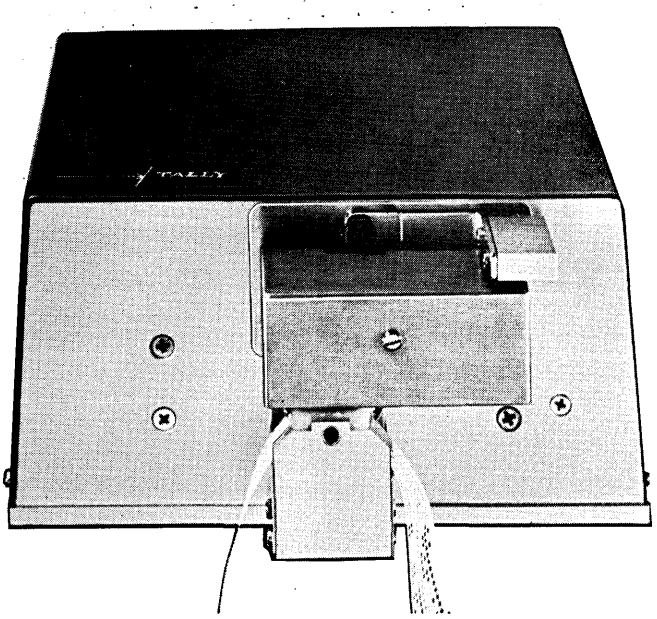
CIRCLE 1 ON READER CARD

Start your own Data Communications System with this easy to use plug-in terminal.



You don't have to upset your present paper tape data preparation routine to take advantage of a high speed data communications system. The low cost, easy to use, Tally data terminal shown above transmits paper tape data over the ordinary dial-up telephone network at 72 characters per second.

Cost is low. Lease or buy. Ready to deliver. Collect digital data from any number of remote locations for computer processing.

Features include automatic error correction capability during transmission and unattended operation so that the data site can be polled at convenient and low cost line charge times.

Other Tally send/receive/duplicate data terminals are available at operating speeds up to 1200 words per minute. Choose from the broadest, most complete line of punched card, magnetic tape or perforated tape data terminals on the market today. For complete information, please write or call **Tally Corporation, 8301 South 180th Street, Kent, Washington 98031. Phone 206-251-5500. TWX 910-423-0895.**

Or contact one of the regional offices:
New York: 45 N. Village, Rockville Centre, N. Y. 516-678-4220
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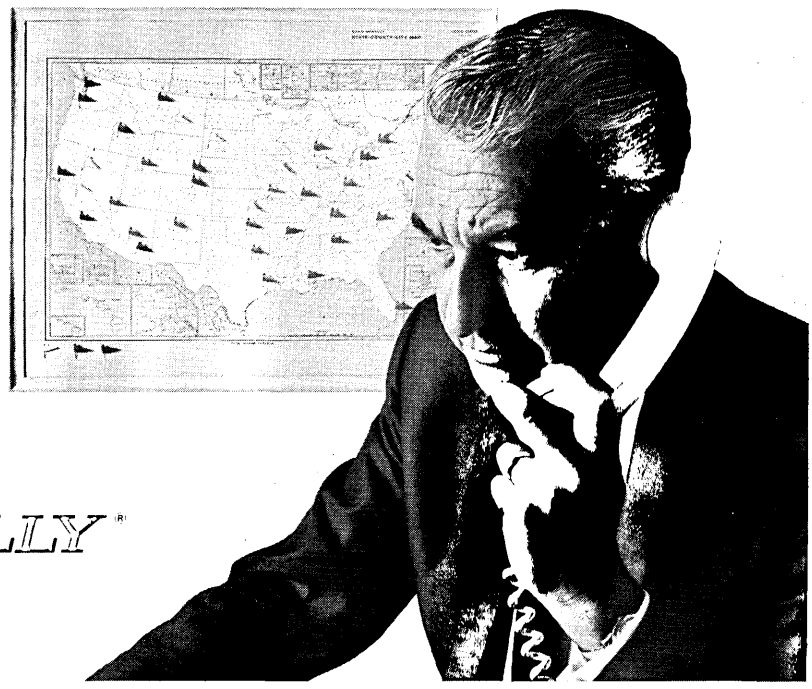

TALK TO TALLY®

Sanders makes many display systems.

You'd be hard put to find a location too remote for the Sanders 620* Data Display System. The unit contains all the hardware needed to operate the display. It links directly to a computer through a data set.

You can spread 780 characters over any of 2,688 locations on a horizontal screen. Or over 2,080 locations on a vertical screen. And Memory Save—exclusive with Sanders—lets you display up to 50% more data in nearly all formats than other systems having equal capacities.

Want hard copy? All it takes is an optional circuit module in the cabinet and a teletypewriter. Another option—format mode—permits a combination of both fixed and variable data fields. The 620 system is totally compatible with the multi-station 720* System, which permits up to twelve displays per control unit. And there's a Sanders interface unit to link 620 and 720 Data Display Systems to a System/360.

Whatever your data handling requirement—from microimage retrieval to a complete data management system—consider Sanders as your single source. Call any of our sales offices across the country, or write: Marketing Manager, Data Systems Division, Sanders Associates, Inc., Daniel Webster Highway S., Nashua, New Hampshire 03060. Or call: (603) 885-4220.

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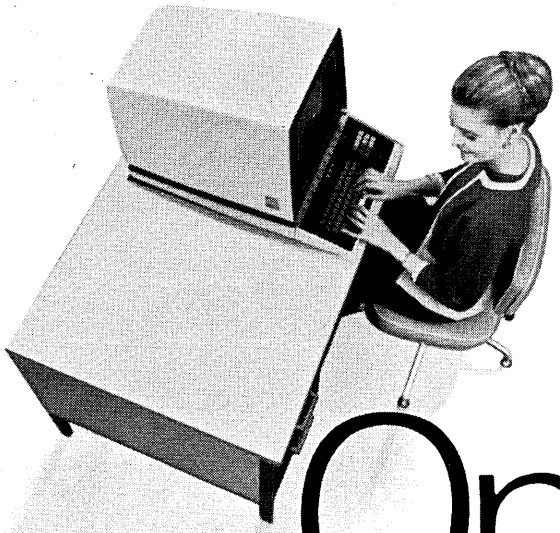
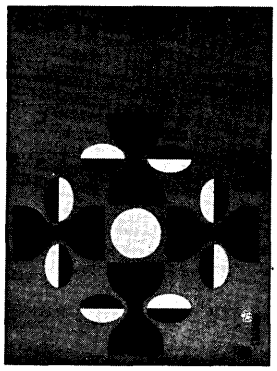


One stands alone.

CIRCLE 47 ON READER CARD

august
1969

volume 15 number 8



DATAMATION is published monthly on or about the tenth day of every month by F. D. Thompson Publications, Inc., Gardner F. Landon, Chairman and President; Gilbert Thayer, Senior Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, Conn. 06830 (203) 661-5400. Editorial offices, 94 So. Los Robles Ave., Pasadena, California 91101. Published at Chicago, Ill.

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CIRCLE 20 ON READER CARD

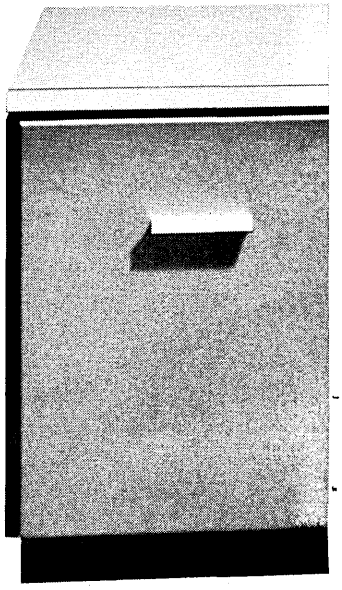
DATAMATION 69®

august
1969

volume 15 number 8

datamation departments

Sooner or later, keypunching, key-to-tape, and KeyProcessing™ all get data ready for computers.



KeyProcessing does it sooner.

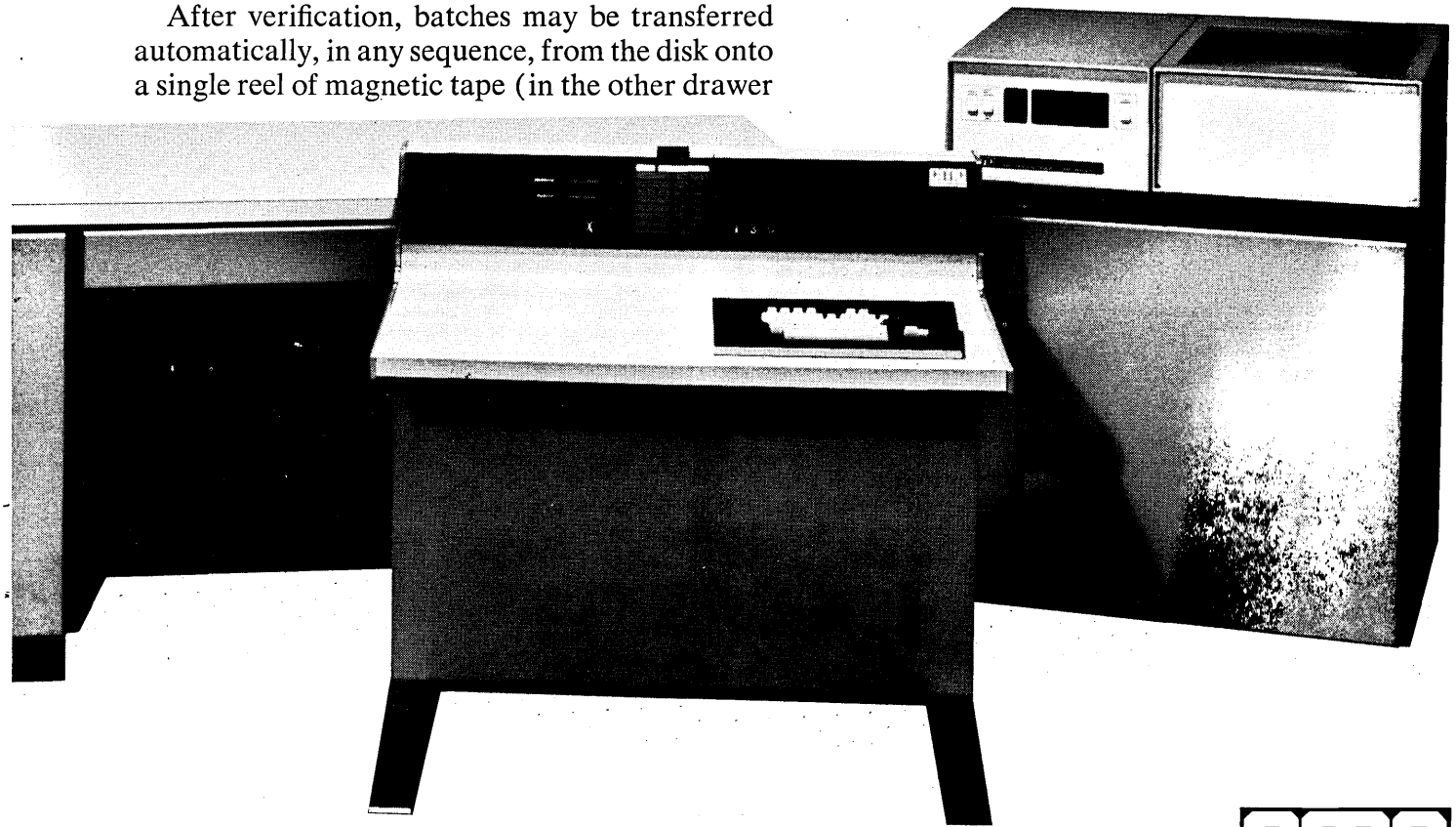
Quickest way from source documents to processing is through a CMC KeyProcessing System. No cards. No tape-handling. No pooling. No fooling!

The CMC KeyProcessing System is a computer-controlled keyboard input system. Each system can have up to 32 keystations, operating independently and simultaneously. As operators enter data through their keystations, it is processed by the system's computer (located in one drawer of the supervisor's console) and written on a magnetic disk.

After verification, batches may be transferred automatically, in any sequence, from the disk onto a single reel of magnetic tape (in the other drawer of the console). That's all. Done! This tape then becomes clean input to your main computer.

Sooner or later, many centralized data preparation installations will use this simpler, faster, more economical system. Some already do. The sooner *you* begin, the sooner you begin saving.

For more information, check the inquiry card. Meanwhile, keep this in mind: KeyProcessing will make your data preparation as modern as your data processing.



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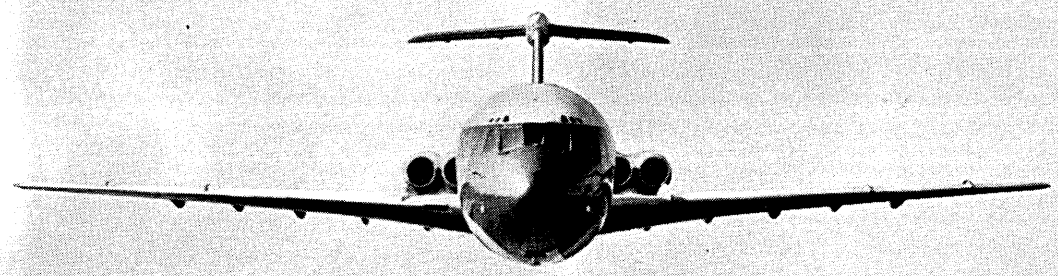
CMC

It takes a fast printer to keep up with BOAC's 100 million dollar computer system.

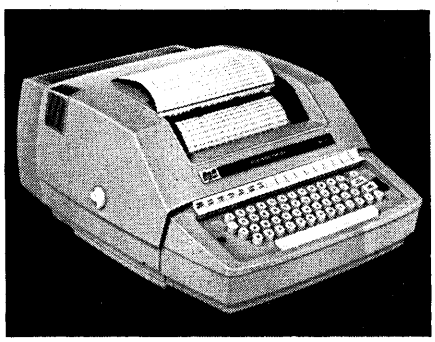


Kleinschmidt.

The amazing Kleinschmidt 311™ Teleprinter is part of BOAC's 100 million dollar computer system called Boadicea. This system puts all the BOAC offices in the United States right next door to the home office in London.

For example, if the BOAC office in Miami needs a passenger list for any BOAC flight, Kleinschmidt gets the answer from London in seconds. At 400 words a minute.

The Kleinschmidt 311 Teleprinter gives BOAC the ultimate in speed and reliability. Furthermore, the 311 Teleprinter can accept parallel information on demand at an average speed of 40 characters a second, which eliminates the formatting problems of serial printers.



What Kleinschmidt is doing for BOAC it can do for any business that requires quick reception of the printed word. If you would like to learn more, please write Kleinschmidt Division of SCM Corporation, Deerfield, Ill. 60015. Or call us at 312-945-1000.

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CIRCLE 211 ON READER CARD

OUR TDX IS alive AND MULTIPLEXING

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It's working with time sharing systems by Control Data, the Digital Equipment Corporation, IBM, Burroughs, General Electric, Hewlett-Packard, Interdata, RCA, and Univac.

Time sharing systems planners all over realize that the Rixon TDX is the most economical, efficient, and reliable time division data multiplexing system for them. Wouldn't it be worth a few minutes of your time to see if the Rixon TDX is the best way for *you*?

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CIRCLE 46 ON READER CARD

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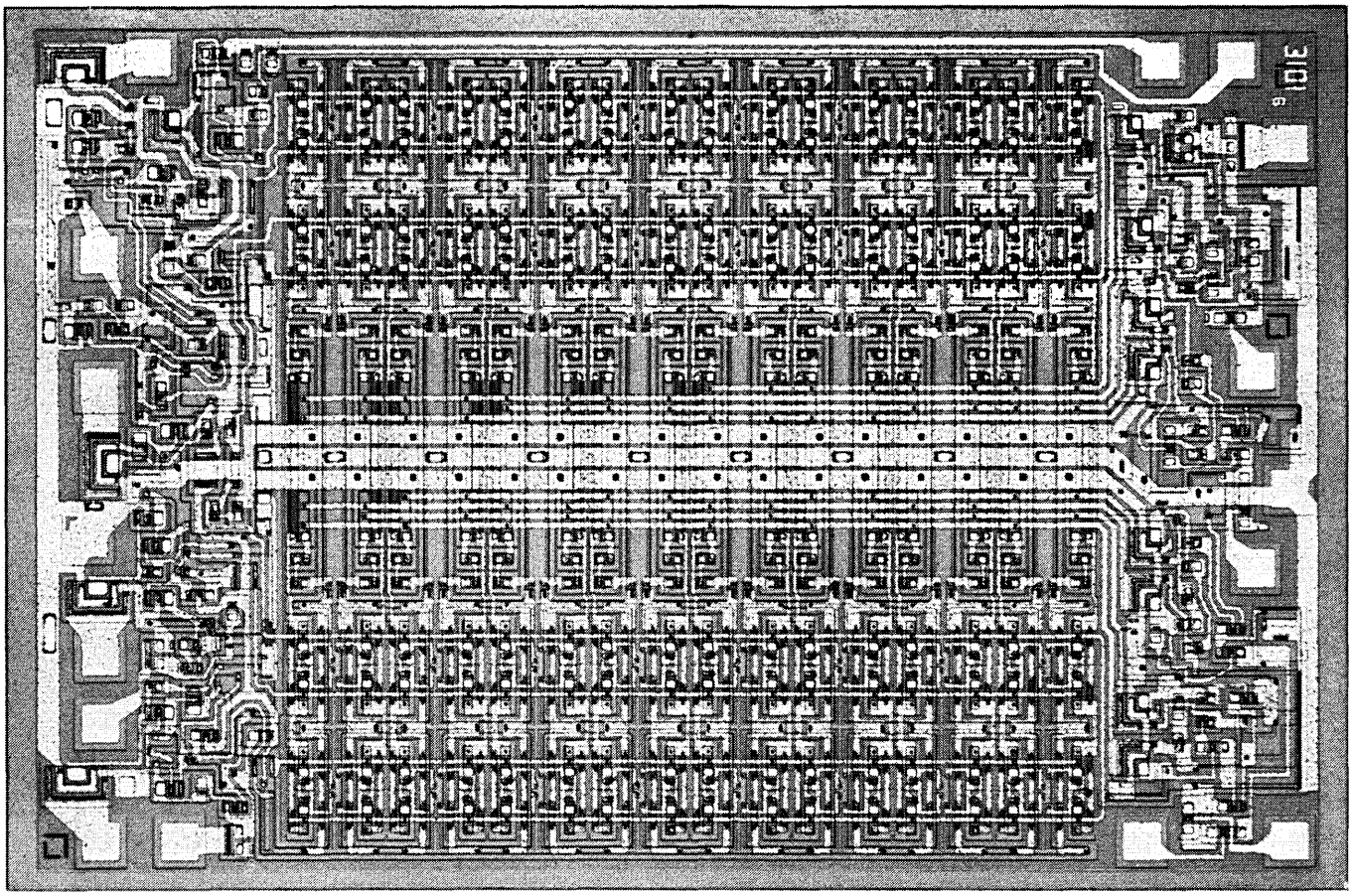

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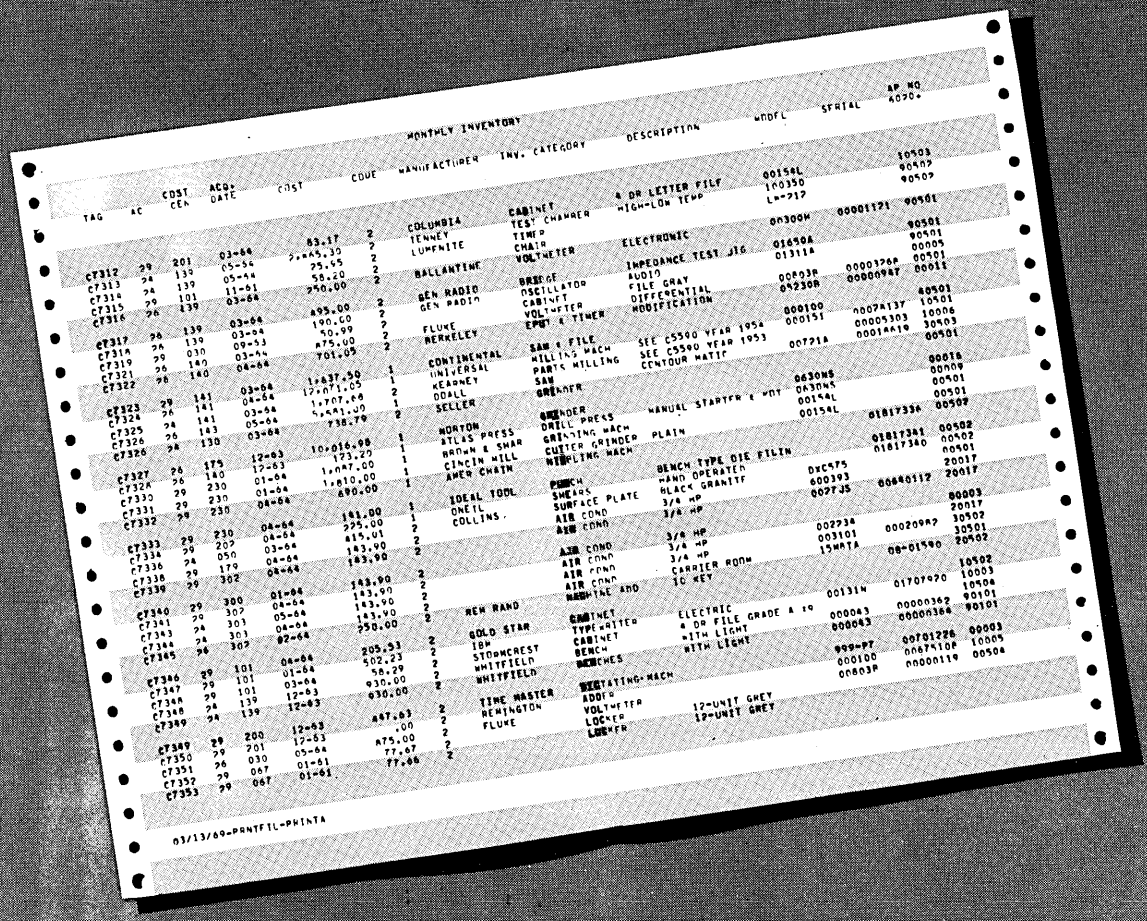

MONTHLY INVENTORY

TAG	AC	COST CEN	ACQ DATE	COST	CODE	MANUFACTURER	INV. CATEGORY	DESCRIPTION	MODEL	SERIAL	AP NO 4090+
				83.17	2	COLUMBIA	CABINET	4 DR LETTER FILE	00154L		10903
				2,445.30	2	TENNEY	TEST CHAMBER	HIGH-LOW TEMP	100350		90489
				25.65	2	LUMENITE	TIMER		L-717		90509
CF312	29	201	03-64	58.20	2		CHAIR				
CF313	24	139	05-56	250.00	2	BALLANTINE	VOLTMETER	ELECTRONIC	00308W	00001121	90501
CF314	29	101	05-44						016504		90501
CF315	29	139	11-61					IMPEDANCE TEST J16	013114		00005
CF316	96		03-64			GEN RADIO	BRIDGE	AUDIO			90501
				495.00	2	GEN RADIO	OSCILLATOR	FILE GRAY	00803R	00001268	00501
CF317	24	139	03-64	190.60	2		CABINET	DIFFERENTIAL	05230R	00000987	00011
CF318	24	139	03-64	50.99	2	FLUKE	VOLTMETER	MODIFICATION			
CF319	29	030	09-53	475.00	2	BERKELEY	EPUT & TIMER		000100	00021137	40501
CF321	26	140	03-44	701.05	2				00015I	00005303	10501
CF322	98		04-64			CONTINENTAL	SAW & FILE	SEE C5590 YEAR 1954		0001AA10	10006
				1,437.50	1	UNIVERSAL	MILLING MACH	SEE C5590 YEAR 1953	007218		30503
CF323	29	141	03-64	12,071.05	2	KEARNEY	PARTS MILLING	CONTOUR MATIC			00501
CF324	24	141	04-64	1,707.68	1	ODALL	SAW				
CF325	24	143	05-64	4,491.40	1	SELLER	GRINDER				00018
CF326	24	130	03-68	738.79	2						00009
CF326						NORTON	GRINDER	MANUAL STARTER & MOT	063045		00501
			12-63	10,016.98	1	ATLAS PRESS	DRILL PRESS		043045		00501
CF327	26	175	12-63	173.29	1	BROWN & SHAR	GRINDING MACH		00154L		00507
CF328	26	140	01-64	1,047.00	1	CINCIN MILL	CUTTER GRINDER	PLAIN	00154L	01817336	
CF330	29	230	01-64	1,810.00	1	AMER CHAIN	MILLING MACH				00502
CF331	99	230	04-64	690.00	1					01817341	00502
CF332						IDEAL TOOL	BENCH	BENCH TYPE DIE FILIN		01817340	00501
			04-64	141.00	1	ONEIL	PUNCH	HAND OPERATED	DXC575		20017
CF333	29	230	04-64	295.00	2	COLLINS.	SHEARS	BLACK GRANITE	600393	00680112	20017
CF334	29	202	03-64	415.01	2		SURFACE PLATE		0027J5		00003
CF336	24	050	04-64	143.90	2		AIR COND	3/4 HP			20017
CF338	29	179	04-64	143.90	2		AIR COND	3/4 HP	00273A	00020987	30502
CF339	99	302	04-64	143.90	2		AIR COND	3/4 HP	003101		30501
				143.90	2		AIR COND	3/4 HP	15WATA		20502
CF340	29	300	01-64	143.90	2		AIR COND	CARRIER ROOM		08-01580	
CF341	29	307	04-64	143.90	2		HEATING AND	10 KEY			10502
CF343	24	301	05-64	143.90	2	REM RAND				01707970	10003
CF344	24	303	04-64	950.00	2		CABINET		001314		10504
CF345	96		02-64			GOLD STAR	TYPEWRITER	ELECTRIC		00000362	90101
				205.53	2	IBM	CABINET	4 DR FILE GRADE A 19	000043	00000364	90101
CF346	99	101	04-64	502.23	2	STROMCREST	BENCH	WITH LIGHT	000043		
CF347	99	101	01-64	58.29	2	WHITFIELD	BENCHES	WITH LIGHT			
CF348	99	101	03-64	930.00	2	WHITFIELD			990-P7	00701226	00003
CF348	24	139	12-63	930.00	2		WEIGHING MACH		000100	00674106	10005
CF349	24		12-63			TIME MASTER	ADDER		00803R	00000119	00504
				467.63	2	REMINGTON	VOLTMETER	12-UNIT GREY			
CF349	29	200	12-63	.00	2	FLUKE	LOCKER	12-UNIT GREY			
CF350	29	201	05-64	475.00	2		LOCKER				
CF351	26	030	01-61	77.67	2						
CF352	29	067	01-61	77.66	2						
CF353											

03/13/69-PRNTFIL-PRINTA

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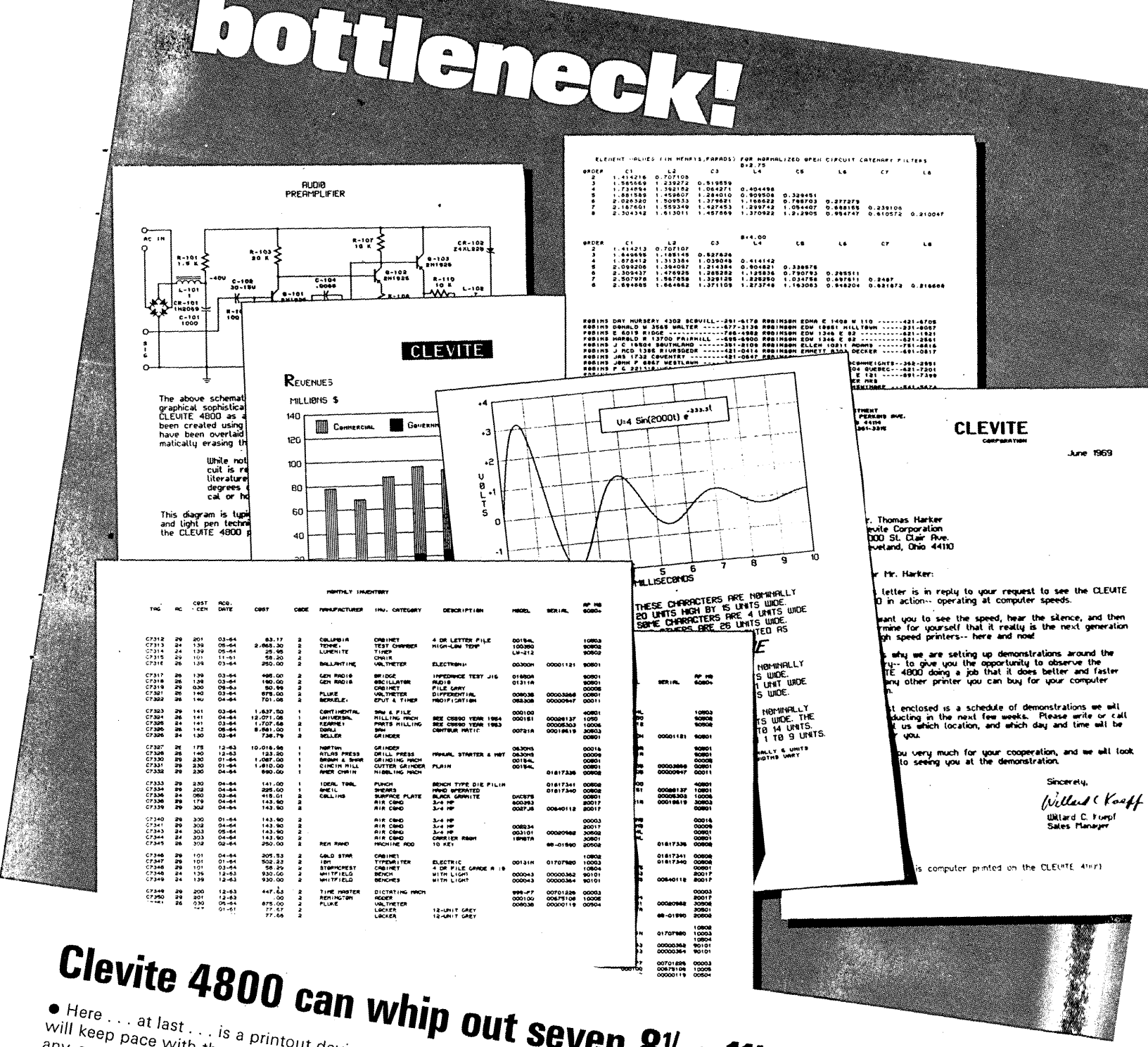

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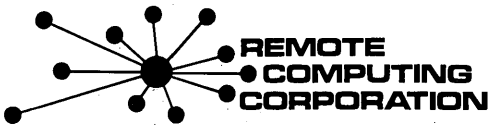

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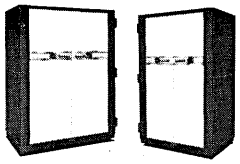

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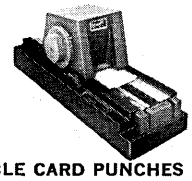

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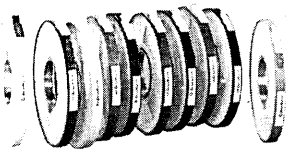

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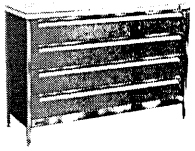

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calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
Aug. 26-28	Nat'l Conference & Exposition	San Francisco	ACM 69, P.O. Box 2867, San Francisco, Calif. 94126
Sept. 7-11	11th Annual EDP Conference	Los Angeles	NRMA 100 W. 31 Street New York, N. Y. 10001
Sept. 8-9	1st Annual Management Information Systems Meeting	Minneapolis	SMIS/G. W. Dickson, Bus. Adm. School, Univ. of Minnesota, Minneapolis 55455
Sept. 8-10	Aerospace Computer Conference	Los Angeles	AIAA/HQ 1290 Sixth Ave., New York, N. Y. 10019
Sept. 16-18	Int'l Conference Management Information Systems	Stresa, Italy	IFIP/IAG HQ 6, Stadhouderskade, Amsterdam 13, Neth.
Sept. 17-19	Int'l Computer Mining Applications Symposium	Salt Lake City	AIME/Alfred Weiss 1356 Kennecott Bldg., Salt Lake City, Utah
Sept. 28-Oct. 1	Int'l Systems Meeting	New York City	ASM/Richard L. Irwin 24587 Bagley Rd., Cleveland, O. 44138
Sept. 30-Oct. 2	Computers & Communications Conference	Rome, N. Y.	IEEE/J. M. Harrington 304 E. Chestnut St., Rome, N. Y. 13440
Oct. 1-5	32nd Annual Meeting	San Francisco	ASIS 2011 Eye St., N.W. Washington, D.C.
Oct. 14-16	3rd Annual Symposium	Gaithersburg, Maryland	NBS, NSF/Dr. E. Dewan Data Sciences Lab. USAF, Hanscom Field, Bedford, Mass. 01731
Oct. 26-30	Joint Conference Math & Computer Aids to Design	Anaheim, Calif.	ACM, IEE, SIAM 33 S. 17 Street, Philadelphia, Pa. 19103
Oct. 27-30	24th Annual Conference & Exhibit	Houston, Texas	ISA 530 William Penn Pl., Pittsburgh, Pa. 15219
Oct. 27-31	11th Annual Exposition	New York City	BEMA 235 E. 42 Street New York, N.Y. 10017
Nov. 18-20	Fall Joint Computer Conference	Las Vegas	AFIPS/P. O. Box 49672, Los Angeles, Calif. 90049

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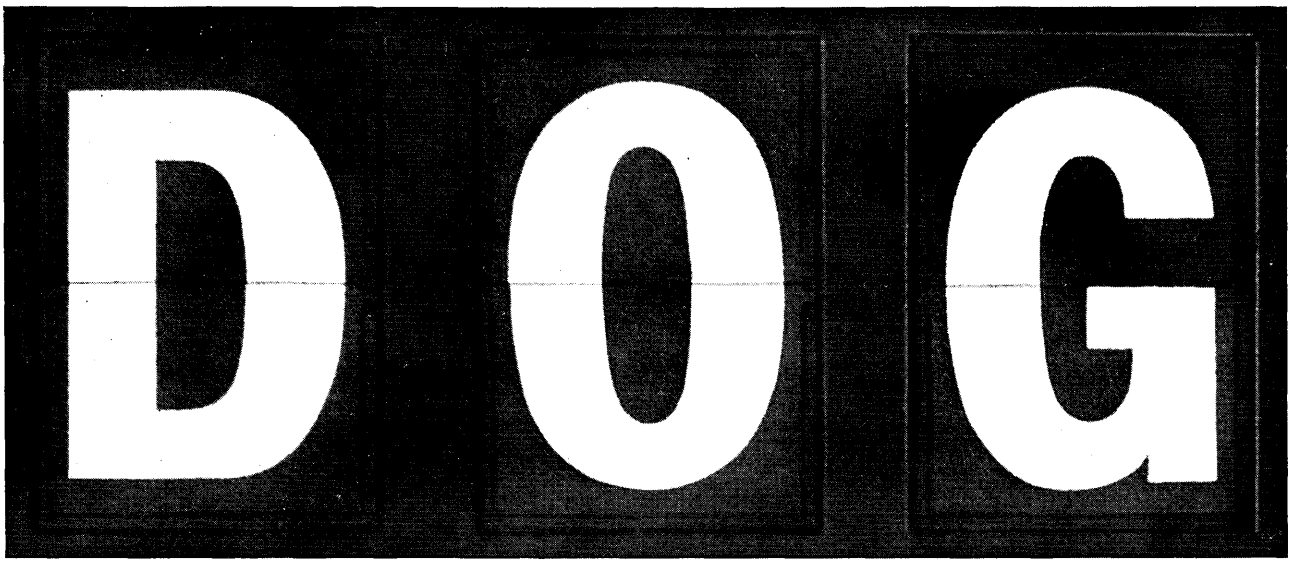

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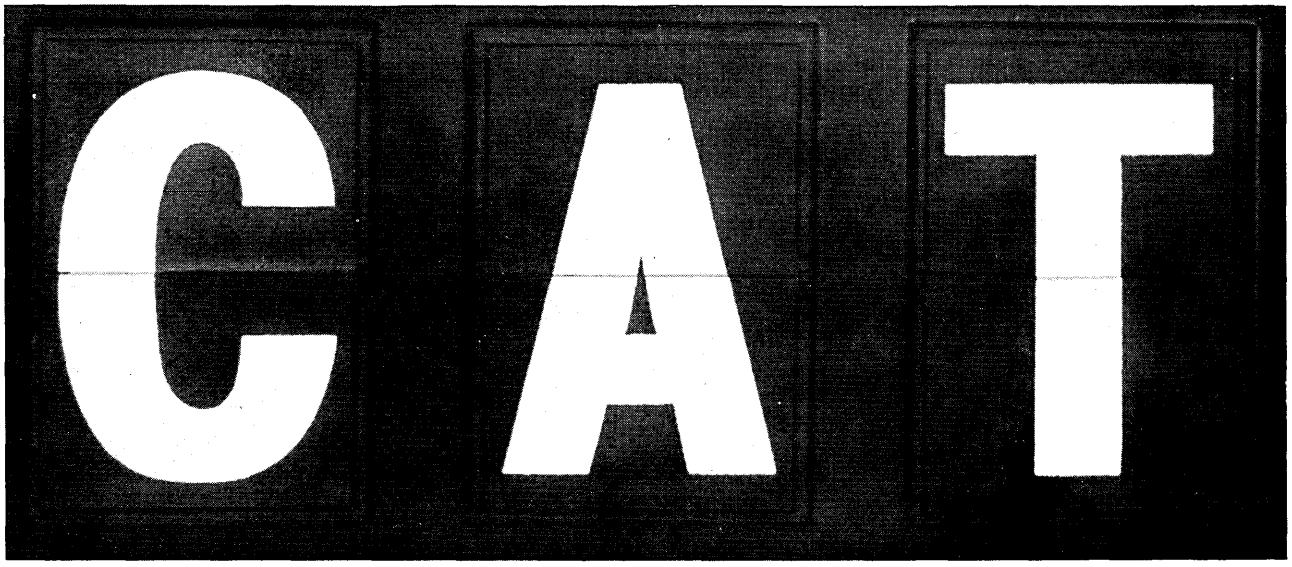

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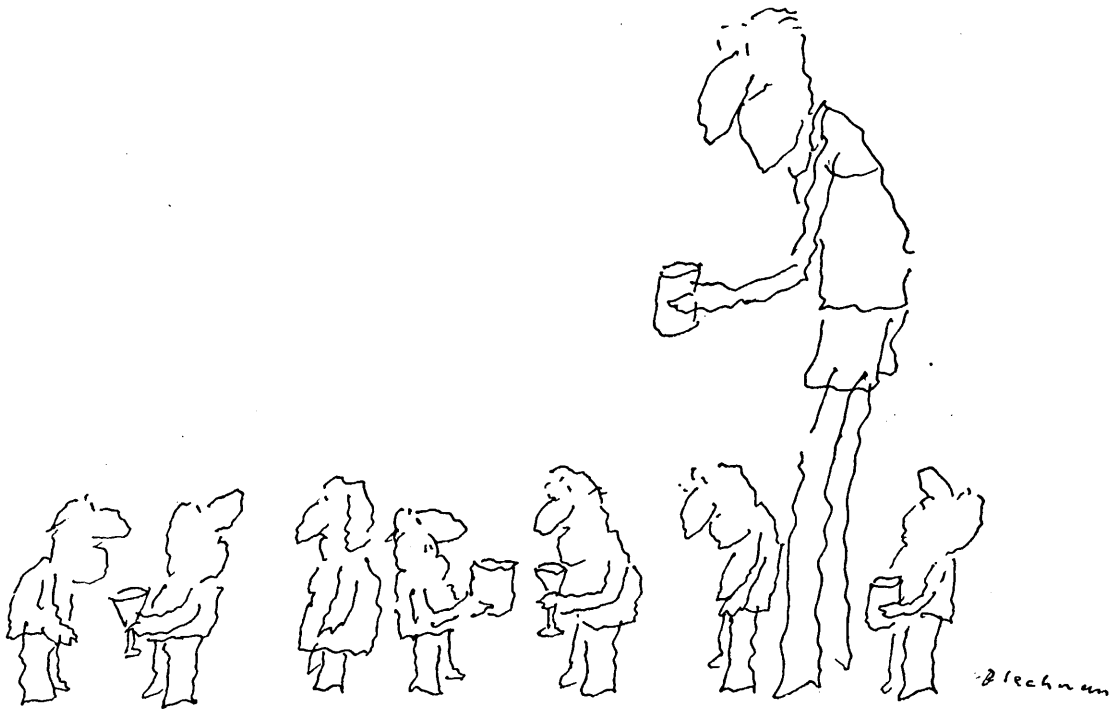

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CIRCLE 21 ON READER CARD

letters

think of that

Sir:

We have probably all heard the statement that humans use only 10% of their brain for "thinking." I suggest that this statement is probably true because that's all that's available; the operating system uses the rest.

F. PFISTERER
Syracuse, New York

mos: euphoria or against

Sir:

After reading Bob Graham's article (June '69, p. 99) with great interest, I was barely able to contain my excitement over the "pleasant surprise" that was in store for me when I looked into using MOS for delay line memories. The visions of .2¢/bit seemed way beyond my fondest hopes: yet, there the figures were in red, black, and white in Tables 1 & 2, as well as in the exuberant prose. I proceeded to hypothesize a poor man's crt terminal that would have only the barest minimum of memory, just 512 8-bit words, or 4,096 bits. At .2¢ per bit, the memory would only cost me $8.18 each.

To see how many memories I would have to buy to get this price, I read the text that described the prices in Figure 2 as "dropping rapidly with volume." I quickly noted that the required order quantity was only approximately 1,200 megabits. (I assume he meant mega, not microbits). My trusty slide rule told me that 4,096 bit memory divided into my order for 1,200 megabits will yield 294,000 crt terminals.

At this point, my rapture was uncontainable. Since my memory only cost $8.18, I could price my crt terminal at only $1,000 (or rent it for $20.00/month using IBM's 2% rental factor). My gross shipments will be $294 million—I can start a company and be a billionaire!

The next morning after the billionaire euphoria had passed, I started to do some research. Skipping over the computer industry's ability to absorb 294,000 crt terminals in a year as being only a detail, I decided to look into the MOS industry's capability to produce the 1,200 megabits of memory I must buy to get my price of .2¢ per bit. There have been enough articles published recently on MOS industry production figures that it was not hard to zero in on this figure. Most informed sources seem to point to an industry production of 1,100,000 devices during 1968. If we assume that a 200-bit serial shift register was then a reasonable average device, we then conclude that the industry produced about 220 megabits during 1968. Since the MOS industry shipments are expected to double during 1969, we can also assume that 1969 shipments will be something under 500 megabits. My blood suddenly chilled as I realized that my order would require 5 times the MOS industry's 1968 capacity, or only 2½ times the MOS industry's 1969 capacity.

The type of phony boloney that Mr. Graham is passing out (also passed out by most hucksters of the MOS industry —and some would-be terminal manufacturers as well) is an example of the "suction-pressure" school of economics. Followers of this philosophy, who are probably polar opposites of members of the Flat Earth Society, believe that with sufficient advertising and shouting of unbelievably low prices, the market demand will become so great as to create an enormous suction. This suction, according to the theory, creates a tremendous pressure within the factories and somehow magically increases yields, and forces the products out.

GEORGE SOUTHERN
Menlo Park, California

Mr. Graham replies: Mr. Southern must, of course bear the responsibility for the quality and correctness of his market research and his deductive reasoning, just as I must bear the responsibility for mine. Commenting on each of Mr. Southern's statements, although soul satisfying, would be pointless, but if he would like to do a bit more "research," he might study the extent and growth rate of the present magnetic memory market. The core, thin film and drum market is where we must compete, and it requires a much greater investment of money and talent than Mr. Southern is apparently willing to think about. I understand his approach in this instance, since I also was accused of being out in the noonday sun too long when I started marketing monolithic digital integrated circuits at their incept some years ago. At that time, three input gates sold for $150 a package, and production capacity was in the 1000/month bracket. Fortunately for our technology and economy, the men of vision far outnumbered their detractors.

exclusive exchange

Sir:

In response to your May Editor's Readout, I would like to inform you of such an organization as was described. It is called Electronic Computing Hospital Oriented—ECHO—and its objective is the free exchange of information. It is unfortunate, however, that membership is limited to IBM users.

JOHN B.MACARTHUR
Flint, Michigan

mother watcher

Sir:

The "unbundling" as officially announced has to be the slickest move since the great social security gambit of the 30's. It delighted even this hardened, over-thirty-year mother watcher. My combined reactions of amusement and admiration resulted in the following tribute.

SYNOPTIC ODE TO MOTHER GRAY

Sound your horns, beep-beep, beep-beep,
Hail Mother Gray, and do not weep,
Dignified, respected lady
Could she ever have been shady?

Up the years from Baltimore
Always some new trick in store.
She was great and well she knew it
Typists could she teach to do it?
She pioneered an innovation
The three-initial corporation.
Mistress of a crafty master,
Toward his end a near disaster.

But her wealthy clientele
Had always paid her doubly well.
They'd stand in line to share her kludges,
Geniuses? or merely stooges?
Government and business gents
Lured into her pricing tent.

The tent which spawned competitors,
Some good, some imitative bores.
Now from her losers they've divorced her.
She didn't want to 'til they forced her?

Ay she'll grin at all her scoffers
While she overloads her coffers.

Who will pay the rising bill?
Who always have—and always will?
Her customers, bo-peep, bo-peep,
She taught them how to Think—
Like sheep.

Heed, Mother, lest they tend your wake—
So late; and such a teeny break.

JOHN Y. MURRAY
San Anselmo, California

eloi and hoi polloi

Sir:

Garrett Hardin's "An Evolutionist Looks at Computers" (May '69) prompts—inevitably—a number of

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CIRCLE 57 ON READER CARD

thoughts and—inevitably—a tendency to disagree with his conclusions.

I feel particular doubt about his assessment that education will provide the panacea. Time and again there has been evidence of education being valueless unless immediately succeeded by practical application of the skills, techniques or thought processes learned. The whole problem of the Eloi versus the Morlocks lies in the fact that there will be an insufficient quantity of needed mental gymnastics available for more than the "fortunate" few. The concept of transcendental (i.e., therapeutic) mental gymnastics for the masses must surely be in doubt if the current tendency for the populace to be far more willing as spectators than as participators in physical athletics is any guide.

My main challenge to Mr. Hardin is, however, more fundamental. He equates those of us who are "with it" computer-wise with the Eloi, and the remainder with the Morlocks: he concludes that Wells was standing upside down!

Surely history teaches us that there has always been the Eloi who, through application of some irrational power (be it wealth, rank, church, height or whatever), have created a situation of leisure, culture and time-to-sit-and-think for themselves. Mental agility has never yet figured as a criterion for membership of this club, but even if it were to, I suspect that the characteristics of human-nature would soon downgrade it.

My leaning therefore is to stick with H. G. Wells as the prophet (always play with the table!) and to suggest only that his Morlocks will be stratified into intellectual (computer) workers and into physical workers. If, as we are told, "miserable being who meets more miserable being is happy," things just might work out.

N. L. F. WRIGLEY
Egham, Surrey, England

In answer to the above and to the letters that appeared in July, Dr. Hardin replies: Looking over the spate of letters stimulated by my article "An Evolutionist Looks at Computers," I am struck by the lack of consistency in the criticisms. Not wanting to be as dull as a textbook, I chose to make my points lightly and in passing. Perhaps I should have striven for more clarity even at the risk of dullness.

For those who, at this late date, are still interested in discovering my message, let me try to summarize it here without rhetorical flourishes.

1. Natural selection is unavoidable. Some people think that the word "natural" should not be used when selection results from human cultural forces, e.g., the automobile, which selects for the degree of neuromotor skill required to drive it. Whether the adjective "natural" should be used is a purely semantic quibble.

2. Natural selection requires differential reproduction and survival, not just social selection or community rewards. In medieval Europe the clergy were a privileged class, but they were biologically selected against by their vow of chastity. Insofar as they may have broken this vow they lessened the force of negative selection. All too often we don't know the biological effects of social privilege.

3. Every adaptive structure or function is the result of both heredity and environment, in varying degrees.

4. Selection is effective no matter how slight the hereditary component of an adaptation. It is often urged that because education has a large effect on intellectual performance selection can have no effect. This is not so. The selective process can be likened to message transmission and reception, with genes corresponding to the message, environmental fluctuations being the noise. Shannon's theorem says that given a sufficiently long transmission, the message can always be separated from the noise. This theorem applies to the selective situation. The genes in 200 million people is a lot of message!

5. A selective force is effective even if men are unaware of its existence. A pluralistic society like ours that asserts the freedom to breed, selects in favor of those groups that have the strongest pronatalist policies. The Hutterites, for example, average around ten children per family, versus less than three for the rest of the nation. The ratio of Hutterites to non-Hutterites through time is a positive exponential function. Try that on your computer.

6. Whether classes are important or not does not depend on majority opinion, but on the existence of those people who perceive themselves as members of a class, however outnumbered they may be at the moment. If all Americans except Hutterites perceive themselves as one nation, one class—a true melting pot—while the Hutterites perceive themselves as a class set apart, then all non-Hutterites will have to recognize the existence of classes if they are to survive. The idea of classlessness cannot survive in competition with the idea of classes.

7. We become what we select for.

8. A structure or function that is not selected for atrophies in time. Cave animals become blind. The true explanation is not Lamarckian. Mutation constantly tends to erode the genetic basis of every structure and function. Mutation is a sort of entropy that is normally countered by selection. Remove selection, and the ordered adaptation disappears.

Should we be concerned about the present forces of selection? I believe we should at least think about them. There are many unknowns. Rapid cultural change means rapid change in the force and direction of selection. Perhaps the long term picture is one of a random walk. Perhaps it isn't. If an endosomatic adaptation is converted into an efficient exosomatic one, should we worry? That depends partly on how stable we think our exosomatic-manufacturing society is. Personally, I am not convinced of its stability.

correction correction

Sir:

In the Letters section of the June issue, Mr. R. C. Sawyer of Lockheed-Georgia Company expressed a preoccupation with fact in regard to statements published in your magazine. He then states that REDCOR, through an internal policy decision, replaced the Varian 620 with Decade 70 processors, and that the Lockheed evaluation team found the proposed system would not satisfy the defined specifications and negotiation with REDCOR was terminated. It is true that an internal policy decision replaced the Varian 620 with the Decade 70 (now REDCOR 70) processor but it is not true that the Decade 70 would not satisfy the defined specifications. In fact, we at REDCOR would be very interested to hear of any of the defined specifications which were not far surpassed by the Decade 70. Although Lockheed evaluation teams have the prerogative to choose whatever processor they please, I believe, in this case, the decision was purely subjective and that rather than create the serious misconception that the Decade 70 under evaluation did not meet the defined system specifications, it would be correct to say that Lockheed chose to terminate negotiations with REDCOR and to use the Lockheed Mac 16 Computer for their own business reasons.

RONALD A. OCKANDER
Redcor Corporation
Canoga Park, California

grecian earns wreath

Sir:

After plowing through "A Look at Unbundling" (June '69), I note that there is at least one glaring error. The article states that leasing companies have over $250 million worth of computers on lease. As one who not long ago did research on the leasing field and wrote an article (Aug. '68, p. 26) that rivals Miss Pantages' unbundling treatise in long-windedness, I can tell you that many leasing companies *each* own $250 million worth of computers and that the total is in the $2 billion range.

MISS PANTAGES
Greenwich, Connecticut

Ed. note: Miss Pantages, a female journalistic Diogenes, is now on an obviously much-needed three months' leave of absence in Greece. She was the first to note her inaccuracy, and for admitting it in print we offer her an olive wreath to adorn the DATAMATION editorial derby she won for her June unbundling article. While in Greece, she might well cry down the wrath of the gods on the fellow editors who let the error get through.

notes for singer

Sir:

From time to time magazines get into trouble on reporting the facts as they are. We have this problem within Burroughs and elsewhere. Normally you can pass it off and let it go. However, I think that Mr. J. Peter Singer did Bur-

(Continued on page 219)

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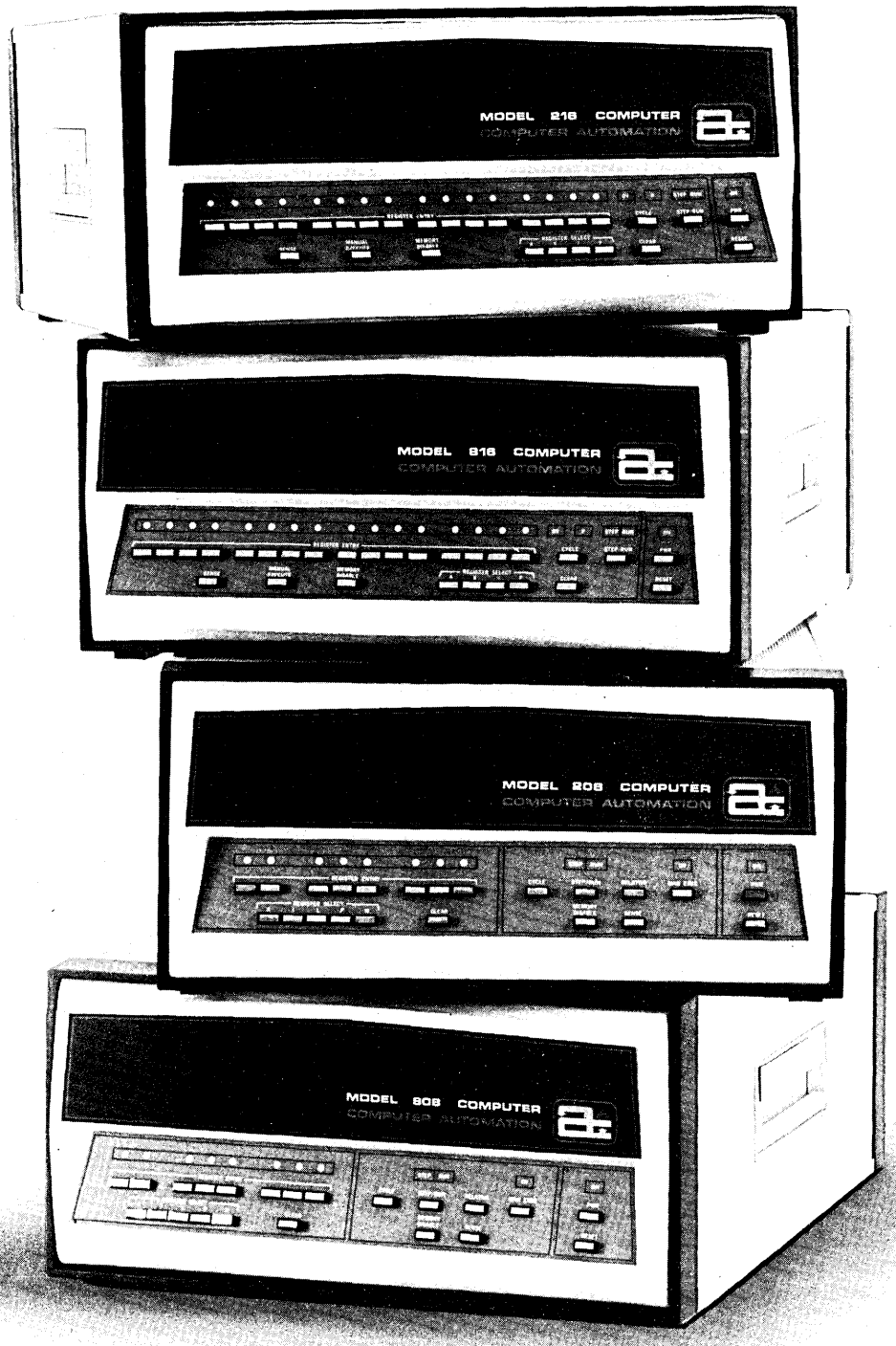

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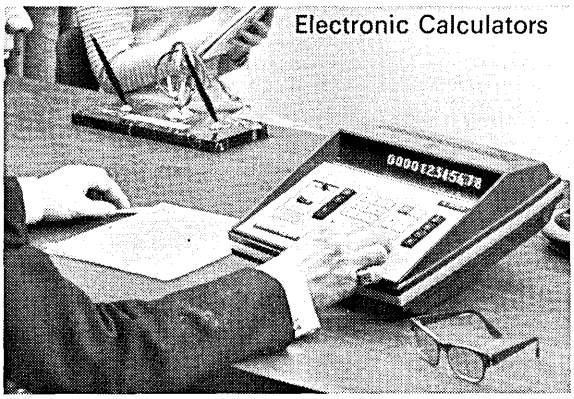

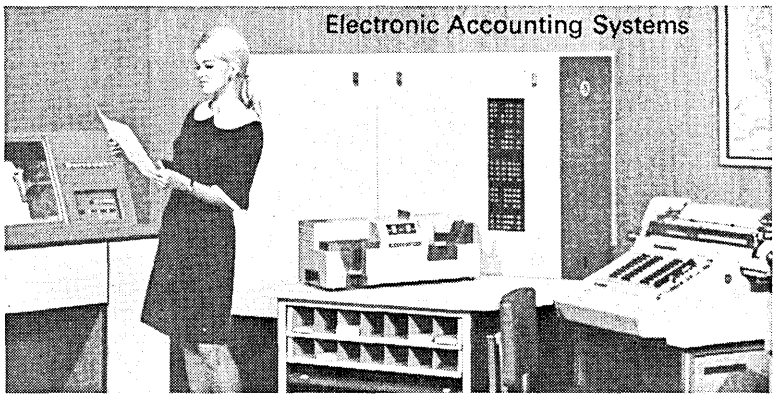

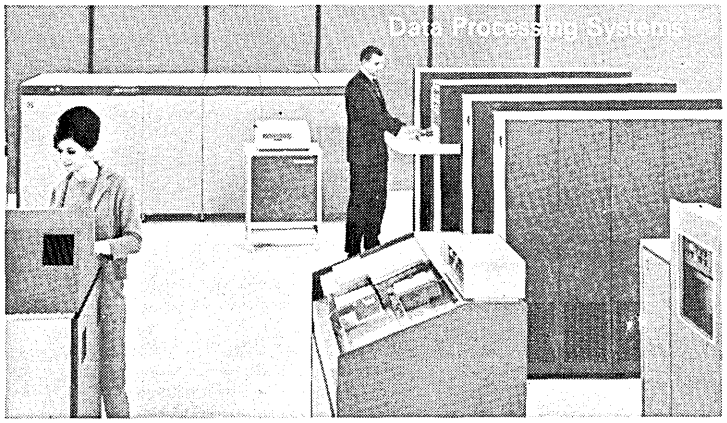

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CIRCLE 9 ON READER CARD

look ahead

CCI BRANCHES SIDEWAYS TO SYSTEMS, MINICOMPUTERS

Tired of being thought of as a terminal maker, Computer Communications, Inc., has taken a couple of sideways steps toward earning recognition as a systems house.

The first was announcement of a 12-18 month cooperative venture with newly formed Disk Research & Development Corp. (Penna.) for the development of a 30-million-bit fixed head-per-track disc to augment CCI's line of peripherals. The agreement will add $645K to CCI coffers.

And CCI is in the process of negotiating a $750K contract (plus a $500K contract in progress) with another new firm, Intelecom (Minneapolis), for the design of an on-line financial service center that will feature a healthy hunk of CCI gear, including the disc, and a new minicomputer, the CC-701. CCI owns 22.5% of Intelecom.

Intelecom recently signed a 10-year $12.5-million contract with Blair & Co. (which recently acquired Schwabacher, giving it 47 branch offices) to deliver an on-line integrated message switching/order processing and accounting system for the big investment house. Intelecom must deliver an operating system within two years; once accepted, the rest of the contract takes effect.

Founder and chairman of Intelecom is Bill Lendman, past president of Blair, and a member of CCI's board. Intelecom president is Bob Bender, ex-CDC executive. Joining him as a vp is George Morpurgo, a key man at the company which is now handling Schwabacher's paperwork. The CCI-designed Blair system will probably center around twin 360/40's, feature a CCI front end plus video and remote batch terminals. To get rolling on its first order, Intelecom will seek $4 million soon.

Meanwhile, CCI has recorded its fifth straight black-ink quarter ($170K on revenues of about $2.8 million in its third FY), anticipates sales of $6 million next year.

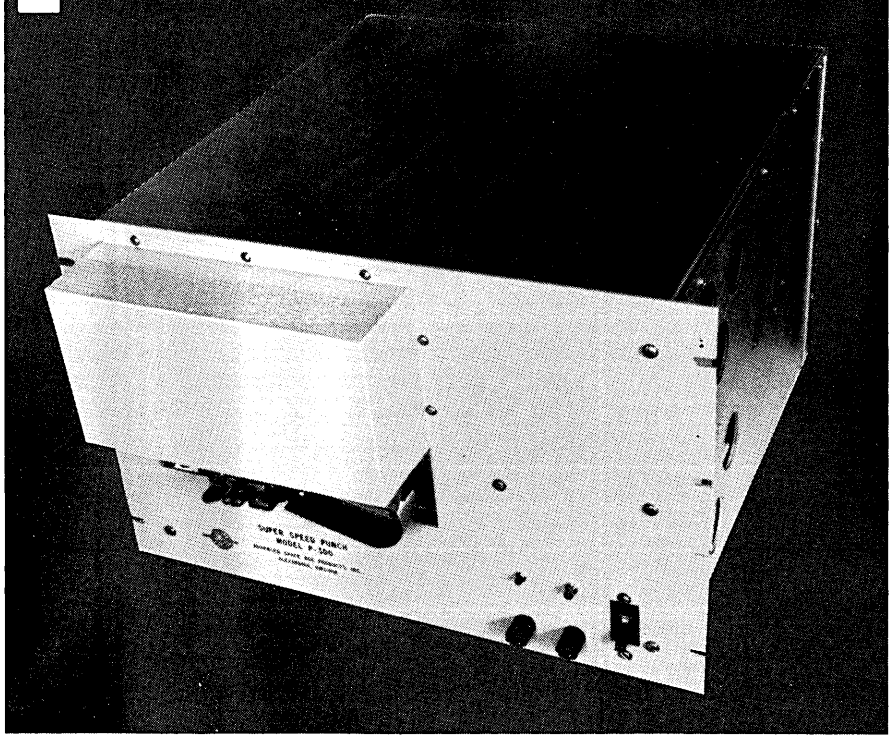
SEL SEEKS SDS IMAGE

Eight-year-old Systems Engineering Laboratories, Ft. Lauderdale, Fla., will try to fill the slot it feels is being vacated by Scientific Data Systems as the result of its merger with Xerox. The custom systems house will make general purpose scientific computers with a systems approach and continue its successful operations as an OEM supplier.

Under new computer-vet president, Sheldon Eglash, SEL will announce two 32-bit systems in September, the 86 and 88, direct swats at SDS's Sigma series. Right now it should be detailing its new Key-Tran, a processor-oriented keyboard entry system. Packages for the 32-bit machines will be developed jointly with the customer and then offered on the market.

(Continued on page 35)

powerful puncher!



ASAP's Model P-300 Paper Tape Punch—310 Characters Per Second. This close tolerance, heavy duty perforator packs a 310 characters per second punching capability! ASAP's peripheral engineers have transformed Teletype Corporation's DRPE Punch into a remarkably compact (less than 15" x 20½" x 21") high performance puncher that has enhanced the use of paper and mylar tape.

ASAP engineering has automatically synchronized the electro-mechanical and electronic assemblies. No operator adjustments are required throughout the speed range, and interface with computers, modems, peripherals and data sources is easily achieved.

The P-300 is available in either table-top or relay rack models.

Optional equipment includes:

- Verifier unit for simultaneous check of punched data against source data.
- Dataphone interface.

A 240 character per second model (P-240) is also available for installations not requiring the super-speed P-300's 310 characters per second capability.

Price: P-300—$3,500 P-240—$3,000

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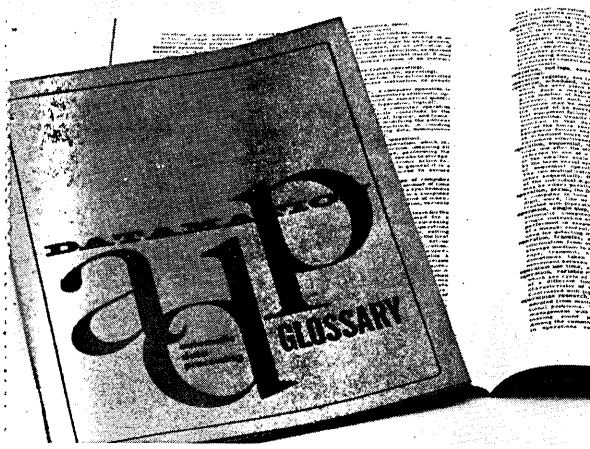

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SEL's primary problem, and it's not unique, is personnel. Vital to its progress is the development of application packages and the firm hopes to increase its present staff of 60 software people to 200 in two-three years and expects to have 40-50 salesmen in the field next year. SEL rang up $17 million in sales in fiscal 1969, plans to be a $100 million firm in five years.

DATA 100 REVS UP NEW TERMINAL, SELLS 50

Manned by a covey of Control Data and Univac refugees and backed by lots of loot, young, ambitious, acquisition-oriented Data 100 Corp. is readying its first product, a remote batch terminal, in Minneapolis. They've already sold 50 units to Leasco for its time-sharing service centers and signed an exclusive, two-way, three-year agreement with that firm to sell terminals to the end user, with certain exceptions such as the feds and T-S service bureaus.

Heading up Data 100 is Ed Orenstein, a founder of Data Display, Inc., who stayed with DDI after its acquisition by CDC. Also from DDI: Secretary-Treasurer Henry M. Conor and Marvin L. Bookin, vp engineering. From CDC come Bruce Bambrough, vp. corp. development; David J. Ekberg, vp marketing; Kenneth F. Tiede, head of the systems div.; and Gary A. Stoltz, asst. to the pres. Stoltz will worry about acquisitions, an art he learned under CDC financial vp Harold Hammer. Ex-Univacer Thomas G. Herschbach heads up manufacturing.

Formed last Dec., the 50-man company raised $2 million by mid-Feb., added another $3.75 million when it went public in June. Now it will start broadening the product line—including conversational terminals—lining up a service co., and acquiring. First acquisition is Royal Machine Industries, St. Paul metal cabinet maker.

RAYTHEON'S IPS GROUPS LOSING DP SPECIALISTS

Several of Raytheon's business dp managers, programmers, and technicians in the government divisions have quit recently, and more are likely to soon. They're part of the Information Processing Services (IPS) groups Raytheon established throughout all divisions to manage and run business dp. But sources claim that engineers running the lucrative projects, like Safeguard, are poaching on IPS territory—and are successful in capturing the money and equipment to do bdp themselves, ''something they know nothing about.''

The dp specialists lack clout because ''we have to work for bookkeepers who are timid, unsympathetic, and don't have detailed data processing knowledge.'' This could be a reference to controller Art Schene, who has corporate responsibility for the IPS groups.

COLLINS FUMBLES IN THE NAME GAME

Collins Radio makes radios, right? No, only half right. They're very big in radios and all sorts of communications but they also make computers—and have been making them for several years.

Until recently, though, they were giving everyone the impression that you couldn't talk to them about buying one unless you knew the password. But they did confess in early 1968 to having sold and installed several, called the C-System or C-8500. Then this summer came a sudden broadside of ads touting the sensational, colossal, all new C-8500. The predictable

(Continued on page 197)

Sometimes our first name makes liars of us.

A lot of SDS systems aren't scientific.

People keep thinking our computers are only good for science. But they're not limited to science. Here's a selection of applications. Read the lot, or just those in your area.

A university in Canada uses an SDS computer to run the library circulation department and help students select books. At other schools the same model computer handles student registration, class scheduling, grade reporting, teaches students about computers and runs research projects.

In industry you'll find standard applications like numerical control, of course. A southern oil company monitors over a hundred oil wells with a single SDS computer, while many others use them to analyze seismic data and blend gasoline. Engineers in the midwest are coping with the complex variables in designing large structures with the help of our computers. And there are a multitude of other systems designed for specific industries, like controlling a rolling mill.

Biomedical uses include running an entire hospital, from preparing payrolls to monitoring critically ill patients. In some hospitals they're formulating mathematical models predicting patient survival, analyzing ECG's and clinical laboratory experiments.

Business data processing applications include commercial time-sharing installations in several large cities, on-line general accounting, database maintenance and retrieval systems, payroll, accounts payable, purchasing, spares provision, parts explosion and production control, material control, cost accounting, purchases and manufactured parts inventory control and even an automatic motor transport rating and billing system.

In aerospace and data acquisition you'll find SDS computers almost everywhere. A federal agency uses one for air traffic control studies. Many of the largest aerospace companies use them for simulation of weapons and flight systems, and testing aircraft performance. Our computers also help control the launch of multi-stage space boosters and train pilots. They're involved in the world-wide spacecraft tracking and telemetry system, in making sure pictures transmitted from the moon are sharp and clear, and in a bundle of other applications.

Communications based systems are a relatively new area for everyone in the industry. Except us. Message switching and message concentration systems have been built for a major New York bank, a national credit rating system and classified government communications systems.

As we said before, this is only a selection. If you'd like more information about any of them, drop us a line. Our first name may sometimes make liars of us, but our applications won't.

SDS

Scientific Data Systems, A Xerox Company, El Segundo, Calif.

editor's readout

SAFEGUARD AGAINST TECHNOPOLITICAL GLITCHES

The ABM, you may or may not be interested to learn, has indirectly caused the editor of this magazine to get sunburned.

It happened because we decided to take some reading material to the beach one weekend recently. We chose *ABM, An Evaluation of the Decision to Deploy an Antiballistic Missile System* (Signet Q4006, 95¢).

Besides discussing such cute topics as the number of megatons of nuclear explosives (at what range) it takes to set buildings and clothing on fire, and defining "bugs" and "glitches,"* the anthology of articles makes clear that the Congress has one hell of a sticky, tricky problem on its hands trying to decide whether or not to allocate funds to implement the Safeguard ABM system President Nixon has requested.

Sections of the book of most immediate interest and concern to computer professionals are "An Overview" (pp. 3-30), and "Underestimates and Overexpectations" (pp. 118-129). The latter was assembled by J. C. R. Licklider, a highly regarded computer professional with a long, varied and appropriate list of credits—which makes him worth listening to.

Part of the book's arguments against Safeguard are based on past performance of systems of similar sophistication. For this kind of system, the report claims that out of 11 major systems designed between 1960 and 1967, "only two met performance specifications, and only one achieved as high as 75% of planned performance. Two met a 50% standard and six rose only to 25% of planned performance. In a number of these cases, large-scale redesign and redevelopment of electronic and computer elements of the system after extensive in-service testing failed to result in materially improved performance."

Licklider goes into more detail on the experience with past systems, including the costs of programming, and the delays experienced.

Another group—Computer Professionals Against ABM—has joined the argument. Their views and those of an anonymous pro-ABM DOD official are reported in this month's News Briefs.

We've been concerned, ever since watching a small college town ineffectually wrestle with the problem of fluoridation of its water supply 15 years ago, with the question of how a large democracy solves technical questions.

And the question of whether or not the Safeguard system (as presently planned) can be effective is certainly a technical question. The fact that the system will, to a great extent, depend upon the performance of computer (hardware and software) systems, makes it a technical question of legitimate interest to the computer technologist.

It's clear that the technical information and advice available from the military/industrial complex cited by General Eisenhower cannot—and should not—be totally trusted.

We urge each of you to study the current Safeguard proposal, the arguments for and against, and—on the basis of your technical experience and wisdom—to make known your views to your Congressman.

If, in the process of your studies, you get a sunburn, forget it. This issue is a bit more important than that.

—R. B. F.

**According to the book, "Glitches are errors that, once they are located and understood, seem more glaring and blatant than bugs."*

THE '69 TIME-SHARING GOLD RUSH

some must fall

by Robert F. Guise, Jr.

Conventional computer service firms, riding high on the computer industry's booming growth wave, have seen a new offspring shoot by them in less than two years.

Hoping to strike gold, the new breed, the time-sharing industry, has passed quickly from a pioneer phase into the sometimes vague area of market predictions and pure mythology. The myths began with sound technological concepts based on equally sound economic hypothesis. However, because the growth of the new industry has been anarchic and too quick, in the view of many observers, the door has been opened to some dreamers and perhaps even a few scoundrels. A gold rush is, after all, a mob of people in pursuit of fast and easy wealth.

On the other hand, the gold rush of '49 was based on the discovery of real gold, and gold in quantity was found by some. It may be that this chaotic period of 1969 is a necessary trial if success is to be achieved—if the time-sharing industry is to make good on its vast potential.

The concept that has caused the entrance of hundreds into computer time-sharing is most commonly called the computer utility. In today's accepted nomenclature, the computer utility would ideally provide remote batch processing for production runs, on-line information retrieval from integrated data bases, and interactive problem-solving languages, both procedural and application oriented—in other words, conversational computing. This combination of services would be offered over a national or international communications network from strategically placed, multi-computer centers handling a complete range of terminal speeds and capabilities.

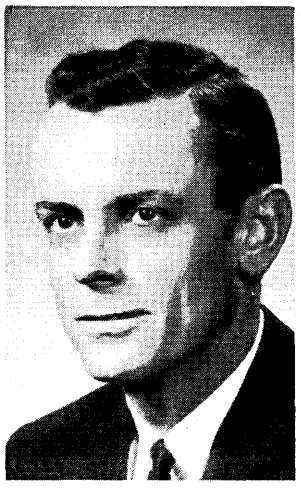
The list of those entering the time-sharing field consists primarily of independent entrepreneurs; however, a large number of well-established companies both in and out of the mainstream of computerdom are joining the gold rush. In one form or another, all the time-sharing entries see themselves operating several medium to large computers that can access, control, and distribute large amounts of data and application programs to thousands of geographically dispersed users performing myriad jobs.

The initial stimulus that motivated the march toward the ideal of the computer utility was the people inefficiency and the inconvenience of batch processing. Eight or nine years ago, the majority of computers were used for the volume production of routine data processing and complex calculations. The methodology of this era was based on maximizing the throughput of the computer and minimizing transaction costs. By discounting the economics of the user in favor of the computer, the methodology resulted in the plague of delayed turnaround time, a source of extreme frustration to the scientific and engineering communities.

The advance of computer technology pointed to a way of alleviating this widespread frustration. The fundamental economic hypotheses supporting the commitment of large sums of money to time-shared computing were and still are:

1. Computers and their attendant peripherals are becoming larger, faster, and cheaper every year.
2. A small piece of a big computer is more economical than a big piece of a small computer.
3. The number of people needing to use computers is rapidly increasing.

It is important to note that most of the early time-sharing offerings were designed primarily for use by the scientific and engineering communities and that viable application packages for the generalized business community have been lacking. At the close of 1968, it was reliably estimated that 70% of the gross time-sharing business was in the scientific-engineering calculation market, that another 15% went to academic institutions, and that the balance came from the business community. Also, 80% of time-sharing sold to scientific-engineering users was sold to large business organizations which own and operate large in-house computer installations.



Mr. Guise is president of Com-Share, Inc. He was formerly vice president of Scientific Management Council, a management consulting firm, and has been a professional engineer and consultant to industry and government on computer system design. With 12 years of experience in the computer field, he has been involved in both business and engineering systems.

Accounting applications, inventory control packages, and many other types of information retrieval and management information systems are just beginning to evolve. This is clearly because the first time-sharing systems were designed by computer scientists, engineers, and programmers, and marketed to the same community. In addition, the early time-sharing systems had monumental reliability problems which only scientific-engineering users could tolerate.

The new market-place dimension is based on the generally accepted estimate that the information services industry will nearly triple in volume in the early 1970's, going to about $2.7 billion from its 1967-68 level of approximately $950 million. Time-sharing in 1968 was a $70 million industry, representing about 7.4% of the total information service market.

Other market estimating sources are pointing to a figure of approximately $4 billion in the 1970's. Whichever set of numbers one chooses to use, the growth will be phenomenal. Time-sharing expects to account for over 60% of that market, and all present and would-be participants in the business will want to increase their share.

It is this situation that has led to the "get rich quick in time-sharing" myth, which is well expressed in the following excerpt from *The Investors Digest* of March, 1969:

> "Take a couple of hundred thousand dollars. Add some shrewd programmers, a pinch of good luck, and a friendly rent-a-computer dealer and you've got the makings of a time-sharing business. Beyond question, this is the hottest brew in today's heady computer industry. It's like the computer leasing field a few years back; even like the components sector in the mad, scrambling days of the late 1950's. It's the "in" field now and over one hundred companies are betting that the future of time-sharing will prove to be little short of fantastically profitable."

A similar sentiment was expressed in the article "The Wild Beginning of a New Industry," which appeared in *Business Week* of May 24, 1969.

Are the myth makers right? Well, let's see. . . .

In the beginning, circa 1965-66, the problems of achieving the utility ideal were greatly underestimated. The projected economics were more an extension of batch processing than reality. While universal acceptance and the time necessary to provide reliable and quantitative user functions were underestimated, the return for both effort and investment was greatly overestimated. Even after four years, computer time-sharing continues to mine surface gold and has yet to tap the mother lode. Not only are we a long way from the universal utility, but it has cost a lot more money and effort to get this far than was originally expected.

The optimism associated with time-sharing, in spite of such grim truths, has not evaporated. If anything, it has become more tumescent. A high point was certainly reached in late 1968 when anyone who could speak the time-sharing language and put together a reasonable proposal could secure investment capital. Today, unseasoned companies are finding it increasingly more difficult to procure risk capital for new time-sharing ventures.

By contrast, larger well-established companies have announced that they are prepared to enter the time-sharing utility race by investing sums three to ten times greater than those invested by the earlier entrepreneurs.

Many of the newest companies are little more than speculative schemes wholly dependent on the excitement and charity, if you will, of the investing public. Close attention should, perhaps, be given to the motives of firms engaged in businesses totally unrelated to time-sharing. Such firms hope to make their market multiples more palatable by adding a pinch of time-sharing to the product mix. One manufacturing company, a classic example of this phenomenon, almost went under because of unanticipated costs. It has since disposed of its data processing operation, computer training school, and associated activities.

defining the dropouts

Like it or not, a goodly number of existing time-sharing companies will be forced to drop out from the gold rush. They will not survive because they lack one or more of the basic ingredients of success:

1. A systems programming staff to maintain software independence and a continuing research and development program.
2. A systems operations staff capable of communications design, implementation, and maintenance.
3. The realization that computer time-sharing is not a simple machine time-vending operation but one requiring continuing customer education and service.
4. An adequate market penetration featuring comprehensive and widespread geographical service and sufficient broad scope and user-unique applications.
5. Adequate investment and/or working capital.

Current business data processing applications are not likely to be replaced directly by time-sharing programs. For the new entrants in the industry, big and small alike, the problems of entering the time-sharing market are increasingly higher startup costs; development of personnel with

the necessary skills in computer time-sharing, background software systems, and user-oriented systems; and development of high magnitude operational computer reliability, remote terminal systems, and attendant file storage and communications systems. This is not to mention the perilous entry into a market place characterized by increasing competitiveness in both functional offerings and price.

The cost of entering time-sharing is considerably higher today than it was three years ago. This is so because there have been enough entrants into the field to establish a competitive market-place environment in which the customer expects (1) sophisticated systems performance, including several programming and application languages (all with extended features), user-oriented system features such as random files and text editing, and an ever-increasing library of application packages; (2) a reliable computer system and attendant communication network performance; (3) skilled programming and educational services; and (4) a service unlimited by geographic location or communication cost.

To survive in today's time-sharing market place, newcomers will have to be competitive in all these areas.

In spite of this, the technical people most commonly heard from within the time-sharing industry continue to demand more intricate computer architecture, greater cpu power and memory size, more sophisticated terminals, higher level languages for machine instruction sets, and more languages like ALGOL and PL/I. This is not surprising since the state and growth of the industry to date has been a function not of the market place but of the product planning of the early time-sharing innovators. Because, historically, the market for time-sharing has been the engineering, scientific, and educational communities and because these people demand little in the way of training facilities, customer aids, reliability, "packaged" software, or special services, the gold rushers of '69 apparently believe that the market will continue to be satisfied with technical advances only.

embryonic now

Twenty years from now, however, we will see that today's time-sharing systems were just a beginning, that the industry had not yet begun to serve the more difficult but more voluminous commercial applications market.

As previously noted, using figures from the 1968 Auerbach report, approximately 56% of today's usage is by engineers in manufacturing companies. If scientists and educators are added, some 70% of current time-sharing revenue comes from the analytical or calculational market place. This represents only an estimated 5% of the 950,000 engineers and scientists in the U.S.A. Assuming that commercial time-sharing can capture 40% of the engineering and scientific market by 1972, it is obvious that only half of the projected billion dollars for the industry can be expected from this source. This represents a drop from the present 70% to 50%.

The missing half billion dollars must come from business-oriented, commercial usage of time-sharing systems, via industry-oriented packages. Clearly, many problems must be solved in order to make time-sharing work effectively for commercial data processors.

Among the requirements of the kind of data processing most applicable to time-sharing are (1) data file storage, manipulation, and retrieval from geographically dispersed locations and (2) a very high degree of reliability. These are difficult requirements for a time-sharing system to meet.

Data files for commercial time-sharing have two major uses. One is the somewhat temporary storage of data in a simple sequential fashion to facilitate the operation of a program. The file acts as an extension to the program's storage capacity in a "scratch file" sense. Most time-sharing systems offer this capability and the additional ability to preserve files from day to day and month to month on a permanent basis.

The second and ultimately more significant use of data files is as a data base where information can be accessed randomly and retrieved simultaneously by many remote users. This random accessibility is required to make many information retrieval applications feasible in terms of access time.

Common, simultaneous access to a file is required for those applications most attractive to time-sharing companies. Any application that encourages and thrives on many users inquiring into a single data base via one or more programs is attractive because of its multiplier effect on the company's investment in software development and file building. This type of application is not economically viable if only one person at a time has access to the file.

In many business applications, file reliability and integrity are more critical than they are in engineering applications. If a file is damaged because of a malfunction, the effect of backup recovery time or undetected errors is multiplied many times over and may result in some very expensive mistakes. Comprehensive file backup procedures are the very least of the safeguards that must be developed to protect the information retrieval user. Today, even experienced time-sharing companies *do not know* if they have sufficient file reliability to serve a large, information retrieval market. This is primarily because of the general lack of good time-sharing statistics that describe types of users, types of applications, file error rate, size of files, frequency of access, and success of backup. Since most time-sharing companies have not attempted to serve the business market place, they have not the foggiest notion as to whether or not their systems can support large files adequately.

the communications problem

Finally, after all is said about the need for reliable and capable information processing capabilities, the market place cannot be served unless the information can be carried to user terminals at many distant locations. In order to obtain the multiplier effect from programs servicing industry-oriented applications, access must be provided from more than just major cities. The most feasible way to provide such service now is via common carrier telephone lines. Newer firms which hope to serve several cities in the near future are not aware of the real difficulties associated with establishing a national network. They assume that the problems of installing a communications network are few because the vendor is always American Telephone and Telegraph and its associated companies. Even those few companies with a working network have only just begun to solve the problems involved in offering the kind of service required by industry. Varied and higher speed data transmission, as well as geographic expansion of communications availability, continue to pose great difficulties for time-sharing companies.

The following random sampling of some of the problems encountered in establishing a national network will illustrate the problem.

Time-sharing service vendors are currently experiencing longer delays in the delivery of both new equipment and standard equipment and facilities which are and have been the fundamental offerings of the carriers to their data communications customers. Delivery delays on leased voice grade lines, 103 Data Sets, 201 Data Sets, and related equipment have increased markedly in certain areas over

the past few months. For example, in one major midwestern city an additional 16 weeks has been added to the normal six-week delivery of these facilities, and Pacific Telephone and Telegraph is requiring an additional nine weeks above the normal delivery interval.

Inconsistencies between AT&T and local public utilities commissions are causing another set of problems in constructing a national network. The Model 37 Teletype, which has been released by AT&T and is now being reviewed by each individual telephone company, has certain optional features which are required for reasonable operation with time-sharing hardware and software. The burden of assuring that the proper equipment is supplied to the customer in each area serviced by a unique telephone company rests with the time-sharing vendor. Currently, the question of the Teletype Model 37 being supplied by the telephone companies is under consideration by state public utilities commissions or their equivalent; however, no decision-making dates have been released.

This situation is dangerous to the time-sharing vendor. Unless all the various utility commissions unanimously decide to accept or reject the device and each of the particular options necessary for use with the time-sharing systems, the time-sharing vendor will be unable to provide a uniform service across the country and, in fact, may not be able to utilize the device in some areas. The situation is further complicated by AT&T's offering of the device on interstate service (private lines and WATS), as well as by voluminous advertisements of the device by Teletype Corp. as the "Ideal Computer Terminal," which encourages customer demand for a product that may be unavailable. This is not the first time something of this sort has happened in an industry where technical advances sometimes precede accomplished facts by as much as three years.

Another situation similar to the above example is the "direct access arrangement" made possible by the various public utilities commissions in most states. Here again, nonuniform or untimely decisions by the various public utilities commissions may prevent the time-sharing vendor from offering certain services in parts of the United States.

the maintenance problem

Maintenance is also a major problem in numerous areas throughout the country. Often, the maintenance of data facilities is performed by personnel trained primarily in voice communication. This paucity of sufficiently trained data communications maintenance personnel, manifested in excessive repair times or in substandard repair, deals a body blow to the time-sharing industry which, of necessity, must be entirely dependent on the communications common carriers.

Ironically, most remote communications equipment or remote communications processors are capable of correctly diagnosing outages or failures of an attached telephone line (even to the satisfaction of the local telephone company) and of reporting the problem to the central computer, which brings the problem to the attention of the computer operator. The operator must then contact the telephone repair facility where the outage occurred, usually in an area serviced by another telephone company. The luckless operator is then faced with the interesting paradox that he may neither dial the remote service facilities (usually accessed by dialing 611) nor persuade a telephone company operator to connect him "long distance" with the remote telephone service facility. Because of this and other maintenance deficiencies, we do not possess a truly viable national telephone network.

But the problem is still worse. The quality of data communications lines is not consistently good. Serious problems are often found in switching centers when outdated switching equipment is utilized, or when pulse signaling techniques are used. Excessive noise and widely varying changes in gain on leased lines is also often found.

Delays and long delivery lead times are particularly harmful to the time-sharing vendor. The companies in this industry have a very high overhead—computers and trained personnel are expensive. The necessity of having equipment stand idle while waiting for the communications common carrier to install lines or provide equipment is intolerable.

However, once the equipment arrives, the troubles are only beginning. In an internal study of one time-sharing company's new installations in Pittsburgh, Los Angeles, and New York, during the first quarter of 1969, only 20% of the data sets were reported as having been installed correctly initially. An additional six to eight weeks were required before the faults were corrected by the telephone companies involved.

For these good reasons and others, the Computer Time-Sharing Service Section of ADAPSO recommended to the Federal Communications Commission earlier this year that it require the communications common carriers to publish meaningful specifications of transmission line quality and insure compliance with these specifications. This is absolutely necessary to upgrade and maintain the quality of the service.

Some of the many time-sharing companies have also been concerned with the limited number of transmission speeds offered by the common carriers. The *Carterfone* decision will certainly ameliorate this problem by permitting a vast variety of privately produced modems to be used when the "direct access arrangement" (and most importantly, the automatic answering version) becomes available.

This does not completely solve the problem of providing a variety of transmission speeds. In reality, by allowing direct access to the DDD network, communications customers may now make their own trade-off between transmission speed and error rate. The curve on which this trade-off may be made is fixed by the frequency bandwidth and signal-to-noise ratio characteristics of the DDD network, which were determined, rather arbitrarily, by the fact that the network was designed for voice transmission. This trade-off reaches a point of diminishing returns where it no longer pays to increase the transmission rate beyond approximately 10,000 bits per second. Interestingly enough, at least for the present, it is faster to send a reel of magnetic tape via commercial airlines than to use data transmission equipment on the switched (DDD) network. There is a definite need for a higher speed switched voice network in order to provide reliable service at a reasonable price.

Going in the opposite direction, there are a great number of customers who require very limited communications of less than 300 baud. However, under current tariffs they must purchase service with capabilities exceeding their requirements by perhaps a factor of 30. In dealing with this very question, the BEMA DePodwin Study concludes that "... the nature of demand is not such that decreasing costs can be realized through standardization."

new network needed

These basic limitations of today's switched voice network, coupled with substantial requirements for both lower speed and reliable intermediate speed switched service, substantiate the argument for a separate network designed specifically for data transmission, one which would not be limited by the influences and constraints of concomitant voice communication. One alternative would take the form of a Pulse Code Modulation network, such as the one being contemplated in Western Europe.

This need could also be fulfilled by a special class of microwave common carriers geared for the transmission of data. These common carriers could take advantage of technical advances such as lower priced microwave hardware

produced in competitive equipment markets and offer a wide range of quality, capacity, and price levels as well as more rapidly adapt to the varying needs of their customers.

The Computer Time-Sharing Section of ADAPSO (CTSS) has recommended to the Federal Communications Commission that the class of service proposed by Microwave Communication, Inc., in Docket No. 16509-16519 (and others which may become a possibility through technological improvements for long or local traffic) be approved by the commission so that effective data communications services can be expeditiously established. CTSS has also recommended that the commission encourage interconnection between that service and a switched telephone network.

The commission should also explore the possibilities of encouraging competition among the common carriers and the development of alternatives to the telephone network. In this way, the future needs of the data processing common carrier users in particular and all common carrier users in fact may best be served.

That such problems exist should not have a discouraging effect, for they present a lesser total problem for the industry than did the basic system software and hardware problems of the recent past. The point that should become clear is that the future growth of the time-sharing industry is dependent upon its entry into the commercial applications field. The rapidly changing technology of time-sharing must be influenced by the demands of this market place rather than by the design expertise of the industry innovators.

Obviously, this will not be a quick road to riches. Some will succeed, but it is safe to say the gold rush of '69 exists primarily in the eye of the beholder. ■

all things to all men

THE BRAVE NEW WORLD OF TIME-SHARING OPERATING SYSTEMS

by Arthur M. Rosenberg

Is the time-sharing "fad" over? Like all innovations, the use of computers has been passing through phases that are popularized, yet suspect. Nevertheless, there are signs that time-sharing is starting to get over its adolescent stage.

The acceptance of time-sharing as a routine way of life was reflected in a casual survey of some computer salesmen in the scientific market place. Prospects for general-purpose systems all want a time-sharing capability which will handle batch and interactive user needs. Less computers and more terminals are being exhibited at the computer conferences. Most programmer resumes indicate *some* kind of experience involving a time-sharing system. At a large aerospace company, the computer managers were not concerned whether or not to install a time-sharing system; they were more worried about who should get terminals. And, of course, the time-sharing service bureau business is not a mythical market invented for the benefit of Wall Street.

Has the state of the art satisfied the needs and goals of the world of computer users? Does everyone really understand what they are doing and talking about? Unfortunately, the answers are not affirmative in every case. Everyone is now talking enthusiastically about "time-sharing"; everyone is buying or building a computer to start a chain of service centers which will open up in 20 cities; everyone is developing proprietary applications software packages which will be offered on-line to the small businessman; etc., etc. Never-

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theless, when you talk about details of implementation, you will find obsolete values still being carried around like old injustices, as well as misconceptions, unresolved practical problems, and, above all, semantic confusion.

The computing industry and technology is evolving so rapidly that it is perfectly understandable why there is confusion. The manufacturers are guessing at what the customer really wants, while the customer installation is trying to learn what its users can effectively utilize. Symptomatic of the current situation are the philosophical debates still encountered among the technicians, customer skepticism on the availability, performance and reliability of time-sharing software, and the confusing semantics bandied about in advertisements and technical papers.

When questioning the credibility of a time-shared operating system's development status, many customers dwell upon the scheduling philosophy, rather than worry about the file management facility, which is a much more critical and expensive software implementation job. There are those who are still using just a Gibson Mix to evaluate the performance of a time-sharing system.

Some people equate time-sharing with program development and debugging; some refer to time-sharing as an application; special-purpose on-line systems involving data bases are sometimes referred to as "transaction" systems; all kinds of programs that are available on a Teletype are called "conversational"; there are beliefs that batch and on-line processing are incompatible operational modes that should not even be in the same system, commercial business data processing is incompatible with scientific processing, COBOL, by definition, is not an appropriate language for on-line users, etc., etc.

system performance vs. user service

A fundamental understanding of techniques for maximizing the use of system resources will help to differentiate over-all system performance from the quality of service offered to an individual user. Multiprogramming is used all over the place to improve system throughput, turnaround time, and response time. Time-slicing is used to equitably allocate cpu time to a number of users who want concurrent service. Swapping is employed to sequentially share the use of core memory for program execution. Obviously, these techniques are not services called for by the user; they are part of system management's responsibility, namely an efficient operating system. Performing these operations does not necessarily provide a user with good service, since the ultimate interface with the user is the program he actually employs.

The functional facilities for user service can be broken down as follows:

USER FACILITY	Depends Upon	FUNCTION
1. Remote access		Communications
2. On-line responsiveness, batch turnaround time		Scheduling, efficient allocation of resources
3. Conversational service		Design of user program

Note that having remote access to a computer system and giving time-slice scheduling will not inhibit a program that has been written for batch-mode processing from being used on-line. In fact, many "conversational" facilities have been trivially arrived at in this fashion. To differentiate such an "on-line" service from a "conversational" service requires the service program itself to be a little more sophisticated. Otherwise, remote batch operations and on-line execution could appear the same, but for the speed of transmission and turnaround times.

modern operating systems

A modern operating system ("third generation"?) is designed to maximize the use of system resources through multiprogramming techniques, simply because individual jobs cannot effectively use all of the available power and capabilities by themselves. Such systems also have to assist in overcoming the wasted time incurred because of human intervention; this applies to batch processing as well as conversational use. It would be foolish to have an efficient system waiting for an operator (who may be all thumbs) as the slowest piece of I/O gear. Add remote accessibility and recognition of various priority schemes, and you start to have a flexible system which can be tailored more closely to individual operational environments.

An operating or monitor system is an extension of the hardware and, as such, must be prepared to handle a variety of peripheral input/output devices, both local and remote. The proliferation of various kinds of input/output gear, e.g., graphical output devices, optical character readers, remote printers, conversational terminals, etc., is putting the pressure on standard operating systems to be more adaptive.

The scheduling logic of a modern operating system must be reasonably flexible to allow an installation to run its business as dynamically as possible. This includes batch job scheduling as well as conversational service. One can conceive of scheduling algorithms that optimize system efficiency vs. algorithms that satisfy specific operational needs. Clearly, each installation must resolve any conflicts between the two in some practical manner, rather than be forced into using some arbitrary logic designed for a "well-behaved" but unrealistic user world.

Finally, a modern operating system must provide functional services, not only directly to user programs but also to the users themselves. In the on-line environment, this is an extension of what has been available up to now only to the central site computer operator and, in a very restricted form, to the user via job control cards. Services to the user include system entry, program loading (including library searching), status information, checkpointing, accounting data, I/O device assignment, and inter-terminal communications facilities. Explicit services to the user's program include: I/O handling; data file manipulation, access and retrieval; allocation of hardware resources (core memory, peripheral devices, auxiliary storage, etc.); clock-watching service; checkpointing; overlay; I/O device assignment; and calls for other programs. Other functions of the operating system are typically overhead activities for maximizing throughput (e.g., multiprogramming, scheduling) and for system management and control. The latter has become a much more critical function for today's dynamic operational needs.

Perhaps the most important aspect of a modern operating system is not that it does everything for everyone, but rather that it is flexible enough to adjust to varying needs and that it does not get in the way of an installation's special requirements.

who is the user?

There is no magic to a time-sharing system—or rather, a resource-sharing system. An efficient system will do the best it can, but its performance will depend upon the load imposed upon it and the kind of service expected. These are highly variable and dynamic, making the problem of performance estimation very difficult. Assuming the system configuration is reasonably adequate, with no unnecessary bottlenecks, the critical factor is determining the characteris-

tics of the "user." This is an area where there is a tremendous amount of guesswork and insufficient experience in classifying user needs.

From a system performance point of view, we are concerned with the user in terms of resources used and frequency of use. We need to know if he is I/O-bound or compute-bound; is his process and/or data big; does he just have a private program or is he sharing a public, re-entrant subsystem, etc. These kinds of answers are highly dependent on the types of activity the users are engaged in.

Another significant reason for understanding more about the user is to recognize what kinds of services must be provided by the operating system to user programs. One can imagine two kinds of people who will be employing an operating system; one develops service programs and the other uses such programs.

Time-shared accessibility has led to immediate thoughts of users, who are not programmers, able to directly exploit a powerful computer. Not being programmers, it was implied that the users would not be as demanding and clever as programmers; they would be "casual" users. Certainly, they would not be writing strange programs and debugging them. In that case, such users would not require sophisticated operating system services. The "casual" user will not personally require (let alone understand) all the operating system services for his processing. However, he will be *using* a program that may require these services for maximum effectiveness or efficiency. A modern operating system that is prepared to handle a spectrum of activities and demands will provide a comprehensive set of facilities to user programs, no matter who develops (and maintains) the programs or who uses them.

what is a conversational service?

Nothing has been more abused than terms like "conversational," "on-line," and "interactive." Whether applied to compilers or applications programs, there has been little consistency in qualifying the fundamental elements of such service. Rather than rely on using the programmer's tools (e.g., compilers, debugging packages) as examples to illustrate the basic elements of interactive processing, let me describe the fundamental characteristics inherent in such service.

First of all, conversational programs must be prepared to use terminal input and output facilities for carrying on a dialogue with users. Next, user programs, whether public subsystems or private programs, will always require some form of input from the user, either command functions or data. This is an obvious source of error because of lack of experience, typographical mistakes, or transmission errors. Consequently, it is most appropriate to provide assistance to the user in guiding proper input, reporting detectable errors, and enabling corrections. This facility is reflected in conversational programming languages by immediate syntax checking.

There is one problem with providing such input help to a user. Depending upon the expertise of the user, it may or may not be appreciated. If a user is very adept, excessive verbosity on the part of the program will be considered a severe annoyance and will tend to slow him down. If the user is a novice, or highly subject to making errors, it is appropriate to insure proper input. This is particularly true for input entry into a data base, where "garbage protection" techniques should be employed to prevent bad data from ever contaminating the data base. By recognizing that a user may optionally need comprehensive input help, a conversational process can satisfy the real-world spectrum of users.

Error processing is one of the key distinctions of a conversational process in that those errors or problems occurring during execution which require some decision-making or correction can be resolved because the user is available at his terminal. Batch-oriented programs usually assume that a serious error will cause a job abort because the user is not around.

Finally, a conversational process permits the user to change his mind by stopping execution, starting over again, and even backing up the process to a previous logical breakpoint. Such flexibility supports the dynamic on-line user environment, rather than the attitude of "speak now or forever hold your peace."

It matters little to the user how efficiently such conversational flexibility is achieved, as long as it is reasonably responsive and easy to use. From the system performance point of view, there will always be a serious concern for the amount of core memory required and execution speed. This conflict of interests will always be present and carries certain implications to program generators, i.e., compilers. Efficient use of conversational or even simple, on-line processes, means that they should be re-entrant (pure procedure) to reduce swapping overhead and for multiple, concurrent use. Thus, in order to generate efficient conversational applications programs, the compilers employed should be "on-line compatible." That is, they should generate re-entrant object programs and allow for terminal input/output. Needless to say, all compilers are presently not quite so capable.

batch vs. conversational service

A time-shared operating system can and should be able to accommodate batch mode as well as conversational operations. This is functionally a scheduling responsibility that can be dynamically adjusted for an installation's varying operational needs. It is important to understand why this flexibility is a real-world requirement.

The two major concerns of system capability are to provide system efficiency and system effectiveness. The former can be provided by an operating system whenever it is given the opportunity to do so. Effectiveness is more a function of availability of facilities which the user, at his discretion, properly employs. It is a highly subjective use of system resources, which will vary considerably depending upon the user, the nature of his problem, and his time schedule.

The batch mode of operations is aimed at maximizing system throughput and will always be used when the nature of the job is production-oriented. That is, when the input can be firmly defined beforehand, the process itself needs no further interaction from the user, and does not have to be performed instantly.

The conversational mode of operation is applicable when there are unknowns which cannot be accurately assessed except by trial and error, when inputs to a process are highly subject to errors which will require interaction for detection and/or correction, or when the computer service is required immediately. The determination of service immediacy is clearly a subjective decision, but should be made on a rational cost/effectiveness basis.

What does this all mean? It indicates that some of the elements in making the decision to perform a task on-line or in the batch mode rests with the individual. If a long computation follows an interactive period, and it is five o'clock, the user should be allowed to go home and have the process executed overnight. Conversely, even a simple production-type job, which has no conversational function, should be executed on-line if the user needs the results immediately. This latitude in choice of service must be constrained by installation management: first, to conserve computing re-

sources as much as possible; second, to encourage proper selection of services. Such constraints imply proper management control both inside the system and with the users. It does not mean that only batch or only on-line service should be available.

To support this facility of choice, compatibility for dual execution must be provided. Service programs can be executable in either mode, if conversational output can be shunted to a user file for later recovery, and an unexpected request for user input (error situation) will cause the job to be checkpointed for subsequent on-line interaction. It would not hurt to have informational feedback on job status reported in some convenient fashion back to the user.

general vs. special-purpose systems

It has been difficult to classify the various time-shared operating systems that have been developed, primarily because of the differences in services provided to the users. There are many commonalities as well as differences in goals. However, it is more practical to highlight some key differences of operating systems structure, constraints, or type of use, rather than use fuzzy nomenclature.

ON-LINE USER CAPABILITY	REQUIREMENTS OF OPERATING SYSTEM, MACHINE
Machine language programming	Time-sliced scheduling, object program loader and debugger, hardware memory protection and operation protection (master, slave modes)
Higher-level programming languages	Time-sliced scheduling
Compiler	Object program loader (optional), hardware memory protection
Interpreter	
Specialized service	Transaction scheduling (may also use time-slicing)

All of the above types of systems profitably employ a wide range of standard file management, I/O service, and batch mode scheduling facilities common to operating systems in general.

Machine-language programming capability enables software development and use of programs of any type. Systems with this facility can be called general-purpose. Because users can execute any kind of program, maximum protection is required to protect the system from the unknown.

Where only higher-order programming languages are available, the need for hardware protection diminishes since the code generators and the program loaders could inhibit dangerous instructions or illegal address references. However, addresses computed during execution remain a source of trouble for proper memory protection. (This can impact operation protection by allowing execution of a data word which is illegal.) Interpreters can always watch and catch such problems. Because execution time requirements are unknown when a user supplies his own program, time-slicing of the cpu is necessary for equitable scheduling.

Special service systems can be delineated on the basis of a user employing a canned process; he merely supplies inputs consisting of requests for execution of the service and data. Since the process is a known, (hopefully) checked-out program, scheduling and resource allocations can be more precise. Very often, each request can be organized by type and executed to completion (transaction scheduling). Memory protection would not be required because the program is checked out. Finally, the monitor interface and bookkeeping for individual users of the special service do not have to be as great as for a user providing his own program. With more precise organization, a system can become much more efficient.

If we can tailor systems and gain economies in development effort, system simplicity, and configuration costs, would we want to develop many specialized service systems rather than "tune" a general-purpose system? There are a number of practical reasons for choosing the latter course, providing that available general-purpose systems are properly designed for adjustability, comprehensiveness, and flexibility.

1. Development and particularly checkout of an operating system is an expensive and time-consuming task. Most users of an operating system want to and should concentrate on solving their application problems. The operating system should be a stable and effective extension of the hardware.
2. Every operating system should be capable of being self-supporting for maintenance purposes. Even in a special service environment, on-going development of the user service is always necessary and there is no real justification to shift systems to accommodate this need.
3. The needs of most service programs are not so different that major economies cannot be derived from short-cutting certain types of operating system services. Many of these savings will only exist in software development costs, not in actual system usage. For example, if overlay loader service is not required, it will not be around to interfere with performance; if certain peripheral I/O devices are not going to be employed, the handlers can be lifted from the system.

Perhaps the biggest complaint about using an existing operating system is not that it does not do all the right things (which happens often enough), but rather that it is restrictive and gets in the way, and was inefficiently done. The efficiency of the software can be improved and, of course, every programmer thinks he can do it better. Doing it differently does not necessarily mean doing it better.

the trade-offs: cpu time, core, i/o

There is no magic to computers; it is amazing how often professionals tend to get caught up in cleverness to pursue old problems. Everyone is concerned with minimizing the cost of computing service but we sometimes create system bottlenecks that will negate expected benefits. We cannot short-change an operating system by skimping on essential hardware facilities. Like a bug in a program, it will show up sooner or later.

In an effort to maximize the use of the cpu, more efficient use of core memory has been sought to enable multiprogramming at the system level. More efficient use of memory includes hardware relocation and fragmentation, the use of re-entrant (pure procedure) programs, and selective swapping. Given a certain amount of core memory, there is a desirable goal of having enough user processes resident that will drive both the cpu and the I/O as much as possible in productive work (not overhead).

One of the approaches to minimizing the amount of core memory and, at the same time maximize the number of user processes sharing that core, involves keeping only a part of a user's program and/or data in core. By trapping references to parts of the program of data that are not in core memory, the operating system can hustle to bring in the required pieces as needed. This approach has been called "demand paging" and has inspired many violent philosophical debates, analytic studies, and, of course, technical papers for conferences.

The trade-off to a user, in the case of demand paging, is less core memory in exchange for more I/O and elapsed

time. It also is a service rendered "automatically" by the operating system, since the user does not have to organize overlay structures in physical core memory. To the operating system, the trade-off is a little more bookkeeping, a little more guessing, and more I/O activity to increase the sharing of core memory, thereby handling more users.

The user will want such service, if indeed his core memory needs exceed available core space. He may even accept delays in response time and additional charges if he can execute his process somehow rather than not be able to execute at all. However, there will be strong objections from the user if his process is "well-behaved" and he is unnecessarily forced to receive a worst-case treatment. In effect, the "user's machine" could arbitrarily be made too small to satisfy his needs and he will be forced into an uncomfortable and expensive situation. It is like a business venture that is undercapitalized; it gets more expensive to run and will not perform well.

The operating system has its problems too. One of the limiting factors in load-handling a large number of users is swapping I/O. The idle time generated because of swapping delays can be recovered by having enough space in core for executable users. Hopefully, in a balanced system, there is sufficient cpu demand from resident users to cover I/O activities. However, if the resident users all need I/O service, whether or not it is I/O for "overlay" service, then the cpu goes idle. This can happen naturally, or it can be forced artificially by undercapitalizing user's core memory availability. This can and will happen if the operating system attempts to second-guess how much core space a process really needs and particularly what pages of a user's process or data it can replace to make room for new pages required. Data-dependent execution is highly variable and cannot be easily anticipated; in most cases, a "large" process will be data rather than procedure. Generating additional I/O pressure in a system which will already be fundamentally I/O-bound is not a solution to the performance problem.

Demand-paging must be considered as a service to individual users, like overlay service, and not system overhead. It must be charged to the individual user and not impact other "well-behaved" users in the system. It should not be a service forced on the user by undercapitalizing the user's available core memory space. It is not a source of system efficiency as long as an operating system is swap-bound and there is guesswork rather than organization involved in what parts of a program or data can be replaced.

system reliability

Putting large numbers of users on-line has made system reliability very critical. Reliability is a key requirement for system security. Terms such as "fail-soft" and "graceful degradation" have been used to describe systems that do not suddenly crash into oblivion but can limp along slowly. In actuality, something else is required to offset the lack of 100% reliability; that is, fast recovery to provide maximum system availability. If the restarted system is not as potent as before the crash, it will be tolerated if the user load is reduced proportionately.

More critical than system availability, however, is the need for preservation of permanent files. A user might get upset if a crash causes him to lose the results of his current session of an hour or two. But to lose data generated over the last year is something else again. Rollback procedures to save such data off-line must be provided, either automatically and selectively by the system (which can be expensive) or by explicit user request.

The problem of hardware reliability is shaking up the manufacturers because their past maintenance procedures have been shown to be inadequate. Integrating maintenance routines with the operational system appears to be a rational way of coping with the problem, along with the operating system itself cooperating in detecting and reporting hardware problems. Redundancy in system configurations (e.g., multi-processors, switchable modules) is appropriate for back-up, but curing the source of problems is even more important to on-line stability.

systems management

It used to be fairly simple to manage a computer installation. Job priorities could be assigned and controlled outside of the system. The computer operator controlled the machine and tended the peripheral input/output devices. Now the systems are too fast and user demand is too great to tolerate manual *interference*. Furthermore, the capability of a modern operating system to maximize system resources for concurrent usage requires more consideration for proper planning and management to achieve effective and efficient system balance.

The responsibility for proper system planning and operational management cannot be delegated to programmers nor left to the discretion of a computer operator. All of the system resources, which can be made available to users, must be given administrative allocation limits that satisfy estimated needs and/or insure a proper balance of service throughput. Service to all users must be protected from accidental or purposeful pre-emption of critical resources by one user. These resource variables are the controls with which the installation management can properly assume its responsibility for effective system performance in an environment that is highly dynamic, demanding, and uncertain. Planning for a system involves a lot of guesswork that may be proven or disproven after operational experience has been gained. This will be derived from operational statistics supplied by the operating system itself, since nothing else can be more accurate. On-line user activity is hard enough to record, let alone anticipate.

With empirical statistics on hand, system management can then make resource allocation adjustments. Such adjustments are not fixed forever, but may have to be scheduled to satisfy particular operational patterns, or temporarily modified for unusual user requirements. The resource control parameters must be available for dynamic adjustment even while the system is running; we have entered the era of on-line system management of on-line systems. An efficient system is not necessarily an effective system; an effective system is a manageable one.

t-s service bureaus vs. in-house

With the ever-increasing number of commercial time-sharing service bureaus, what is going to happen to in-house systems? Installation managers are already reporting difficulties in keeping their users from going to outside terminal services.

Fundamentally, users want computer-based services, not really the machines. But as the amount of in-house usage goes up, there will be a practical trade-off point where it is more economical to have a private, dedicated, in-house system. This, however, may be supplied and maintained by a service bureau for exclusive use of an organization at wholesale rates, thus relieving the customer of the problems of staffing and facilities. Of course, organizations with a heavy investment in people, equipment, and programs will not give up their internal operations for a long time. In cases where hands-on research, critical real-time operations (e.g., process control), or where sensitive data and proprie-

tary processing are employed, an in-house system will be retained.

Organizations with their own in-house systems will still be candidates for outside services for several reasons. There is the traditional overflow problem, where more computer time is required than can be handled in-house. The magnitude of occasional problems will require more system capacity than available from the in-house system. Finally there will be special, proprietary services, programs or data bases, which would be too expensive or impossible for an organization to develop and support in-house. Expertise in special applications is expensive, hard to find, and will take time to fully exploit. The service bureau, which has such a special service, is readily available to the user, without any long-range planning and staffing. There is, however, a major problem of compatibility cropping up with service bureaus. In an attempt to outdo competitors' as well as manufacturers' software, they are making improvements and changes to accepted software, particularly languages. On the one hand, they are trying to attract customers by offering a superset of the competition's software, but then try to lock customers into their system by incompatibility. It sounds like a practical strategy, but it will restrict freedom of choice and cause difficulties to the poor users who will have to evaluate apples and oranges and relearn operational "languages." This problem will manifest itself primarily where there is user investment in programs and data files.

We can look for three basic kinds of services which will be available from time-shared service bureaus:

1. Computational service
2. Data management service
3. Information service

Computational service will let you write and execute your own programs or use proprietary programs. Data management service will let you store, retrieve and provide data reduction and manipulation programs to operate on your data. Information service will offer proprietary data bases for customer access. Service centers will offer one or more of these kinds of service.

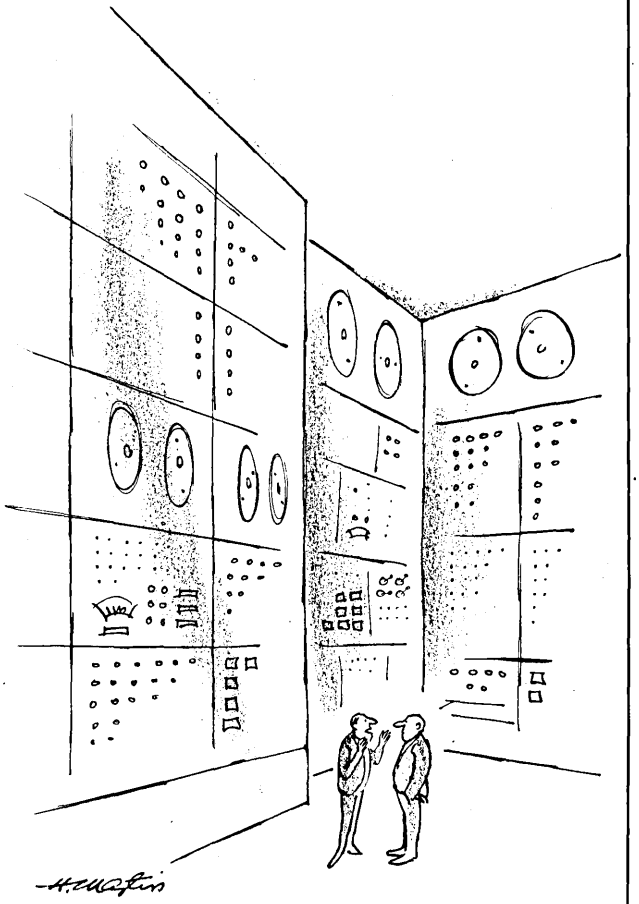
A major source of system efficiency is specialization. If only one service process is offered, then the operational environment is highly controllable and resources can be very tightly allocated. Performance can be more accurately predicted; service costs can be more easily distributed. For the service bureau operation which is anxious to capture many application market areas, this means one thing. They will tend to organize specialized "hardware subsystems" within a multiprocessing network. To the user entering the network, there is little difference which machine is doing the actual processing, but the hardware subsystem doing a particular process will be configured for such service, i.e., have an efficiently balanced set of hardware facilities.

What about data storage? If we consider the critical demand for maximizing the reliability of permanent data files, then the notion of a file storage system, which will be the custodian of data for various kinds of processing, appears interesting.

The commercial time-sharing service bureaus have formed a rapidly developing class of customers for computer systems who want a ready-to-go operating system upon which they can build applications packages. Their needs are essentially no different than for an in-house system, but they do have to make a profit and they must keep the customers happier or lose them. For simple program development or scientific problem solving, a budding service bureau can employ a standard time-shared operating system available from several manufacturers. However, that kind of business is very competitive because it is easy. In the long run, it will be marketing, quality of services, and cost of the services that will make service bureaus successful.

Drastic changes in how computers will be employed and deployed will not happen overnight, mainly because of the heavy investment in the past and resistance to innovation. However, it should be clear that computer service is the major commodity that will be exploited more and more as time goes on. Homeowners requiring electrical appliances are not forced to obtain their own power plants; in the same vein, users requiring various computer-based services will normally not undertake the responsibility for having their own computer plant. As a matter of fact, neither will the specialists or consultants who wish to offer their expertise to their clients. This is not to say that in-house computers will disappear. Critical real-time processing, large number smashing requirements, classified secure systems, research organizations, universities, large industrial companies, etc., will still have private, in-house systems, probably supplemented by various outside services. Smaller, "terminal" computers will be available at a customer installation to do some preprocessing and communications interfacing to outside systems as well as offer internal accounting, scheduling, or inter-terminal services for the local terminal users. Graphic processing, bulk input and output for remote batch processing, as well as management of local data files will also be functionally handled by these terminal computers. From the point of view of a central computer facility, the remote terminals will be "smarter" and more flexible. This approach is part of the "network" concept of distributed processing.

From the software point of view, a word to the wise should be sufficient. We have always been concerned about machine dependency. Let us now be concerned with operating system dependency. ■



"You'll be all right as long as you remember it's just another tool."

SOME LEGAL ASPECTS OF COMMERCIAL REMOTE ACCESS COMPUTER SERVICES

by Robert P. Bigelow

Commercial time-sharing—remote access immediate response, the computer utility—it has several names—seems to be developing in several forms.

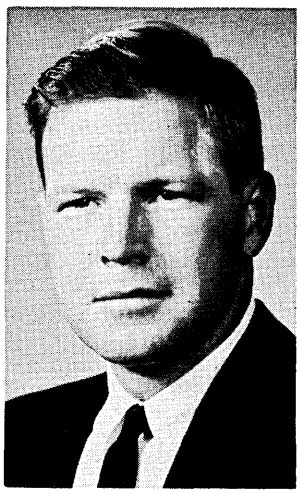
The term "computer utility" is not popular with certain people, primarily because it carries overtones of government regulation. Commercial time-sharing and remote access immediate response are pretty long. At the risk of adding more alphabet soup, I am going to include the entire spectrum of commercialized multi-access immediate response operations within the term remote access service (RAS) and, when the distinction is useful, remote access service—computational (RASC) and remote access service—informational (RASI). The people involved include the customer, whom I call the user, and the proprietor of the service, whom I call the operator.

One provides conversational computing power for the user, who designs his own application programs, establishes his own files, and manipulates the data when and how he wishes. A flowering variant of this form is the IBM-SBC CALL/360 system; it has computational ability, storage capability, and programs are on three levels: originated and dedicated by IBM; originated by users and donated to the system; and originated by individual users who determine who controls use of the programs.

At the other end of a spectrum from the purely conversational system is what some have called the "information utility." The essence of this system is that the user cannot alter the data within the files; this is a function reserved to the system's operator. Examples of this type include the stock quotation system and the real estate listing service.[1]

The legal problems which may arise in the establishment and operation of a remote access service are not necessarily the same for the user as they are for the supplier. Nor are the problems in a RASC system necessarily the same as those in RASI. While the user's legal problems do not usually depend on whether the service is computation or information oriented, the difference may be important to the user in some applications.

For example, as will be noted below, there are antitrust implications in the information service that are not present



Mr. Bigelow practices law in Boston and is a member of the American Bar Association's Committee on Law and Technology, the Boston Bar Association's Committee on Automation, the American Management Association, ACM, and DPMA. This article is based, in part, on a paper given at an AMA meeting.

1 *Computerworld*, April 23, 1969, p. 17

in the computational type. Before you enter any contract with a remote access service, or before you establish one, you should thoroughly discuss your plans with your lawyer to be sure that your plan of action does not expose you to risks which you have not foreseen. And before considering some of the legal problems of commercial time-sharing, the user should also discuss with his attorney some of the legal problems which he faces in using any computer. These include whether you need computing power at all, whether there are labor problems involved, and whether you might be liable for not using a computer.[2]

Not only corporations but individuals should examine this last point. Suppose a consulting engineer has been asked to help design a bridge. Suppose also that there is a widely available mathematical model for determining stresses on the steel work at various points during construction, and that the model could be run on a time-shared system for $150. But the engineer omits such a test, and the bridge collapses during construction because of design deficiencies which would have been shown by the model. A court could find the engineer negligent for not having run the test.

All decisions on using or not using a computer, and what kind of computing power to use, should be reviewed periodically. The single computer of the first and second generation has been succeeded in many ways by the remote access system. But this system has economic limits because of high communications costs. Now much attention is being given to putting computing power in the terminal. Continuing review of the assumptions which lead a user to prefer one form of computing power to another is a business necessity.

contracts

Let us turn to some of the contract considerations which should be discussed with your counsel, whether you are user or operator of a remote access service. First, who owns the program? The simple answer is the one who pays to develop it. But this is not always the case. If the service does the programming—and charges the user a fee—the latter should realize he may have to pay for reprogramming if he terminates the contract. And *every* programming contract (even if not for time-sharing) should require the programmer to document fully. How much money has been wasted because poor documentation has required reinvention of the wheel when a program is modified?

The legal protection of proprietary rights in software is a topic where the ground rules seem to change monthly.[3] The relationships in a remote access service where a user builds on the work of other users, perhaps amending their programs substantially, could give rise to complex ownership problems, unless the developers have by their actions indicated a willingness to contribute the program to the public.

How about the data which is stored in memory? There is currently serious discussion going on between the publishers and others involved in similar endeavors as to the copyright interests in material stored on computers. Whether the input of copyrighted material to a computer or its output is an infringement or is fair use is currently under debate. Various groups have taken different viewpoints, dependent primarily upon their economic orientation.

When the service provides information, the user must protect himself against possible claims of copyright infringement and—if the information is personal, such as credit records—against claims of defamation.

The obvious solution to such problems is making sure that the contracts between the remote access service and the user clearly cover these questions.

Before a remote access service commits itself to provide a particular kind of service, it had better be sure it can perform. The courts are now beginning to award verdicts, some of them substantial, for failure to deliver on promises of computer service. No reported case has yet involved time-sharing; but at least three major companies have been held liable for failure to deliver the in-house or service bureau performance they thought they could.

Another point which both the operator and the user should be sure to cover is the continuous availability of service and proper replacement equipment which will automatically go on line if there is a breakdown. If the system, be it RASC or RASI, is available to the professional man such as a consulting engineer or a scientist for his own work, he may well be working with it at any hour of day or night. Therefore, the operator can not plan on closing down the entire operation for maintenance at any particular time. This almost necessitates the use of modular equipment, so that portions of the processor can be taken off line for maintenance without impairing the viability of the entire system. The user must also be sure that storage facilities are such that none of his data could be lost during maintenance.

And when program or data are updated as part of the system service, the service should be sure not to promise more than it can provide, and the user should be sure that the contract spells out the operator's commitment and its liability for failure to perform.[4]

implied warranty

We must also consider the law of warranty. For example, let us go back to the bridge engineer we talked about before. Assume he is connected to a remote access service—informational, which provides engineering data. The service at the time of the contract certainly had reason to know the particular purpose for which the information was required and also knew that the user was relying on the service's skill in furnishing this information accurately. There might be an implied warranty that the information was such that the engineer could rely on it. If the engineer, in reliance on inaccurate data, made erroneous calculations, the service might be held liable.

This particular problem could arise in any situation where a computer is used for information retrieval, for example, stock quotations, credit information, or medical research. Therefore, the operator must be sure that its contracts expressly exclude any warranty. Similarly, if the programming is done by the service for the user and there is any possibility that the program becomes the property of the user, counsel for the service should make sure that the contract therefor negates any warranty.

Another area where counsel must be consulted before any system is devised is ensuring the creation of the necessary records for evidentiary and auditing purposes. The operator of every service which will keep business records should discuss these points with his lawyer. And the operator's salesmen should be able to tell potential customers how the service meets these needs.

It has been held that computer-produced evidence is admissible under the Uniform Business Records as Evidence Act. In a case decided in Nebraska the plaintiff, a liability insurer of the defendant trucker, received reports of all losses from the trucker and billed the premium retrospectively. The premium was not paid and the insurer sued for the unpaid premium. The insurer kept its records on a computer and at the trial introduced a cumulative printout of losses and of premium due prepared from the tape records. It was held that the printout was admissible, the court saying:

"The machine . . . performs the bookkeeping task in

2 See Bigelow, "Counseling the Computer User," 52 Amer. Bar Ass'n. Journal, 461 (May, 1966)

3 See Hirsch, "CCPA Reconsiders Patent Decision," *Datamation*, April, 1969, p. 174; Bigelow, "Legal Aspects of Proprietary Software," *Datamation*, Oct., 1968, p.7

4 See Allen, "Computer Time Sharing," Management Accounting, Jan., 1969, p.36

the usual course of business. Instead of on paper, the information and calculations are stored on tape and may be retrieved and printed at any time. The taped record furnished a cumulative record based on information flowing into the office of the . . . company day by day and fed into the machine in response to the systematic procedure for processing each insured's account."[5]

Well, this is very nice when we have tape records including the father, son and grandfather tapes. But in a disc and drum system where there is no tape record it may be necessary to obtain printouts every so often just to have the evidence to collect your debts.

And the Internal Revenue Service has not been very accommodating, so far, in helping computerize business records. Revenue Procedure 64-12 lays down some strict rules which require retention of hard copy for much that is in the computer. One major company failed to investigate IRS requirements and had to redesign a major computer system completely—after it went on line—in order to comply.

security

When we turn to file security in commercial systems, many different types of problems must be considered. Douglas Parkhill has noted "If a time-shared system is to function effectively, then it is necessary to incorporate foolproof measures for the protection of certain memory areas. These areas include (1) the private files of the various users, (2) the area of memory occupied by another user's program, (3) the system executive program, and (4) the public files."[6] Before anyone will trust their information to a remote access service, the service must be able to guarantee to each user that the information which he stores within the system will be untouched by anyone else without permission. Furthermore, there must be levels of access to this information. For example, in an invoice-inventory record system, clerks may enter invoices but only specified people may change prices. Security is likewise required to insure that low-level people or even reasonably high-level people do not change the program of another, at least without the latter's consent. And complete security is required to prevent accidental interference between data and programs of one user with another. The executive program of the service is, of course, the most sacrosanct of all—access to this by any user could be disastrous.

If the user ever wants to use his records to be admitted as evidence in court or to be considered accurate by the tax authorities, he must be able to show that there has been no unauthorized access to, and no jimmying with, the programs he used or the data he stored.

In a RASI system, the public files are, obviously, the most valuable asset. While all users will have a "read only" capability on these files, access for updating purposes must be severely limited—as a practical matter it must be available only to the operator itself. Further, since there is not unlimited storage there must be a decisional process whereby data to be included in these files is selected from the data offered for addition. Parkhill expressed it well:

"This decision mechanism must also include quality control, for the usefulness and public acceptance of the public files will be to a large extent dependent upon the corrections and quality of their contents. Consequently, the garbage—the useless and the patently false—must be excluded. Quality control is also required for controlling file modification and deletion. For example, if one customer contributes a valuable new routine, one cannot then permit another customer to modify it indiscriminately. On the other hand, as better routines are developed, or new data is obtained, it is essential that the system be capable of absorbing the new material even if this means that the older files must be destroyed or at least moved to less accessible archives."[7]

The user must determine whether the application of the criteria applied by the service will affect adversely the validity of the information he is getting. Perhaps some item of information, e.g., the tensile strength of a special kind of steel, may be deleted from the file without a record being made of such deletion. If a user relied on that information, after deletion, and had to defend his reliance in court, his proof of justifiable reliance might be difficult.

Probably the most likely invasion of file security is an accidental intermix either of data or of programs. For example, if the service provides both public files and private files, and poor programming permits the private files to get into the public sector, inaccurate information could result. While the usefulness of private information to another user is probably limited, it could prove embarrassing for the service, and the person whose data was disclosed might well have a law suit against the service.

Another problem for a remote access service arises when it undertakes to provide a program which will achieve certain results and the program doesn't, or where it undertakes to provide data and fails to keep the data up to date.

Suppose an engineer uses a RASI system to design a dam. Let us say that he plans to construct the dam with a new type of concrete and that the manufacturer had provided technical data on strength of the concrete to the service. Subsequent tests disclose that the data was inaccurate and that the concrete was not as strong as had been originally thought. The manufacturer, commendably and promptly, immediately informed the service of these findings, but the service had failed to update its file. Therefore, the information available to the user still said that the concrete was much stronger than it really was. The engineer uses this data to design his dam and, obviously, doesn't put enough concrete in the dam. The dam bursts. It would seem that the service should bear the loss.[8]

It will be interesting to see what standard of care is applied to a RASI system in such a case. Obviously, it would be liable for its own negligence, but would the standard be higher? Could a legal rule like that which imposes almost absolute liability on those who make unprivileged defamatory statements come into play? How about the expression now in use of the "computer utility"? There is a legal doctrine that some public utilities, such as the railroads, are practically insurers of the safety of their customers. The communications companies, such as Western Union, have limited their liability by their contracts with the telegraph sender. They have also been helped by legislation. Before a remote access service—informational goes on line, its management should be sure to discuss with counsel its liability for misinformation.

The intentional civil wrong—the tort—must also be considered when we discuss remote access services. While there has been considerable hoorah in the public press on the problems of invasion of privacy, particularly with respect to a federal data bank (and I do not mean to minimize the serious problems which could arise in such a federal system), most remote access services in the near future, with the exception of credit bureau types, will probably not deal with too much personal information. However, there is no question that intentional illegitimate access to the system is a problem. Project MAC has found their password system "to be a highly important requirement: it is necessary to

5 Transport Indemnity Co. v Seitz, 178 Neb. 253, 132 NW 2d 871 (1965)
6 Parkhill, *The Challenge of the Computer Utility*, Addison Wesley, 1966, p.101
7 *ibid*, p.102
8 Compare Restatement, Torts, Section 402A

guard the privacy of each personal set of files and protect the information and programs from accidental or malicious alteration by someone else. (Experience has shown that some people are unable to resist the temptation to commit mischievous vandalism of that kind.)"[9]

watch for time thieves

The operator must guard against time stealing. The executive routine customarily keeps track of the time taken by each user; these records are the basis of many of the charges in the commercial system, and budget allocations in a non-commercial system. When we consider the high cost of computer equipment and time, it is not unlikely that some user may corrupt some programmer to arrange a by-pass of the accounting area for that particular user. Contractual arrangements with users should not foreclose the operator from collecting years later for unpaid time—stolen or accidentally not charged for, and the user must try to make sure the service timers are accurate.[10]

Security methods will also be necessary to protect against intentional copying of data files or the stealing of programs which have not been given to the public. To some degree these may be protected under the rules of copyright or patent. A third approach suggested by some writers has been to rely on the law of trade secrets with the right to enjoin violations thereof.[11] It may be difficult in a remote access service, but consideration should be given to including in the executive program a means of accounting for each time proprietary information such as a program is read by another user. Such an accounting method is also useful for determining royalties when the author has permitted inclusion of copyrighted material in the public files.[12]

Turning to the problem of personal privacy and its invasion by unauthorized personnel—the problem which has created so much discussion in the press—we find two conflicting rules. One is the businessman's right to know about the people with whom he is doing business. The other is the right of the individual to be secure in his own person. The first stems from commercial necessity. The latter looks to such old maxims as "Every man's home is his castle" and to the thoughts expressed in the Bill of Rights.

The computerization of the information file of Insurance Company A, Bank B, and Credit Bureau C, is no problem. This has been done for years. But when A, B, and C get together and add in police records, court records, and hospital records, and then accumulate this information in one file, by individual names, we have passed the limits of commercial necessity. It may be convenient to have all this information filed, person by person, and available to those who can show a business reason for it; but business has other ways to get the same information and other ways to protect itself. For example, it would be very helpful for a life insurance company to be able automatically to examine the personal physician's record on each of its applicants. It might well improve the underwriting and lower the ratio of losses to premiums. But a person who is not in good health may not live out the two years from the date the policy is issued to the time when the insurance company's right to rescind the policy for misrepresentation in the application expires.

Currently, credit files, health files, and similar types of information are regarded as confidential information by the organizations which maintain them. Recent guidelines by the Associated Credit Bureaus Inc. permit the individual access to his records, on certain conditions including execution of a waiver of his right to sue for inaccuracies.[13] But these guidelines have limited application. We may well expect legislation permitting an individual to examine some of the files which include information about him, and to require the organization maintaining the file to correct inaccuracies.

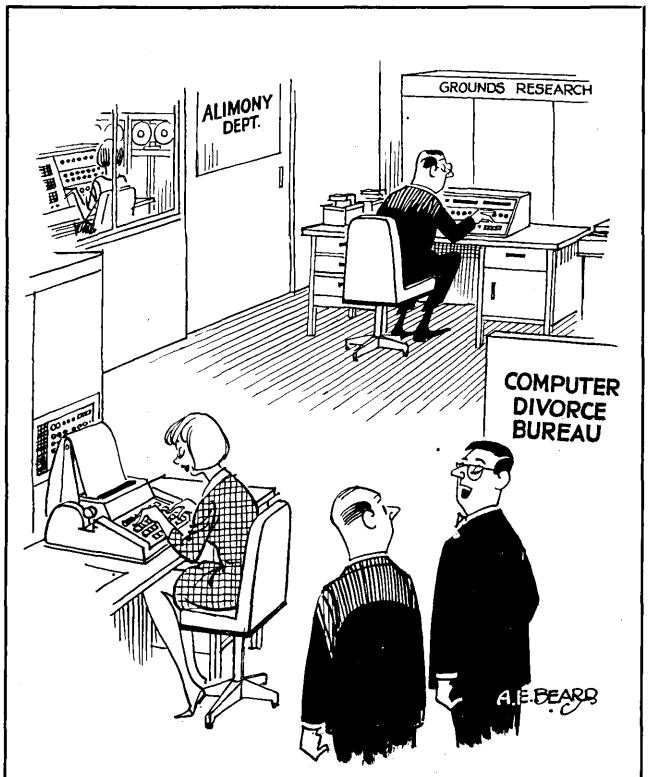
The inaccurate report is a major problem in the existing personal and credit files. There have been discussions as to the best method of letting people correct inaccurate reports.[14] The advent of the computer and the possibility of a federal data bank have added emphasis to these discussions. As Paul Baran has said:

> "If the computer industry is to avoid external regulation, then it behooves everyone who is involved with time-shared systems handling potentially sensitive information to start working, or at least thinking, about the problem of privacy. The computer industry should take the initiative and the responsibility of building in the needed safeguards itself before "Big Brother" is forced to do it himself and we may not be too happy with the way he might want to do it."[15]

And any RAS which maintains information of such a personal nature should be sure it is accurate. If a credit file, erroneously, labels a person a deadbeat, so that he can't get a loan, the service maintaining the credit file could well be on the losing end of a suit for defamation of character and slander of credit.

the role of government

Government will have a decided effect upon the growth and the structure of the remote access service industry.[16] Already the FCC inquiry into the relationship between



"After the success of our computer marriage bureau, this seemed the next logical step."

9 Fano and Corbato, "Time Sharing on Computers," in *Information*, W. H. Freeman & Co., 1966, p.79
10 See *Datamation*, April, 1969, p.283
11 Wessell, "Legal Protection of Computer Programs," Harvard Business Review, March-April, 1965, p.97
12 See Parkhill, op.cit., p.164
13 Congressional Record, Jan. 13, 1969, p. E199
14 See transcripts of the hearings held by Senator Long and Congressman Gallagher during 1966-1968
15 Testimony before Gallagher Committee, July 28, 1966. (Hearings Transcript p. 126)
16 See Bigelow, "Legal and Security Issues Posed by Computer Utilities," Harvard Business Review, September-October, 1967, p. 150, 157

SOME LEGAL ASPECTS . . .

computers and communications[17] has produced tremendous volumes of economic studies and legal briefs; it may produce regulation. The Carterfone decisions in June 1968 and the new AT&T tariffs are producing a major effect on some communications rates and on interface equipment.[18] Allowance of the Microwave petition[19] could reduce the cost of long distance RAS substantially.

Some governmental aspects are of particular interest to RAS operators and users. For example, a remote access service could be a very good illegal monopoly machine. If it served competitors, it could be programmed to feed all orders east of the Mississippi to one company, and orders west of the river to the other. Or if each company immediately updated its sales records, and allowed its competitor access to those records, price fixing would be quite easy.

The service must be sure it does not so limit its clientele that it is boycotting other possible users. Ordinarily there will be good technological reasons for a possible user not being interested in a particular system. However, if the service itself makes an effort to exclude just a few members of a certain industry or otherwise to compete unfairly, the operator may find himself on the receiving end of an antitrust action.

The role of state and local government should not be overlooked, especially by the operator. Recently, a Massachusetts court decided that RASI terminals located at the users' offices were stock in trade for local tax purposes, not taxable by the municipality, but that the memory drum located at the operator's office was taxable.[20]

And the states may well take an active role in licensing remote access services, particularly the operating personnel.[21] While such licensing may raise questions of state vs. federal powers, the usual result of such a disagreement on respective powers has been regulation by both.

Even without licensing, anyone contemplating the establishment of a remote access service should consider the regulatory statutes which may now—or soon—affect the business. For example, if an insurance company in New York proposed to run a service for its mortgage correspondents, it might well violate the New York insurance law, even though a bank might have a legal right to run such a service!

And the operator who plans to offer services to regulated companies, such as banks and insurance companies, should look into some of the regulations they must comply with. For example, in Massachusetts bank records maintained by a service bureau must be open to audit by state bank examiners. Similarly, federal agencies like the SEC, the Federal Reserve System, or the Department of Labor may have regulations which will put constraints on system design. The operator's attorney can help in finding out what these are before programming starts.

This has been a review of some of the legal problems which may arise in the establishment and operation of a remote access service. Many others have undoubtedly already been met and solved, and still more are yet unthought of. Perhaps the best suggestion for a person who is contemplating a healthy outlay for RAS—as operator or user—is to see your lawyer before you get in too deeply. Being aware of your legal problems *before* they explode saves you money, time, and heartache. ■

17 FCC Docket No. 16979
18 Walker, Mathison & Jones, "Data Transmission and the Foreign Attachments Rule," *Datamation*, Feb., 1969, p.60
19 FCC Docket No. 16509 et seq.
20 Ultronic Systems Corp. v Assessors of Boston, 244 NE 2d 318 (1969)
21 See the proposals in Dennis, "A Position Paper on Computing and Communications," 11 Comm. ACM 370 (May, 1968)

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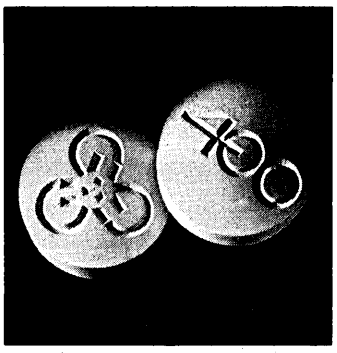

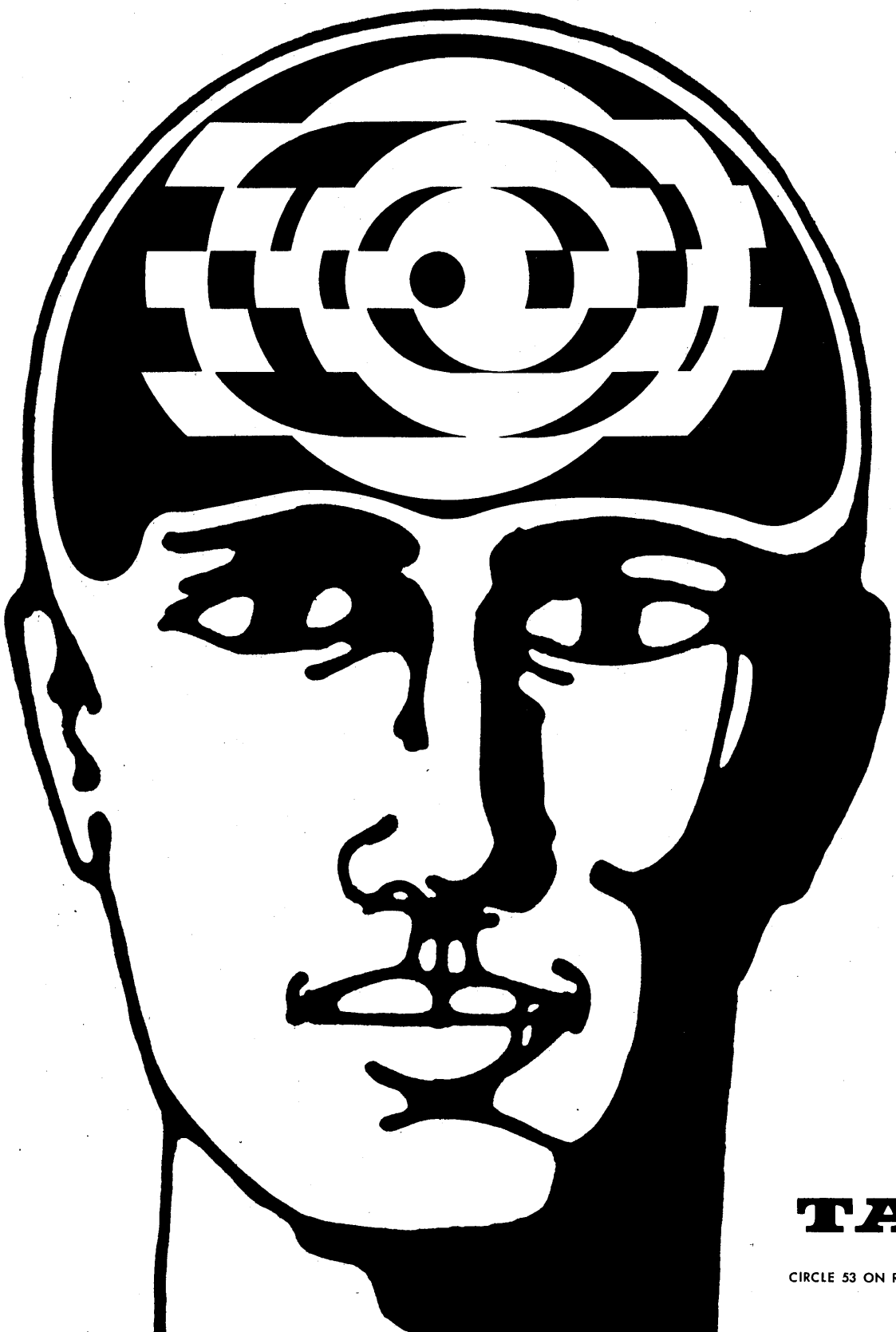

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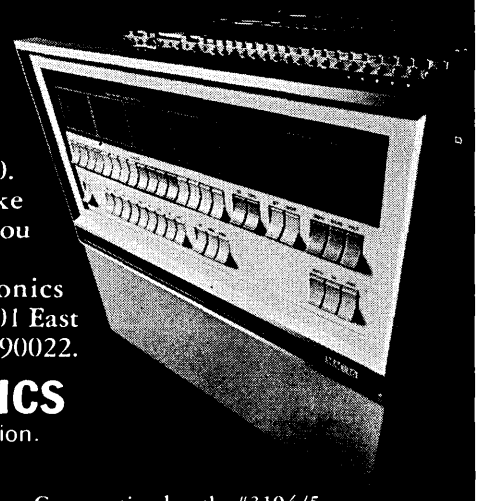

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a survey

THE TIME-SHARING USERS: WHO ARE THEY?

by Bohdan O. Szuprowicz

Much has been said and written about the universal appeal of time-sharing and many claims made that time-sharing introduces the use of computers to the small businessman and professional person who do not have nor need programming and computer experience.

To find out if this is happening, DATAMATION conducted a study of a large segment of its readership in a variety of industries, government agencies and small businesses.

The study was designed to answer five basic questions:

1. What industries or organizations are the heaviest users of conversational time-sharing services?
2. What are the most common applications in which time-sharing is used?
3. What programming languages are most commonly used?
4. What is the status of in-house time-sharing?
5. What is the level of time-sharing usage, measured by monthly bill, average number of terminals in use, hours of usage and number of time-sharing suppliers?

A questionnaire was designed and sent to 3780 operational management personnel, about 20% of the total of this title classification receiving DATAMATION. Of these, 1534 responded to the mailing—representing 40.6% of the total, a meaningful sample.

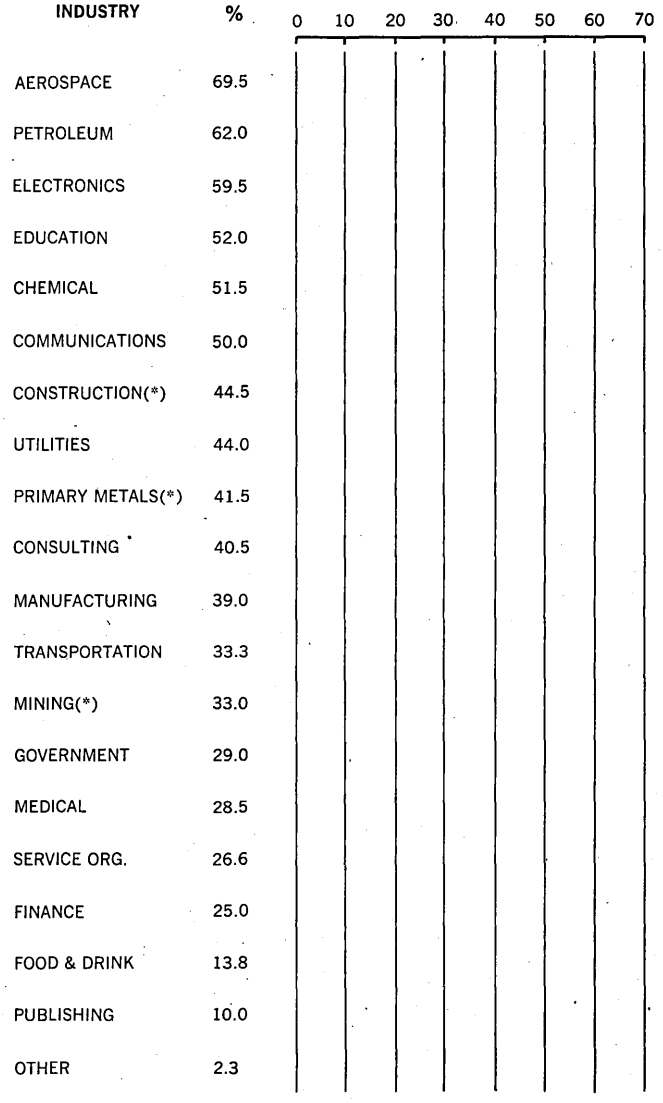
Of those replying, 497 were users of time-sharing, or 32.5%. The remaining 1037 or 67.5% did not use time-sharing at present but many were using standard batch or service bureau computing services.

To answer the questions posed, the analysis focused on those 497 users. Among the users, 79 did not use any outside time-sharing services, relying entirely on in-house time-sharing installations. This accounts for 16.0% of all the users. A further 71 users also had in-house time-sharing installations but did go outside to purchase additional time-sharing services. Those represented 14.3% of all the users. Therefore, only 69.7%—slightly over two thirds of all the users—relied entirely on outside time-sharing vendors. If one includes the users who bought outside as well as used their in-house systems, users of outside services accounted for 84.0% of the total.

what industries time-share most?

Those industries with the biggest usage of computers to date are also the biggest time-sharers. The explanation of this seems to be that time-sharing as offered today requires programming experience. And programming know-how is

Fig. 1. Percentage of total responses within each industry indicating use of time-sharing. E.g., 82 questionnaires were returned from the aerospace industry of which 57 indicated usage of time-sharing—hence, 69.5%.



*Sample too small for definite ranking.

most abundant where big installations with large programming staffs exist. Hence most time-sharing is done in the aerospace, petroleum and electronics industries, all among the first and heaviest users of computers.

Fig. 1 shows the relative percentage of responses within each industry group indicating use of time-sharing. The first question listed 20 industrial categories, asking each respondent to identify the major industry group from which he was responding; 274 responses from those who were not users of time-sharing failed to indicate their industry affiliation and, together with 33 from "conglomerates" and other enthusiastic users checking many industries, were classified under "other." While these account for 307 or a shade above 20% of all the responses, only 7 or 2.3% of them declared themselves time-sharing users. Should these be allocated proportionately to the number of responses in each industry group the usage percentages would be slightly lower but the relative industry usage sequence is unlikely to be changed.

However, the relative positions of such industries as construction, primary metals and mining (marked with an asterisk in Fig. 1) is questionable for other reasons. In those industry classifications the total responses were 9, 12 and 3 respectively and probably too few to reflect a proper percentage of industry usage of time-sharing. For comparison, aero-space respondents numbered 82, of which 57 were time-sharing users, while education produced 148 responses with 77 time-sharers.

what are they using time-sharing for?

The second question invited users of time-sharing to check the most significant applications implemented in their industries on time-sharing systems. A list of 20 applications was suggested with one "other" category. Users could check more than one but were asked to indicate only those applications which represented significant and repetitive use of conversational time-sharing. Many respondents indicated two to four significant applications and some apparently do almost anything on their time-sharing systems from accounting and circuit design to market research and stress analysis.

Looking at the distribution of applications within each industry group (Fig. 2) some interesting facts become apparent. By far the most common application of time-sharing in all industries was just plain old mathematical calculation. This was the most common application within all industry groups except medical, food and drink, finance and education.

Statistical use of time-sharing was apparently most popular in medical, food and drink, and the chemical industry, with mathematical calculation taking second place in the medical and food and drink categories but scoring equally with statistics in the chemical industry.

The leading application in finance was investment analysis, with mathematical calculation again running a close second together with operations research.

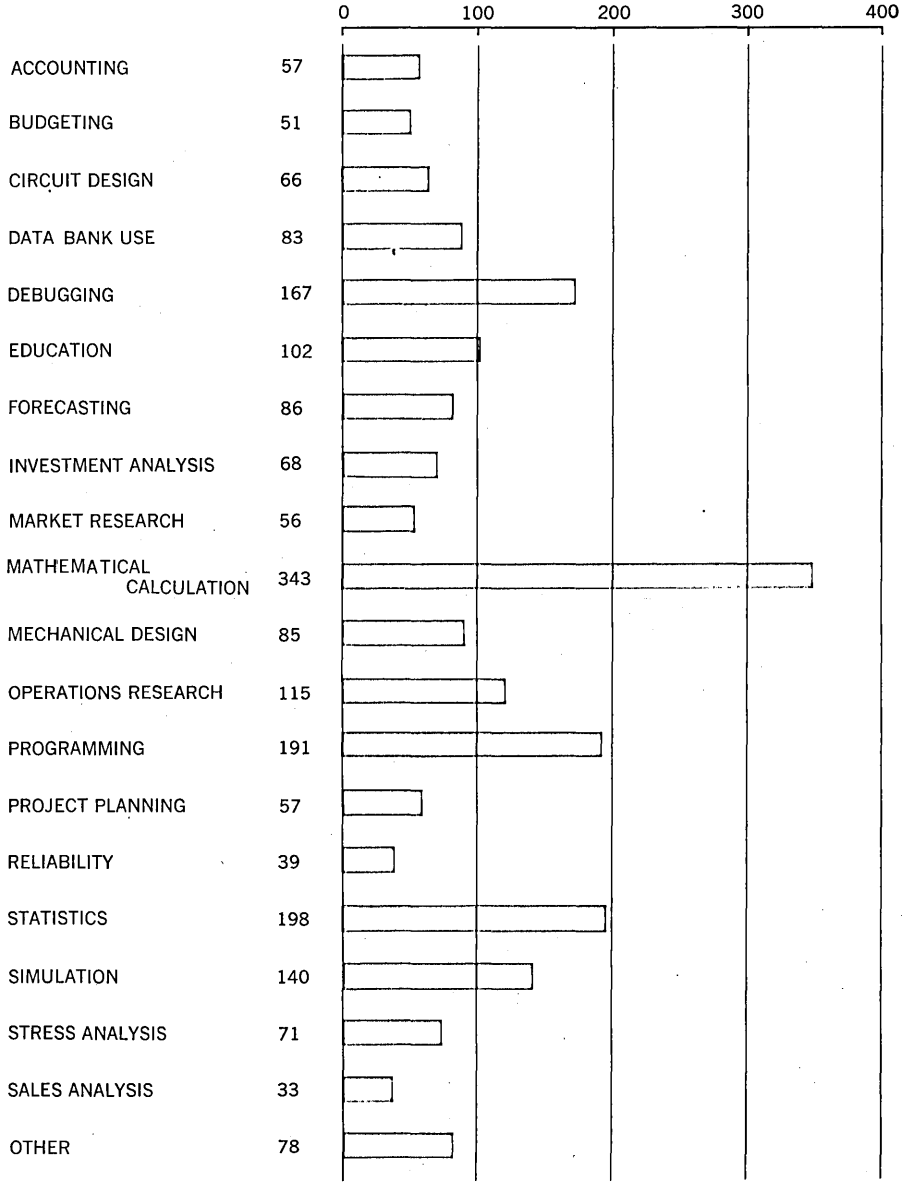
In education the most common application of time-sharing was, and you guessed it this time, for education. Again, mathematical calculation was not far behind with programming and debugging also claiming a big chunk of usage. It is, of course, difficult to draw a line between educational and production programming use of time-sharing in an educational institution, so the educational use may actually be larger than reported.

The only other industry group showing an application more popular than mathematical calculation was construction, where stress analysis won by a single vote. But considering the few returns from that industry, the significance is negligible.

fortran spoken here

In trying to discover which programming languages are most used by time-sharers, the questionnaire asked each user to list two of the most commonly used languages in

Fig. 2. Numbers of users indicating relative use of time-sharing for various applications. Mathematical calculation leads as the most common use.



their company for conversational time-sharing. As could have been guessed from the most common applications, FORTRAN is indeed the most commonly used language. The 497 users of time-sharing who responded indicated 892 responses or 1.8 languages per user. This indicates that some were only one-language users, presumably confirmed FORTRANERS. Of the 892 responses, 351 checked FORTRAN, or 39.6%. However, BASIC was the second most common language in use with 276 total indications, a healthy 31%. (See Fig. 3.)

Language	Responses	%
ALGOL	25	2.8
BASIC	276	31.0
COBOL	68	7.6
FORTRAN	351	39.6
PL/I	62	7.0
OTHER	110	12.0
	892	100.0

Fig. 3. Comparison of languages used

Among other languages APL accounted for the largest number of indications—12 out of 110—but CAL, JOSS and QUIKTRAN were also mentioned a few times. The rest were represented by such languages as TELCOMP, OSCAR, BRUIN, CAMP, GRAPH, LYRIC, MUMPS, NEAT, PAL, RUSH and TENT, but none accounted for any significant percentage. Some, such as ECAP and ICES, cannot truly be classified as all-purpose languages.

in-house time-sharing

Of the 497 users of time-sharing, 187 indicated the intention to establish and use an in-house time-sharing system. This is 38%. While 15 of the prospective in-house operators did not have any idea when this might take place, most could indicate the year when the system will be operational. Two of those, however, could not say more than "after 1975." Fig. 4 gives details of proposed establishment of in-house time-sharing centers.

In the last part of the questionnaire, readers were invited to list their pet peeves and general comments. Many praised time-sharing in general or a particular application, system, language or supplier. A few gave detailed suggestions on how to improve some particular aspect of time-sharing and supplied their names and addresses inviting further inquiry.

In general, the comments dealt mainly with usage, speed and quality of service and the costs. The more characteristic remarks are listed below:

Facility of Usage. The fact that time-sharing does not require much previous computer training on the part of the user has obvious advantages.

"We have found," writes a user in communications, "that we can introduce our older engineers to the use of the computer much more easily with time-sharing. Where many of them would not go near the computer room they could be induced to use a terminal. In most cases, after initial exposure they will use any machine available."

Others state that time-sharing, though expensive, "does get the key people involved" thus resulting in "tremendous intangible savings." Time-sharing has been "widely accepted by scientists" (a government user) and was used to overcome the reluctance of many people to use the computer since "it does not overwhelm them" (manufacturing).

One of the users in government waxed quite enthusiastic: "Conversational time-sharing has freed the computer user from the deadly grasp of the computer operating bureaucracy."

But this very independence of the user brings problems: "The use of time-sharing services has made engineering people very independent of central computing," complains a user in electronics. "We are having a very difficult time persuading people to use the planned in-house system rather than the outside services, which they feel do a very good job."

Others complain that people tend to misuse it for jobs that could be done on a desk calculator and overuse time-sharing in place of normal computer operations. Several mention the difficulty of monitoring or controlling the use of time-sharing by individual employees.

Response. Of the 39 users who commented on the speed

Fig. 4. Users planning in-house time-sharing installations.

NUMBER OF USERS	INDUSTRY	'69	'70	'71	'72	'73	'74	'75	Later	
57	Aerospace	5	6	6	3	1	1	1		23
4	Construction		2	1						3
22	Consulting	1	2	2						5
18	Chemical	1	3	2	1					7
14	Communications	3	1	1	1					6
77	Education	8	9	6					2	25
38	Electronics	2	3	4						9
21	Finance		5	2						7
3	Food & Drink					1				1
59	Government	5	11	6	4					26
89	Manufacturing	3	4	7	4	1	4			23
10	Medical		2				1	1		4
1	Mining									
5	Primary Metals		1	1	1					3
16	Petroleum	2	2	3	1					8
2	Publishing					1				1
24	Service Organization	1	5	2						8
15	Transportation	1	1	1						3
15	Utilities	1	1	4			1			7
7	Other	2		1						3
497		35	58	49	15	4	7	2	2	187

of response, 32 found it too slow (82%).

Input/output was criticised by four users. It was too slow for high school instructions, for programming and debugging of large programs in the aerospace industry, and was presenting problems to a user in finance.

Terminals, Teletype and output were criticised by several users:

"Teletype too slow an output device"

"Need faster output with less noise"

"Teletype speed too slow."

Others complained about the delays during prime time and "not getting on whenever we want and having to wait when we do." These delays were often blamed on the overload resulting from oversell by the vendor:

"Speed varies as vendor expands the operation from excellent to very poor . . . vendor overloads his computer before installing additional systems . . . " (user in electronics).

"Speed is satisfactory until the service is oversold and customer pays high price for waiting in the queue" (user in manufacturing).

"Unadmitted oversubscription allowed by terminal renters causes inordinate delays to get terminal on line with computers at peak time" (user in government).

"Commercial T-S firms tend to oversell their ability to provide prompt service, resulting in delays while on-line running up your connect time" (user in communications).

INDUSTRY	Number of responses indicating monthly $	Average monthly expenditure	Average number of time-sharing suppliers	Maximum number of suppliers to a single organization
Aerospace	35	$11,300	1.72	7
Construction	4	975	1.75	2
Consulting	19	5,350	1.67	4
Chemical	12	8,200	1.75	3
Communications	10	8,940	2.70	6
Education	37	5,320	3.05	5
Electronics	18	5,480	3.95	7
Finance	15	10,800	2.34	8
Food & Drink	2	350	1.00	1
Government	33	5,200	3.17	10
Manufacturing	75	2,600	1.90	5
Medical	4	2,180	1.80	3
Mining	1	1,000	3.00	3
Primary Metals	5	1,860	2.20	4
Petroleum	13	5,500	2.15	4
Publishing	2	325	1.50	2
Service Organizations	18	2,260	1.76	4
Transportation	9	4,050	1.69	3
Utilities	12	2,570	1.73	3
Other	4	7,880	2.33	3

Fig. 5. Monthly costs and vendors used.

how much are they spending?

In an attempt to find out which industry spends the most for time-sharing, users were asked to indicate their monthly bill as well as the number of suppliers of time-sharing services. Not all users were able to answer these questions. Some no doubt are using in-house computers and would not have such information. Within each industry group all dollar figures reported per month were accumulated and divided by the number of respondents giving such figures, to arrive at average expenditure per month in a given industry. These results are given in Fig. 5.

Another interesting aspect of time-sharing usage is the pattern of hour-to-hour usage of a particular computer after a full complement of users or clients exists.

While the questionnaire was not designed to collect such data and it would be difficult to do so without a controlled environment, Dr. Eugene Grabbe, the publisher of TRW's in-house Software and Information Systems News, came to the rescue by providing the results of their own study of time-sharing usage. Not only does it show when people are inclined to do some work during their daily grind, but provides precise utilization patterns of value to those who wish to optimize their time-sharing operations in a random access service environment.

hourly changes plotted

Prompted by varying response rate of their in-house time-sharing systems from one time of day to another, members of the department monitored the usage of their time-sharing computer for several months, carefully plotting the results. The environment consists of 76 remote terminals available throughout TRW to various random users who can access only 32 available lines on their SDS 940 system. The situation is similar to that which occurs in a typical commercial time-sharing firm and underscores the difference between a time-sharing business and a service bureau operation where scheduling of jobs in sequence can take care of peaks and valleys. Profit-minded time-sharing vendors can easily see why their time-sharing networks should extend east to west and never north to south. The plotted results of the TRW findings are shown in Fig. 6.

nonusers planning in-house systems

The question about contemplated in-house time-sharing was also the only one answered by those who do not use time-sharing today. Of the 1037 nonusers who sent back the questionnaire, 11.5% indicated that they plan to use time-sharing in the future, 11.2% said definitely no, but the bulk of nonusers or 77.3% failed to indicate one way or the other. It is still interesting to see how various industries are thinking about future use of time-sharing. Fig. 7 gives the results.

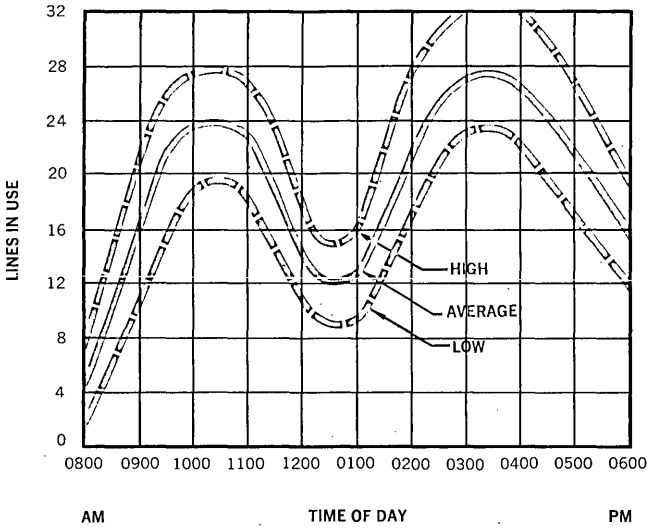


Fig. 6. Usage pattern by time of TRW in-house system.

THE TIME-SHARING USERS . . .

Perhaps the single most important conclusion that can be drawn from this study is the confirmation of the fact that time-sharing in its present conversational form is primarily thriving where programming talent exists. This is not only borne out by simple statistics but by such findings that FORTRAN, rather than the simpler BASIC, is the most commonly used language.

However, close to a third are now BASIC users. Since this language was little known and used before the advent of time-sharing on a commercial basis, it could be assumed that the BASIC user represents the newer and less sophisticated computer user. But from both observations it is difficult to say that time-sharing brought the computer to the small businessman —the nonuser so far who suddenly found a simple and inexpensive tool.

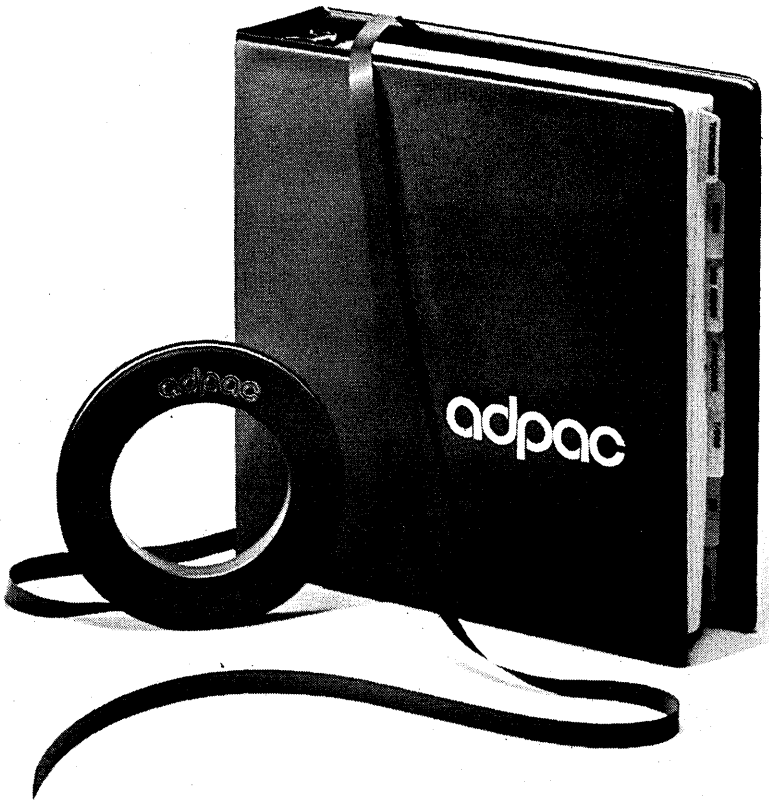
Except for consulting and service organizations, the industry categories in this study are usually represented by large and well-established corporations. Most of these have considerable in-house computing capacity and consequently a lot of programming talent. It is also interesting to note that the largest users—such as aerospace, petroleum, electronics or communications companies—were the first to install computers and continue to be the largest users of data processing equipment to this date. Some are undoubtedly going to convert their in-house systems to time-sharing or real-time systems and are only filling in with outside services for testing and temporary purposes.

One other fact which is probably made clearer is that without very specific applications, data banks or even dedicated systems the mass usage of time-sharing cannot materialize. ■

Fig. 7. Plans of nonusers for in-house systems.

INDUSTRY	NUMBER RESPONDING	PLANNING T-S USE	NOT PLANNING	NO ANSWER
Aerospace	25	2	3	20
Construction	5	—	1	4
Consulting	32	7	2	23
Chemical	15	2	2	11
Communications	14	4	2	8
Education	71	26	10	35
Electronics	26	1	6	19
Finance	63	8	10	45
Food & Drink	26	3	2	21
Government	143	25	12	106
Manufacturing	139	14	28	97
Medical	25	5	2	18
Mining	2	—	—	2
Primary Metals	7	2	—	5
Petroleum	10	2	5	3
Publishing	18	5	11	2
Service Organizations	67	5	8	54
Transportation	30	4	3	23
Utilities	19	4	2	13
Other	300	4	5	291
	1037	119	114	

wonder bundle



It's Adpac, the new generation programming language that works wonders in business applications. With Adpac, programs are written two to three times faster. Adpac programs take 50 to 75 percent less machine time to compile and debug. The Adpac compiler operates in any partition with device independence — even under DOS. Programmers learn Adpac twice as fast. And Adpac doesn't cost a bundle. Just $650 a month for any IBM System/360 Computer. For a 90 day trial, call your local office or, Adpac Computing Languages Corporation, (415) 981-2710, 101 Howard Street, San Francisco 94105.

CIRCLE 28 ON READER CARD

it all adds up

THE PRICING DILEMMA

by Joseph T. Hootman

Whether you are a user, a vendor, or a department head charged with establishing internal charge rates for an in-house system, considerations of pricing for computer services have always caused interesting problems and raised interesting questions. The advent of computer utilities, most especially time-sharing services, has opened a whole new field for exploration, discussion, and efforts.

Obviously, the rates established for these new services have an immense effect on the feasibility of their use and in directing the user toward intelligent decisions as to application areas, which types of services to use, and from which vendor to obtain these services. The present situation, in which pricing and rate schedules range all over the lot, creates some natural concern and confusion.

To the vendor or to the in-house facility, the question of pricing may well be one of life or death for his enterprise. Adequate revenues to cover costs, overhead, profit targets, and capital for expansion are essential. In every situation, there is keen competition—if not from a competing service, then clearly from the availability of other alternatives.

We are faced with an interesting set of conditions, which affect pricing. The industry has been growing at a phenomenal rate—new companies and new facilities are being established almost daily. There is entirely too little knowledge or experience in this area and, hence, most pricing decisions are made with insufficient study or facts. As we will see in the following discussion, too little consideration has been given in hardware or software design to provide means in many cases to adequately log or analyze data needed for intelligent pricing decisions. Also, the key facts regarding the market—users, applications, system loads, and all the interrelations between these factors—have not been available; and when they are available, they are subject to substantial change in the months ahead.

The subject of pricing clearly cuts across the entire field of computer technology—hardware, software, applications,

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communications, etc. Some effects from each area will clearly affect final pricing.

On top of all of this lies the question of pricing regulation for computer services.

principles of pricing

We all know that there are several bases on which to set price:

1. Based upon cost.
2. Based upon competitive alternatives.
3. Based upon "what the market will bear."
4. Based upon all of the above.
5. Based upon none of the above ("seat of the pants plan").

We have already implied that the last point is winning out as the current method, though certainly the consideration of competition must be accorded a very strong second place. Computer services pricing on the basis of cost has always been very difficult because of the key question as to utilization or system load. This is not unique to communications-oriented systems; we live with it in site batch just as much.

It is probably important to dwell on certain pricing "principles," at this point, which in some way govern the eventual decisions made in setting prices.

The first of these we will label the principle of resource utilization. The computer utility has so many resources of a known capacity. It must price its services so that a reasonable load will generate sufficient revenue to meet its goals. (We shall not define reasonable load or sufficient revenue, leaving that to the individual who must cope with the specific pricing problem.)

The second principle is that of user control. A differentiation must be made as to the use of resources over which the user has control and as to those which he cannot influence. The latter, lumped as "system overhead," presents some interesting problems. One of these is how to accurately measure the overhead; another is how to determine what portion, if any, the user should absorb. The key problem, of course, is how to charge the user. Those resources clearly under user control create fewer problems, but even then there are questions raised about whether the user is trained well enough, etc. to be able to make efficient use of the system.

The third principle of pricing is that of demurrage. This involves charging a user for resources he is not using directly, but charging him because the resource may not be charged to another user. Examples of this are dedicated ports, tape transports where the file is open but not being used, bulk store space requested, etc. Some of this nonused resource cost will go into the overhead allocated to users, but in this area we speak of direct charging.

Edmund Conti

A fourth principle is one not always agreed upon and therefore not always used. It is the principle of understandability. This simply says that basically the pricing scheme should be one the user can understand and work with in evaluation and estimation. (Some claim it is better defined as being a scheme the salesman can understand!) It is often most difficult to determine the resulting cost of running a given job on a system—multiprogramming and time-sharing have not eased that difficulty. It has been suggested that simulation techniques and use of computers will be required to find out which services to use and which jobs to run where. The principle of understandability implies a pricing scheme where this approach could be held to a minimum.

The final principle we shall touch on is that of differentiation. Every vendor would like to have his service different from any other if that would help him build a market, compete, and hold his clients. Attaining differentiation through the pricing techniques used has clearly been a factor in the time-sharing business to date.

specific pricing considerations

Now we should turn our attention to the specific considerations involved in pricing within each of the areas where the vendor has resources available. No attempt is made here to provide definitive pricing schemes or solutions, but rather to review the areas where problems can arise and where decisions need to be made to arrive at such prices.

Central Processor: The first resource area is the central processor. The key points affecting price are clearly the speed and capability of the main frame. There must be some relationship between the pricing and the cost of the hardware as well. One of the interesting problems presented is that for very powerful processors pricing cannot be set so that the rate is in direct proportion to smaller processors. The simple fact is that while the user can effectively achieve the same price/performance ratio if the price is proportional, he often cannot overcome the psychological obstacle of paying such a high rate.

The advent of multiprogramming provided both some solutions to the cpu pricing dilemmas as well as some additional complications. Clearly, the ability to share the cpu among various jobs and to thereby better balance it with other components relieved pressure on absolute cpu wall-clock time pricing. On the other hand, the problems of logging and recording such performance, coupled with logging the differentiation between "useful" cpu time and "system overhead," tended to make life a bit miserable.

If we think we have problems with multiprogramming, what about multiprocessing? Now we have more than one central processor, sometimes operating slave/master, sometimes with multiple masters, operating in the same environment. The logging problems are critical to success in proper (even reasonable) pricing schemes.

On top of all this, we now impose the communications preprocessor. Who is willing to say what portion of that function is "system overhead"? Again there are decision problems, assuming the system can even come close to doing a reasonable job of logging.

The question of system overhead can take considerable thought. What, in view of the principle of demurrage, defines overhead? We have problems separating (and logging!) that which is overhead for *all* programs or jobs and that which is associated with *one* job. We recognize that the vendor must price to "eat" overhead, and yet it is true that some overhead *must* be allocated to users to properly cover costs.

To make things really complex in cpu pricing, we must, of course, raise the question of how much the user controls the use of cpu time. What about the efficiency of object code developed by the compilers? We can recall the discussions re Type I and Type II compilers (or was it Type A and Type B?) where on one side we compiled like a bat out of Hades and on the other we generated *very* efficient object code.

On top of all this, let me add the question of the use of emulation and ROM (sometimes known as "firmware"). Now, let us take a long look at logging and cpu timing to determine the pricing algorithm. What is cpu and what is memory?

Memory: We can begin where we did with the cpu. What is the speed and, in this case, capacity of memory? Very few computer utilities charge for memory utilization alone. Some charge for memory as a function of cpu use (more on that later), but most avoid it like the plague. Why? Can it be (1) that it is difficult to log and (2) that the user has limited control over it? (Yes.)

If just one homogeneous memory is tough, try hierarchical memories! Scratch pad, ROM, main, auxiliary, bulk, etc., etc. can cause problems to a pricing algorithm in spades! What about transfers to different levels of memory—either at user or operating system request?

Another problem here is the technique of the system in memory allocation. Many systems use the load-and-go concept or static allocations of memory. Others, though not enough yet, use dynamic memory allocation. Static allocation is relatively simple to log and charge for; the dynamic is very difficult, and here one reaches (for the first time of several) the time and space problem attendant to resource pricing.

Then we can move to overlays and the question of who controls memory use and overlay handling. (And somebody here is bound to mention "*virtual*" memory.) The question again is one of user control vs. system overhead.

The overhead problem always rears its ugly head. Is general overhead—no matter how many jobs and how much load exists—edible by the vendor? Is specific overhead, related to one job under user control, chargeable?

Would you believe that we again come to the question of whether the efficiency of the object code generated by the compilers has an effect? It most certainly does; and, if the user is charged for main memory, he can be penalized or rewarded by the compilers.

Another hellish question raised as to memory in some cases has to do with the level of system utilization. We may have beaucoup main memory and find the memory underutilized and have to charge on demurrage principle for a pro rata share. Or we may have too little and find we are swapping like mad; and then, again, the question is whether swapping is overhead or chargeable.

Auxiliary Memory: For the sake of argument, auxiliary memory shall be considered to be any storage medium (except maybe tape) where permanent files are allowed to reside on the system.

The pricing problems here, first of all, have to do with hierarchies (as mentioned before) and who controls allocation. The size of bulk storage, the transfer speed, the access time, the number of paths from main memory, the bulk storage load and unload times, the amount of user control over allocation, the file creation and maintenance techniques, and, again, the size/time dimension ratio are all factors that can, if the vendor allows, affect the pricing scheme. The question here, again, is how much user control. The key point is that the user should have some ability to decide as to the amount of space vs. the access time, all of which can be translated back to the cost of bulk storage.

Input/Output Channels: Some question, not in vain, as to whether any consideration of charges for input/output channels is valid. The logging problem is tough enough, but the key question is whether this resource isn't really all overhead. Part of the answer lies in whether the user has control and another part in whether the channels are dedicated to another device that is chargeable or whether they are multiplexed or floating. The key problem with multiplexed channels is clearly the problem of logging and allocation and in most cases is clearly ignored (out of wisdom?).

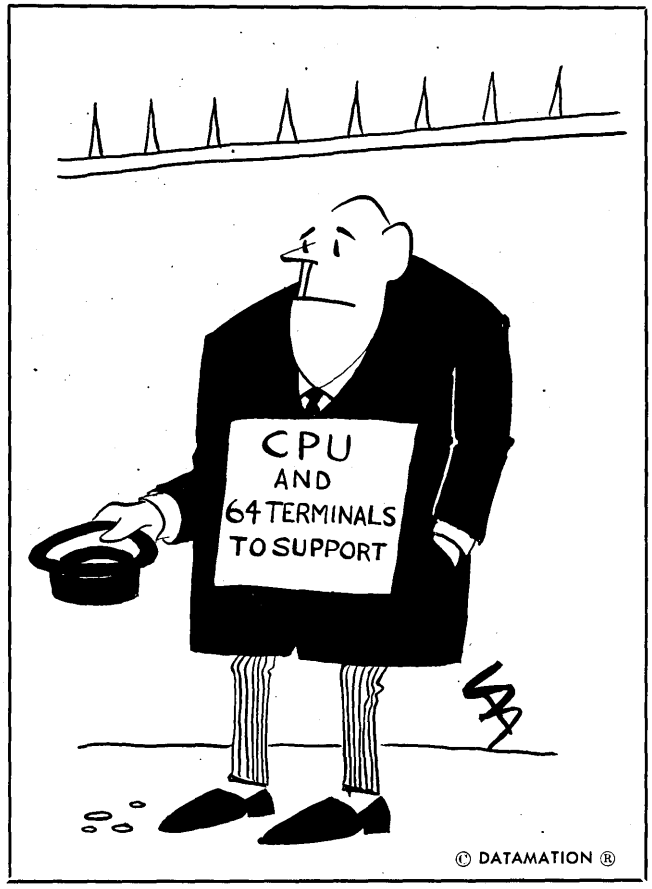
If charges are made, one of the questions lies in whether transfers are made between various memory devices, between memory and terminals, between memory and peripherals—or any combination.

No fast, snappy answers here.

Peripherals: We should also address ourselves to peripherals, not including terminals, for a discussion of resources. Some computer utilities do not permit peripheral device operation and they, therefore, solve their pricing problems rather arbitrarily, though effectively. The usual set includes card readers, punch, line printer, magnetic tapes, and, sometimes, paper-tape devices. The principle of demurrage comes into most prominent play here, depending upon the number and speed of devices on the system. The vendor cannot have a peripheral device tied up under a "file open" condition when that resource is not being used and could be made available to another user.

There are two approaches to peripheral charging: unit pricing (e.g., so much per card or per page) or time pricing, where the use factor is "file open" rather than numbers of whatever. Unit pricing involves a tally of cards, records, pages, etc. where the time approach involves logging absolute time. The decision of the vendor lies in whether he or the user has control of the resource.

Terminals: The first question raised re terminals is whether the vendor wishes to become involved at all. Some vendors will wish to provide terminals either because of special-purpose type or so they will have that much more



More bang per bit

Microprogramming gives you more useful core, more usable core.

Enough for large sorts, large user programs, advanced operating systems, time-sharing and remote job entry.

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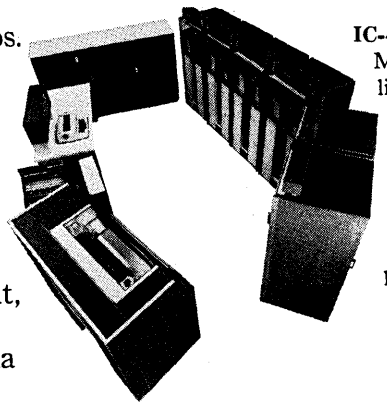

IC-4000—fourth generation. Microprogrammed. Multilingual. Machine-language independent. Other models for time-sharing, remote job entry and other innovative applications. Leasing starts at $4131 per month.

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control over the user. Another reason, clearly, is there is some profit potential. The vendor can obtain quantity discounts or can use long depreciation periods to reduce his costs but can still charge the user rates comparable to single unit lease or purchase prices.

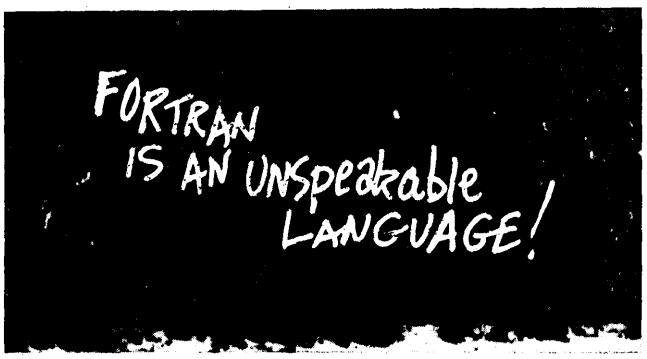
It was mentioned that special-purpose types of terminals can cause special pricing questions. The solutions can run anywhere from the user paying the entire terminal cost to the vendor absorbing the entire cost as part of his marketing effort. If the terminal is dedicated to one vendor, the approach is clearly different from the situation where the terminal can be used to access multiple vendors. In the latter case, it would seem clear that the user would wish to obtain and pay for his own terminal. There will be considerable pressure in the future by vendors to have dedicated terminals—and equal pressure by users not to have them. No doubt the development of special proprietary programs will come into play here as well.

A key question in terminal pricing lies in whether the method of use is controlled by the user, the central system, or by the terminal itself. Again application considerations can govern. The terminal device entirely under user control comes under that principle and can be charged for differently than one that is under absolute system control—such as a realtime input terminal. We find, in some cases, the use is under terminal control provided by some prior built-in—and, hence, relatively fixed—program. (We concede that if the user wrote the program it is under his control, but this is not always the case. More of this approach in terminal development appears likely.)

An important question is how much free-standing capability the terminal has and, if it has some, how easy it is to program. A terminal used in a free-standing mode for accounting functions or tabulation must be charged for in relation to its use in the off-line mode. A terminal that creates a theater ticket, which might be its only function (as well as the only output from the vendor), will be treated differently.

Whether the terminal is a polled or contention-mode device, whether it is interactive or batch, whether it ties to dialed net or a private system, whether it ties in through line concentrators, and whether it has a dedicated port to the system are other questions that might be looked at for their effects in different situations.

Communications: The most interesting question here is whether the vendor has or wishes to have communications capability. The current status runs all the way from those who wish to interface to the user only after he comes to them through standard tariffed common-carrier services to those who have or are developing their own communications network.



Edmund Conti

Assuming the vendor does wish to engage in this portion of the business and face the myriad questions raised about regulation and control he then has the whole field of communications pricing open to him. This article will not even open that door. We will toss out some thoughts and go on. How about: type of service, whether to charge for the whole service (including terminal, communications, and computer service), what about line concentration and line sharing, what about dedicated lines, what about competition (good and bad) from the common carriers?

Auxiliary Services: We don't wish to spend much time here, but auxiliary services are offered in some cases and used. There are charges for tape storage, manuals and other publications, training, and site auxiliary equipment charges. These have been around some time and are not new. They represent some extra revenue to the vendor and can be of considerable value to the user.

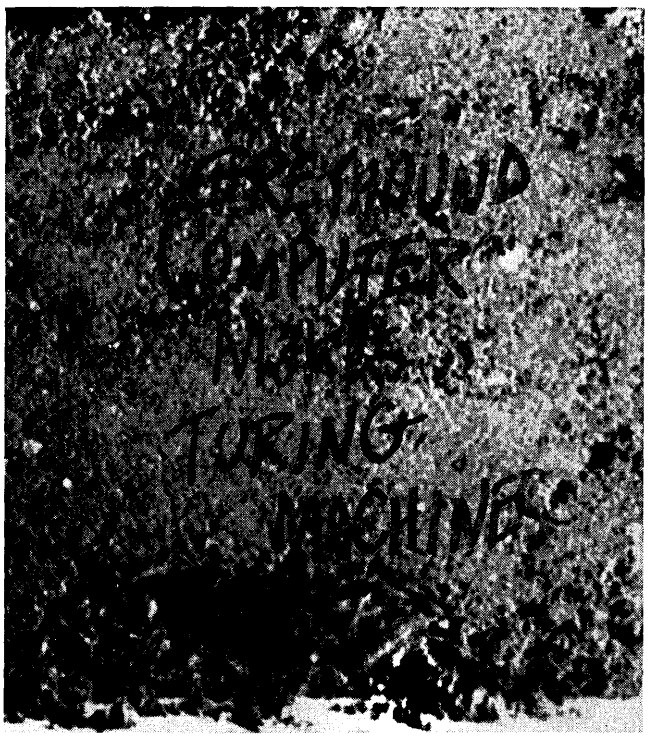
We would comment here that training is a most interesting area. The vendor may provide some free classroom training or he may charge. He may also charge for system time used by the user to learn about the system, or he may allow the user some access for training and indoctrination. The amount of such allowances and the accounting for them must be carefully considered by the vendor.

Proprietary Programs: The proprietary application programs that he can offer to the user are another key resource of the vendor. The first consideration the vendor has is whether to offer these as part of his public library or whether they should be given special handling. It is most likely that, because of the principle of differentiation, most vendors will make every effort to provide proprietary programs under special terms and conditions.

The pricing considerations for special handling can vary considerably. Treatments include one-time fees, periodic minimums or guarantees, programming and training charges, mark-ups on standard rates, pricing per some unit of measurement in the application, and any combination of the above.

The logging and billing problems here are very significant and not easily handled. Another possible complication is that of royalty payments based upon usage.

(Continued on page 66)



THE PRICING DILEMMA . . .

The resource pricing we have already discussed assumes the approach where each resource is priced separately. This would be true "incremental" pricing. In most cases, this form of pricing is not possible or practical due to problems in logging, user control, or user psychology, etc. The vendors have responded to this problem by providing package pricing. (Did someone say "bundled" prices?) In this situation, free use of some resources, or some specified allowance, is provided and billing is based on one or more resources as the vendor desires. Some vendors bill only for terminal time; others bill only for cpu time. (This led to what we shall call Patrick's rule. Bob Patrick pointed out that those who are I/O bound should use services from vendors who charge only for cpu time and those who are cpu bound should buy from those who charge only for terminal time. Patrick then pointed out that the vendor who charges only for terminal time should run a line to the vendor who charges only for cpu time!)

Other variations include cpu charges as a function of core use and cpu charges as a function of terminal time. Allocation of bulk storage space based upon use of other resources is common.

The primary concept behind package pricing or pure incremental pricing is to allow the vendor to make a return on his investment in a given resource, to control resource use, and to attract the type of users he wishes to service.

There are some questions to be considered on contracts: liability of users and of the vendor, protection of data and programs, rerun provisions, term of use, multiple center use. Minimum fees, guarantees, and connection charges must also be considered.

There are some questions to be considered on logging and billing: can the system log sufficient detail, what detail does the user need or get, can billing handle cost distribution, can system handle appropriate user codes, what about centralized billing, and how are credits handled?

conclusions

We offer some concluding thoughts. There is a long way to go in gaining the level of competence needed, and more tools must be made available for analysis and for proper logging and accounting.

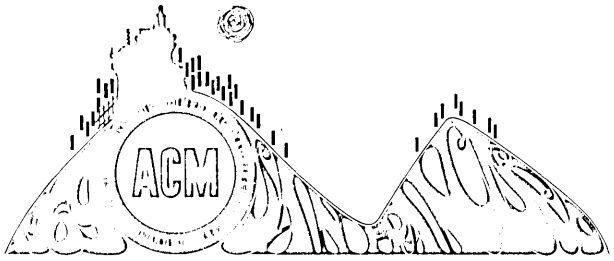
The variations in pricing are considerable. Some of these are deliberate for differentiation. Some variations are due to lack of information or proper study; others are due to lack of proper logging abilities.

We do not wish to see a situation where, as one individual predicted, a computer is required to analyze the job characteristics and service pricing to determine the optimum source of service. This would fly in the face of the principle of understanding.

We do suspect that the situation currently and in the future will present many problems to those who would attempt regulation of computer-utility pricing. The argument against regulation here is not that it would be difficult but rather that the various pricing techniques reflect the great differences in resources and in user options as to services available.

We also would predict that most users will, in fact, subscribe to multiple services to take advantage of pricing differences.

The future of pricing in this industry will be determined clearly by user acceptance; it won't be caveat emptor. ■



1969 ACM NATIONAL CONFERENCE AND EXPOSITION

august 26-28
san francisco

For some, it may be a hard journey from WESCON Week at the Cow Palace in San Francisco north to the ACM National Conference and Exposition at The City's Civic Center the very next week, August 26-28. But since WESCON ends Friday, the 22nd, and some ACM activities begin as early as the 24th, you might as well stay on. Surely there are some stalwarts among us who can make it through two straight weeks of conventions.

Of course, the two will be very different. ACM will be small and cozy compared to WESCON. Like 40-45 exhibitors vs. 625. And 3000 conferees plus 3000 exhibits-only registrants expected at ACM vs. a total of 45,000 for WESCON. Also, the ACM show is entirely computer-oriented.

Again this year, in an effort to select from a wider variety of topics, the conference has no theme. The Technical Program Committee has attempted to work closely with the Special Interest Groups and Committees of the ACM in order to prepare an integrated and interesting program and to offer more unsolicited papers. The approximately 75 papers that are being presented were selected from over 300 submitted. There will be 19 paper and panel sessions in addition to the opening session.

The opening session on Tuesday from 10:00 a.m. to noon will begin with remarks from Conference Chairman Solomon L. Pollack, of Information Management Inc. This will be followed by the ACM President's Address by Dr. Bernard A. Galler, of the Univ. of Michigan. Dr. Marvin Minsky of MIT, a pioneer in artificial intelligence, will deliver the A.M. Turing Lecture as recipient of the ACM's most prestigious award, the A.M. Turing Award.

tuesday's sessions

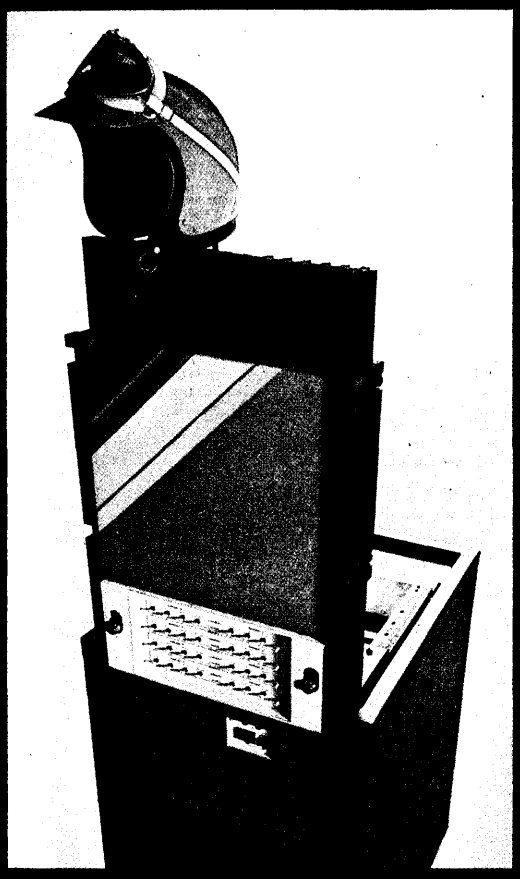
There are four sessions Tuesday afternoon from 1:00-3:00. **Visual Prothesis and Information Processing Technology** will consist of a report given by those closely involved in new developments in the problem of artificial aids for the blind, together with a review of the past involvements of ACM in sponsoring an examination of this computer application. Chairman is Theodor D. Sterling, Washington Univ. Prof. David B. Benson, Univ. of North Carolina, will chair the session titled **On Computational Linguistics.** Results in the application of computer science and technology to the relatively new field of language analysis and humanities will be reported in two papers. **Digital Simulation and Related Areas** addresses a variety of interesting fields within simulation languages and should be of particular interest to practitioners developing simulation languages and those engaged in computer simulation of computational systems. Chairman is Arnold Ockene, IBM. The ACM committee on **Computing and the Disadvantaged** (ACM-CCD), the successor to SICSIC we are told, will hold an open workshop on the subject of "Entry Level Jobs for the Disadvantaged into the Computing Field." CCD will also hold a session on Wednesday from 9 a.m. till noon that will be an extension of the Tuesday afternoon discussion.

Three sessions will be held Tuesday afternoon from 3:30 to 5:30. **Major Problems in On-Line Hospital Systems,** chaired by Joseph Yeaton of the Univ. of California at San Francisco, will review recent advances in defining problem areas of hospital systems with emphasis on the use of remote terminals, file organization, and duplexing and redundancy. Dr. T. W. Olle, RCA Information Systems Div., will chair **Information Retrieval,** where three papers dealing with implementation of information retrieval systems will be presented. **Computer-Assisted Instruction Applied to Mathematically Based Subject Matter** will focus on programs which generate problems for CAI steps or generate the steps themselves and on programs which evaluate student responses. Dr. Gloria M. Silvern, Computer-Assisted Instruction Systems, Inc., is session chairman.

wednesday's sessions

There will be three sessions Wednesday morning from 9:00 to 11:30. The first, **CODASYL Report on Generalized Data Base Management Systems,** will not appear in the *Proceedings,* since a separate report (that costs $7.50) has been issued. Nine members of the Systems Committee will discuss the report with emphasis on how each of the systems studied handles various features. The motivation behind the survey and what the committee learned will be discussed, together with an outline of future plans. Dr. Charles Lawson of Jet Propulsion Lab will chair **Numerical Mathematics,** where seven papers representative of the blend of mathematics, machines, people and problems which together constitute present-day scientific computing will be presented. **Measurement and Modeling of Operating Systems,** chaired by Harold Stone, Stanford Univ., emphasizes memory resource allocation.

The conference luncheon will be held from noon to 2:00 p.m. in the Imperial Ballroom of the San Francisco Hilton, the headquarters hotel. The



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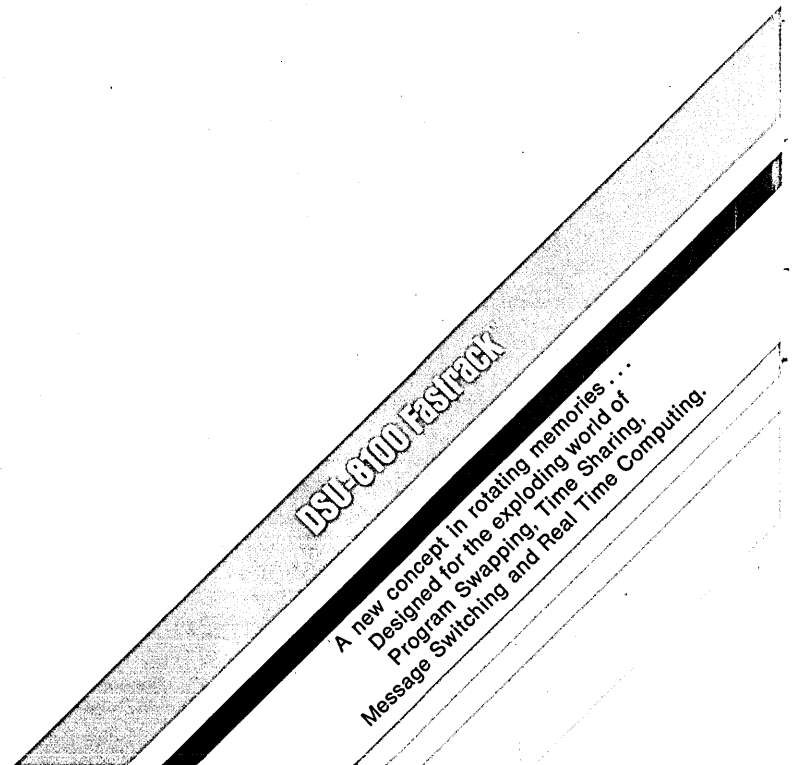

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guest speaker, Dr. Emanuel R. Piore, vice president, chief scientist and a member of the board of directors of IBM, will talk on "The Challenges of Progress in Computing: People, Technology, Purposes."

According to informed conference sources, no camels have been invited.

The four Wednesday afternoon sessions will be held from 2:30 to 5:00. At **Computer Science and Statistics: A View of the Bridge,** a panel of technical experts explore facets of the interface of computer science statistics and document important elements of both software and hardware in the area of interaction. Dr. Daniel Teichroew of the Univ. of Michigan is chairman. **Applications in Business Data Processing** will be chaired by W. K. Williams, Stanford Research Institute. This session brings together several papers covering a variety of applications related to data processing in the business environment. P. J. Scola, of GE, will chair **Techniques for System Design and Evaluation,** where four papers describe several of the methods that engineers concerned with the evaluation and design of complex digital computer systems can use to improve the effectiveness of their operations. The theme of the four papers in **Program and Language Structures for Interactive Systems** is system organization for interactive computing. E. C. McIrvine, of Xerox, is chairman.

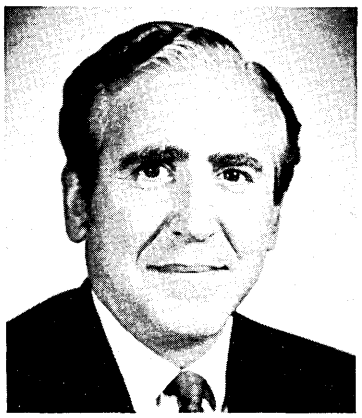
thursday's sessions

The three Thursday morning sessions will be held from 9:00 to 11:30. A general discussion is scheduled to follow **Computer Science Education,** to be chaired by Samuel D. Conte of Purdue. The session will consist of a series of presentations by university professors on progress in the development of computer science degree programs. Sherbie Gangwere, of Advanced Programming Inc., will chair **Operating Systems-Design and Implementation.** Three time-sharing operating systems will be described. The fourth paper deals with the general problems of integrating a large software system. The three papers to be presented in **Biomedical Information Processing** describe several ways in which the use of computers can assist the medical profession. The session will be chaired by Dr. Carol Newton, of UCLA.

The three Thursday afternoon sessions will be held from 1:00 to 3:30. **Programming Languages,** chaired by William McKeeman, of the Univ. of California at Santa Cruz, will consist of a presentation of new developments in the technology of syntactic and semantic problems in computer languages. Four papers will be presented at **Symbolic and Algebraic Manipulation,** chaired by Dr. Stanley R. Petrick from IBM. Four papers that lie outside the usual guidelines established for sessions are gathered in **Data Acquisition, Processing & Control; Structural Dynamics Modeling.** The first three should concern users of special purpose acquisition and processing facilities. The fourth describes a powerful analysis program for large three-dimensional structures modeled by discrete elements. William P. Jones of NASA is session chairman.

sig and sic meetings

Some of the following Special Interest Group (SIG) and Special Interest Committee (SIC) meetings are open to non-member conferees. All will be held at the Hilton. SIGPLAN (Programming Languages) will meet all day (9:00 a.m. to 5:00 p.m.) Sunday, the 24th, and Monday, the 25th, and from 8:00 to 11:00 p.m. on the 26th. The Curricula Committee on Computer Science (C^3S) will meet all day Monday and from 7:00-10:00 p.m. Tuesday. The meeting of the ACM Curric-



SOLOMON L. POLLACK
Conference Chairman

ulum Committee on Computer Education for Management will be held all day both the 25th and 26th.

On Tuesday, August 26, the following meetings will be held:

SICLASH (Language Analysis and Studies in the Humanities), 2:00-5:00 p.m.

SICCOSIM (Computer Systems Installation Management), 3:00-6:00 p.m.

SICCOM (Data Communications), 7:30-9:00 p.m.

SIGOPS (Operating Systems), 8:00-10:00 p.m.

SICCAI (Computer-Assisted Instruction), 8:00-11:00 p.m.

The remainder of the SIG-SIC meetings will be held Wednesday, the 27th:

SIGBDP (Business Data Processing), 7:30-10:00 a.m.

SICFIDET (File Description and Translation), 4:00-8:00 p.m.

SIGUCC (University Computing Centers), 5:00-7:00 p.m.

SICCSE (Computer Science Education), 7:00-9:00 p.m.

SIGART (Artificial Intelligence), 7:00-10:00 p.m.

SIGIR (Information Retrieval), 7:00-10:00 p.m.

SIGGRAPH (Graphical Display), 7:30-9:30 p.m.

SIGSPAC (Civil Engineering, Architecture, Planning and Urban Systems), 7:30-9:30 p.m.

SIGNUM (Numerical Mathematics), 7:30-10:00 p.m.

SIGMAP (Mathematical Planning), 8:00-10:00 p.m.

SICMICRO (Microprogramming), 8:00-11:00 p.m.

ACM Forum, 8:00-11:00 p.m. The "Council opens itself to potshots from anyone."

special activities

The conference reception will be a no-host cocktail party on Tuesday evening at 6:00 p.m. in the Imperial Ballroom of the Hilton Hotel.

The traditional graphic arts will be on display throughout the conference as a feature of the second annual Art and Music Festival. In addition, there will be periodic showings of computer-created motion pictures, as well as recitals of computer-composed music.

At the Computer Science Fair, a new feature, students from the San Francisco Bay Area will be displaying their computer projects during the show. The students will be on hand to answer questions about their projects.

Women's activities will be centered at the Hilton, where a hospitality suite will be maintained in the Rosewood Room throughout the conference. Scheduled activities include a tour of the Brundage Collection at the de Young Museum, an educational feature, a boat ride to Tiburon, a shopping tour to Jackson Square, and two luncheons.

exhibits and registration

All exhibits will be at Brooks Hall, adjacent to the Civic Auditorium. Paid registrations include admission to the exhibits. Non-registrants may gain admission to the exhibit area for a $5 fee. The exhibits will open at noon on Tuesday, August 26, and close at 6:00 p.m. On Wednesday, exhibit hours are 10:00 a.m. to 8:00 p.m.; on Thursday, 10:00 a.m. till 5:00 p.m. Registration fee for the entire three days is $30 for ACM members, $55 for non-members ($25 of which may be applied toward a National ACM Membership), and $5 for students (does not include *Proceedings*). Registration will be at the Hilton on Monday and in the Civic Auditorium thereafter. ■

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THE AIR FORCE COBOL COMPILER VALIDATION SYSTEM

by Harry T. Hicks, Jr.

At the completion of the final affirmative ballot in August, 1968, the USA Standard COBOL became a reality. This article describes a recently developed computer system used for measuring compilers for compliance with this Standard. In addition to its primary purpose, this system should prove to be a useful tool for other compiler investigations.

The Standard allocates a subset of COBOL, Edition 1965, into a two-dimensional structure of functional groupings (modules) and levels within these groupings. Eight modules represent collections of elements alike in their functional purpose: the NUCleus (basic internal operations), TaBLe handling, SEQuential access, Random ACcess, RePort Writer, SoRT, LIBrary, and SEGmentation. Each module is divided into two or three levels representing at the lowest non-null[1] level the minimal group of elements that can perform the function of the module, and at higher levels, elements of increased sophistication. This organization is shown in Fig. 1, using the abbreviations noted above, each preceded by a number denoting null (0), low (1) or high (2 or 3) level.

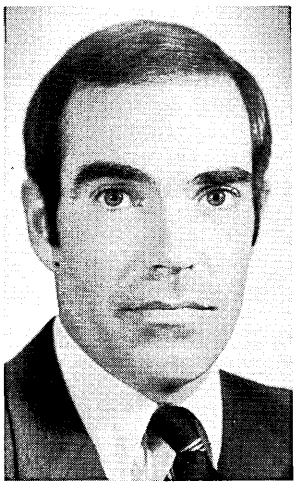
2NUC	3TBL	2SEQ	2RAC	2RPW	2SRT	2LIB	2SEG
1NUC	2TBL	1SEQ	1RAC	1RPW	1SRT	1LIB	1SEG
	1TBL		0RAC	0RPW	0SRT	0LIB	0SEG

Fig. 1. USA Standard COBOL

The minimum USA Standard COBOL consists of the lowest level of each module. Because of the effect of the null sets, it is composed of 1NUC, 1TBL and 1SEQ. The higher levels of each module contain all the elements of their lower levels. Thus, 2NUC consists of all the elements that are in 1NUC plus those elements unique to 2NUC. Obviously, the maximum USA Standard COBOL is made up of the highest level of each module.

The Standard describes the component elements of each

[1] Five modules have empty sets at their lowest levels in order to simplify the definitions of the minimum and maximum levels of the Standard.



Mr. Hicks is director of consulting services for Information Management, Inc., and is a member of the USASI X3.4.4 Working Group (COBOL standardization). Before joining IMI, he was with Computer Usage Co. and Boeing. He has BS and MBA degrees from the Univ. of California at Berkeley.

module using text from COBOL, *Edition 1965*, edited in response to comments received from the data processing community between the publication of the proposed USA Standard COBOL in 1967 and the period of balloting. Because of the essentially descriptive nature of the document, the standardizing committee recognized early in its work that another element was necessary for the Standard to be effective. The needed element was a "yardstick": a method for measuring compilers for conformity to the Standard. Without such a measure or at least a specification of how such measurements could be taken in a standard manner, responsiveness of compilers to the Standard would not be verifiable.

The Air Force recognized the need for such validation techniques and decided to develop a methodology that could be used equally well to validate COBOL or any high level language implementation. It was in this context that the USAF COBOL Compiler Validation System (CCVS) was developed.[2] The remainder of this article describes the design criteria of the system, its internal structure, and its use in measuring a compiler against USA Standard COBOL.

design criteria

The system was designed to fulfill a number of design objectives. First, as mentioned, the basic techniques that the CCVS employed should be applicable to the validation of other high level procedural languages. While it is obvious that the test programs would be language dependent, the methods for specifying the contents of such programs, generating the programs themselves, and presenting the test results should be as language independent as possible.

The CCVS was destined to run on many different computers but the number of runs on any given machine was likely to be small. Therefore, it had to be easily and quickly adaptable to any computer that had a COBOL compiler.

The current group of compilers suggested another criteria. Most of the COBOL compilers available were designed when work on the Standard had not progressed sufficiently to be certain of the composition of the final document. As a result, their COBOL dialects differ in terms of the features (e.g., SORT), statement variations (e.g., multiple results in arithmetic statements), and rules that they implement. The CCVS must therefore provide a way for its users to vary the contents of a particular test program without resorting to detailed manual changes. Such manual changes would be cumbersome in view of the anticipated size of test programs (as large as 4000 cards). Furthermore, many changes would be difficult to make correctly because of the often complex relationship between COBOL features and the statements in the test program. However, because compilers will adhere to the Standard more and more closely as time passes, this mechanism for change had to be such that it would not interfere with measuring a standard compiler.

Because of the newness of the Standard and, more importantly, because the developmental activity within the Programming Language Committee of CODASYL is spreading the gap between COBOL as expressed in the *Journal of* COBOL *Development* and USA Standard COBOL, it can be safely assumed that the Standard will change and continue to change. Therefore, the CCVS must facilitate the addition of new statements to existing modules, the transfer of statements between modules and the addition of entire new modules.

Finally, the CCVS must be capable of testing a COBOL compiler thoroughly enough to guarantee a high probability of an accurate evaluation. It was deemed most important that the CCVS avoid rating a compiler as standard when it is, in fact, non-standard. Because it is clearly impossible to test every variation of each COBOL statement, the thoroughness of the system would be a function of the judgment (and patience) of the designer, the programmer and the evaluator.[3] The objective of thoroughness was tempered by prudence in the area of testing statements that purposely violated the rules of the Standard. In these cases, the difficulty such intentional errors might cause in interpreting other results overcame the desire for completeness. Therefore, it was decided that no erroneous statements would be tested.

The usually important objective of efficiency was not included in the list of CCVS design criteria because of the infrequency with which the system would be run. Moreover, it was felt that many of the techniques that would increase efficiency would have compromised the system's machine independence.

ccvs description

A compiler validation system must seek the answers to two related questions: (1) does a compiler that claims to satisfy the requirements of a certain level of a Standard module really implement all the functions contained therein, and (2) does the object code generated by that compiler produce standard results? It specifically does not attempt to analyze or evaluate how such results are obtained; that is, it makes no attempt to measure efficiency. One validation method that immediately suggests itself is a set of test programs that contains a large sample of COBOL statements and a method for displaying the results of their execution. However, the use of this method would not satisfy the previously stated design criteria of applicability to languages other than COBOL, rapid adaptability to diverse compiler/computer environments, and ease of modifying test program content.

The CCVS is not a test program, but rather is a test program generator. The user of the system specifies the compiler to be tested and the level of each USA Standard COBOL module to appear in the test program. In response, the system generates one or more programs tailored to the compiler's environment and containing the set of tests corresponding to the designated modules.

The CCVS consists of a data base known as the Test File and three major utility programs. Each of these components will be discussed in turn, starting with the Test File.

The principal resident of the Test File, and indeed the fundamental unit of the system, is called a "Test." A Test consists of a set of COBOL statements that exercise a particular COBOL element, statement or feature. The range of COBOL elements validated in a single Test varies among the different modules. Most Tests appearing in the Nucleus exercise one variation of a single verb; for example, a MOVE of the figurative constant SPACE to a five-character alphanumeric field. For this reason, 1NUC and 2NUC together contain over half the Tests in the whole system. Tests appearing in other modules are more inclusive. SEQ Tests, for instance, use a combination of language elements to validate such functions as the handling of blocked,

[2] The work described in this article was performed for the Air Force Systems Command, USAF, under ESD Contract F19628-67-C-0424.

[3] It is clear from the above that the CCVS cannot prove absolutely that a compiler is standard. There always exists an untried variant which, if tested, could reverse the verdict of "standard."

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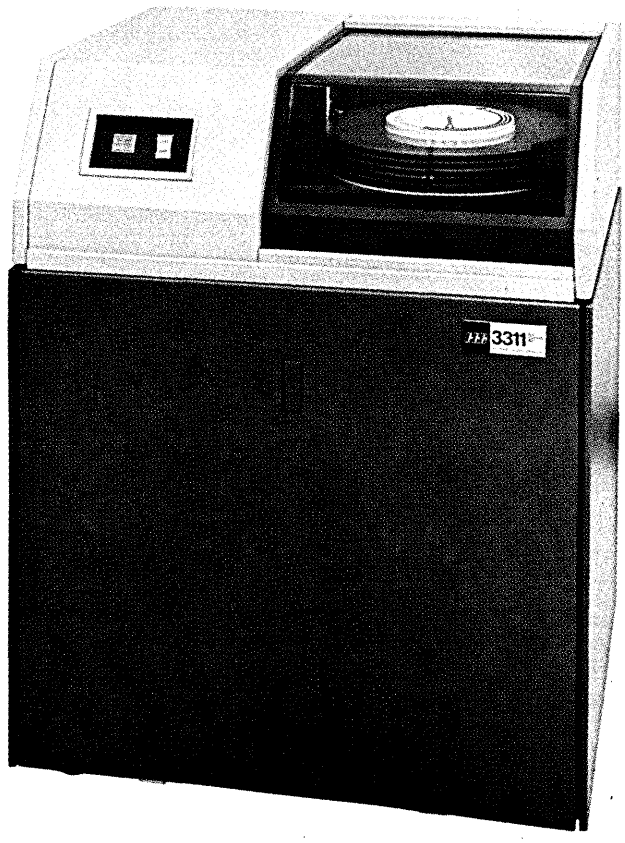

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variable-length records, while RPW combines the validation of several functions in each of its Tests.

In order to simplify programming and maintenance, each Test contains all the Environment, Data and Procedure Division statements that it requires to compile and execute, with the exception of those elements common to

```
T  1N078A101NUC, 2NUC                                          4U
400151  77    WRK-DS-18V00                    PICTURE  S9(18).
400461  77    A18ONES-DS-18V00                PICTURE  S9(18).
400471                                  VALUE   111111111111111111.
400881  77    A18ONES-CS-18V00                PICTURE  S9(18)   COMPUTATIONAL
400891                                  VALUE   111111111111111111.
802925  TEST-1NUC-078.
802930          MOVE   A18ONES-DS-18V00              TO     WRK-DS-18V00.
802935          ADD    A18ONES-CS-18V00              TO     WRK-DS-18V00.
802940          MOVE   WRK-DS-18V00                  TO     SUP-WK-A.
802945          MOVE   '222222222222222222*'         TO     SUP-WK-C.
802950          MOVE   '1N078'                       TO     SUP-ID-WK-A.
802955          PERFORM  SUPPORT-RTN  THRU  SUP-RTN-C.
```

Fig. 2. Example of a CCVS Test

all Tests (e.g., Division headers). Test preparation was also facilitated by the use of conventions that were developed for the assignment of sequence numbers and data-names. Sequence numbers were divided into blocks by Division and Section within Division. The numbers allocated to each Division/Section were then divided further to provide a set of numbers for each USA Standard Module. The naming convention effected the assignment of data-names indicative of the complete COBOL description of the data item. For example, the convention would assign the name A15-DS-03V02 to a signed numeric DISPLAY item of three integers and two decimals having a value of 015. This convention also guarantees that data items having identical COBOL descriptions will have identical names.

Each Test was assigned a serial number indicating the level of the USA Standard COBOL module for which it was written. This number appears in the Test header entry and is used to identify the Test in the results printout and in documentation. An example of a Test is shown in Fig. 2. The first line of this example is the Test header, positions 3 through 7 of which contain the serial number. This particular Test is number 78 of the low level Nucleus. Other information shown in the header is:

1. A code indicating the latest action performed on the Test. The "A" indicates the Test was added to the Test File. A "C" would indicate that the version originally added to the file had been changed.
2. The number of the program in which the Test will appear when it is called out by the system. Program 10 is indicated in this heading, but Tests can appear in any of 28 currently assigned programs. The reason for this large number is that some COBOL elements must be isolated in separate programs because of either the action they cause (e.g., DECIMAL POINT IS COMMA) or the requirements imposed by the rules of USA Standard COBOL (e.g., the rules of 1SRT limit the number of SORT statements to one per program).
3. The modules to which the Test belongs. All Tests written for the low level of a module also test the high level of that module, hence the appearance of both 1NUC and 2NUC in this header. This is the only indicator that need be changed to reassign a Test to another module, or to expand its range to additional modules. As many as nine modules can be specified in the heading.
4. Up to nine two-character indicators called "Drop Codes." These codes represent COBOL functions that are commonly not implemented in current compilers. The code, 4U, used in this example represents COMPUTATIONAL usage. The function of these codes will be discussed later, in connection with the Selector Program.

The body of the Test contains one or more COBOL statements. In this example, the Date Division statements occupy lines 400151 through 400891, and the Procedure Division occupies 802925 through 802955. The statement being tested, an ADD of a computational field to a numeric display field, is found at 802935. The surrounding statements initialize the result field (802930); place the actual results, expected results and the Test serial number in work areas used by the support routine (802940 through 802950); and execute the support routine (802955). This support routine, a copy of which appears in each generated test program, formats and prints the test results.

Three kinds of Test results are developed by the CCVS Tests:

1. The most widely used result is the target field of the operation being tested. Two such results are shown in Fig. 3. In this example 1N078 executed according to expectation, but 1N079 exhibits a difference between the expected result (09900) and the actual result (10000), causing an underline to appear.

```
* 1N078                * 1N079 *
* 222222222222222222 * 09900 *
* 222222222222222222 * 10000 *
*                     * ____ *
```

Fig. 3. Test Results

2. Tests whose results involve a large volume of data (e.g., tests of the SORT statement) or whose answers are logical states rather than changes in fields (e.g., the test of a relation condition) utilize one or more true/false indicators. The expected result is usually a string of 1's while the actual result consists of a string of all 1's, all 0's or a mixture, depending on the number and outcome of the states produced by the Test.
3. The Report Writer Tests produce a sample report which must be compared visually with the report that is developed at execution time.

Tests share the Test File with one or more sets of

Environmental Data. Each set of Environmental Data is related to a specific compiler/computer by a mnemonic name and is composed of 52 card images containing complete or partial implementor-dependent COBOL statements. A statement within a Test can be designated to be replaced by one of the card images from a set of Environmental Data. This feature permits any statement within a Test to be tailored to a particular environment. The CCVS utility programs themselves were placed on the Test File in the guise of tests so that they too could utilize the Environmental Data.

Two of the CCVS utility programs, Test File Maintenance and the Selector, operate on the Test File. The third, Source Program Maintenance, operates on the test programs generated by the system.

The Test File Maintenance program (TFM), as its name implies, enables the user to alter the Test File by addition, deletion or modification of both Environmental Data and Tests. When specifying a new set of Environmental Data, the user fills out entry cards with the information requested in a list provided with the CCVS documentation. These cards do not contain COBOL statements; they are used only to convey the necessary information (e.g., hardware names) to the TFM which, in turn, creates and places the COBOL entries on the Test File. Environmental Data appears at the front of the File and is sequenced by mnemonic compiler/computer name. TFM adds Tests to the Test File with no change to their content. They are ordered by their serial numbers and follow the last set of Environmental Data.

The Selector program performs most of the functions of the CCVS. It chooses those Tests from the Test File that satisfy the user's control specification and amalgamates them into one or more COBOL source programs. The Selector program requires two control cards and will accept three optional cards. The hardware card (HDWR) is required. It contains the mnemonic name of the set of Environmental Data that is to be used by the Selector program for this run, and an indication of whether all Test results or only those that differ in expected and actual results should be displayed at execution time.

The Test selection card (TEST) is also required. It specifies the criteria against which the Tests are accepted. The card can contain one or more of the following designations:

1. The level of a module, in standard form (e.g., 1TBL).
2. The group indicators 1MIN for the minimum USA Standard COBOL modules of 1NUC, 1TBL and 1SEQ; or 1MAX for the uppermost level of each module.
3. Abbreviations for the three CCVS system programs.

Tests with designators matching those in the TEST card (or implied by the card in the case of 1MIN and 1MAX) are tentatively placed in the program being selected.

The DROP card is optional. It can contain a mixture of Drop Codes which correspond to COBOL functions, and Test serial numbers. Tentatively selected Tests are eliminated if either their serial number or a Drop Code from their header entry appears in the DROP card. Otherwise, the Test is permanently selected and any of its entries that refer to Environmental Data are resolved.

The remaining two cards, HEAD and TAIL, can be used to place implementation control system cards in front of or behind each program generated by the Selector.

When the Selector reaches the end of the Test File, it sorts the file of selected Tests on a key consisting of program number, data-name (extracted from Data Division entries and blank otherwise), and Test serial number. The Selector then eliminates from each program all but the first of any entries containing identical (non-blank) data-names. Another sort, this time by program number and sequence number, places the entries in COBOL source program order within each program.

If a HEAD or TAIL card was submitted, the final Selector pass places the implementor control system cards that followed the HEAD card before each program and those that followed the TAIL card after each program. The Selector eliminates all but the first of any entries having duplicate sequence numbers. Finally, it inserts into each program all the required Division, Section and Paragraph headers, and a copy of the support routine if the program produces results (among others, the CCVS utility programs do not produce results).

A typical set of Selector control cards is:

```
HDWR UNV1108002,ALL
TEST 1MIN,1RAC,OPFM
DROP 4U,1RA04
```

Using these cards the Selector would produce the following programs:

Program Number	Content
02	Test File Maintenance Program
10	1NUC,1TBL,1SEQ,1RAC
11	1SQ22 (RERUN)
19	1N314 (CURRENCY SIGN IS literal), 1N315 (DECIMAL POINT IS comma)

The designator 1MIN causes the selection of 1NUC, 1TBL, and 1SEQ. The selection of 1NUC, in turn, produced two programs, 10 and 19. The two Tests in program 19 are isolated because of their effect on PICTURE clauses. Similarly, the selection of 1SEQ resulted in the generation of program 11 in addition to 10. Test 1RA04 and all Tests containing COMPUTATIONAL data items would have been eliminated from the programs, and any implementor-dependent entries appearing in the programs would contain information from the UNV1108002 Environmental Data.

The last CCVS utility program, Source Program Maintenance (SPM), is used to make changes to the test programs produced by the Selector program. The primary use of SPM is to add non-standard clauses whose presence is required by the compiler or whose absence will adversely affect the execution of the test program. A secondary use is the deletion of non-implemented clauses or statements from the test program. Most of these omissions can be better handled through the Drop Code facility, but some are so minor that no Drop Code has been assigned. There are also some instances in which a more thorough validation is obtained by keeping a Test in the test program and eliminating those of its parts that are not implemented, rather than dropping it entirely.

using the ccvs

The CCVS is delivered on a tape containing a self-loading program. This program reads the remainder of the tape and produces the Test File and a source copy of the Selector program.

The initial step in readying the CCVS for use is the compilation of the Selector program on the user's computer. This program (as well as Test File Maintenance and Source Program Maintenance) is written in a subset of minimum USA Standard COBOL to insure, as nearly as possible, that it will compile into an error-free program when processed by any COBOL compiler. Once the three phases of the Selector have been compiled, the object programs must be interfaced with this implementor's Sort program and control system. The Selector program in its object form may now be used to generate the Test File Maintenance program and the Source Program Maintenance program. After compilation, these programs must also be interfaced with the control system.

The first step the user takes when he desires to validate

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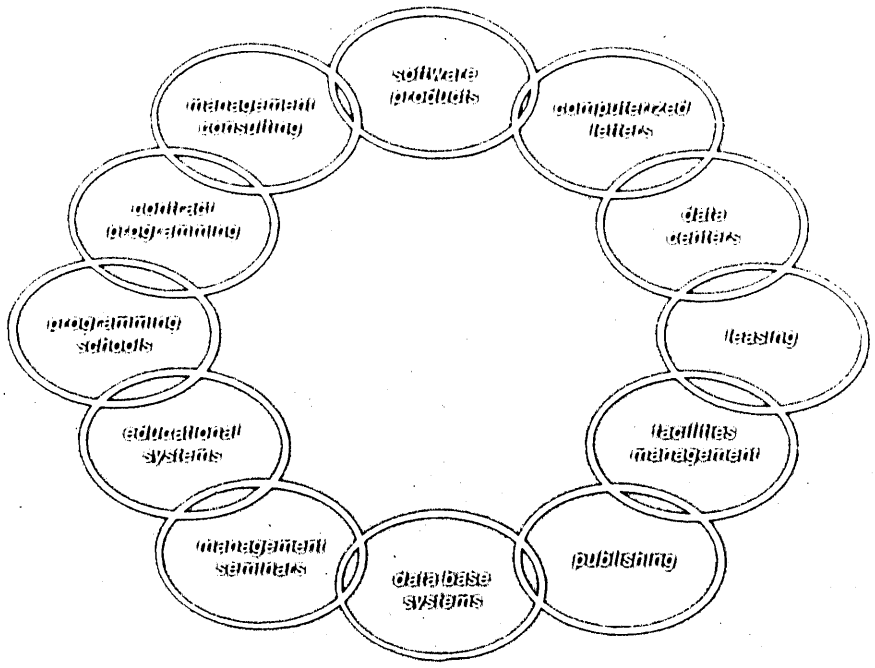

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CIRCLE 173 ON READER CARD

a compiler is to determine from the latest print-out of the Test File whether it contains Environmental Data for the compiler to be tested. If not, the user fills out the environment entry cards and makes a Test File Maintenance run.

Next, the user decides which modules and which level of each module he wishes to measure the implementation against. There are at least two ways of arriving at this decision:

1. The reason for evaluation may provide the criteria. For example, if the compiler has been named as part of the answer to a request for proposal, the RFP may contain a list of the modules that must be implemented, or the issuing agency may have a standard requirement that provides this information.
2. The implementor may claim in his advertising the level at which his compiler is rated and the user may simply wish to verify this claim.

If neither of these ways is available, the user can initially generate test programs to measure the compiler against full USA Standard COBOL, then successively reduce the requirements until he achieves a clean compilation. This, obviously, is a time-consuming approach and should be avoided.

The user should review the implementor's COBOL manual and determine which elements in the modules he has decided to test are not available in this compiler. These elements can be identified to the Selector program for elimination via the Drop Code facility. The user then prepares the Selector control cards, makes a Selector run to generate the specified test programs, and prepares a set of operating system control cards to be used for the compilation and the execution of the programs.

The next step is the compilation of the source deck of the test program(s) as it emerged from the Selector program. If the compilation is free from serious error messages, the resulting program is executed. If compile-time errors have occurred, the user must trace each message back to the source statement that caused it and, using the Source Program Maintenance program, modify the test program to eliminate the errors. Output from the Source Program Maintenance program should be retained to document these changes.

The final step of the validation process is to run the test program. If an error occurs during the run, the error must be traced to the source program. The program must be corrected using Source Program Maintenance, and then compiled again.

The result of a validation run—the answer to the question of compiler compliance with a particular set of Standard modules—must be determined from:

1. The list of language elements initially eliminated by the Selector program.
2. The modifications made to the source deck of the test program as indicated by the output of Source Program Maintenance.
3. The Test results that are flagged in the output of the test program.

The Test serial numbers that identify each flagged result can be used to locate the documentation of the Test that produced the questionable result. This documentation indicates the module to which the Test applies and the particular feature being examined. The Standard should then be examined to see whether the expected or actual result should have been obtained. Often, the user will find that the Standard does not say, and that the final judgment must be his.

During its Air Force acceptance tests, the CCVS was run with four third-generation COBOL compilers and demonstrated that it satisfied the original design objectives. (The objective of extendability of the CCVS design to the validation of other languages was satisfied by the subsequent USAF acceptance of a JOVIAL Compiler Validation System, developed by another organization using the basic design of the Test File, TFM, SPM and Selector programs.) As was anticipated, these compilers, having been developed prior to the Standard, provided a challenge to the CCVS. Each compiler had at least one non-standard rule or restriction that, while probably never noticed by its regular users, caused the test coordinator to make numerous changes to the test programs before they would execute correctly (fortunately, the utility programs ran correctly with little or no change on all four machines).

The acceptance tests indicated that validating a compiler is not a simple matter. The most difficult task was that of interfacing the test programs with the implementor's control system. Because these programs use every peripheral device accessible through COBOL and call upon auxiliary programs like the sort/merge, a wide variety of control cards must be prepared. As these cards are far from standard, the CCVS can offer almost no assistance in their preparation. Another major task was that of interpreting Test results. Because the Standard does not always specify exactly what should result from the execution of a particular statement or functional group of statements, the precomputed Test results sometimes vary from the actual result. While they are flagged by the test program's support routine, such differences cannot always be considered "errors." Each must be analyzed carefully to determine whether it is: (1) the result of a compiler malfunction, (2) a definite violation of the Standard, (3) an interpretation of the Standard that, while not erroneous, is not acceptable to the user, or (4) a different but equally acceptable interpretation (i.e., an ambiguity).

In conclusion, it should be noted that the CCVS has uses other than compiler validation. Three will be cited here, but others are undoubtedly waiting to be discovered.

1. The issuance of a new COBOL compiler is usually followed closely by a series of modifications. Although the time between the arrival of such modifications increases with the compiler's age, it seldom reaches a comfortable span until the compiler is obsolete. These modifications often cause trauma when the newly updated compiler is released within an installation, because COBOL programs thought to be "debugged" suddenly produce unusual results following their next compilation. This situation can be mitigated by generating a set of test programs that reflect the dialect of COBOL used by the installation and running them against each modification prior to release. A comparison of the Test results will indicate those statements and functions that produce different results in the new version, permitting timely and appropriate action to be taken.
2. In similar fashion, CCVS-generated test programs can be used to uncover differences between one's present compiler and the compiler to which a conversion is anticipated.
3. The CCVS provides a method of rapidly developing a high degree of familiarity with an implementor's control system as well as his COBOL compiler. As noted previously, CCVS test programs are able to exercise all the functions that a given system provides and, hence, the very act of making them operate breeds expertise.

It is therefore a fairly safe assumption that the CCVS and its fellow audit routines will enjoy a long and beneficial relationship with the COBOL user. ■

management insight system

ALPHA BETA'S INFORMATION CENTER

by R. A. McLaughlin

When the fourth computer generation comes upon us it will be met with curiosity, mingled with a sense of awe, by laymen and professionals alike. It will also be met with a shudder by many data processing department managers . . . those who experienced the coming of the third generation too close on the heels of the second. Many of those dp managers realize that what have too often become quietly obsolete are not the machines but the converted and reconverted tab card programs being run on them, those hold-overs from an earlier time, and the operating systems still geared to processing them.

Can anyone get off the computer generation merry-go-round, stop long enough to get their applications running smoothly and efficiently without being left behind in some sense? What happens if they do? Very few have tried it and talked about it. Very few had anything they could say. But it has been done. It is being done, for instance, at Alpha Beta Acme in California.

alpha beta's application

Alpha Beta, a subsidiary of Acme Markets of Pennsylvania, runs a chain of 155 California supermarkets, eight in the San Francisco Bay area, the remainder in the five Southern California counties. Some of the store orders for the Bay area stores are filled from a local warehouse. Many of the items for the Bay area, and all 15,000 items for the other chain outlets, are delivered by a fleet of 85 trucks from one La Habra, Calif., warehouse.

The Alpha Beta dp installation near that warehouse has a sizeable job. It must service a horrendous number of stock orders, billings, and buys for items as small as a pack of cigarettes (52 brands or types, seven vendors, seven purchase price and delivery schedules). Each of the 155 stores orders an average of over 1,000 items each day. Once the individual order has entered the computer system, a network of operating programs must add the stock to the store allotment, deduct it from the warehouse (plus print an order list for the warehouseman), refigure the store item and dollar volumes (plus compute gross profits), and update order information by item, by store, as required for store inventory control. Of course, within one store's inventory listing there is a tree-like structure of subtotals by grocery category, mark-up, etc.

The only difference in the two 360/30's are signs reading "primary" and "secondary," and even the signs are interchangeable.

The data processing task here is no small assignment, and the competency of its execution directly affects the profit and loss picture for the parent company. The dp organization is a real world operation which has itself operated as a separate profit and loss burden center since it bought tab equipment. This is a big part of the story. DP decisions to buy new hardware or hire more people or to produce new software have always rested on the question

"What do we get for our money?" Using that criterion the shop has evolved into its present configuration: two IBM 360/30's, four tape drives, and six 2311 disc pack drives.

Sounds like a run-of-the-mill configuration, and it is. It is not the hardware that makes Alpha Beta's operation unique, but the manner in which it is used. All of the applications program coding, and all operating system coding, and all utility package coding is in—believe it or not—1401 AUTOCODER.

There is something at first painful in seeing 360's being used as 1401 emulators full-time. Many users have played the emulation game part-time (and felt guilty about it), to handle checked-out tab shop jobs that did not warrant rewriting. But Alpha Beta is not running a tab shop, and emulation, for them, may be more efficient than the alternatives.

The decision to bring in a 360/30 and run it as a 1401 is not a casual one, and understanding the reasoning involved requires a deeper look into specifics. For an appreciation of the complexity and sophistication of their application, consider that all of the inventorying and merchandising tasks listed above are only a part of the center's work. In addition to these, the center must determine and "control" fixed expenses for employee benefits, services purchased, insurance, taxes and licenses, depreciation and amortization. It must similarly keep track of non-fixed expenses for supplies, utilities, bad check losses, and special promotions. Add to this the payroll accounting and personnel reporting (for 7,000 employees) in a multi-multi-level personnel structure where even the computer operators are members of the Teamsters.

Inputs to the system are in the form of punched cards, journal tapes prepared on NCR optical font adding machines for conversion to magnetic tape, audio transmissions from remote site mag tape cartridges prepared on Digitronics or MSI (Marketing Systems Inc.) adding machines in the stores, and from Mohawk key-to-tape units.

Over 200 different reports, some with varying formats for persons at different need-to-know levels, some personalized to look like what somebody in Department X wants, are produced each month.

The Alpha Beta dp staff has effectively produced a black box management information system. Its varied inputs are operated on by an integrated network of 180 component programs to directly tie each customer purchase and each cost consideration to profit and loss history, to the current budget, and to projected earnings.

Perhaps the most pertinent reason that this network of interrelated reports and jobs was not converted to native 360 language is simply that the 10-man dp staff could not handle the extra work load while attempting to accommodate the changes in marketing or accounting strategy continually imposed upon them, such as adapting the system to carry retail pricing infomation as well as wholesale for better profit and shrinkage insight, or to adapt to a discount pricing structure.

Bill Cowan, manager of systems and data processing, states the Alpha Beta case this way:

"At this point in the technological progress of computer based systems, it is not difficult to save money in many clerical operations, with adequate systems design. However, the real challenge is to devise systems to aid management in generating profits. During the past two years [since the installation of their first 360 system] much of our work has been devoted to this goal. It is for this reason primarily that we have yet to program our applications in third generation languages. It can easily be argued that we are not taking advantage of the processing speed of the

Bill Cowan, left, manager of Alpha Beta's Data Processing and Systems Departments, and Nick Olfee, systems supervisor, are largely responsible for producing the company's black box management information system.

Inputs to the system are in the form of punched cards, Mohawk key-to-tape unit records, journal tapes which are recorded on NCR optical font adding machines for conversion (as above) to mag tape, and audio transmissions.

ALPHA BETA'S INFORMATION CENTER . . .

360. However, we have managed in general to stay abreast with current management requirements and it is hard to argue with this result."

Just as anywhere else, as one program became older and patches were made to keep it current, rewriting became more desirable and also more formidable. Multiply this by the 200-plus programs used and it is easy to see why new generations of hardware are met with mixed emotions by users such as Alpha Beta and why user groups push hard for standardization and compatibility. Hopefully, the increasing problem of too few attempting to do too much to keep up with pyramiding software needs has suggested constraints to the builders of the hardware and the architects of the forthcoming systems.

Unlike nearly anywhere else, "falling behind" may have put Alpha Beta involuntarily into a mode of operation more desirable and more efficient than "keeping up" would have. It has been suggested that the application which the center services well with the 360/30's could not be done using third-generation techniques, operating systems, and higher-level languages on anything less than two 360/40's using two IBM 2314 disc subsystems.

Several factors were active in the acquisition of the 360's. Factor One was price. The 360 series was introduced with a rental scheme more lenient toward overshift rental than were 1400 series leases (30% of prime time rental for time past 176 hours on the 1400; 10% for the 360). Overshift rental on Alpha Beta's single 1460 was running up to $3,000 per month, jacking a normal month's rental above $12,000 (considering that a normal month for them would see as much as 575 hours). The rental for a 360/30 has proven to be more than $1,000 less:

November 1966 — 1460 Disc/Tape System	
Base Rental	$10,415.60
Overtime	2,377.45
Total, including taxes	$12,793.05
January, 1967 — 360 Disc/Tape System	
Base Rental	$11,016.60
Overtime	312.81
Total, including taxes	$11,329.41
Initial Savings Per Month	$ 1,463.64

(Continued on p. 89)

Typical of the complexity of the 200 reports generated is this copy of the Stock Status Sheet, on which even the entry for packages of egg roll is broken down into quantity and date ordered, updated suggested order quantity, rate of discount, and minimum order.

STOCK STATUS — BUYER F — PAGE 26 — 03-22-69*

STATUS / ORDER	TIE	HIGH	W/V RATIO	CUBE RET/	LBS. RET. $	PACK-SIZE-DESCRIPTION	INVENTORY BALANCE ON ORDER	AVE. DELAY DAYS AGO	ROP	EOQ	SOQ	X	ORDER COMM. CODE	ORDER QUANTITY	MOVEMENT ESTIMATE NEXT WEEK	03-22 CURRENT DATE	03-15	03-08	03-01	02-22 PRIOR WEEKS			RECEIPTS	UNITS SHORT
						GENE J VELLING CO 8830 CALAVO AVOCADO GROWERS 1220 P 2.0% 10 DAYS, FREIGHT-FREE#						F-0067-8200												
	016	7			140	247 3/4 OZ CALAVO AVOCADO DIP	108	5	55	137	80@		924811		37	33	45	6	21	39			96	
				-A		-B -C			60-D				-E											
	PROFILE			$	%	$ % $ %	%		$060 100%			$	%	$	%				112-LBS -CUBE				3.7-O.O.P. 96-REC	
						GENE J VELLING CO 8830 CONTEMHORARY CAPITAL CORP 2082 P 2.0% 10 DAYS, FREIGHT-FREE, MINIMUM- 100 CASES#						F-0068-8300												
C	10	3			2000	6400Z BUTLER REC APPLE PIE	21	3	65	225	170@		928549		70	62	68-15ST							
						ORDERED...	100	5																
				-A		-B 170-C			-D				-E											
	PROFILE			$	%	$ % $1,168 100%			$	%		$	%	$	%				3,400-LBS -CUBE				3.2-O.O.P. -REC	
						GENE J VELLING CO 8830 KOLD KIST INC 4730 P 2.0% 10 DAYS, FREIGHT-FREE, MINIMUM- 200 CASES#						F-0069-4070												
*	10	5		70	2650	2414 OZ K K CREAMED CHICKEN #		6	55	53	XXX	R	918318		26									
*	10	5		70	2650	2414 OZ K K CHILI # BEANS #	-2	6	25	19	XXX	R	918409		11			0-100T	12/31					
C						126Z K K BOIL BAG SIRLOIN TIPS	473	6	351	484	362@		918417		237	17/	20#-55T	-40T	3/31				420	
C						126Z K K BOIL BAG CRM CHIX	220	6	176	216	166@		918425		105	57	9#-55T	-40T	3/31				180	
*						126Z K K BOIL BAG CHILI/BEANS#	169	5	136	157	XXX	G	918433		76	3/	7#-55T	-25T	3/31				150	
*	10	5		70	2650	2414 OZ K K K SIRLOIN TIPS #	17	6	4		XXX	RNO	918490		3		0-100T	12/31						
				-A		-B 528-C			-D				-E											
	PROFILE			$	%	$ % $1,727 100%			$	%		$	%	$	%				-LBS -CUBE				2.0-O.O.P. 750-REC	
						WONGS DIV-CHUN KING % D KEENE 9291 P J REYNOLDS FOODS INC 7217 P 2.0% 10 DAYS, FREIGHT-FREE, MINIMUM- 1000 CASES, REMARKS-.10 ST #						F-0070-3587												
F	12	6		20	1400	1217 CHUN KING CHICK CHO# MEIN	1030	6	107	77	-84@	INO	926105		49	45	52	53	53	43				
F	12	8		50	1200	1212 CHUN KING EGG FOO YOUNG	114	6	65	68	-82	INO	926162		40	38	32	52	46	40				
						ORDERED...	96	7																
F	16	7		20	600	126 CHUN KING EGG ROLL	35	6	98	96	-97	INO	926220		58	58	67	74	57	54				
						ORDERED...	256	7																
UF	16	7			600	126CHUN KING MEAT & SHRIMP ROL	731	6	195	153	-383	GNO	926238		93	92	78-85T	3/14						6
F	16	7				126Z CHUN KING SHRIMP EGG ROLL	390	6	127	136	-367	GNO	926240		82	88	72-85T	3/14						
						ORDERED...	240	7																
F	16	7				126Z CHUN KING CHICKEN EGG ROL	329	6	112	120	-289	GNO	926253		72	81	64-85T	3/14						
						ORDERED...	192	7																
F	12	6		20	1100	1210 CHUN KING FRIED RICE	68	6	61	68	-47	INO	926287		40	41	40	41	40	41				
						ORDERED...	108	7																
F	12	6		20	1000	1216 CHUN KING SWEET/SOUR PORK	106	6	97	77	-40	INO	926642		47	52	40	51	48	38				
						ORDERED...	108	7																
				-A		-B -C			-D				-E	2,151	-F				-LBS				1.7-O.O.P.	
	PROFILE			$	%	$ % $ %	%		$	%		$	%	$12,909 100%					-CUBE				-REC	

Add this, plus the investment tax credit IBM shifted to the user (amounting to ⅓ of all of the 7%-of-cost credit, depending upon the calculated life of the machine), to the plus side of the ledger.

throughput speed

Factor Two was speed. Billed as being 1.6 times as fast as a 1460 internally, a 360/30, in Alpha Beta's environment, produces at an overall rate of 32-34% faster. Almost nothing of this gain was realized from increased tape and printer speed. Very little was realized from the faster card reader. The biggest advantage, as would be expected for a commercial application, was faster sorting—due to the faster cpu (1.5 usec memory cycle time compared to 6 usec; a 40 usec add time compared to 228), and due to the 50% faster 2311 disc drives which replace the 1311 discs used on the '60. Results of test runs looked something like the chart below.

their operating system vs dos

After the letter of intent for the 360 was delivered, the next big decision, not to go to native 360 code, was made. The biggest consideration in this decision was the manpower justification problem. The next-to-biggest consideration was Alpha Beta's software investment. For the 1401, later revised for the 1460, Alpha Beta had developed an effective *operating system* which provided for, among other things, step by step program roll-in/roll-out, a feature that 360 DOS does not offer. This interrupt feature is especially critical to them since it allows for the AB operating system to make use of one sort program, with multiple options, rather than having it simple-mindedly require one per program to be executed as does DOS. The AB monitor also establishes processing priorities for mixed input so that data files are updated in the proper sequence. For instance, in inventory control, new vendor information is added first, then new items, purchase orders, receivings, adjustments, and billings.

On questioning, the dp staff is very willing to offer comments on shortcomings in DOS. As expected, the complaints are familiar, and begin with JCL. "We find the idea of VOLS, DLABS, TPLABS, ASSIGNS, UPIS, and others all wrong. This information could be supplied by the program control and should not be left to the discretion of an operator. The DOS approach to scheduling is completely archaic. We feel that with a minimum of effort the system can monitor all jobs and supply the operator with a schedule of what must be done and the sequence to process it in. The only decision the operator should make is 'Yes, I want to do that job' or 'No, I do not want to do that job.' From that point on the system should be telling him what it needs."

Libraries and directories come in for a share of complaints, too. "We dislike the approach taken with link editing and cataloging source statements. We believe that the linking together of subroutines, defining of areas and constants, and resolving of addresses should be done at execution time (program load) rather than at assembly or link-edit time. This whole series of systems functions is unnecessarily complicated."

IOCS, and similarly Sort-Merge, is mentioned with disdain. "It is extremely difficult to memorize all the 'rules' for IOCS because the logic behind the rule is either not given or misrepresented. You are asked to blindly fill out coding sheet after coding sheet of information you have memorized. The coding of DTF's is involved; they are much too general. The file organization techniques with ID's, WRITE AFTER's, WAITF's, SETFL's, ENDFL's, etc. is overly-complicated."

Undoubtedly we would not have to look far for agreement on any of these fault-findings.

In contrast to DOS, or perhaps more correctly, in opposition to DOS, the AB monitor is coded to provide a maximum of operator messages and a minimum of control cards. There is no control card stream as such. One program generally calls another, using the roll-in/roll-out feature, and an operator can be trained to understand the processing sequence commands in about five or six weeks. This training is largely a matter of explaining how to interpret the console messages and how to mount a disc pack—but not when to mount it, the system decides that. The operations staff has now had many years to memorize these commands and diagnostics; this fact is reflected in a claimed op error rerun rate of 1%.

To incorporate the operating system on the 360, one clever fudge factor was introduced. Each of the perfectly-redundant 360 configurations has three discs, which, through fake sector addressing, are made to look like six. One result of this fix is that the total storage capacity of each pack is cut from 6.5 megabytes to 4.0. This is still enough to contain all 180 main line programs plus file control information, an on-line communications area, a

	1460 Time	360 Time	% Reduction
Meter Time (in hours):			
A. Card input	.26	.16	38%
B. Process misc.	.04	.03	25
C. Billing sort	.23	.13	43
D. Billing print	.46	.36	24
E. Other	.01	—	—
	1.00 hr.	.68 hr.	32%
Clock Time (in minutes):			
A. Card input	15	11	27%
B. Process misc.*	08	09	—13
C. Billing sort	13	07	46
D. Billing print	30	22	27
E. Other	—	—	—
	66 mins.	49 mins.	26%

*With the exception of step B, "Process Misc.," the test was entirely successful. In step B, four disc pack changes were required. Pack changes on the 360 are slower than on the 1460 because of sweeping (cleaning) the discs, which takes much longer than simply changing from one pack to another.

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CIRCLE 6 ON READER CARD

store reference table, and 2.0 megabytes of work area. Another result of the patch is that alternate scratch packs are made available for the applications programs and for the roll-out.

Programs are catalogued by name on the systems pack. Program ID, consisting of name, program length, and load point, is stored one name per sector and accessed by a table look-up routine. It takes a total of three seconds to access each program with this scheme. A valuable communications area for the monitor is left without memory protect, but program-to-program information is written to a disc communications area.

Careful original planning made the conversions thus far attempted for the system—from 1401 to 1460, from tape-oriented to tape and disc-oriented—relatively painless. For instance, the basic 1401 inventory data record was set up with 700 characters (1,400 for mag tape budget records; 900 for taped financial records) and has not yet been completely filled. Those same kinds of considerations could make conversion to native 360 code somewhat easier, too.

trying 360 coding

For one newly-conceived program package, for maintenance and control of the trucking fleet, Alpha Beta set out to test the conversion concept. The trucking application was chosen because it would least relate to the other nested programs for data. The most capable 360 language man was assigned the task. After five weeks of design and 300 hours of coding, the fleet utilization and maintenance system is not yet completed. AUTOCODER could have been used, Bill Cowan claims, to do the same job in a maximum of 200 hours. Here he is willing to admit, however, that initiation and program maintenance routines had to be designed anew, rate tables had to be constructed, and several complicating factors such as size and type of truck, fuel type, and new forms of input akin to badge readers had to be considered. Still, he maintains, the job could have been finished by now with AUTOCODER, and still he waits for the 360 version.

the not-so-final evaluation

In some ways being on a 360 helps even in emulation. For instance, the prospect of going to programs of larger size due to the increased core looks inviting. Obviously there are many more features that are not available in emulation mode, such as the full internal speed (instructions are processed at approximately half-speed in emulation) and multiprogramming (although some tape, printer, and card functions *can* overlap even in 1401 mode).

Alpha Beta has taken an unpopular stand in staying with the 1400 language, but it is hedging its bet by acquiring and familiarizing its staff with the 360. A good third-party lease of second-generation machines for doing the same job would be cheaper today by 20-40% than their third-party lease of third-generation gear for emulating the second-generation hardware, but would forestall ever getting to those desirable 360 features. It seems that if they have not used the 360 as a 360 by now they never will, but perhaps they will join the rest of the world in the fourth generation.

Maybe they are right. In the final evaluation, as far as such things can be final, the Alpha Beta staff is elegantly performing a very real, very large job at less cost than it did several years ago and is providing, at the same time, additional management tools for achieving better profits. In a real world commercial shop, that is the goal. ■

faster

DYNAMIC CALCULATION OF DISPATCHING PRIORITIES UNDER OS/360 MVT

by Bruce S. Marshall

In viewing the use of a multiprogramming operating system on today's larger and faster computers, it becomes obvious that the proper management of the flow of jobs through the computer is a prime necessity for efficient machine utilization. Included in this job management must be the consideration of job priorities for the allocation of the resources of the computer. In particular, the priority allocation of the central processing unit (cpu) itself can be of prime importance at an installation where many jobs will completely utilize all the available cpu time to the detriment of total system throughput. The discussion which follows describes an attempt to allow the OS/360 MVT operating system to set priorities of jobs according to their individual cpu usage.

internal and external priorities

Any installation using or contemplating use of a multiprogramming system is faced with the problem of computer job priorities. These priorities should be classed as two distinct types. The first is the external (to the computer) priority which defines the relative priority of a particular job among all other jobs to be submitted to the computer. This priority is usually set by some individual in the installation who has the authority and knowledge to judge the relative merits of each job in relation to other jobs. It is reasonable that the setting of external priorities should be done by humans as opposed to letting the computer do it because the algorithm required to allow the computer to make the decision would be infinitely complex to cover all situations. However, once the computer has been presented with a number of jobs to place in the process of execution simultaneously, the second type of priority (internal) comes into play and it is here that the computer is the best judge of its own environment.

It is a fact of the multiprogramming environment that the most efficient means of running the computer is to place those jobs which are doing the most input and output (I/O) operations in a position to receive high priority service from the cpu. It is usually the case that these jobs will be idle a considerable amount of the time they spend in execution due to their waiting for the completion of I/O operations. By placing these "I/O bound" jobs at a high internal priority, they will execute at top speed, limited only by the I/O device speeds, and yet allow a great deal of work to be done on lower priority jobs which should be more "compute bound" in nature.

Since the I/O boundness or compute boundness of a job

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change n second to second throughout the run, the operating system can know the character of any job at any point in time during its execution. Therefore, it would seem that the system itself judge what internal priority a job should have relative to the other jobs currently in execution. Ideally, the computer should be able to determine the I/O or compute boundness of a job in relation to other jobs in the system and should juggle the internal (dispatching) priorities accordingly to obtain the most efficient utilization of the computer. However, a facility for overriding the dispatching calculations of the system should be provided for those instances where a given job must have highest or lowest dispatching priority regardless of efficiency due to external priority requirements.

priorities used by os/360 mvt

The OS/360 MVT system as currently implemented has really only one type of priority which is used and that is the external priority. The individual(s) who set external priorities may specify an external priority at the time a job is submitted to the MVT system. This priority then serves to indicate which job will be selected first for execution and also what the internal priority of the job will be. The internal priority is thus fixed over the life of the job regardless of the nature of the job. Two jobs given the same external priority will receive internal priorities relative to each other based on the first job submitted receiving higher priority.

A job class facility exists which allows jobs to be classified as to the resources (peripheral devices, memory, etc.) required for execution. The cpu may be considered as one of these resources and jobs may be placed in classes which reflect the cpu requirements of each job. But the internal dispatching priority will still be determined by the external priority specified for each job and the job class facility will only serve to keep jobs with conflicting cpu requirements from being placed in the process of execution concurrently.

Again, the determination of priority and job class for each job is an external judgment and thus the efficiency with which the machine executes a given set of jobs still remains primarily a human decision. The MVT system makes no attempt to increase efficiency by automatically setting internal priorities. Since most installations run a large number of jobs each day with widely varying or unknown characteristics, it is usually only a "best guess" which determines priorities.

The scientific computer installation at Lear Siegler is a medium sized installation whose work load consists of 95% FORTRAN compile, load, and go jobs. Most job run times range from 1 minute to 20 minutes on a model 50 running MVT in a 512K memory. For the past year, we have been setting external and, by default, internal priorities on normal job submissions based on three priority levels. The priorities are determined by the estimated job running times with time ranges of 0 to 6 minutes, 7 to 12 minutes, and 13 to 20 minutes receiving high, medium, and low priorities respectively. These levels worked reasonably well under the assumption that if the shorter jobs were compute bound, at least they would not capture the cpu for long periods of time before terminating. However, it was obvious that a better method of setting dispatching priorities would gain much in efficiency. The nature of even the shortest (and, therefore, the highest priority) job was to go from compute bound during compilation, to I/O bound during linkage edit, and all possible combinations during execution.

Much thought was given to the algorithm to be used in calculating dispatching priorities as well as implementa-

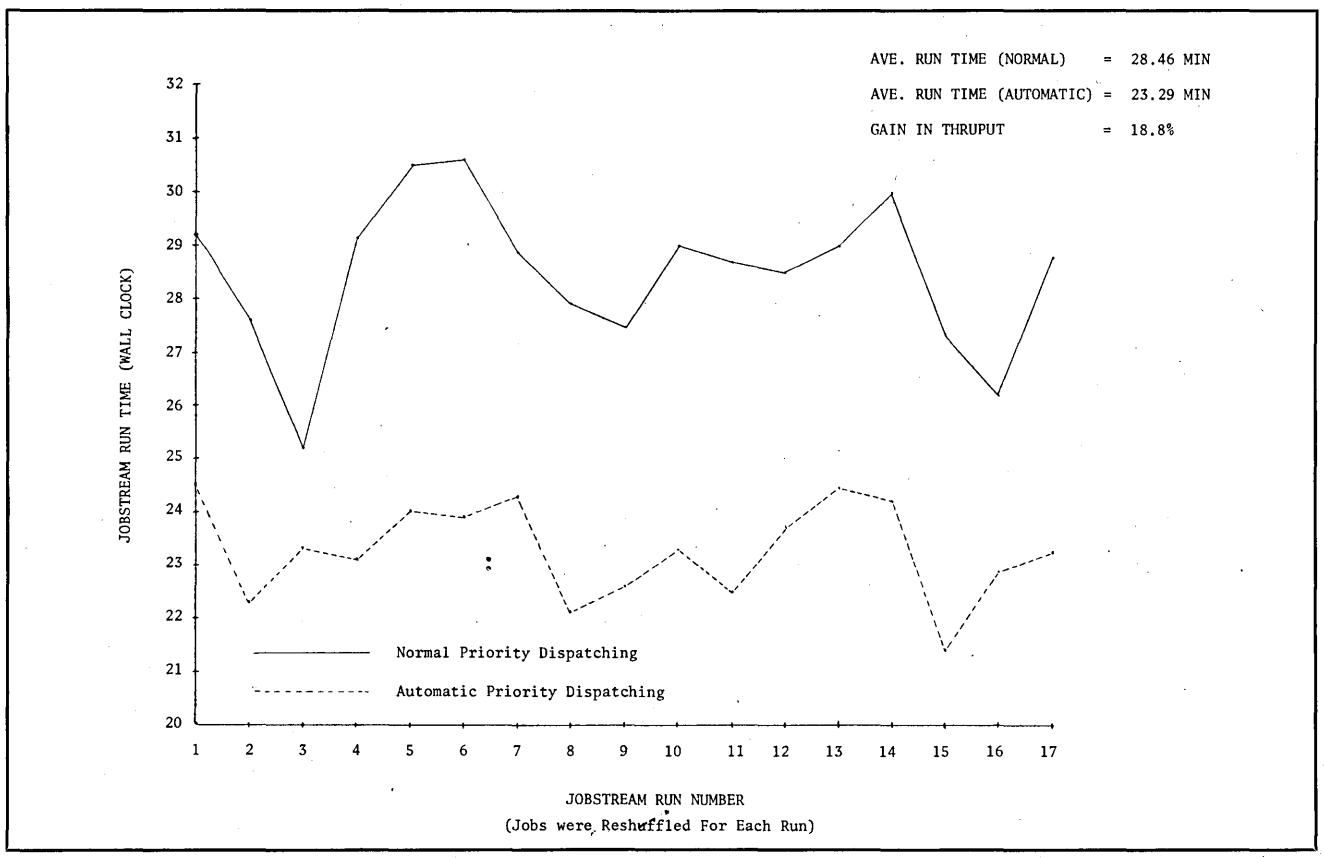

Fig. 1 Automatic Priority Dispatching (without time slice option).

dispatcher simply selects the highest task in the chain which is ready for dispatching. To implement the automatic priority scheme would require rearranging the order of a portion of the TCB chain every five seconds (the chosen interval) and then letting the MVT dispatcher follow the normal dispatching logic over the following five-second interval. The ordering of those TCB's not contained within the automatic priority group would not be changed.

The priority algorithm was successfully implemented on a non-time-slice system and was again tested showing an increase in throughput of from 7% to 22% with an average increase of approximately 19%. Fig. 1 shows the run times obtained, again using wall clock times from third job start to third job from the last finished. As was expected, the reduction in overhead provided a slight gain in efficiency. In addition, the core required to make the modification was reduced from 1800 bytes to 500 bytes.

The modified system was placed into production and most jobs are now being submitted at the automatic priority level. Jobs which run longer than one hour are placed at a fixed priority level lower than that of the automatic level and we still have the option of running jobs at a higher priority level. No problems have been encountered with the modified system and a great burden has been removed from the individuals who used to specify priorities, while at the same time the system efficiency has been improved.

An additional feature which became available with the implementation of the automatic priority dispatcher is an easy method for obtaining statistics pertaining to the characteristics of the normal installation work load. Additional logic has been placed in the dispatcher to sum up the amount of time (cpu + wait) spent at any of the 100 automatic priority levels. By displaying these sums after a period of several hours of normal system operation, it is possible to observe the "profile" of the computer work load. The information can be obtained from system core locations by a program run under the MVT system without disturbing the continuous gathering of statistics. A profile was obtained of our normal work load and compared to the profile of the sample jobstream used in testing to ascertain that the jobstream was typical of the normal work load.

conclusions

The implementation of an automatic priority facility has been extremely successful at the Lear Siegler scientific installation and it is felt that we are running at a much greater efficiency even though we were very conscientious about machine efficiency under the old nonautomatic priority scheme. In any event, the implementation of the automatic priority setting has relieved much of the decision making required by operations personnel.

It is our opinion that the gains in throughput which we have realized could represent a minimum gain for an MVT system as the machine and core configuration at the Lear Siegler scientific installation is probably a minimum MVT machine. It should probably be expected that on a machine which allows more than three jobs to be in core at a time, a greater gain in efficiency could be realized. There is also no reason to believe that the same dynamic priority scheme could not be applied to OS/360 MFT with even greater gains in throughput for that system. ■

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THE COMPUTER UTILITY: IMPLICATIONS FOR HIGHER EDUCATION

It was almost a put-on. There, amidst not-so-beautiful Manchester, N.H., sat the Sheraton-Wayfarer Inn, guest rooms nestled around a brook, covered bridge between buildings, waterfalls and all the beautiful greenery of spring. It was early May, and university professors and other attendees at the Symposium on the Computer Utility: Implications for Higher Education, sat basking on the sundeck, listening to the dronings of the sessions inside come over the loudspeaker—while a few miles away students at Dartmouth and MIT rioted.

But the symposium itself was not unreal or organized just for pontifications of ivory-tower thinkers. It began the universities' cooperative address to a very important prospect for the future of education: the computer utility. The 150 attendees at the meeting, sponsored by the National Science Foundation, Educom, and the Univ. of New Hampshire, were charged with developing at least a skeleton of a position paper on the problems and needs involved in the utility concept, useful for review by others involved in higher education.

"We serve as a test bed for what will happen later," said Dr. Jordan Baruch, president of Educom (Inter-university Communications Council). This was to be the first and last such session with invited papers. Henceforth, once issues are identified, working committees will be formed to hammer out positions and plans of activity.

Taken piece by piece, many papers given here suffered from the usual weaknesses of being ill-directed or poorly given; much information was there but often hidden and not in logical order. But the intent was good and what resulted was worthwhile.

Actual definition of the computer utility was lacking. The group seemed to limit itself to the idea of a network of interconnected computers within the university environment, which was reasonable for a start. The concept of a nationwide utility outside the control of any one category of users was not really addressed, although the Federal Communications Commission inquiry on computers and communications was discussed.

Richard Mills, MIT, held up his university as a scale model of the problems that a larger, more widespread computer utility may face. (MIT is in the initial phases of interconnecting its 10 computers, ranging from the 1130 size to the 360/65, GE 645, and IBM 7094.) He noted that the computer resource now ranks with people and laboratory facilities in importance. The most difficult problem, now that intellectual recognition is being gained for this resource, is making sure that there is management and budgetary recognition as well, "a slow painful process." *(Continued on p. 100)*

THE COMPUTER UTILITY . . .

some problems

MIT's experience has identified the following problems: facing computer utility development are technological difficulties in the form of the current communications plant, which is "not ideally suited to support the data communications requirements that arise out of the computer utility concept." Mills is concerned that the direction and speed of growth of this concept will be influenced by the inertia and friction of data communications developments.

In regional sharing—for example, the plan for 70 New England colleges and universities—there is the problem of how to normalize internal management so that the centers with special and larger capabilities are not overloaded. A central agency is needed to oversee this, as well as to assure that the needs of individual faculty members are transmitted to the "mushy" big computer plant.

Among other problems: "We have learned to communicate intellectual output via publications and other media, but do the job badly with computers." The computer utility could deprive the developers of hardware, software, and communications of their own machines; but ways must be found to make them think they have sole use of a computer. The student wants hands-on experience with a system; he can't "change wires" in a regional network, so some local machines will be needed. The use of computers as a tool in the teaching process is a giant "intellectual area that's really untouched," said Mills. "We must rethink the learning/teaching process." Machine compatibility is another problem. Finally, for every technological problem there are a dozen administrative, management, and political problems.

There are several on-going projects which will hopefully lead to some solutions. The Defense Department's Advanced Research Projects Agency is sponsoring a nationwide interconnected network of computers (of various makes) involving universities and research organizations. Too, Harvard and MIT have formed a corporation to study the problems and feasibility of connecting two universities.

Educom members are now engaged in an important first step in university utility development. Tom Keenan of Educom told attendees about the EIN project (Education Information Network), a cooperative effort of universities aimed at the exchange, both on-line and via the mails, of software. Currently Educom is trying to gather and refine documentation of interesting, useful programs. Liaison has been established with personnel in 40 universities so far.

crossing lines

Effective use of the computer utility will depend on developments within several computer science disciplines; this was evident from the papers given on topics ranging from graphics and simulation to data banks, libraries, and educational testing.

J. C. R. Licklider, noting that the cost of the graphics console is finally going down ("small graphics will be as cheap as typewriters"), said that computer scientists will have to conquer the art of expression in interactive dynamic graphics. There is no current language or technique for doing this. The problem is how to get away from the trap in which data is so close to the program, moving instead toward expressing ideas in data sets and two-dimensional images. The input-output scheme will have to be reconsidered, he said.

The problems of achieving on-line simulation were described by Malcom Jones, of MIT, where the OPS (on-line simulation language) system has been held back in development by the inadequacies of time-sharing systems. Currently a new OPS is being developed in pieces on an IBM 1130.

The panel on data banks in essence showed that very little has been accomplished in automating such data reservoirs, except for the commercial, statistically oriented banks as in credit bureaus. What little has gone on in disciplines such as physics has primarily been in storing references rather than actual data. There is, for example, no hospital which depends on a data base for patient care, although computers are being used in parts of this process, such as patient history, EKG analyses, and administrative records. There are unsolved problems in data organization (no algorithms to deal with large data bases), information retrieval and file management software, terminology, file accuracy, and, of course, in privacy. These are compounded when the aspect of access by all systems in a computer utility is considered.

privacy again

The cyni-comic voice of reason of the moderator of the data bank panel, Prof. Arthur Miller of the Univ. of Michigan,

helped make the privacy issue debate lively. "Do you realize," said Miller, "that the penalty for refusing to answer the Census Bureau question on how many flush toilets you have is the same as that for indecent exposure?" Attacked by census defenders who said that such questions help determine the standard of living in the U.S., Miller rebutted that the 1960 census missed 7 million Americans, including over 5 million in the ghettos, thus destroying the validity of such a census. His point was really that the government and others are running around collecting data in quantity and variation, but the data gatherers are not being selective, are not thinking through what they want in the form of output. Thus, such lack of discrimination can lead to a dangerous and harmful encroachment on privacy.

Speaking on the utility's implications for university libraries, Ron Miller, of the Five Associated University Libraries, noted the rapid rate at which libraries are joining in consortia, federations, associations, and networks. "There is uncertainty about how these various aggregations should develop to work effectively as interrelated units with regional, national and international groups. Many have identical objectives but dissimilar administrative structures and resources to accomplish them. Some groups are committed to computer-based bibliographic and management systems which emphasize building, modifying and accessing variable length records in large on-line time-shared systems. To be effective these systems must also handle accounting and management functions. . . Local library expenditures for computer power are rising with some short-term sacrifice of on-going operations during early research and development phases.

"The shortages of staff, inadequate budget increases, increases in information-bearing resources, and the concentration of development grants in a few systems may force other groups to rely heavily upon packaged special-purpose utilities regardless of who produces them. Commercial systems, if they serve the needs of university libraries, may replace local reliance upon campus computing centers unless universities reallocate computer power among several institutions or support the acquisition of library-dedicated machines usable in remote time-sharing modes."

Dr. William Harless, Univ. of Illinois, speaking on the implications for the "continuing education of the professional," discussed the pioneering work being done at his university on updating medical doctors. The program developed involves an "interactive session" between doctor and computer that "simulates reality." In the "clinical encounter," the doctor may hold dialogue with the simulated patient, ask for laboratory reports and other diagnostic data, etc.

government intentions

The government's role in the computer/communications issue was discussed by Donald I. Baker of the Antitrust Division, who reiterated the division's stand on the issue. Briefly, it is to "achieve and protect competition" in the data processing industry, "despite their existence in the shadow of a giant regulated monopoly," and to keep the common carrier out of the edp service business (excluding message switching) except perhaps through subsidiaries with "segregated accounts and facilities, and subject to a prohibition on selling data processing services to the carrier." He noted that "every opportunity should be taken to educate people in government." "We don't have anywhere near the resources to deal with today's and tomorrow's problems." Lee Loevinger, former FCC Commissioner, said that he was glad the regulatory bodies lacked resources to plan for the future. "God help us if the future is in the hands of the government. I can't think of anything the government has planned for the future that has come off. The F-111 ranks high on its list of successful planning."

Breaking up into small groups on the last day of the symposium, the attendees came up with several comments and suggestions for cooperative action. Among them were to establish a forum by which the education community can express itself to the government, common carriers, manufacturers, etc.; it was suggested that Educom could be strengthened to fill this role. Too, Educom should promote communication of university work being done in all areas discussed. A national advisory commission on data communications—in which universities would participate—was another idea.

On data banks, it was said that it is "high time" for a significant experiment with a single national data bank on one information area, such as poison control. In instruction and testing, it was recommended that experimentation continue, but with learners, teachers, and administrators playing a bigger role in program development. A series of seminars was suggested to inform non-computer scientists about computers and education. (For a transcription of the symposium, write Educom, 100 Charles River Plaza, Boston, Mass. 02114.)

—ANGELINE PANTAGES

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STANDARDIZATION OF MEDICAL DOCUMENTATION

As briefly outlined in the May issue of this publication (p. 117), in the health field the true potential of automated data handling cannot be exploited until certain basic systematization and coordination are achieved. National coordination is needed to develop the standards for medical computing. The first such effort took place on May 5, 1969, when the first task group assembled in Buffalo.

The objective of this task group was "to determine the feasibility, in the real world, of creating a nationally acceptable, computer-compatible clinical drug documentation system, and to study the possibility of a mechanism which will lead to information on drug utilization and continuous surveillance of drug effects and side effects."

There are four groups of drug-related data. The first includes the clinical observations of the physician leading to a diagnosis and selection of drug treatment. The second is a comprehensive, uniform coding of all drugs. The third is documentation of the actual drug administration to the patient and the fourth is the follow-up medical data recording the effects, treatment, and the possible side effects observed.

Various organizations and agencies, e.g. the Food and Drug Administration, the American Medical Association and the World Health Organization, have exerted considerable effort to enhance the safety of drug treatment, thereby assisting physicians in drug selection. Effectiveness and risks associated with each drug are major considerations in these studies. The Drug Information Association is also concerned with such information, and the National Library of Medicine has systematized published drug-related observations for rapid retrieval. Others, like the Excerpta Medica Foundation, the American Society of Pharmacists and various drug manufacturers have also collected drug data of great value.

The task group meeting in Buffalo included representatives of the Food and Drug Administration, the American Medical Association, the National Institutes of Health, the Drug Information Association and the World Health Organization.

The committee reviewed the most recent effort for uniform coding of all drugs, developed by the Science Information Facility of the Food and Drug Administration. This National Code Directory is intended "to serve as a national drug data base with the widest possible utility, thus assuring broad acceptance." The basic design is a 9-digit code. The first 3 digits identify the manufacturer, the next 4 digits indicate the product, and the last 2 digits code the packaging. The system enables manufacturers to use the code on packing labels, in catalogues, on bottle labels, on tablets and on capsules. This system will be useful for positive identification of a capsule or a pill and will facilitate drug data handling. Since the volume of such data will soon exceed a half billion records per year, automation will be imperative.

While drug identification coding is well advanced, the standardization of the other three types of drug-related data, viz., the clinical information preceding drug selection, documentation of actual administration of the drug and uniform recording of the follow-up data require substantial standardization. For adverse reactions there are several dictionaries in existence but these were developed for a specific intramural objective rather than for national use.

A computer-assisted system would make it possible for physicians to share their drug experience and thereby make better therapeutic decisions. But uniform recording of all pertinent data is imperative to accumulate the required large data bank for statistically adequate information and to pool resources. The members of the task group showed marked willingness to pursue this aim of achieving uniformity in a cooperative manner. Progress of this group will be described periodically in this journal, not only to inform those interested in medical computing programs about the work of the task group but also to invite recommendations. The work of the task group would be facilitated by receiving input from computing program staff members.

Besides the Task Group on Drug Data Needs, similar committees have been formed to develop standards for (a) uniform use of medical terms, (b) genetic data needs, (c) social-economic data needs and (d) standardized patient identification.

—E. R. Gabrieli, M.D.

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No doubt you've read ads about small time-sharing systems that claim to do everything.

Ours doesn't.

We've designed our MINITS II for one purpose only: to give your UNIVAC 1108 a time-sharing capability. It can cut computation costs and greatly increase the flexibility of the 1108 by adding a new and more economical method of processing engineering and scientific applications. With only one MINITS II time-sharing system, you allow 24 people to simultaneously access your 1108 while you continue to run batch work. Its speed is an impressive four seconds maximum response time.

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The MINITS II command language is complete, simple, and one of the easiest to use terminal languages available. It's designed to ease your burdens by minimizing the learning curve. MINITS II is fluent in a wide variety of fully conversational languages. Included are FORTRAN, BASIC, Deskalculator, and EDITOR. An 1108 symbiont is provided for direct communication with the 1108 and its mass storage devices.

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It can significantly cut computation costs by increasing the performance of your current computer system.

If you're not using the 1108... Our MINITS I time-sharing system is similar to MINITS II, with the exception of the 1108 coupler and associated 1108 software. It is used as a complete, stand-alone time-sharing system capable of serving 24 users simultaneously. Its advanced features make it ideal for companies who desire the security and economy of their own in-house time-sharing computer, or for individuals who wish to enter the time-sharing business on a modest scale.

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CIRCLE 161 ON READER CARD

news scene

an interpretive review of recent important developments in information processing

INDUSTRY REACTS WITH APPROVAL AND DISMAY AS IBM GOES SEPARATE WAYS

IBM's new pricing policy announcements for software and support services (July '69, p. 33) have:

Upped the giant's long-term income expectations.

Wounded the user, who is bewildered and moaning — but oh, so softly and ineffectually — about the prospect of increased costs.

Given the leasing companies a break for now, but a false sense of hope for the future.

Opened significantly more of the software market to competition than had been dreamed.

Satisfied firms in professional edp education.

Pleased — perhaps — the Justice Department.

Forced more choice on mainframe makers in the setting of their own policies.

And earned the IBM task forces that designed the policies a week's vacation for a "superb" job.

The announcement has also set the stage, perhaps dimly lit, for the next major computer announcements from IBM, beginning reportedly before 1970.

IBM did most of what was expected, and in the case of software, more. Prices were set in four system support areas, generally to become effective Jan. 1, 1970 for all current installations and orders made prior to June 23, and effective immediately for all orders placed after the June date. First, IBM will charge, as expected, for all applications software that has not been delivered, including products that have been announced. But, a big surprise, all future compilers and utility programs will also have a price tag. These priced programs, called Program Products, will have a monthly fee per central processing unit. Second, an hourly rate will be charged for programming maintenance provided by field engineers. Systems engineering help will come for a fee, starting with a three-hour minimum rate. And finally, and most simply, professional-level edp education courses will have a price tag. (Details of each new policy are discussed later.)

Correspondingly, IBM reduced the price on current systems by 3%, effective on purchased equipment installed on or after June 16, 1969, and to become effective on rentals on Oct. 1, 1969.

IBM also announced that the Data Processing Division is now offering customer contract services, involving all phases of system design, development, and installation, but excluding operation. And one week after all this, IBM announced a decrease in the educational discount from a maximum 30% to 10% maximum, and the maintenance discount of 10% was obliterated.

what happened

The reaction to the pricing changes and the substance of the policies is multifaceted. The initial part of this report will revolve around those competitors creating products and services for IBM equipment and the IBM user.

The prices that have been set are "reasonably lush," says one observer, meaning they are not out-of-line, but are high enough so that the competitor in each activity will have a chance to under or outbid IBM and increase his share of the market. If one couples "high" pricing on Systems Engineers and software with the added bonus of separation of compilers and utility programs, the software house and service bureau may be the greatest beneficiary of IBM's new policies. The edge is slightly dulled on this, since both these competitors and education firms must rely upon IBM documentation on any new product to prepare their own competing product — and IBM releases this material "sometime between announcement and delivery," indicating an obvious time disadvantage.

The reduction is little enough that the leasing company is happy, since it can still attract customers with its 10%-plus discount off IBM rental. Had IBM produced the reduction that experts expected (10%), while providing no rebate for past purchases, the lessor would have been furious and almost irreparably damaged. Separate pricing of the SE, software, and education services on both purchased and rental equipment also means the obliteration of the subsequent user classification. Second users of purchased equipment did not receive all IBM support services, and thus, lessors trying to obtain the second contract on a system had been at a disadvantage. Now they can play their discounts to the hilt. Some lessors are unhappy that they will not receive the full complement of services that they paid for in their purchase price and that their equipment has automatically depreciated by 3% with the reduction. But the general reaction, according to statements issued by several major lessors, was bullish. What could happen after 1971, when new systems may be delivered, could end this optimism.

what might happen

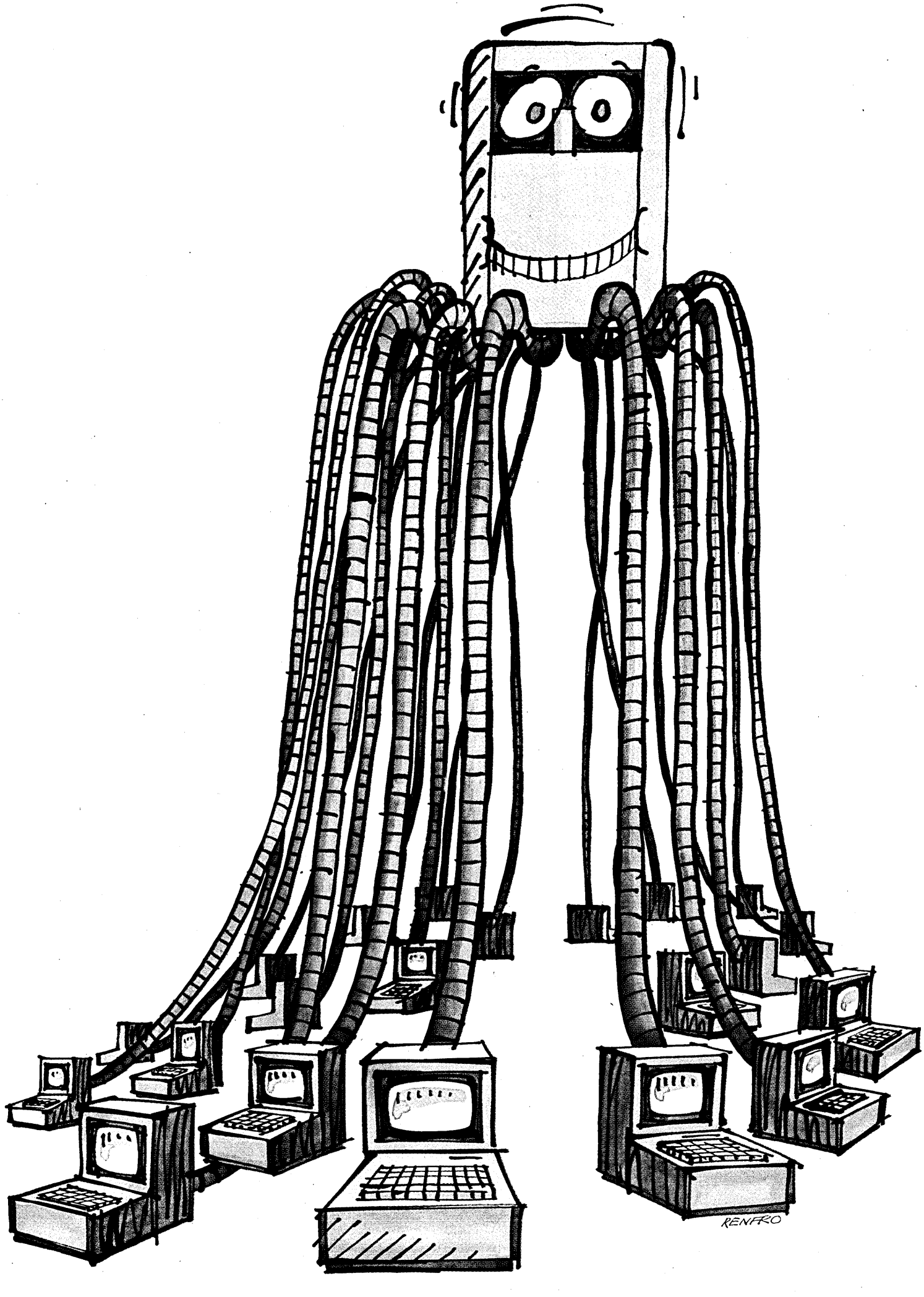
Speculation on the next set of IBM computer announcements is that better price performance and phased introduction of new software and peripherals will undercut the market for existing 360 machines.

As reported in Look Ahead in June (p. 37), "New Systems" replacements for the models 50 and 40 are expected. The NS for the 50 may be out before the end of the year. Both will run 360 code 1.5 to 2 times faster than the machines they replace, although rental prices will be about equal.

Thus there will be better price/performance for the user and he can keep his old 360 software, much of which remains "free." The use of older software will also minimize the need for Systems Engineering help. This will attract customers while permitting IBM to further streamline its new cumbersome SE force.

Gradually, new software products for the NS series will be announced, most for a fee, and users interested in greater efficiency will convert. Once the user is in effect hooked, further software enhancements will appear coupled with new peripheral equipment (such as a faster, higher density disc). IBM is also expected to use pricing to push PL/I by setting a lower price for it and a higher fee for its prime competitor, COBOL.

While the user is seduced by this evolutionary approach, the lessor may be raped. The price/performance improvement, plus the 3% reduction on current 360's and a possible higher purchase/lease ratio on NS mainframes, will depreciate the value of the 360's the lessors currently own and discourage them from buying the new equipment. This situation, however, will be molded by the reaction of the lessors, the Justice Department, and the courts hearing the antitrust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Once there were only monster computers that did big batch jobs like payrolls. Problem? They kept people waiting.

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Now there's a new kind of creature that does time sharing and batch work together. So lots of people can use it—efficiently.

It's the Spectra 70/46. The Octoputer. There's nothing quite like it on earth or under the sea.

Remote computing is its basic concept. That means it works from way over here where you are, to way over there where it is. The Octoputer's arms are long and strong.

It sits in the middle of your company and reaches helping hands out in all directions. Suddenly, your company works harder. More of your people use the computer—solving more problems, finding more facts, writing more programs. And it does your big batch jobs in its spare time.

The Octoputer does a real armload of work for a handful of change. Check the bills from your time-sharing services. See if it's not more efficient to do the same work on your own Octoputer. And get batch processing, too.

One more thing. The Octoputer concentrates on remote computing because that's what you're going to need—that's where the industry is going. We got there first because communications is what RCA is famous for.

It'll keep us ahead of our competition. It can keep you ahead of yours. Step up to the Octoputer and shake hands hands hands hands hands... We will arrange an introduction. Call 609-424-2385. Or write RCA Computers, Cherry Hill, N.J. 08034.

RCA COMPUTERS

CIRCLE 95 ON READER CARD

complaints currently levied against IBM.

For the user, such possible developments, which he knows are coming up all too quickly, only contribute to the confusion. At present he only sees that the changes will cost him much more money starting Jan. 1. And he's unhappy. One source, irate because the user is doing little to make his demands heard, strongly commented: "The user loses out because he is the only one that isn't organized. SHARE and GUIDE user groups are for technical guidance only. IBM doesn't use them for pricing input. The men who pay the bills have no voice. and independently they don't have the guts to go elsewhere."

So the user sits, miserable and confused about the "lush" prices, the "skimpy" reduction, the promised compiler that hasn't been announced and may be priced, the number and type of Systems Engineers he will need vs. what he can afford, what programming maintenance bills he will have, how he can afford that software package that must be paid for 10 times for the 10 computers he has scattered about the country, and what loyal programmers he will send for education.

A market researcher in this field claims that the pricing affects small, medium, and large-scale users by the same percentage, and that the net increase will come to almost 25%. He attributes 12% to systems engineering services, 10% to programming, and 5% to education. Installations will vary, of course, mostly on the downside, he says. Although the details of the analysis were considered proprietary, the researcher stated that the figures were based not on the services the user had been receiving, but on what he would be likely to purchase. That is, rather than using five systems engineers of varying skills as he had previously done, the user would contract for two "senior" SE's; rather than send all his staff to edp courses, he would have an instructor trained.

An ex-IBM executive called 25% too high ("if that's what it comes to, the user is ordering too much"), claiming 15% as closer to the norm.

separate maintenance

If the increases seem too high to many, some increase was inevitable. Input to a DATAMATION survey on separate pricing in the June issue (p. 85) showed that IBM's marketing and support costs had significantly increased over the last few years and that the firm would look for ways to defray this. It also was expected that maintenance would be separated from the rental price, or at least that maintenance prices would be raised due to the increase in labor and materials costs. IBM did not do the former. This was considered a wise move because of the problems entailed. But IBM has, in effect, raised the maintenance prices via the for-fee programming maintenance that will come out of the Field Engineering Division.

It is expected that IBM will be flexible in its charges for this programming maintenance as well as for Systems Engineering assistance. Neither is an area in which costs can be readily fixed, and are subject to the judgment of those who control their provision. IBM has about 10,000 Systems Engineers, but perhaps 15% of them, one source says, are trainees and technical salesmen. It is expected that these SE's will be moved both into the Field Engineering Division and into the technical sales area. From the latter group, the needy user may find that he is getting some assistance for free as he did in the past, but IBM will be careful that such aid will do little more than border on the kind of service now defined as for-free systems engineering. One source thinks this method will be most used to protect the new small accounts that IBM counts on to grow into the more lucrative medium-scale users.

A last general note on the substance of the new policies. IBM has been careful to try to answer any legal questions that may arise. Two major points: IBM has copyrighted all for-fee software, and will license its use on a monthly basis, rather than an outright sale. Its defense against those who would demand software as well as equipment sales (the Consent Decree of '56 forced the latter) is that outright sale would diminish IBM's ability to protect its copyright on software, which it considers a valuable corporate asset. The other point is that since IBM has put prices on SE's, software, programming maintenance, and education, it has stated that it will provide (but not solicit) these services to non-IBM customers. If some of these policies do not fully satisfy the Justice Department's antitrust complaints, IBM may make some changes or go further, separately pricing all software and education for example. Another possible solution may be the sale of Service Bureau Corp., we're told, but maintenance bundling is expected to be defended staunchly by IBM.

THE COMPETITION

The only definite actions taken recently have been by two mainframe manufacturers. Early in June, Burroughs added applications software for the E4000 and 6000 series of electronic accounting machines to its list of separately priced software. Other such announcements since February have involved the L2000 billing computer, the TC500 terminal computer, and the TC700 teller terminal. Said Pres. Ray McDonald, the June step was "part of a program that may encompass a variety of additional electronic business machines, terminal computers, and electronic data processing systems."

July 1, Honeywell, after a six-month study, announced that it would not follow IBM's lead but will maintain the "package pricing policy" for its systems. It did, however, raise the prices on leased systems by one percent, "reflecting the rising costs of labor, material and interest." Purchased systems have also been increased by that amount via increased maintenance charges. Some observers consider this an unwise move by Honeywell, believing that all manufacturers ought to take steps similar to IBM's to increase their profits. One user felt that software is not a Honeywell strong point and will not draw new customers because it is for "free." In the last year, Honeywell has been building up on-line service bureau and contract programming activities under its Computer and Communications Group, but these are efforts independent of computer sales. Nevertheless, the stand-pat policy may draw Honeywell some new accounts, particularly among the smaller and/or less sophisticated users who do not have the talent to choose among separately priced products.

getting down to details

The details of IBM's separate pricing policies and the educational discount reduction follow. According to a later IBM announcement, the marketing of IBM's dp equipment and new priced services will fall under C. B. Rogers, Jr., vice president of marketing and development. Reporting to him is to be J. F. Manning, new vice president of marketing with staff responsibility for data processing equipment and information records products; C. S. Kilner, vice president of systems engineering and education; A. J. McGill, vice president of market development for specialized industry activities and for program products; and C. P. Webb, vice president of custom contracts services.

ibm programming

All delivered Type I (systems) programs, announced improvements to delivered Type I programs, Type I programs announced prior to June 23, or delivered Type II (applications) or Type III (IBM-developed, nonsupported) programs will continue to be "free." Type IV (customer developed, nonsupported) programs of the past and in future will also be distributed. The services for Type I and Type II delivered programs will be "free" until Jan. 1, 1970, when they will receive service classifications, described below.

Concerning all new programs announced after June 23 and applications programs (II) announced before that time but not yet delivered, IBM developed two new categories: Systems Control Programming (SCP), which will continue to be included in the equipment price and Program Products (PP). SCP serves as an "interface for Program Products as well as user programs and is directly involved with the management of available system resources." Typical functions include: supervisor, job management, system service, data management facilities, system generation/installation facilities, diagnostic and maintenance facilities, and language facilities for system modification. Most service and installation for SCP programs will be included in the equipment price.

Program products will be offered at monthly charges under a license that will authorize use on a "designated central processing unit." "Typical" programs in this category will include language processors, sorts, conversion aid programs, general purpose utilities, and industry and general application programs. All Type II programs announced but not delivered will be licensed. IBM has announced charges for 18 such programs. Some of these are: Generalized Information System (OS), $1500/month; Information Management System (OS), $600; Text Processor under EDIT/360 and PAGINATION/360, $250 and $450; Power System Planning (OS), $300; Customer Information Control System (OS), $600; Order Allocation System (DOS), $125.

Program products, as well as all currently available programs, are being assigned a service classification. Class A includes, at no charge, central programming service (design error correction, automatic distribution of corrections) and field engineering service (design error verification, documentation, and other functions). Most current Type I programs will receive this classification. Class B includes central programming service, free, and FE programming service on an hourly per call charge. Most Type II's will be class B. Class C includes FE "programming assistance" (problem diagnosis, corrections requiring eight hours or less) on the hourly per call basis. Only SCP products will not be classified. These classifications will be reviewed every six months, since as a program reaches advanced stages of completion IBM will move it into the higher for-fee class.

IBM also notes that FE services for programming products will be charged for when the call results from a customer error or when no specific problem is identified, similar to Bell System policies.

Charges for FE assistance are $22/hour during normal hours and $28.50 outside hours for IBM 1130, 1800, and 360/20 systems. For the 1400 and 7000 series and models 360/25 and up, it is $30 and $39.

insuring the policy

Other IBM answers concerning the new programming policy:

A program product function could become part of SCP in a future system. "For example, while a simulator may be a program product, a combined machine/programming embodiment of the same function, such as an emulator, could be made part of SCP."

While a separate program product license is required for each cpu, multiprocessing configurations such as MP65, and TSS/67, in which several cpus are connected and controlled by one supervisor, will require only one license.

A user of an IBM system can sell machine time and include the use of his licensed program product, as long as it is not removed from the "designated cpu."

A program product can be transmitted to another cpu over phone lines only when it is an emergency backup to the "designated cpu."

A program product cannot be used on a trial basis prior to obtaining a license for use. Charges for the program begin one month after installation.

Any modification made by the user to a program product may be marketed, but each customer will pay IBM for a license to use the PP itself. (However, a user tells us IBM reserves the right to implement all user and SE modifications in its systems.)

systems engineering services

The user will pay for SE assistance in installation, application, and enhancement of his system. Charges for SE services prior to Jan. 1, will be "waived to the extent that such services are equivalent to the assistance IBM and that customer had mutually planned before this announcement." Assistance will include system analysis and design, application design and development, program design and development, conversion and implementation planning, and installation evaluations and improvement.

IBM's charges revolve around the equipment and the environment in which it is used, rather than the experience of the SE himself. These categories include the following. Basic systems: 360/20, 1130 and 1620 computers, accounting machines, calculating equipment, punched card, paper tape, data transcribers, and some banking equipment. If the computers noted are used in terminal mode, they will be included in general systems or complex systems categories.

General systems: 360/25, /30, /40, /44, /50, 1240, 1400 series and 7000 series computers when used in batch, limited multiprogramming, and general teleprocessing environment; data collection systems, data communication systems, data transmission units, optical readers, 2495 tape cartridge reader, and some banking equipment.

Complex systems: 360/65, /67, /75, /85 computers and the 1800 data acquisition and control system, as well as all systems used in such environments as general multiprogramming, multiprocessing, complex teleprocessing, time-sharing, and real-time and graphic display systems.

SE services will be scheduled in half days (3 hours minimum) and full days (6 hours minimum). Time worked beyond the minimum will be charged in hourly increments.

Prices:	Full Day	½ Day	Hourly
Basic Systems	$132	$66	$22
General Systems	168	84	28
Complex Systems	210	105	35

IBM's Basic Systems Centers will also offer, at $28 per half-day, per individual, group workshop sessions to assist users of computers in that category in systems and application design and programming.

IBM will make recommendations for SE services and provide a cost estimate for anything over three hours during a three month period.

The customer can count on some free help from marketing personnel and Field Systems Center personnel. FSC people will help in sales and proposal activity, as well as help the SE in a "consultation capacity." Anyone replacing an unavailable SE in his regular paid for activities will charge SE rates.

Service will be provided for systems involving non-IBM equipment "if the necessary skills are available."

Fees are set on more than 50 professional-level courses and 40 additional courses for private study in the form of programmed instruction

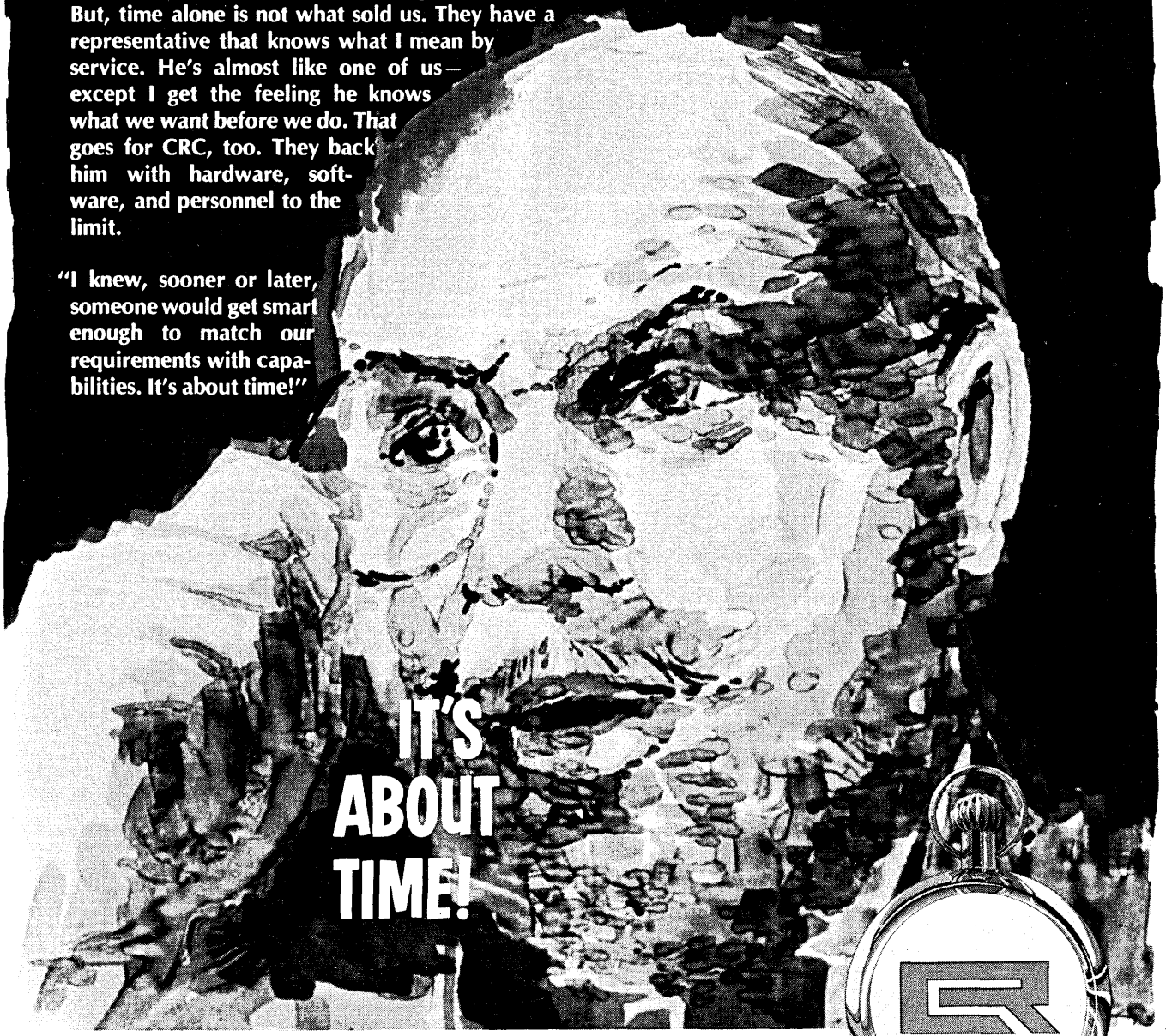
"I am absolutely sick and tired of waiting for information!" Dr. Wallerstein did not become one of our top aerospace scientists by being unduly impatient, but the EDP turn-around situation in his Operations Research Group was the sort of frustrating situation that always annoys him. And, any time Wallerstein blows up, the propulsion engineers rush in to see how the energy might be converted into fuel.

"This time, though, "Wally" was telling his ops researchers why Computer Response Corporation had been engaged to handle their programs. And, his pleasure was unrestrained.

"Computer Response Corporation's Univac 1108 configuration is one of the most complete to be found anywhere today. This simply means that they can do: Everything. And, we can tie-in to CRC with almost any in-house terminal: TTY 33, TTY 35, Univac 9000 series, Univac 1004, DCT 2000, IBM 1130 – in fact, almost anything from a memo pad to another Univac 1108!

"Turn-around delays? With our programs on their machine, you can forget about it! But, time alone is not what sold us. They have a representative that knows what I mean by service. He's almost like one of us – except I get the feeling he knows what we want before we do. That goes for CRC, too. They back him with hardware, software, and personnel to the limit.

"I knew, sooner or later, someone would get smart enough to match our requirements with capabilities. It's about time!"



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or audio and video tapes or supervised study halls. This was effective June 23 for courses beginning on or after that date, although current users will not have to pay for courses announced prior to that date and beginning before Jan. 1. Systems Features Instruction, customer executive seminars, industry seminars, and promotional sessions are offered without charge. The latter three are by IBM invitation.

The courses are intended primarily for IBM users, although applications will be accepted from the general public. Classroom courses designed to train operators in keypunch and unit record equipment have been discontinued, because, says IBM, such training is provided "by many private and public schools." IBM's materials of instruction for these and basic programming courses are available at "established prices."

Examples of course prices: OS/360 Advanced Coding, $460; S/360 OS Workshop, $1500; DOS Workshop, $640; OS BTAM Coding, $425; S/360 Continuous Modeling Program, $170; S/360 Communications Systems Design and Analysis, $560; PL/I Coding Workshop, $200; OS Systems Programming, $1175; DOS/TOS Data Management Coding, $330. A full complement of OS courses, for example, would total over $5,000.

custom contract services

Although IBM's Data Processing Division has long worked closely with various customers in developing new systems, it has primarily left custom contract services to its Federal Systems Division and to its independent subsidiary, Service Bureau Corp. An IBM spokesman notes that some FSD personnel involved in nongovernment contracts have been transferred to the Data Processing Division for this activity. (An outside source says 128 people were transferred from FSD.) FSD will continue to provide these services to government agencies. No comment was made on the overlap in services offered by DPD and Service Bureau Corp., and observers opine that IBM will compete with SBC only in the megabuck-and-over contracts of long duration (two-four years). VP Cecil Webb is also said to be a "cautious, wise" businessman in this area, who will go after few, but highly profitable, contracts.

The services include system design and analysis, application and program development, systems installation and evaluation, and customer training. Contract customers will pay standard rates, however, for standard, unmodified program products and education courses.

educational allowance plan

The maximum discount allowable on 360 and other systems has been decreased from 30% to 10% and the maintenance discount has been eliminated — in obvious response to antitrust complaints. Actually, discounts will remain the same — 10% — for some models, including the 85, 30 and 25. But the model 75 and 50, for example, will decline to 10% from 30 and 25%, respectively.

Seventeen non-360 computers and peripherals will receive no allowance, including the 1401 H, 1402 mod 6, and the 1080 laboratory system.

This allowance became effective for new orders as of June 30, 1969. Eligibility has also been limited to four-year institutions of higher education and junior colleges. Clinics, hospitals, and laboratories that are part of the corporate structure of an eligible school may also qualify; formerly those organizations affiliated with an eligible school but not part of the corporate structure had qualified. The new policy does not affect IBM's special systems program for high schools, elementary, secondary, and post-high school vocational and technical schools. They will continue to receive 10-70% discounts on 1401, 1410, and 1620 systems and related peripherals.

ANGELINE PANTAGES

NCR REGISTERS INCREASED PRODUCTION, SALES, GETS INTO EDP MAINSTREAM

A revamped, rejuvenated NCR sales force is riding a whisker, a flying head and simplified, mass production-oriented circuitry and logic in a bold move to get more directly into the turbulent mainstream of the computer business.

The whisker is a 1/10-inch-long piece of wire, the main ingredient in the 800-nsec rod memory of the company's Century series computers. Besides offering speed, the speed allowed a 2½D (rather than linear select) memory highly amenable to mass production. At NCR's plant in Hawthorne, Cal., coated wire is run off onto bicycle wheels, then cut up. Then magnetic force marches the whiskers over the surface of a memory plane, where holes accept their falling bodies. Elapsed time: 2½-3 minutes. It takes about 50 minutes of labor to produce a 4K-bit plane vs. about 8-10 hours for a conventional core plane, according to NCR. The results show up in the price, too: $375/month for an additional 16K bytes of memory. The company is producing about 200 16K modules a month now, can up that to 475-500.

One of the keys to the success of the disc-oriented Century is the flying head, the result of some awesomely complex machining, thanks to rigorous tolerances required. Surface flatness must be held to 20 millionths and finish tolerance is three millionths. Track width and the location of the track calls for .0008", and the electrical discharge machining of the read/write gaps calls for .0002" accuracy.

The head was demanded by NCR's desire to offer 12 heads for each of its six disc pack surfaces to cut down access time without paying the cost penalties of the head-per-track disc.

NCR has, too, an ambitious disc manufacturing operation in Hawthorne, where it has developed its own plating (as opposed to coating) techniques, capable of producing 1500 "plates" per shift. With 70% yield, they're now turning out about 100 packs a day, are gearing up to 500.

meanwhile, back at the ranch

Down at Rancho Bernardo, 120 miles south of Hawthorne, in a magnificent manufacturing palace overlooking a sedate retirement village, NCR is gearing up to produce the Century mainframes (also being produced in Dundee, Scotland). The one-story, 300-thou sq.-ft. plant — expandable in modules to 1.6 million sq. ft. — is admirably laid out for mass production, and includes 20 Gardner-Denver wire-wraps plus assorted i.c. inserters, flow-solderers, etc., plus lots of automated test gear and a line of special short-run printed circuit board runs, including those for the long-awaited 615.

The automation is made possible partly by the fact that NCR has opted to build its Century circuitry on six basic different kinds of cards that make up maybe 75% of the system. The company has also standardized on one basic integrated circuit — a dual NAND gate — produced by four outside suppliers. Future lines will use four basic types of i.c. circuits, how-

We're a new firm on the Amex. But when it comes to computer services we're starting off at the top.

We've put the Number One firm in computer leasing—SSI Computer—together with the Number One firm in Accounts Receivable data processing—Statistics for Management. Our new name is ITEL Corporation.

We're starting off with $200,000,000 in assets. We're starting off as the largest lessor of IBM 360 computers in the world. We're starting off processing more Accounts Receivable than anyone else in America.

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ever, and, says NCR, it's doing about 30% better on i.c. costs than it hoped to.

Electromechanical peripherals are made in Dayton, and NCR, evidently confident of its ability to produce workable gear, is beginning to drop-ship these units directly to the customer, bypassing the system tests that eat up time and dollars. The company makes all of its own major peripherals except for CDC tape units and Mohawk's key-tape terminal.

marketing reorganization

While technology and production have been moving rather briskly along, marketing and sales are marching to a new tempo now too. Around the first of the year NCR retired a large number of its older, conventional equipment-oriented branch managers, replaced them with younger, edp-oriented men. A Jan.'69 reorganization beefed up the corporate edp marketing staff, created two US regions composed of 11 divisons each. EDP veteran Owen B. Gardner was moved up from edp sales vp to vp market development. Reporting to him are vp's of systems marketing (applied software systems development coordinator D. C. Brower), and product marketing (P. W. Lappetito, who coordinates equipment development with R & D's product planning division). Both slots are new ones. Gardner, who reports to vp and group exec, domestic marketing, C. L. "Chuck" Keenoy, now is responsible for product *and* industry marketing, a shift from an earlier product orientation that NCR sees as highly significant. They feel it will give them a better chance to aim product development and sales at specific markets such as food distribution, retail, commercial/industrial and GEW (gov't, education, welfare).

Organization charts are fine, but even if the big boxes are manned by experienced and capable executives, the real question boils down, of course, to the front-line troops, the bell ringers. There's no doubt about the size of NCR's sales force: Some 4000 men in 500 sales and service offices across the land (plus about the same size internationally). But how many of them are edp salesmen — or good ones — remains unanswered.

Keenoy points out that the accounting machine sales people represent "a lot of systems knowledge in particular industries." How much of that knowledge is convertible to computerese... and whether these people match the social and intellectual status of their edp manager prospects are two other questions NCR must answer.

But NCR has moved to upgrade its sales people, singling out some of them for special edp training. And video tapes and audio cassettes on products, software, systems and applications are available to branch offices. Every salesman has a tape recorder, and can learn in his car between sales calls, if he's really eager. There are 9½ hours of "self-teaching" Century courses available on cassettes.

The company is trying to educate prospects too: an ambitious roving four-day industry-oriented symposium has been started. Its original goal was to "expose" 12,000 people, but early results indicate that will be exceeded, may rise to 20,000. "It's the reverse of IBM's trip to Endicott," says Keenoy.

NCR says it's delivered 350 Century 100's but only 185 of those have gone outside the company. The first 200 was delivered in June to the Univ. of Bridgeport (Conn.). The company won't reveal its backlog, but Keenoy says it's "very good. Our goal was to sell 5000 in five years, and we're ahead of target." He estimates that 35% of Century sales have replaced competitive equipment, mostly 360/20's and 1400 series.

service bureaus

NCR has 30 data centers, is adding them at the rate of 10 a year. All have the same configuration, offering a chance to recoup application package development costs. They also allow NCR a chance to keep their paper tape-producing cash register and accounting machine customers in house. The company claims that 30 million savings and loan accounts are processed on NCR gear, 18 million of them at NCR data centers. Each region has an on-line financially-oriented system, clues to NCR plans to push time-sharing (perhaps the remote batch variety).

"It's a natural business for us," states Keenoy, who notes that the company's conventional equipment and sales registers are beginning to look more like communications-oriented terminals all the time. And he points out that NCR's broad branch structure lends itself to the servicing of terminals. It's interesting to note that the four product groups under market development are edp, accounting machines, cash registers, and terminals & communication products.

pushing software hard

NCR is proud of its Century operating system, designed and built primarily by a crew of about 65 people in Hawthorne (compilers and application packages are developed by a staff of some 200 in Dayton). There is basically one batch OS, on a disc. Added code provides a teleprocessing OS, and some more provides multiprocessing. New versions of OS come on a disc for automatic entry into the system.

The $2000/month Century 100 includes a monitor that loads and schedules programs according to a pre-stored three-year workday calendar. Two control cards indicating the job and the day it's due are all that is required. Also included: a log routine that notes malfunctions, the history of runs, reruns, performs label checking.

unbundling unsettled

Since July '68, NCR has experimented with separate pricing for some of its application packages, including flowcharting, and systems for insurance and law enforcement. And they've done the same overseas for some time. "It's worked out very well," says Keenoy. But NCR's first assessment of IBM's unbundling move is that it represents a price increase of 20% the first year for a new user, and at least a 10% hike over the life of the installation. If true, this increases what NCR feels is a price/performance advantage for the Century, so the company is in no hurry to unbundle... will wait to see what the new IBM line looks like before it decides what it wants to do.

Under president R. Stanley Lang, NCR says it is definitely now in the information processing business. For the first time last year, says Keenoy, the sales value of edp products outstripped that of the other lines. But perhaps 95% of edp sales are lease instead of purchase... 75% of them, according to Keenoy, long-term contracts. The company writes off its computers on a six-year accelerated appreciation, which means Century profits are a few years away. To bridge the gap, NCR is floating $100 million in debentures.

For some years now, seasoned industry watchers have thought of NCR as being on the periphery of the computer business. But its tripleprong emphasis on technology, production and sales — backed by more money and increased dedication — just might change all that.

—R.B.F.

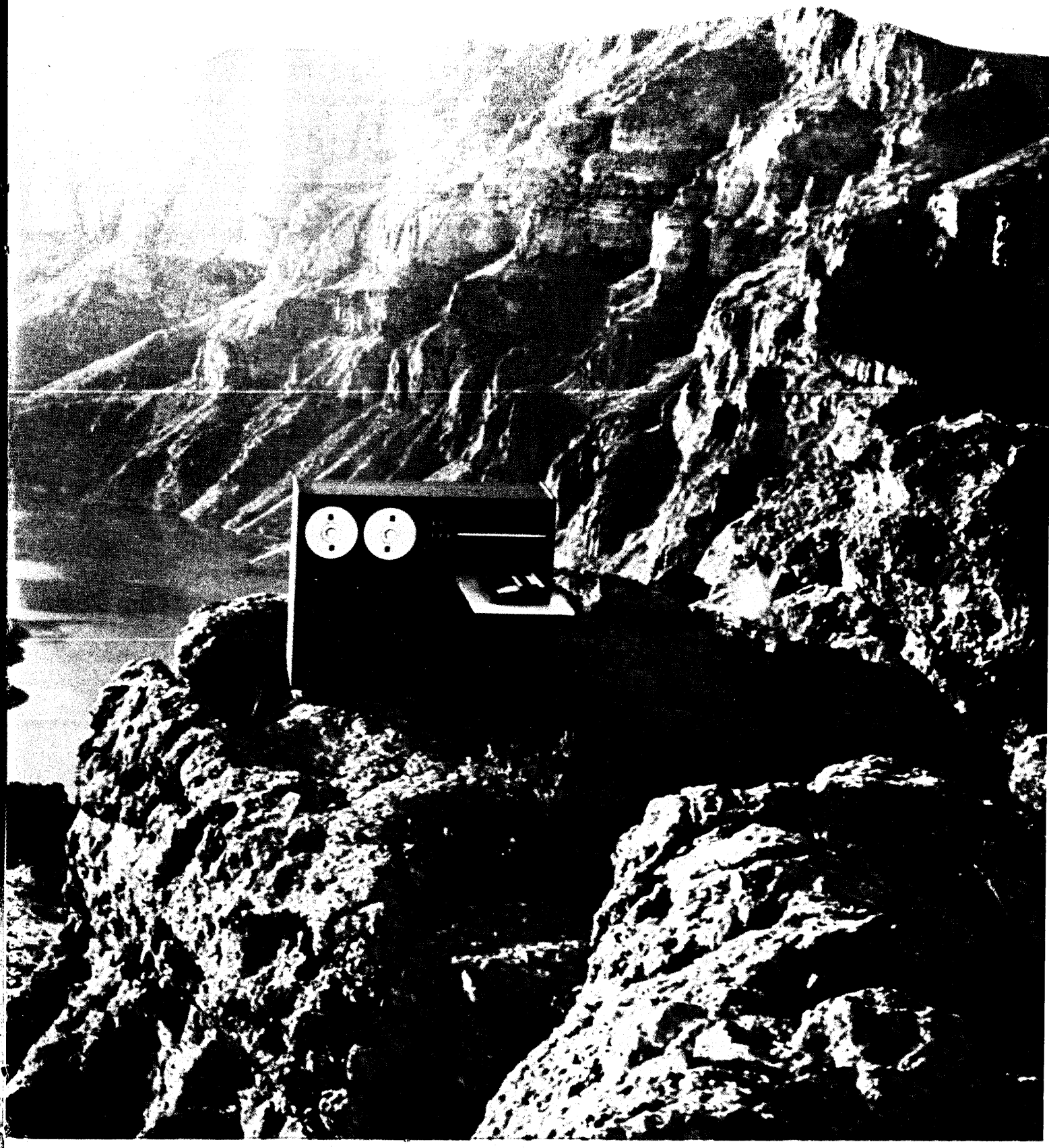
There is only one Keytape.* Honeywell makes it.

Since data preparation came of age there have been a number of keyboard to magnetic tape devices introduced or announced to the industry.

Our unit was one of the first.

We called it Keytape.

And we created a full division to make 52 different models. With



unique Honeywell features like smooth vacuum tape drives and electronic keyboards second to none.

We delivered the first of these units over a year ago. And pretty soon Keytape began showing up everywhere.

Now we find that people are using the name Keytape to describe anything that records data onto magnetic tape.

Before things get completely out of hand, we'd like to make one point.

There is only one Keytape.

Honeywell makes it.

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news briefs

COMPUTERMEN SAY ABM WON'T WORK

An informal anti-ABM group called the "Computer Professionals Against ABM," hastily organized in June, has issued a statement opposing the ABM on the grounds that computer technology is not up to the task.

The executive committee of the organization was composed of: Daniel D. McCracken, chairman, a consultant; Paul Armer of Stanford Univ.; Prof. Joseph Weizenbaum of MIT; and Gregory P. Williams. Sponsors and signatories of the statement included many notable computer industry personages.

The statement began with the underlying argument: "We, the undersigned members of the computing profession, wish to record our professional judgment that there are grave doubts as to the technical feasibility of the computer portion of the Safeguard Antiballistic Missile system. These doubts range from a profound skepticism that the computing system could be made to work, to a conviction that it could not."

The group compared the difficulty of the ABM computer control to suddenly computerizing the national air traffic control system and instantly transferring control to the untried computer system "without any period of parallel operation, testing under actual operating conditions, or evolutionary development." Citing an area where testing and evolution have been possible, the statement notes that computer predicting and reporting of election returns is far from being perfected after more than a decade. In contrast, the nature of the much more complex ABM computing task is unknown, since we cannot know what kinds of countermeasures would be employed by an attacker, nor can "realistic testing" take place because this would require nuclear explosions in the atmosphere.

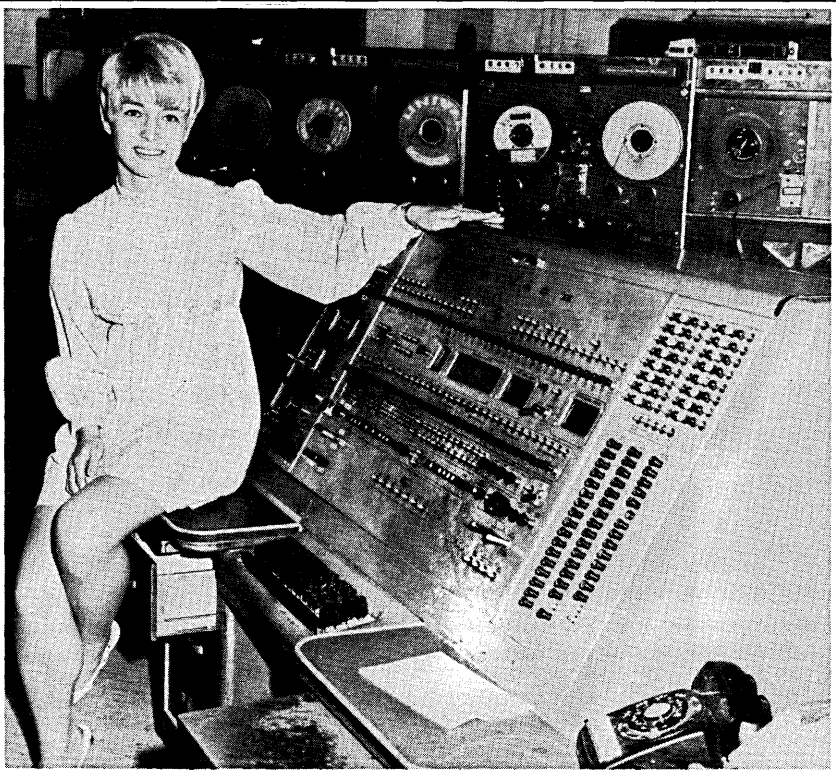
Further, "the computer would have virtually all the decision-making power, because the warning time in a nuclear attack would be so short — minutes at most — that presidential or senior military review would be almost impossible." Indeed, "the ABM system could by itself initiate a firing sequence without any attack taking place. This could happen through misinterpretation of radar signals from harmless objects, or because of machine malfunction or programming error." Finally, "our conviction is that on technical grounds alone the project does not deserve the support of the Congress."

Prof. Weizenbaum conceded that there had been some slight opposition to the statement from within the computer industry, and noted that one individual had suggested that it doesn't matter whether or not the ABM system will in fact work, as long as potential enemies believe such a system may be operational.

DOD OFFICIAL DISPUTES LICKLIDER ABM ARGUMENT

A recent attack by Dr. J. C. R. Licklider on the ABM software system was countered last month — in an exclusive interview with DATAMATION — by a high-ranking DOD official.

One of Dr. Licklider's arguments was the ABM software can't be "perfected." Therefore, the system will be unreliable and may bomb out com-



EXTINCTION OF UNIVAC II'S FEARED

Gone the way of the steam locomotive is the Univac II, of which only 29 were built and an uncertain — but certainly small — number survive. Thus it was amid much sadness that the last Univac II at Univac World Headquarters in Blue Bell, Pa., was disposed of.

The majestic machine boasted a memory of 24K characters and some 5000 vacuum tubes in a cpu measuring 14 feet long by 10 feet high and weighing 15 tons, but the powers that be decided it was no longer economical to maintain the aging machine, much less supply it with the large quantities of water necessary for cooling. William Tyre, operator of the Univac II, commented that "she had one of the most fantastic sort routines around." The machine always required an operator, just as the steam engine needed a fireman.

And so it was that after 11 years of faithful operation, Univac II, serial 023, was given the coup de grace. Although a hastily organized Save the Computer Committee attempted to prevent the execution, the nostalgic group decided instead to campaign to save one of the two remaining Univac I's. Dismantling and removal of the $2 million Univac II took fire days and cost Univac about $900. Requiescat in pace.

news briefs guide . . .

pletely.

The DOD official, who prefers to remain anonymous, admitted that "some programming errors can't be removed no matter how hard we try," but he quickly added that the system doesn't have to work perfectly. "All we have to do is preserve a credible counterstrike. The system could provide that capability even if it successfully defended only a reasonable percentage of our missile sites."

Dr. Licklider is one of the chief architects of Project MAC and a world-renowned authority on time-sharing. His ABM critique comprised one chapter in a book entitled "ABM, An Evaluation of the Decision to Deploy an Antiballistic Missile System," which was published recently by the New American Library. The book was edited by Abram Chayes and Jerome Weisner, and includes an introduction by Senator Edward Kennedy. Dr. Licklider's contribution is titled "Underestimates and Overexpectations." It apparently represents an amalgam of his views with those of several other software experts.

The essay stressed that the ABM system will require a far higher level of debugging than other computer applications because its mission will be far more complex. The DOD official indicated this is an exaggeration.

Specifically, the essay contended that the system will have to have pattern-recognition, decoy-discrimination, and problem-solving capabilities, among others. The DOD official denied that the first of these is actually required. Decoys will be identified by analyzing "two or three simple physical variables," the official explained, adding that the problem-solving requirement is also simpler than Dr. Licklider implies, since it will require "no heuristic programming."

The DOD official also thought the essay overstated the difficulties encountered in deploying the SAGE system. It says that "up to a few weeks (before) the scheduled date of the first full installation-wide software test, the programming was 'on schedule' — but then it slipped a year, and then another. Initially, it was thought that when the software was perfected for one installation, it would have only to be copied for all the others — but then it was found that each location was idiosyncratic and required time-consuming custom programming."

The initial software slippage on SAGE amounted "to a year, rather than two years," said the DOD official. And after the first installation became operational, none of the others required more than three weeks for software modification. Subsequent models of the program were delivered on schedule for almost 10 years.

SAGE was one of the several horrible examples cited by Dr. Licklider and his associates to support the contention that, after a system development contract is let, "the schedules slip, the costs mount, and the delivered product falls short of the promise. We have learned that the misestimation of time, cost, and performance are usually the worst for the most complex subsystems. And we have learned that in many systems, the most complex subsystem is the computer software..." These uncertainties are multiplied, the critics added, because the ABM system's ability to protect the country can't be thoroughly tested ahead of time.

No alternative to the ABM system can be completely tested either, said the DOD official. This includes the hardening of missile silos, which many ABM critics advocate, he pointed out. "The only way we can make absolutely sure hardening is as effective as we calculated is to expose a hardened site to a full-scale, aboveground nuclear blast of the type and size that can be expected in a real attack."

The official also denied that the ABM project would run into delay and performance problems as severe as those encountered by earlier projects. The ABM schedules are "more conservative," he explained. Also, Bell Telephone Laboratories and Western Electric, the prime contractors, worked on many of the earlier projects and now have "more experience."

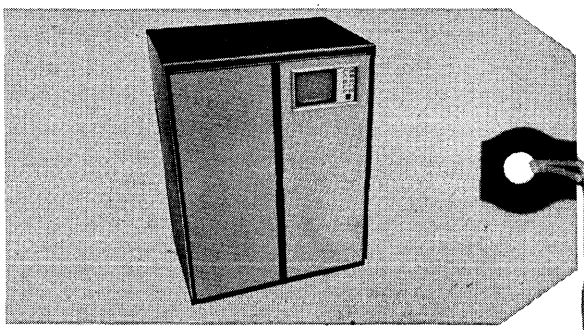
SUPREME COURT TO DECIDE ADAPSO STANDING

The question of whether service bureaus and the Association of Data Processing Service Organizations have the standing to sue banks and the Comptroller of the Currency over sale of dp services will be reviewed by the U.S. Supreme Court this October. A decision is expected by the end of the year.

The high court's interest in the rights of the service bureaus is the result of conflicting decisions in lower courts and an ADAPSO appeal. The other parties — the banks and amicus curiae American Bankers Association, and the Comptroller's office — are also anxious to clear the air.

The service bureaus' efforts in court to get banks out of the dp service business have been balked by District Court rulings that they had no standing on which to bring suit. ADAPSO and Systems, Inc., were denied standing to sue the American National Bank and Trust Co. and the Comptroller by the Fifth District Court in January, 1968. The First District Court made the same ruling in the summer of 1968 in the case of Wingate Corp. against

The $100,000 Bargain.



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What's more, Link has developed a third generation software package especially for the APD-5000. Written in Fortran IV, it's compatible with almost any computer. And, using a Link translator, programs written for other plotters can easily be run on the APD-5000.

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CIRCLE 113 ON READER CARD

the Industrial National Bank of Rhode Island. Both rulings were appealed. The ADAPSO appeal was denied but the Wingate appeal won a reversal. The Supreme Court will decide the issue once and for all.

The service bureaus' actions are based on the contention that commercial data processing services are not "incidental" to banking services. The Bank Service Corporation Act of 1962, they contend, restricts banks to dp services for affiliated banks only. The act and its legislative history displays "a clear recognition by Congress" that national banks are not to engage in dp services for the public, claim the service bureau people.

The ABA in its amicus curiae brief documented that Congress in its consideration of the act was informed that banks were providing dp services for other banks and business firms.

The service bureaus are also contesting the Comptroller's regulatory decisions regarding banks engaging in commercial data processing services and the immunity of these decisions from court attack.

NATIONWIDE NETWORK OF COMPUTER CENTERS FORMED

The long-envisioned nationwide network linking computer centers and different makes of computers will go into operation before the end of 1969 with an initial subnetwork consisting of UCLA, with a Scientific Data Systems Sigma 7; Stanford Research Institute, with an SDS 940; the Univ. of California at Santa Barbara, with an IBM 360/50; and the Univ. of Utah, with a DEC PDP-10.

The project, which is backed by the Department of Defense's Advanced Research Projects Agency, ultimately will number 14 computer centers in the network by the end of 1971. The effort was proposed and is headed by ARPA's Dr. Lawrence G. Roberts. The system is designed to make available to all members of the network the programs, computer power, and specialties of each center. In the beginning four-member network, UCLA will specialize in network analysis; SRI will be the information center; UC at Santa Barbara's specialty will be speech recognition; and the Univ. of Utah will handle graphics.

Each center will be equipped with an Interface Message Processor (IMP), now being developed by Bolt Beranek & Newman, Cambridge, Mass., under a $1 million ARPA contract. The IMP will operate as a message switching device, and will translate the various machine languages during transmission and reception to make computers with different word lengths compatible with each other.

The second phase of the project will take place in 1970 after an evaluation of the four-member system and will incorporate six more centers into the network. These are the RAND Corp., Bolt Beranek & Newman, MIT's MAC project and the Lincoln Laboratory, the Univ. of Illinois, which will utilize its ILLIAC IV computer, and Systems Development Corp. The final phase tentatively will add Carnegie Mellon, Harvard, Dartmouth, and Stanford universities.

Professor Leonard Kleinrock, who heads the project at UCLA, stated that the university would serve as the network measurement center, providing analyses of the system and mathematical models of the network for evaluation and determination of future procedures.

IBM SUES COGAR OVER "TRADE SECRETS"

IBM has filed suit against Cogar Corp., Herkimer, N.Y., charging that the firm is using IBM trade secrets in the manufacture of monolithic chips.

The suit names George Cogar, president, who was a cofounder of Mohawk Data Systems Corp., and 66 former IBM employees who are now with Cogar. The complaint asks that Cogar Corp. and the individuals named be enjoined from using any confidential IBM information, and it demands the return of "all notes, memoranda, manuals, drawings, and specifications" relating to confidential information. It states that the action was brought "on information and belief that IBM manuals, specifications, and drawings containing trade secrets and proprietary information on monolithic chip devices have been converted to Cogar Corp. use and the Cogar Corp. solicited contractors who make trade secret apparatus under confidentiality agreements for IBM to manufacture such apparatus for Cogar Corp."

The former IBM employees, according to IBM, had all worked in the components division and resigned their positions between November, 1968, and the present to accept positions with Cogar. When employed by IBM, the complaint states, each had executed a nondisclosure agreement covering IBM confidential information.

Announcement of the suit, which was filed in N.Y. State Supreme Court, White Plains, on June 9, was made that day by Cogar Corp. DATAMATION was unable to contact Cogar Corp. the next day, however, because their phone number had been suddenly placed in an unlisted status on request of the firm. An article in the *New York Times*, however, reported that Mr. Cogar said the IBM allegations were "without any basis and . . . that the action is intended to dissuade the exodus of IBM middle-management to other segments in the data processing industry." Then, apparently taking his cue from recent IBM defense announcements, Cogar stated that his company's position will be "vigorously defended." Cogar attorneys are also "evaluating filing a counter-claim."

IBM countered the counter-charge concerning the "exodus" with a statement that "The sole purpose of this suit is to protect against misuse of IBM trade secret information. Any implication that there is any other purpose for the suit is wholly without foundation."

MULTINATIONAL GROUP SHOWS NATO NADGE SYSTEM

A three-year-old international consortium with a single, $300-million product showed off some of its wares last month.

The consortium — NADGECO, Ltd. — is comprised of the following companies: AEG-Telefunken (Germany); Hughes Aircraft Co. (USA); the Marconi Co. Ltd. (UK); SELENIA-Industrie Elettroniche Assoc. S.p.A. (Italy); N.V. Hollandse Signaalapparaten (the Netherlands); and Thomson-CSF (France).

Their product, the NADGE system, will offer surveillance and identification of manned aircraft up to 20 miles high in territory some 3000 miles long by 2-400 wide over nine NATO nations. NADGE will be connected to aircraft and missile sites (Nike and Hawk) for deployment against possible manned aircraft threats to participating NATO countries. A possible byproduct: air traffic control.

The system will include 78 different pieces of equipment — computers, card readers, line printers, mag tape units, displays, radars, video links, simulators — plus software, from six companies in six lands. Hughes Aircraft will supply computer software and hardware—including peripheral units from Cubic Corp. — for 37 sites. There will be 85 sites in all, employing a total of some 6500 operational and maintenance personnel when the system becomes operational in 1972. The first two systems will be installed for checkout by the end of '69.

Most of the equipment — and some of the software — for one system has been assembled at Hughes' Ground System Group facilities in Fullerton,

Are you ready for the 1970's?

A division of Planning Research Corporation has developed an on-line, real-time, computer-based system whose work requirements are as complex as any that major business organizations will require in the 1970's. It is an international room reservation system for the hotel and motel industry. Below are some of its capabilities. Where you read the word "rooms"—insert your own products. Where you read the word "terminals"—imagine them installed at all critical points in your organization.

The system maintains an inventory of thousands of differently priced rooms that are located in hundreds of cities.

The room inventory can be interrogated instantly from remote terminals located in hotels, motels, travel agencies, and airlines.

A hotel or motel manager can instantly withdraw from inventory (or add) any price mix of his rooms . . . using his terminal.

He can request on his terminal and receive from it a status report on how many and what type of rooms have been sold to whom *and where the sales originated.*

The cost of a room sale by the system is less than the cost of any other method, unless the hotel or motel has depended entirely on travelers who walked in without reservations.

The traveling public can ask to buy a room in the system from any telephone anywhere in the country, toll free.

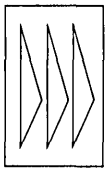
The system provides the usual accounting information required by business.

The system is designed to "warehouse" and sell "products" other than rooms.

These are only highlights of a very complex, on-line, real-time computer system we constructed from scratch. Its counterpart in business is a system that allows *management* to communicate with the computer. In our philosophy, a business system should provide highly refined information that managers can use to control operations. And it should provide the information now, not a week from now.

Unlike other software firms, Planning Research Corporation would begin to design a system for you with a high probability of intimate knowledge of your business: in addition to the computer sciences, the 2,400 members of our professional staff represent most branches of engineering, the classical sciences, the behavioral and management sciences, and economics.

If your company's annual sales are $20 million or more, you are invited to inquire about our capability in your specific field. Write to Mr. John N. Graham, Jr., Vice President for Computer Systems Design.



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Some people will probably not switch to Memorex disc pacl

Security is many things: a thumb and a blanket, a horseshoe over the door, a disc pack bought from the man who sold you your computer.

And we're not knocking it.
On the other hand, for the well-adjusted, independent thinker, we offer a pair of well-adjusted, independent disc packs.

One is our 10-surface Mark I. You don't have to be too venturesome to try it, because every one of its 2030 recording tracks is error-free.

The other is our 20-surface Mark VI.

Even a fairly timid person might appreciate the fact that its recording surface is 1.5 microinches smoother than anyone else's.

We build both packs with our own proprietary substrates.
We build them with our own proprietary coating formulations. And our own proprietary coating processes.

One res
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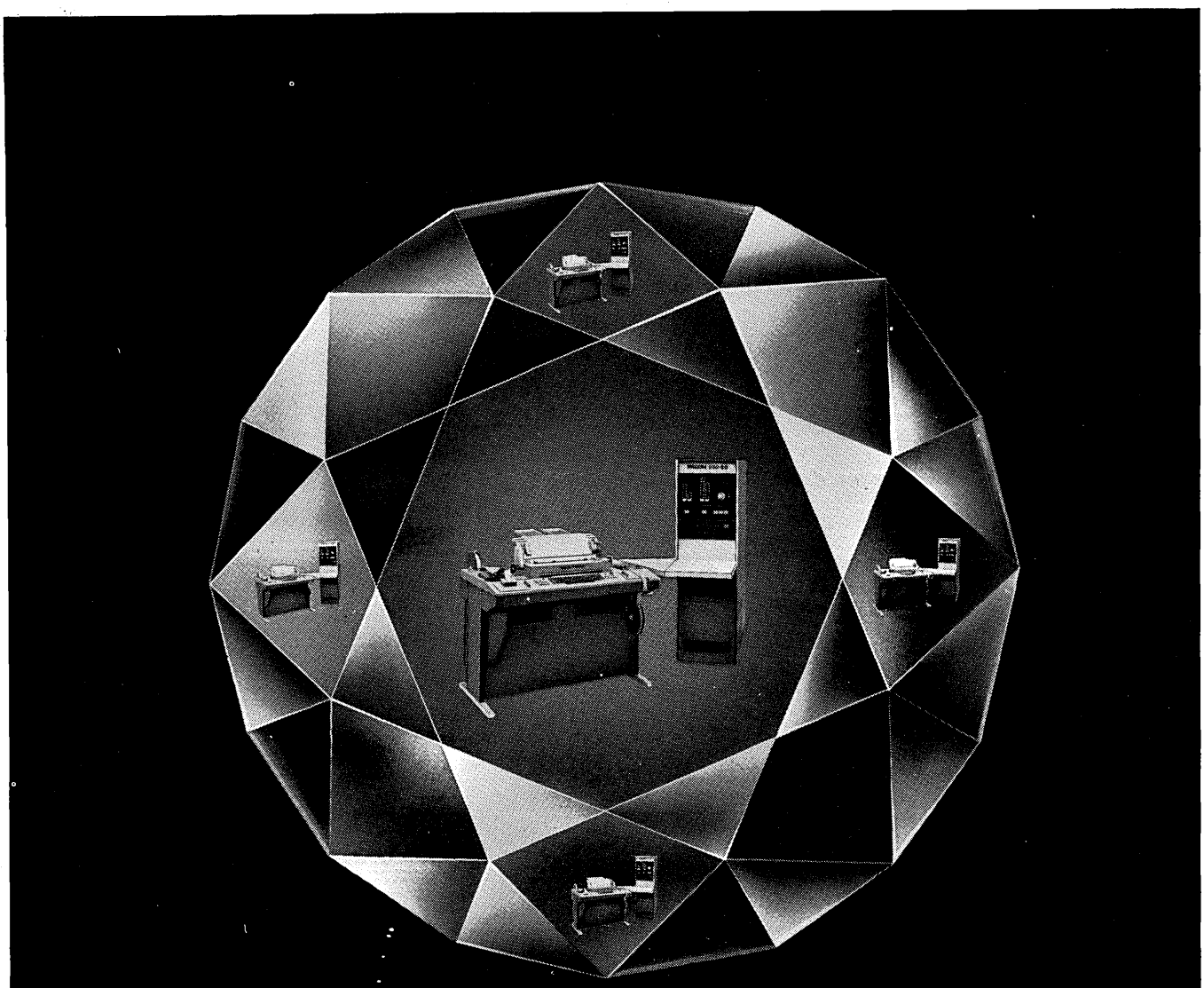
isc packs.

One result is that both are refreshingly free of surface discontinuities and spurious noise.

Not every customer will find these facts reassuring enough to make the switch to Memorex disc packs. Those who do, however, will find some new, richer meanings for the concept of security.

Memorex Corporation, Memorex Park, Santa Clara, California 95050.

MEMOREX



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Our FACOM 230-10 reflects the epitome of modern electronics engineering in every phase. It's a compact, economical model designed as a stage computer for large-scale data centers. The FACOM 230-10 stores up to 65,536 10-bit bytes or 131,072 numeric characters at a transfer rate of 35 K bytes/sec., with a sorting rate of 50 numeric characters times 2,000 in 3 minutes.

Every FACOM 230-10 comes with a complete software package: library programs, service routines, program and operating manuals. The various FACOM compilers, assemblers, utility routines and application packages fit into any given hardware configuration.

And for real international performance, FACOM 230-10 speaks three language—COBOL, FORTRAN and ARGOL.

Up to date, over 600 FACOM 230-10 systems give a brilliant performance in various parts of the world.

Up to date, there are over 600 very satisfied customers. Be brilliant, join them.

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Communications and Electronics

Marunouchi, Tokyo, Japan

MAIN PRODUCTS: ☐ Telephone Exchange Equipment ☐ Telephone Sets ☐ Carrier Transmission Equipment ☐ Radio Communication Equipment ☐ Space Electronics Equipment ☐ Data Communication Equipment ☐ Computers (FACOM) & Peripheral Equipment ☐ Automatic Control Equipment (FANUC) ☐ Telemetering & Remote Control Equipment ☐ Electric Indicators ☐ Electronic Components & Semiconductor Devices ☐ Auto-Radio & Car Stereo (TEN) ☐ Marine Radar ☐ Nuclear Measuring Equipment

Cal., where it went through some meaningless light blinking last month for the press. But so far, said Dr. Nicholas A. Begovich, director of the NADGECO board, few errors — "less than you can count on the fingers of one hand" — have been uncovered.

Although it's a bit early to evaluate the success of the project, the fact that six firms representing six nations have even *assembled* the pieces of a complex defense system is noteworthy. Added to the hazards of cultural, linguistic and technical barriers imposed upon the project is another raised by the balance-of-payments problem.

One of the ground rules of the NADGE award was that funds allocated to the participating countries equal their financial support of the project. Thus system designers had to figure out ways to spend, for instance, approximately $18 million in Italy, $2 million in Greece and over $3 million in Turkey. Although the latter two countries will not provide equipment, it turns out that construction and civil engineering costs there will allow NADGECO to abide by the balance-of-payment rules. Italy will provide displays. The USA will get its money ($98 million) back from Hughes computers, Cubic peripherals and salaries of engineers, programmers and administrators.

NADGECO vp and general manager Bob Reed stressed the low cost and the time span of NADGE compared to earlier defense systems: SAGE (1953-62), $4 billion; BUIC (1962-68), $.5 billion; 412L (1958-65), $1 billion; NADGE ('67-72), $.3 billion.

But, in answer to a question, he noted that this was so because the system was "reaping the benefits of earlier experience; we're not reaching 'way ahead as far as the state-of-the-art is concerned;" . . . the system takes advantage of and augments current defense systems equipment; "the system is viable . . . capable of modification." Another probable factor: the use of the Hughes 3000-series computer; it went into production in 1962, and there are several hundred installed.

The NADGE H-3118M configuration (M stands for multiprocessor) features dual cpu's and 112K words of 1.8-usec core; add time is 3.6 usec. Also featured: a "rich" complement of index registers, fully buffered I/0 (any channel can be an I/0 channel). The 3118 offers a JOVIAL compiler and a skeleton monitor in which the user's monitor is embedded. One Hughes spokesman called the 3000 series a 2½-generation machine, roughly comparable to the CDC 3000 series.

Although the NADGE system is NADGECO's only product to date, the consortium may stay together to pursue similar big contracts. It probably depends in part what sort of profits the contract generates. Any profits will be parceled out to consortium members on the basis of their share of the "risks" involved. Whatever that means, it adds up to about 35% for Hughes Aircraft.

COMSAT LOSES NAME DISPUTE TO COMCET

A United States District Court (Maryland; Civil No. 20343; June 5, 1969), has ruled that the use of the name COMCET by that company does not constitute unfair competition with COMSAT.

Communications Satellite Corp. had sought to enjoin the COMRESS subsidiary from using COMCET due to the confusion that might result from the similarity of the two terms. The court noted the dissimilarity of the markets of the two companies, pointing out "there is no likelihood that defendant's goods, services or business will be confused with or mistaken for plaintiff's." And: "It is not likely that either will expand its business to compete with the other."

COMSAT has filed notice to appeal the verdict.

GE 600 SERIES SHOWS VIGOR IN ITS OLD AGE

General Electric Co. is bragging that its 600 series of large-scale computers is catching on in Europe. The company has been reporting sales at a rate of one per week, which is pretty good, figuring that each order is worth about $3-$4 million.

Among buyers listed were: Vallourec, a French steel fabricator that will link 17 of its plants to a 635 for controlling operations and use GE 115's for remote batch work and provide time-sharing services for its engineers; FAG Kugelfischer, a West German ball-bearing manufacturer that will use a 635 as a base for its management information system; and access it through crt terminals; CNET, the R&D arm of the French national post office and phone system, which will use a 600 in Paris for t-s and remote batch.

The 600 is doing better in the U.S. too, apparently, if a recent $13 million contract with the U.S. Air Force is an indication.

All of this leaves one big question. Why did the 600 take so long to catch on? The series was first delivered in the first half of 1965. At that time it had an operating system capable of batch and remote batch processing and hardware that was pretty good — except for the peripherals, which took a while to come out of the "fair" category. Reaction was mixed. Sources at Hughes Aircraft, in El Segundo, Calif., reported theirs to be more acceptable than their IBM 360's somewhere around 1966-67. Hughes bought a second 635. On the other hand, TRW and Martin Denver returned their 600 series machines in 1967. Poorly written contracts and overselling may have contributed to a slow rate of growth in its early years — not surprising faults on the part of a new vendor in the computer business. But hardware problems were well sorted out — even the peripherals — by late '67 and the advent of the GECOS III operating system, with provisions for a viable time-sharing network, should have set the stage for more rapid acceptance.

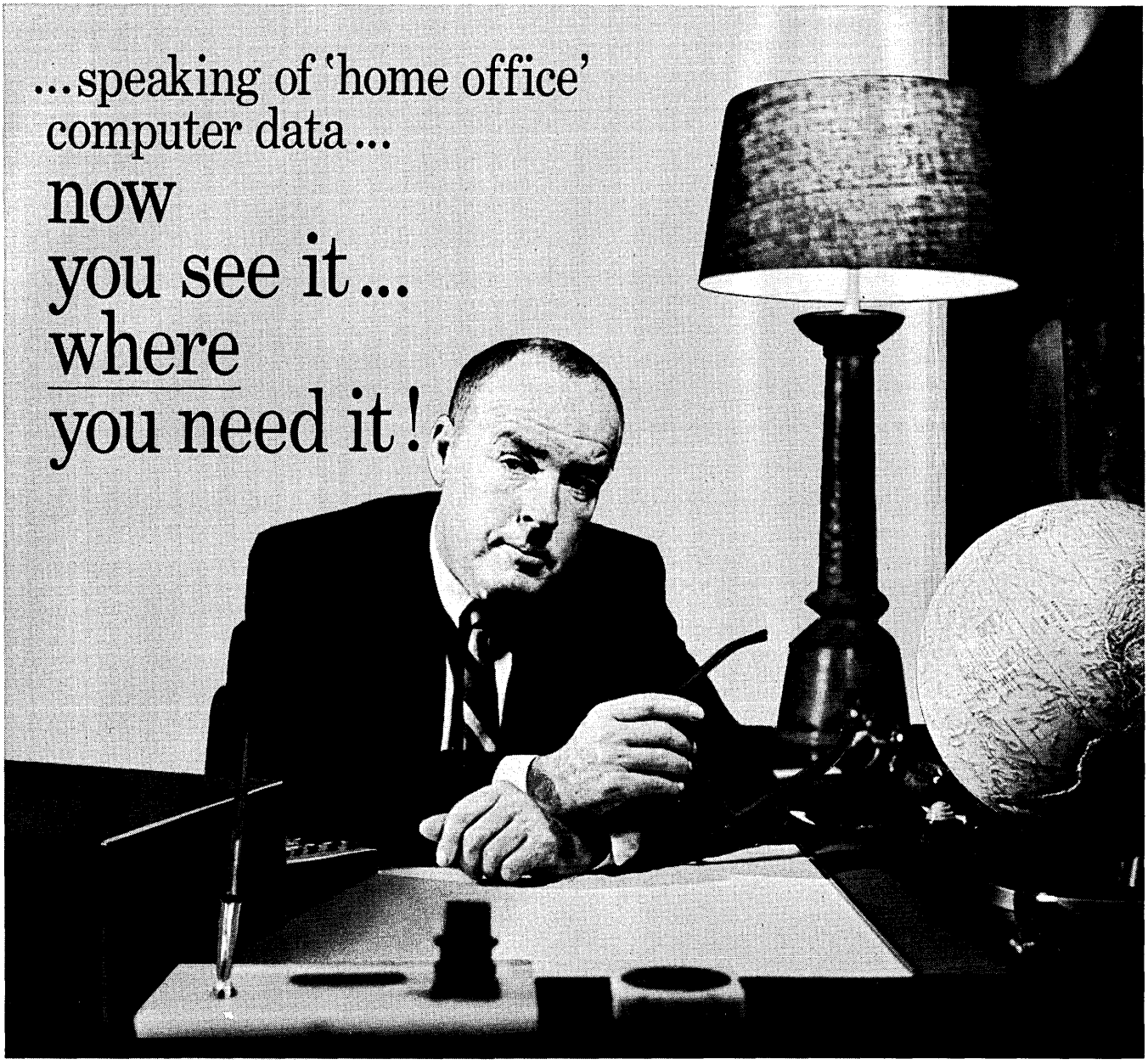
Perhaps the problem is partly explained by a rather slow marketing effort—for instance, the 600 series was formally introduced to the U.K. market only last month. This seems to be an unexplainable lapse.

MAN-OF-THE-YEAR ISN'T

At the DPMA International DP Conference and Business Exposition held in Montreal, that organization selected its first recipient of its "Man-of-the-Year" award, Commander Grace Murray Hopper. Grace Hopper is a well-known figure in dp circles. She learned to program on the first large computer, the MARK I, and was later instrumental in the development of UNIVAC I, the first large-scale commercial machine. Lately she has been working in the area of standardization, strongly backing COBOL as a universal language. The award was presented to her by Charles L. Davis, international president of the DPMA.

ADAPSO ADOPTS TWO POSITIONS

The Association of Data Processing Service Organizations, Inc., has made known its views on two unrelated industry matters that affect its members. The first is in the form of a submission to the House Subcommittee on Activities of Regulatory Agencies Relating to Small Businesses, in which the recently formed Computer Time-Sharing Service Section of ADAPSO seeks the establishment of a special class of microwave common carriers oriented toward the transmission of data. Joan Van Horn, CTSS president, stated, "These common carriers, should be able to take advantage of technical advances to offer low cost service to customers. They would also provide com-



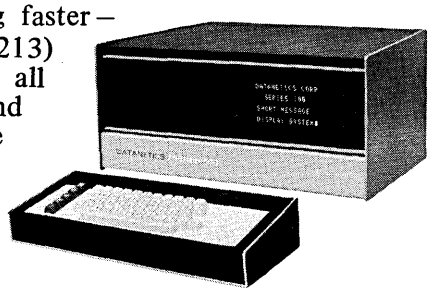
Where you need alphanumeric computer data, is in a branch office, divisional facility or a resident engineer's home – anyplace there is a telephone connection.

The **Datanetics Series 100 Display** is the only low cost (under $1800) computer transceiver device that closes the gap between mechanical hard-copy devices and large message CRT displays.

And it performs right on your desk top. Entirely **self-contained** with all electronics in one compact unit, or with remote keyboard. The Datanetics Series 100 provides **excellent resolution** of characters, easily readable in brightly lighted rooms.

Call your computer long distance, interrogate it, inform it, night or day, and get answers immediately – accurately where you are.

Tell us about your application idea; chances are we can suggest many other valuable uses for the **Datanetics Series 100 Display** terminal. You'll like it, and things will start happening faster – easier. Call (213) 542-4355 for all the details and an informative brochure.



Datanetics Corp.
2828 Spreckles Lane, Redondo Beach, Calif. 90278

petition to the telephone company in the transmission of data and thereby foster improvements by both."

The second viewpoint was expressed in the second of a series of industry position papers released by ADAPSO, which states the organization's opposition to any discrimination in prices charged by hardware manufacturers to different customers, contending that discounts to governmental organizations, universities, charities and other public institutions are anticompetitive in effect, even though the purchaser is required to agree that the equipment will not be used in competition. ADAPSO states that it is its "intention to do all within its lawful power and financial ability to assist in bringing such manufacturers to justice and require them to account to the injured parties."

GAO AGREES INDEPENDENT PERIPHERALS MONEY SAVERS

Federal adpe users could save the taxpayers about $200 million through increased use of independently made peripheral units, says the General Accounting Office in a recent study.

"At least three" independent manufacturers are selling plug-compatible tape transports 17-58% below the prices charged by "the largest computer system manufacturer" (apparently IBM), and are leasing this equipment for 9-26% less, said GAO. It added that plug-compatible disc drives can be purchased for 20-29% less than the system manufacturer's price, and leased for 16-24% less. "Although this type of equipment has been generally available since 1967, only a few government installations have ordered or installed plug-to-plug compatible equipment," the report said.

GAO indicated its findings "warrant a complete reappraisal of the current federal practice of acquiring computers on a system basis." The agency advised federal adpe users to evaluate independents' lower prices before selecting equipment. It recommended that GSA and the Budget Bureau establish "more specific guidelines for the evaluation and selection of plug-to-plug compatible and other (presumably non-plug-compatible) components." GAO also thought third party leasing arrangements should be explored because they offer the possibility of even greater savings, beyond those obtainable from independents. Bulk purchases of plug-compatible disc and tape drives by GSA were suggested as another possible cost-cutter.

GAO reports usually have about as much impact as "a snowflake falling on the broad bosom of the Potomac," to quote Everett McKinley Dirksen's classic phrase, but this one may be different.

The peripheral component study was sired by Bryant Computer Products' Dick Caveney in 1967, when he appeared before the Joint Economic Committee and told how both the taxpayer and the independent peripheral manufacturer were losing money because of the government's preference for buying complete dp systems only from system manufacturers. Now, the independents are actively trying to get a piece of this action; led by Caveney, they've formed a trade association to push the idea. The GAO report is almost certain to spur their efforts.

The big reason federal computer system operators don't buy independently made peripherals, says the report, is because of a fear that dual maintenance will create problems. GAO implies strongly that this fear is unfounded. "Based on our visits to private organizations that have their data processing center under dual maintenance arrangements, we found that maintenance personnel from different manufacturers can effectively maintain an overall computer system ... The alternative practice of having the government perform its own in-house maintenance would... be the ideal solution."

The report estimates that federal agencies could save $5 million/year by replacing tape and disc drives presently rented from system manufacturers with independently manufactured plug-compatible units. Purchasing these components from the independents would be $23.5 million cheaper than purchasing them from the system makers, GAO added.

If the government made maximum use of all the independently made peripherals currently available, it might save $200 million, GAO said. This would involve replacing, wherever possible, peripherals already purchased or leased from system manufacturers with components bought from independents. It would also involve the maximum use of both plug-compatible and non-plug-compatible equipment.

The report recognizes that interfacing the latter units to a system presents problems, but it describes how two computer users solved them—an implication that others could do likewise.

In one case, a "private research organization" not otherwise identified saved about $100K by purchasing an independently made drum storage unit. The manufacturer worked out the hardware interface, and the user developed the modifications required in his existing executive software. Another case involved the Lawrence Radiation Laboratory, which saved about $500K by purchasing an independently manufactured core memory. Technical specs were prepared first, and this minimized the interfacing problem.

The GAO study was based partly on savings reported by nine private organizations which have added independently made peripherals to existing computer systems. This group included American Airlines, McDonnell Douglas, Long Island Lighting Co., and the Reader's Digest. The savings ranged up to $129K/year in rental costs and up to $311K in purchase costs.

GAO also compared the prices charged by a system manufacturer, apparently IBM, for 11 models of tape drives with the prices charged by three independents for similar plug-compatible units. This analysis showed that purchase of the latter instead of the former equipment could save as much as $242,450. On a rental basis, the saving amounted to $250/month. Plug-compatible disc drive prices were also compared. One unit purchasable from a system supplier for $25.5K could be bought from an independent for $18.1K; the same equipment could be rented from the former source for $590/month and from the latter for $450/month.

SOCIAL SEMINAR SAYS NADER NEEDED NOW

Some people expected the DPMA convention seminar on "Social Implications of Computers" to be a sequel to the noisy SJCC session on "Increased Dialogue With Society." But while the DPMA panelists made more imaginative suggestions than the SJCC speakers, the audience was well-behaved and no "peace" groups attended. Again, the panel neglected to mention the Viet Nam war, instead confining itself primarily to means toward communication with society. The seminar was attended by nearly 80 people and aroused sufficient interest outside the edp community to be covered by the Montreal press as well as the Canadian Broadcasting Co., the latter conducting a brief radio interview with one of the panelists.

Panelists were: Alan Taylor, chairman, then editor of *ComputerWorld*; Arthur A. Dunn, mgr., special projects, Dept. of Supply and Services (Canada); William J. Horne, asst. vp, MIS, USM Corp.; Robert P. Bigelow, Boston attorney; Joseph F. Hanlon, reporter on humanities, *ComputerWorld*; and Larry A. Welke, pres., International Computer Programs, Inc. Welke substituted for Herb Grosch,

who was unable to attend.

The seminar began with brief statements by each of the panelists. Hanlon attacked the often-expressed view that the computer is a "tool," stating that it represents an "immediate danger" to society, and anyone who believes it is in the class of a mere tool is "brainwashed." Bigelow disagreed, however, asserting cautiously that computers are "still" tools. Welke commented that phrases like "social implications" are really a cover-up for "dangers" and "possibilities."

Addressing himself to specific actions, Hanlon suggested that what the computer industry needs is control of its ethics, which must be imposed from the outside by government regulation. A member of the audience said that the best way to reach this end would be if we could somehow get a Ralph Nader to expose the industry and prompt regulation, as happened to the auto industry.

This same individual further suggested that most of the mundane clerical tasks which our computers are performing could be accomplished just as well by the "starving peoples of India" and other overpopulated areas, who could be brought to our shores, helping them and enabling us to "throw the computers in the ocean."

All panelists seemed to accept the premise that computers represent at least a potential danger to society, although Dunn questioned whether action is really "urgent" at this time. Toward the end of the seminar, Horn suggested that a group be organized to delve into social implications, and offered to donate $100 a year for five years to such an organization, assuming others would be willing to match this sum. In an effort to keep interested attendees abreast of future happenings in the area of social implications, Taylor volunteered to personally maintain a mailing list; he may be contacted at 633 Central St., Framingham, Mass. 01701.

One disgruntled attendee voiced his disapproval of the seminar by declaring that he had attended "to learn about the social implications of computers, not to try to solve the world's problems." Maybe they'll think up a new name for next year's seminar.

JUSTICE AND TELEMAX FILE AGAINST ATAR AND ATC

Atar Computer Systems, Inc., the airline reservation firm, and International Reservations Corp., the hotel/motel/rental car reservation firm, have signed a preliminary agreement that would make IRC's accommodations available through Atar terminals. Although both firms are young, IRC has listings for 100,000 rooms and a rent-a-car firm and Atar has already signed a five-year contract with Air Traffic Conference for implementing 2700 air reservation terminals within the next 11 months. Under the terms of the agreement, neither Atar nor IRC would be restricted from entering outside agreements, and the commission arrangements between travel agents and clients would not be altered.

Meanwhile, on another front, the CAB approval for the agreement between Atar Computer Systems and the ATC may not come easily. Impediments to the contract include objections filed by the Justice Department and by Telemax Corp., an Atar competitor. The objections maintain that such an agreement would free the Atar system from competition. Telemax noted in its suit that Atar had no revenues or net worth as of Dec 1, 1968, having expended only about $400,000 on its system, while Telemax had invested over $21 million and presently serves 221 air travel agents and has another 682 under contract.

IT'S WRITTEN IN THE STARS —BUT IS IT HANDWRITTEN?

The hoary arts (sciences? sophistries?) of astrology and graphoanalysis (graphology no longer) are turning to computers to stimulate man in his timeless quest for and interest in himself and his personality. A news release recently announced, somewhat inaccurately, "Astroflash, France's Sensational Astronomical Computer, to make American debut," and went on to describe in similar restraint the wonders of personalized horoscopes by computer.

"The Astroflash installation will have its own air-conditioned building, currently under construction, and its own staff of attractive young women programmers, all well-versed both in computer operation and astrology. It will be open seven days a week, from 8 a.m until 11 p.m." An 11 p.m. horoscope from a well-versed young woman programmer really isn't a bad idea.

"Astroflash comes to the U.S.A. with a success record as spectacular as a star-shower. Originally installed on Sept. 24, 1968, in the arcade of the Pan-Am building on the Champs Elysee in Paris, Astroflash stopped traffic — and started an immediate and lasting sensation." Sounds like a lot of Taurus.

"Literally defined, Astroflash is an IBM 360-25 computer, intricately programmed for astrological duty ... Fed with a subject's basic natal date, including day, date, hour and locality of birth, Astroflash provides a clearly written, meticulously detailed psycho-astrological profile plus, if desired, a six-month forecast, at the rate of 1100 lines a minute." Who can live that fast?

"The analysis is between eight and fifteen pages in length and is extremely thorough ... Astroflash can deliver it in minutes — and without any possibility of human error." Unless the subject is a human error. What if he's only an eight-pager?

"The cost of Astroflash service is moderate: $2.50 for the psycho-astrological profile alone, $3.50 for the six-month forecast or $5.00 for both. Much higher fees are generally commanded by individual consultants." Will they now be starry-eyed victims of the machine?

"Astroflash I, in Paris, has delivered between 500 and 800 horoscopes each day for a total, to date, of more than 185,000. Among the horoscopes cast have been those of Charles de Gaulle, Georges Pompidou, and an entire galaxy of other public figures." You mean, Charles knew he'd lose the referendum? And still went through with it? Maybe he only popped for $2.50.

"Astroflash II ... will debut in New York. Other American cities will have subsequent installations as well. How many others? No one knows, at the moment ..." Not even for the next six months?

"For Astroflash ... the sky's the limit." No. This news release is.

Graphoanalysis, the relating of handwriting to personality or vice versa, is the specialty of Handwriting Computer Center, Inc., Chicago, where Charles Martin, a professional scriptanalyst, is vp and director of research. According to a news release recently issued on behalf of his firm, a 360/30 has been programmed to produce a "personality profile" by considering such factors as "letter formation, slant, shading, pen pressure, patchings and retracings, smoothness, regularity, rhythm, angularity, symmetry, flourishes and ornamentations, spacing between letters and words, and arrangement of the writing on paper." Readability, content, spelling, punctuation and grammar don't make it.

Martin, who is a chief criminal probation officer for the seventh judicial district of Illinois, claims that he "can tell your boss if he should fire you, your fiancee whether she should break the engagement, or your bank whether it should turn you down for a loan — all from the way you write." Seems like a rather negative approach.

The release goes on: "Martin's rec-

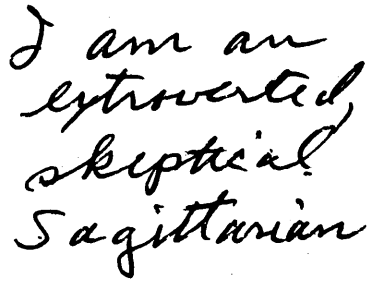
ord of success is amazing ... he has never had a loan failure in his many years of checking out credit and loan applications by scriptanalysis, because the drives, workability, integrity and general positive qualities can be determined by an analysis of the graphic gesture." Can anyone think of a graphic gesture?

"His record as a marriage consultant is equally impressive. He saved one woman from what he believed would be a poor choice by advising her that she would be completely incompatible with her prospective husband." Guess he didn't have the right slant on things. "The graphic gesture revealed that he was introverted and withdrawn and could not give warmth, while she was warm and outgoing and needed that type of love from a husband." What about the old science of opposites attracting?

"In another instance, a juvenile offender became so attached to Martin as a result of his help in rehabilitating the boy that when he was sent to Vietnam, he named Martin as the beneficiary of his insurance policy, even though the soldier's parents were still alive." Heartwarming ... that's real rehabilitation.

Art lovers may brighten at one unexpected development. The news release listed several famous men who had been interested in handwriting characteristics, including Suetonius Tranquillus, Kuo Jo-hsu (who said, somewhat murkily, "Handwriting infallibility can show whether it comes from a person who is noble-minded or one who is vulgar"), Freud, Poe, and Emile Zola, and then the release stated, "The painter Thomas Gainsborough likes to keep on his easel a letter written by the subject of his portrait." Yeah, but he'll never top Blue Boy.

Martin is quoted as saying, "The way you form your letters, your words and your sentences is an expression of the kind of person you are."



SMIS TO HOLD FOUNDING CONFERENCE

Five major technical sessions will highlight the first annual meeting of the Society for Management Information Systems, to be held Sept. 8-9 at the Univ. of Minnesota in Minneapolis. Each session will consist of one 30-minute paper followed by 15-minute critiques by two discussants and then a general discussion.

The program will be opened with remarks by SMIS president Robert V. Head, followed by the keynote address by Congressman Jack Brooks, chairman of the House Government Activities Subcommittee and Honorary Founding Member of SMIS. The five sessions are Data Management, Decision Systems for Planning and Control, Manpower Resources for MIS, Distributed Computer Networks, and Trends in MIS Technology.

SMIS was founded late in 1968 because computer-based management information systems are assuming an ever-growing importance, yet existing systems all too often fall far short of their potential. To implement a successful MIS, an organization must evaluate the needs of management and make a realistic appraisal of the technology available to support the system. The correct balance between the value of information and its cost requires that the gap be bridged between the manager and those closely involved with the technology.

The immediate purpose of SMIS, then, is to exchange ideas among knowledgeable executives and technical managers. Thus, the Founding Conference will focus attention on a relatively few topics of prime importance. Attendance at the conference is purposely being limited in order to facilitate general discussion. For registration information, contact Prof. G. W. Dickson, MIS Research Center, School of Business Administration, Univ. of Minnesota, Minneapolis 55455.

EASTERN CREDIT CARD EDP CENTER OPENED

The Eastern States Bankcard Association has opened a computerized bank card processing center at Lake Success, N.Y. The center includes two 360/50's plus about 250 employees in a 61,000-square-foot building. The ESBA was founded last year by Chemical Bank, Manufacturers Hanover Trust Co., and Marine Midland Grace Trust Co., all of New York, to handle Master Charge card processing for member banks, now numbering 88, in six eastern states, representing 4 million cardholders and 10,000 merchants.

The center handles sales authorization, merchant and cardholder accounting, and security operations. IBM 2260 crt's will be used to provide instant credit verification; a merchant anywhere in the country need only call the center, and the operator can quickly display the current status of the charge card in question. The system is also programmed to detect unusual activity in use of a given card, as in the case of a man going on a spending spree with a stolen card. The center also processes sales slips submitted by merchants and notes payments received by the banks. It sorts out Master Charge balance sheets for each bank, each merchant, and each cardholder, all of whom receive statements of their payments and purchases. After the first few weeks of operation, the computer center was averaging 6,000 calls a day. It is estimated that it can handle four times that number, and may be required to do so by early next year.

COMMERCE DEPT. AGENCY HAS NEW INFORMATION SYSTEM

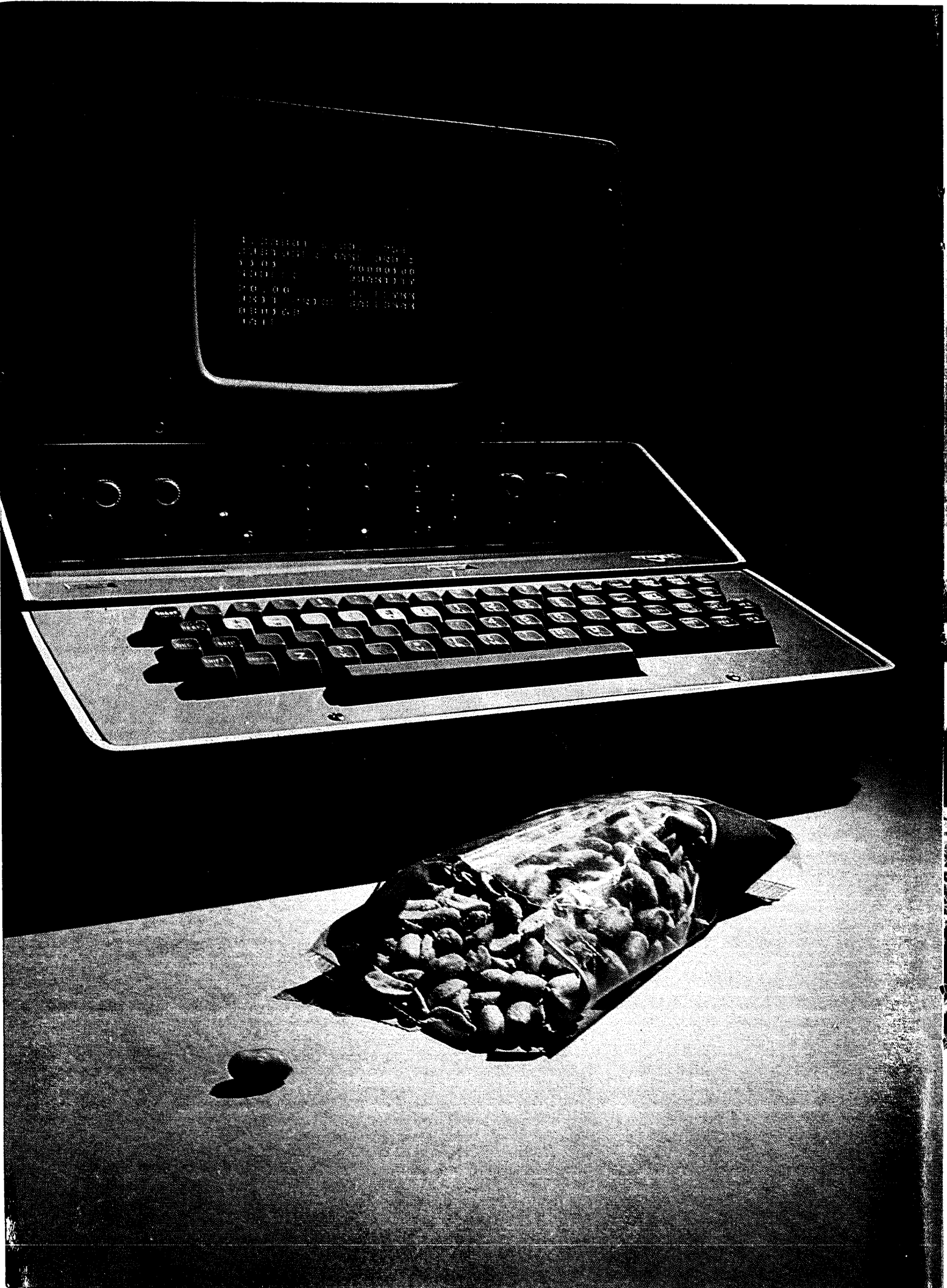
The Economic Development Administration of the Department of Commerce is using a no-programmer-required information system developed by Consolidated Analysis Centers, Inc. (CACI). The associated 500-million-character data base has been built up with information from the Departments of Agriculture, Housing and Urban Development, and Transportation; the Appalachian Regional Commission, and the Equal Employment Opportunity Commission.

CACI's part of the system is called the Quick Query Program (QQP). It's set up so that the user can fill out standard forms to specify the sort of information he wants and what calculations are to be made. The data available comes from such sources as county and city data books, the census of agriculture, county business patterns, unemployment and labor statistics, F. W. Dodge construction statistics — plus the complete files of EDA projects and operations. Turnaround time is overnight.

MOON CRUST SAMPLES ARE NOT THE FIRST

As our astronauts bring back samples of lunar rocks from the Apollo missions, they will not be bringing to Earth the first chunks of the Moon's surface. Although there is still some scientific controversy over the matter, one NASA scientist, Dr. Dean Chapman of the Ames Research Center in Sunnyvale, Calif., maintains that we have received samples at least three times in the past. These samples have come in the form of tektites, small glass globules which are most often only a little larger than grapes, and were last showered upon the Earth some 700,000 years ago.

(Continued on page 133)



Nobody takes just one

That's why VIATRON can replace hand assembly with 1000-unit-a-month production lines. This is one of the reasons you can rent System 21 computer stations for $39 a month.

$39 a month is peanuts to pay for a computer station that lets any clerk format, record and visually verify data. That's the foundation for a complete data management network with batch transmission, data printing and color display capabilities.

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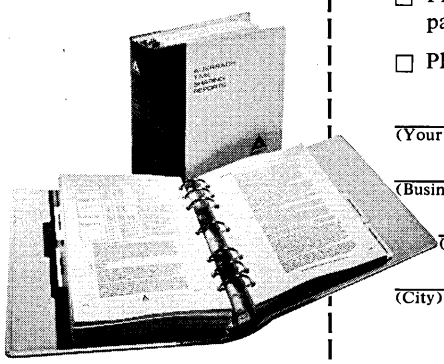

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CIRCLE 179 ON READER CARD

Scientists are generally agreed that the glassy pebbles are formed by a meteor's impact, and that this has occurred on this planet, too. As the meteor imbeds itself in the planet's surface, the high temperatures generated melt the ground on which it falls and tektites are formed. The force of the impact is easily capable of splattering the debris to Earth from the Moon.

When such a shower occurs, the lunar pellets are distributed in a very regular pattern across the Earth. Using about 500 hours of cpu time on Ames' IBM 7040/7094 system, Chapman worked backwards from the pattern to establish the projectile's trajectory. Using a trial and error method, he established, over the course of some six years, that the most "recent" tektite shower originated in a single scar, or "ray," on the edge of the crater Tycho. Further examination has shown that the materials of which the small missiles are composed is very similar to granite — not very exciting stuff.

COMPUTER "READS" TO THE BLIND IN MIT PROJECT

Braille is limited in its use by the expense and time required to produce it, and for that reason, textbooks, reports, and technical articles in Braille are often not available. Blind students and professionals are forced to turn to tape recordings and volunteer readers, but there are never enough recordings or people to make them, never enough volunteers. Computer specialists have been trying for the breakthrough that might reveal the printed word to those who cannot see it.

The breakthrough has not come. Computer Braille is still too slow, too expensive. But the work of the Cognitive Information Processing Group at the Massachusetts Institute of Technology may have brought that breakthrough just a little closer. Under CIPG's group leader, Dr. San Mason, a reading machine has been taking form. The machine is composed of a flying-spot optical scanner, a 24K Digital Equipment Corp. PDP-9, a typewriter with a Braille type font, and a speaker.

The scanner reads in a typewritten 8½" x 11" page at a rate of something like 30 msec per character. (Since the MIT work is listed as "research," the group is primarily interested in constructing something that will work, and has not been very concerned about speeds. They feel the 30 msec/char rate can be significantly improved.) This present rate works out to be in the range of two minutes per full page. Three kinds of output are available; printed grade two Braille, "spelled speech," and synthesized speech.

Grade one Braille is a character for character translation. Grade two Braille is a compacted, condensed version of the language with its own syntax rules. The contracted language requires the employment of algorithms complicated enough to push the PDP-9 to its limits.

The "spelled speech" feature uses PCM (Pulse Code Modulation) signals of the spoken alphabet converted to digital bit strings and stored on a Vermont Research drum. Audio speaker outputs spell out the words read by the scanner, character by character, at a speed of about 10 cps.

The synthesized voice outputs, developed by running computed amplitude, duration, and frequency signals to a sound synthesizer, are said to be 75% - 80% recognizable to a trained ear.

The machine language programs for producing the Braille and the "spelled speech" were written by a doctoral program student, Kenneth Ingham, for whom the work is especially meaningful. He lost the sight of both eyes in a 1955 lab explosion that also took his right hand. His Braille program is said to be the second in the country capable of producing grade two Braille (the other system is in use by the Printing Press for the Blind in Louisville, Ky.). It is the first system capable of being time-shared through a $1200 terminal (constructed from an IBM Model "D" typewriter, and a solenoid key driver with electronics from Connecticut Technical Corp.). Six such terminals can operate on a PDP-8.

The spelled speech option — which among other things will allow a blind programmer on-line access to a time-shared machine — can be implemented at no additional terminal cost. Once made marketable, the investment required for the system will be in the synthesizer and scanner. (The scanner was designed by Drs. Troxel and Schriber; the programming for the synthesizer by Dr. Francis Lee.)

The largest hurdle to be faced by the team will be the production of a less expensive reading machine. However, a way around optical scanning may be in the offing for some text. If the users of a "spelled speech" or Braille printing system can get access to the monotype machine-readable magnetic tapes used to drive the automatic typesetting machines for publishing houses, the first half of the expense battle — optical scanning from typed pages — is cancelled out. With that obstacle erased, the job is made much easier. Kenneth Ingham is already showing how.

CALCOMP FILES SUITS FOR PATENT INFRINGEMENT

California Computer Products, Inc., Anaheim, Calif., recently filed suits against two companies, alleging patent infringement. The first suit is against Bausch & Lomb, Rochester, N.Y., claiming infringement on CalComp's patent covering an interface enabling plotting equipment to operate in remote terminals of t-s systems. CalComp also alleges unfair use by B&L of proprietary CalComp software with B&L's PTC-3 plotter teletypewriter controller in GE t-s systems.

The second suit charges Leviton Manufacturing Co., N.Y., with breach of contract under a licensing agreement for use of CalComp's patented techniques for controlling the level of light from an ordinary light bulb. The suit seeks payment of royalties that have accrued since the agreement was signed in 1962.

A suit filed several years ago against Benson-Lehner (now Computer Industries, Dallas) for patent infringement on a technique for driving a digital plotter with a tape deck is scheduled for hearing in September.

AIRBORNE DATA CENTER TAKES OFF

The U.S. Air Force is now testing an RCA system designed to assess the feasibility of providing airborne data processing centers for commanders directing strategic air forces from flying command posts. The experimental system is installed in a Strategic Air Command EC-135 aircraft. Known as the Post Attack Command Control System — Airborne Data Automation, it is the first ever developed to provide computerized information management capabilities aboard aircraft in flight. The command aircraft are alternate command posts kept aloft around the clock, ready to direct missiles and bombers in the event of an enemy attack.

Key elements of the PACCS-ADA system include an RCA Variable Instruction Computer with 36-bit parallel word processor, eight 4K word modules of 3 usec main memory, and 512 words of .6 usec high speed memory; a 100-million bit drum memory; five operator positions, each with a crt/keyboard terminal; a page printer; two magnetic tape drives, and a teletypewriter and printer.

The system was developed under a $5.5 million contract from the Electronic Systems Div. of the AF Systems Command. It will undergo a one-year evaluation, then the aircraft will be equipped with an air/ground/air data

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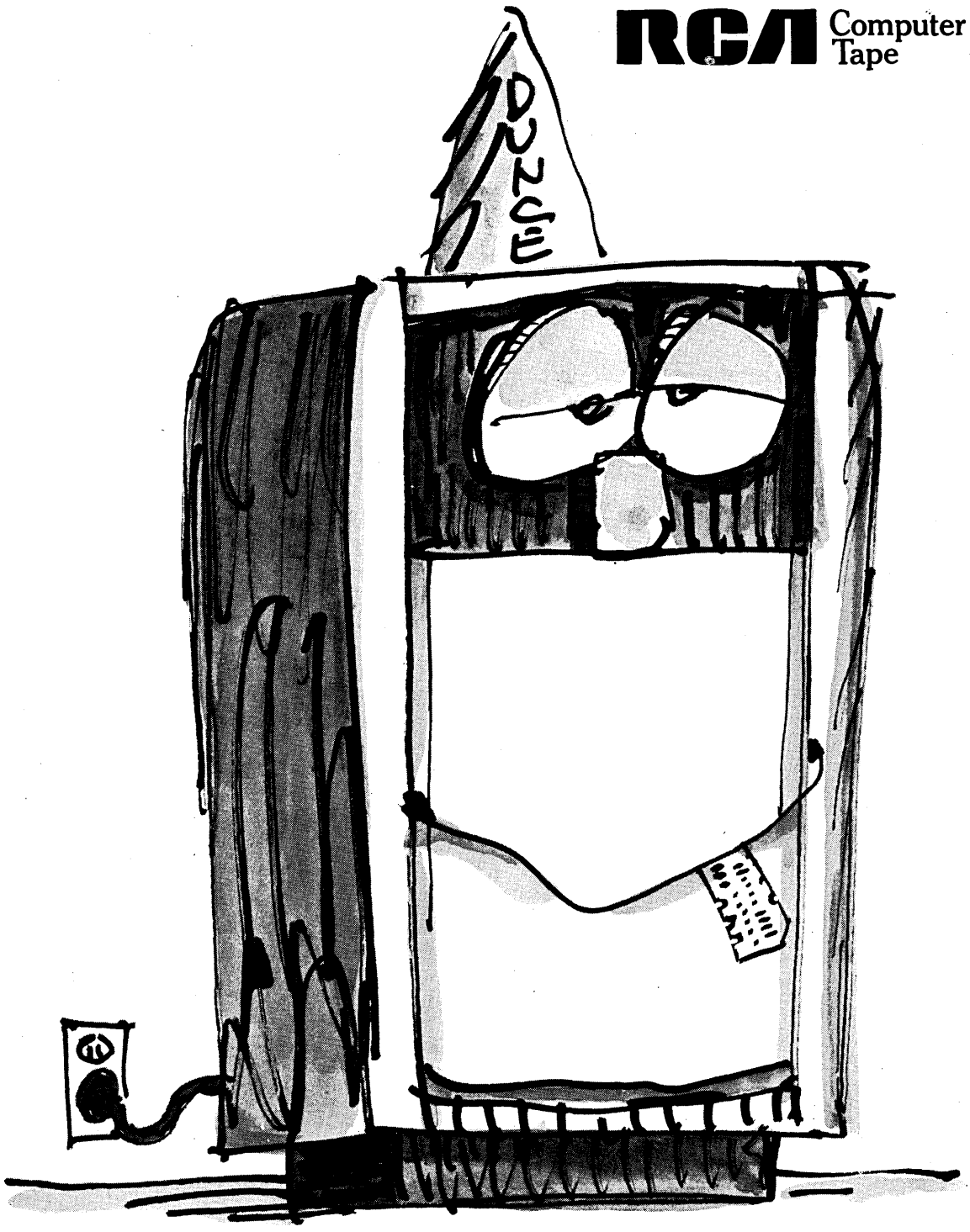

link for ten more months of testing. If it all gets off the ground, the sky's the limit for this new edp application.

VD PRESCRIPTION CALLS FOR 360/67

Systems Development Corp. has received a $35,000 grant to study an automatic venereal disease sex contact tracing system for the Los Angeles Health Dept. SDC's 360/67 has been brought into play against the spread of the diseases because of the volume of data to be handled, the impersonal nature of its performance, and the need for quick identification of carriers.

Obviously this kind of computerized system runs into troubles from many angles; legal, "privacy," and bureaucratic requirements immediately complicate the hypothesized system design. But the application of a computer should help because there are 250,000 vd cases on file with the LA Health Dept and some 25,000 known cases are added each year.

The six-month study contract will see SDC's ts/dms (Time-Sharing Data Management System) used for a prototype solution. Incidence of vd will be recorded, carriers will be traced, and possible contacts noted — but all hypothetically. If the proposed control system looks good, a follow-up $60,000 contract may be made available to operate on real data.

The most difficult part of the design will not, for once, revolve around JCL. It will stem from trying to convince private doctors to give the information required (they do not now and the private cases constitute 75% of the problem) and to overcome the legal hurdles in using the information.

COMPUTER TECHNIQUE TO FIND EYE DISEASES

"Right now there are about one million Americans who have glaucoma — a disease leading to blindness — and don't realize it." The statement was made by Dr. John R. Lynn of the Univ. of Texas Southwestern Medical School at Dallas. Dr. Lynn is engaged in making the diagnosis of eye disorders easier and quicker and cheaper. His technique involves the use of an IBM 1130 with a plotter and a tv screen.

A blip on the television screen is controlled by adding punched cards to the 1130's reader. The patient, who uses small levers to track the moving dot may sometimes lose sight of the blip if he concentrates his attention on the center of the screen. When the blip is "lost," it has entered a blind spot in the subject's field of vision. Everyone has one such blind spot because one spot on the retina where the nerve fibers are bundled is insensitive to light. Finding more than one blind spot may signal the onset of a disease such as glaucoma.

The subject's responses to the moving tv blip are recorded and analyzed by the 1130. From the computations, two maps of his field of vision are recorded, one that looks like a topographical land map and one that looks more like a normal graph. The first map, drawn by a program originally developed for geologists, locates blind or weak spots. The second map delineates the degree of weakness (peaks and valleys on its contours are equated to strong and weak points).

The technique will be useful in checking the progress of medication and the degree of a patient's recovery as well as in detection and diagnosis. Costs should be relatively low since the driving cpu and even the plotters can be shared by several offices with individual screens and card readers.

FIRST COMPUTERIZED BAGGAGE SYSTEM SHOWN

With their existing facilities, airline terminals will not be able to adequately handle the influx of passengers and baggage that will result from the simultaneous arrival of several jumbo jets. There are many air travelers who question whether the terminals can handle the present passenger load. Docutel Corp. so far has the jump on vendors who are trying to produce the baggage handling facilities that the new jets will make necessary. The Irving, Texas, firm has exhibited a computer-controlled baggage handling system that automates the routing and transfer of baggage using electrically driven "Telecars" that speed along miniature tracks at up to 15 mph.

The cars are equipped with two 16-bit memory registers that record their destinations and their identification numbers. The registers are loaded with information at a check-in station where a clerk, or the passenger himself, slips in a baggage check and keys in the flight data. While en route to the departure gate, or to a holding area or back to the passenger, the cars' registers are compared with read stations positioned along the tracks. At the appropriate time in a car's travels, it will switch itself off main feeder lines to various queues or holding stations. The read stations, the car scheduling and the input consoles are controlled by a relatively small cpu. In the case of the prototype shown by Docutel, the controller was a Honeywell DDP-516, but the firm is studying several other vendors for the system to be used in production models. Also included in the configuration will be a disc memory, communications gear and paper tape I/0 devices.

The cars used in the system are quite small — large enough for a couple of suitcases — and therefore will be used for one passenger's luggage, making it possible for him to retrieve his bags without interfering with any other passenger's belongings.

ALGERIAN OIL FIRM SPENDS $4.5 MILLION ON U.S. COMPUTER KNOW-HOW

Scientific Resources Corp., of Philadelphia, was the recipient of a $4.5 million contract with the Algerian government-owned oil company, Sonatrach. The contract, which could lead to follow-on's of the same magnitude in Algeria and in North Africa, calls for technical assistance, systems analysis, training, and the establishment of a large-scale computer center. Scientific Resources will place with the 10,000-man Algerian firm a computer configuration that will include a Scientific Data Systems Sigma 7 with an auxilliary Sigma 5 (both are large-scale hexadecimal machines with 850 usec processors), plus hybrid gear to be supplied by Paragon (an SRC subsidiary), and a software package called PASS for analyzing seismic data (which will be supplied by Mauchly-Wood Systems Corp., another SRC sub).

Other aspects of the contract are a little more unusual. For instance, SRC must first teach the Algerian technicians English so that they can then learn the computer technology involved and later be phased into the operation of their own computer center.

The two firms have already signed a formal agreement to study a joint-venture for additional centers and training.

LEARNING SYSTEMS FOR EDUCATION ONLY

Interactive Learning Systems, Inc., Boston, was formed last year with the purpose of using the computer to solve educational problems. The firm has since grown from six to 40 employees, of whom nine are part time, plus some 20 consultants. Its first products are three services: The Interactive College Suggesting System, a program to aid students and guidance counselors in college selection which provides 250 facts on 2,100 colleges; the Career Training Information System, designed to provide information about technical and trade schools which offer preparation for various occupa-

tions not requiring degrees; and the Interactive Occupational Exploration System, to aid students in exploring career possibilities by providing information about 5,000 occupations. Currently under development are systems called the Interactive Scholarship Finding System and a series of administrative systems for class and bus scheduling, grade reporting, attendance, and other functions.

ILS is using a Burroughs B3500 computer, located at its Boston headquarters, dedicated to the various educational systems. Plans call for linking the computer by phone lines to remotely located satellite computers to handle over 125 users by late summer. Additional computer installations in several major cities across the country are expected to handle more than 2,000 users by the end of 1971. Present users are located in six eastern states, with expansion to all 48 contiguous states expected as additional computer capacity is acquired.

COMPUTER STUDIES HIGHWAY ACCIDENTS

Next time you're driving down Indiana State Route 37, watch out for a 14.5-mile stretch near Bloomington which is equipped with roadside vehicle detectors and buried wires. You just might be on-line to an IBM 1800 data acquisition and control system at Indiana Univ. Have an accident and you'd become a contributor to a study of the causes of accidents being funded by a $175,000 grant from the National Highway Safety Bureau.

The system functions 24 hours a day, 7 days a week, providing data which enables researchers to determine traffic flow profiles and the speeds of vehicles involved in accidents. Results, including type and length of vehicle, proximity to others, and direction, are stored on tape. After further refining, the information is forwarded to Research Triangle Institute, Raleigh, N.C., primary contractor for the study, for final analysis. Investigators also make field inspections of accidents, gathering information for use in determining the sequence of events leading to the accident. This includes interviewing those involved and photographing and measuring physical obstructions, skid marks, probable impact points, resting positions of vehicles and damage to vehicles and surrounding objects. All information is analyzed by RTI, which is coordinating findings in the study, due to continue through late this year. Final results are expected to enable highway engineers to develop mathematical models of vehicle behavior at certain speeds and under certain road conditions.

INFORMATICS AWARDED TWO BIG GOVERNMENT CONTRACTS

Informatics, Inc., Sherman Oaks, Calif., has announced two major government contracts, one for the Dept. of Housing and Urban Development and one for the Federal Reserve Bank of New York. The HUD contract is for $445,158. For that sum Informatics is expected to design and develop a "management system operation" which will handle staff expense accounting and prepare payrolls, and to define additional management systems that HUD will require through 1975.

The Federal Reserve contract is for the design and implementation of large-scale computer systems for automating the bank's data handling needs in connection with analyzing and implementing national monetary policy. Among the functions to be handled by the computer systems are: telecommunication for the transfer of funds, the transfer and clearing of government securities, the interchange of data between Federal Reserve Banks, and management oriented data retrieval. Although no dollar contract figure was released, the cost of implementing the bank's facilities to data has been over $750,000.

COMPUTER-CONTROLLED ENVIRONMENT IS ART ENTRY

The Smithsonian Institution and MIT will collaborate on this year's U.S. art entry in the 10th San Paulo Biennial, a 70-nation art show. Included in the U.S. entry will be an exhibition that consists of a room that reacts to its inhabitants. The room has tubes of phosphorescent liquid running along its walls. Behind the tubes are hidden light sources which illuminate the moving liquid, causing it to glow. The intensity of the glow diminishes with the distance from the last active light source the liquid has passed, and the light sources are controlled by a computer.

As a viewer enters the darkened room, he notes the glowing pulsating lines of color and the sounds accompanying them. Gradually he will note that the room's sounds and lights respond to his own presence and movement, and he can explore a finite but extensive range of light-sound events.

The exhibit grew out of the work being carried out on the campus of the Univ. of Wisconsin. There a similar environment experiment called Glowflow was developed using the same kind of room and a Digital Equipment Corp. PDP-12 as a controller. The 12 is programmed in a language designed for the application and called GLOWTRAN. The art exhibit room will use a computer which is to be built by Phoenix, Inc., of Madison, Wisc., under the direction of asst. prof. Richard Venezky, one of the developers of the idea.

new companies . . .

OCR technology will be offered by **Recognition Terminals, Inc.,** a subsidiary planted near Washington, D.C., by Recognition Equipment, Inc., of Dallas. REI describes it as a "major commitment" following its announcement last year of a remote t-s retina that permits connection of remote reading terminals to a central recognition unit . . . **Optical Data Processing Corp.** is the result of an optical scanner developed by Transducer Systems, Willow Grove, Pa., and an encoding system devised by Dividend Clubs, Inc., Miami, Fla. Combined, they will provide optical scanning systems for monthly rental, and plan to have regional optical reading centers for small-volume users . . . **Memorex Corp.** has arrived overseas at a place called Herstal, Belgium, which it claims is at the geographical heart of the European market. Its $5½ million plant opened in June, also plans to service Africa and the Middle East . . . COMSERV, a computer utility providing t-s, remote batch and on-line services, has opened in Philadelphia with a Sigma 7. Another center newly available to the Philadelphia area is **Computer Input Services, Inc.,** Darby, Pa., subsidiary of Modern Data Techniques, Denville, N.J., which will also offer t-s as well as the usual operations . . . Auerbach Corp. has united with an English firm to form **Attwood-Auerbach Ltd.** in London, the better to serve as computer consultants there . . . A new New Orleans-based consulting, software and leasing company is **International Data Systems Corp.** Also in New Orleans, Lykes-Youngstown Corp., shipping and steelmaking firm, has combined with University Computing Co. to form **Lykes-University Computer Services Corp.** Both companies plan to explore the petroleum field . . . **Virtual Time Sharing, Inc.,** has been formed in Union, N.J., offering a choice of 360 applications software and several languages . . . **Academy Computing Corp.,** Oklahoma City, has established a Software Sciences division in Santa Barbara, plans to open a division branch in Phoenix . . . A t-s service for hospitals and clinics has been opened at Chica-

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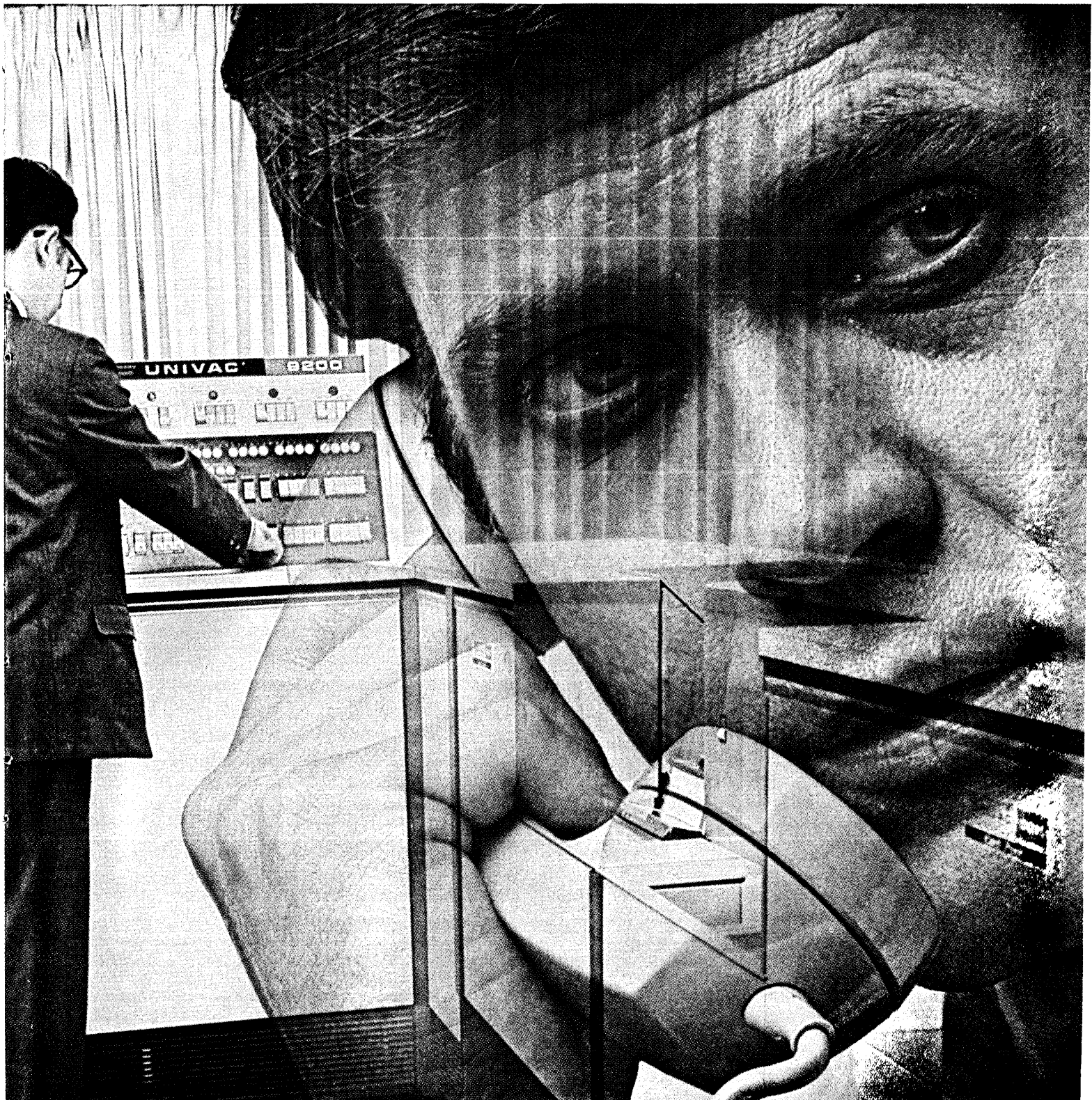

news briefs...

go's O'Hare Aerospace Center by **American Medical Computer Centers,** subsidiary of American Biomedical Corp., which also operates one in Dallas... **Daconics, Inc.,** new turnkey systems firm located in Sunnyvale, Calif., says it has already developed several proprietary software packages and peripheral controllers ... **Cerebronics, Inc.,** headquartered in the Washington, D.C., area, will provide analytical services for government and defense contractors in electronic surveillance, countermeasures, and information sciences ... **Pryor Computer Time-Sharing Corp.,** Chicago, has opened with a large library of existing programs ... **Teradyne Applied Systems, Inc.,** Chicago subsidiary, will design and market computer-operated test installations of parent Teradyne's (based in Boston) automatic test systems... **Microform Data Systems, Inc.,** Palo Alto, Calif., has started a publishing auxiliary to produce microfilm for public libraries, as well as schools, and law and medical centers ... Computer consulting in transportation and urban sciences will be part of the services offered by **Comsis Corp.,** Santa Clara, Calif.... **Reeves Telecom Corp.** has created an INDEX (International Data Exchange) division to specialize in marketing voice response terminals, their associated drums and complete systems; HQ are in NYC, with a branch in Belmont, Calif.... **B. T. Quirk Co.,** Southfield, Mich., will market proprietary software packages ... Formation of **Semiconductor Electronic Memories, Inc.,** has been announced in Phoenix. Financed by Electronic Memories, Inc. (now Electronic Memories and Magnetics Corp.), Hawthorne, Calif., the company is designed to complement EMM's core and disc memory products... **Software Marketing, Inc.,** has been initiated in NYC to acquire, promote and distribute same ... **KDI Corp.,** Cincinnati, has combined three existing operations into another group, Computer Products and Systems, to produce subsystems, peripheral equipment (including remote terminals and I/0), programming and software ... **Alton Associates Corp.,** Los Altos, Calif., will concentrate on systems software and control and display design ... **Diebold Inc.** already claims $14 million in orders for its recently founded **Intermodal Transportation Systems Inc.,** which leases marine containers and piggyback trailers ... **Management Computer Network Inc.,** based in New Hampton, Iowa, will furnish computerized accounting systems and management counseling for all types of businesses, including farms and ranches... In Los Angeles, **Omega Computer Corp.** has set up shop, specializing in financial systems. And **Input Data Corp.** has started a job shop for key-to-tape, keypunch and optical scanning equipment ... **Electronic Voice, Inc.,** Long Beach, will make a low-speed acoustic coupler operable with the switched telephone network... In Waltham, Mass., **Dimension Systems, Inc.,** will design and market small computers for machine control ... Placement offices in Detroit and Milwaukee have been opened by **Computer Personnel Consultants, Inc.,** Chicago-based firm, which plans to have 22 branches, coast to coast... ARDIS, Inc. has been formed as a subsidiary of Subscription Television, Inc., Pasadena, Calif., to produce peripheral equipment utilizing HDDR (high density data recording), developed at their Leach Controls division. ARDIS HQ are in Stamford, Conn ... **Computer Time-Sharing Corp.** has initiated a financial systems division with two centers, one in Palo Alto, the other in Seattle. It has also arranged to take over the commercial dp operations of **Aerojet-General Corp.'s** computing sciences division, with centers in Sacramento and Olympia, Wash.... Software is being brought to the Caribbean by **Cybermatics Caribbean, Inc.,** Fort Lee, N. J., and Albert E. Lee & Son, Inc., San Juan, P. R. The new company will be based in Puerto Rico and emphasize on-line systems ... **Image Systems, Inc.,** has announced its formation in Stamford, Conn., will provide engineering and fabrication in laser scanning and recording systems... A Florida-based (Miami) computer company, the **Tri-COMP Corp.,** will furnish dp support systems for government agencies and the banking industry.

mergers, acquisitions...

Professing to see considerable opportunity for growth of education facilities since the IBM unbundling of computer courses, **Randolph Computer Corp.** has acquired a dp and programming school, the **Louisville Tabulating and Computer Center** in Kentucky... **EDP Technology, Inc.,** headquartered in Washington, D.C., has agreed in principle to acquire **SysteMed Corp.,** health care technology firm of Newport Beach, Calif.... A 3-cornered operation was completed when **Computer Industries, Inc.,** publicly-owned California subsidiary of Dallas' **University Computing Co.,** agreed to take over **Datel Corp.** of Washington, D. C., a wholly-owned subsidiary only recently purchased by UCC... **Computer Sciences Corp.** has announced plans to merge with **Commonwealth Services, Inc.,** (both domestic and international). The Los Angeles firm will integrate the Commonwealth companies into its Systems Group, consulting in transportation, distribution, public utilities and industrial processes, including water desalination and pollution control... **ComShare, Inc.,** has acquired the t-s division of **Data Central, Inc.,** of Clayton, Mo ... and has also bought **Maxwell Printing Co.,** in Plymouth, Mich.... Consolidation of **Electronic Memories, Inc.,** with **Indiana General Corp.** has created **Electronic Memories and Magnetics Corp.** (EMM), which will be headquartered in Hawthorne, Calif.... **Control Data Corp.** has agreed in principle to acquire **Marshall Communications,** Santa Ana, Calif., previously owned by Marshall Industries and MDM Communications, Inc.... **Foto-Mem, Inc.,** Natick, Mass., is acquiring **Business Information Technology Inc.,** digital computer manufacturer in the same town ... **Diceon Electronics,** circuit board maker, has moved into a new plant in Santa Ana and merged into **Applied Magnetics Corp.** of Goleta, Calif.... A privately-owned manufacturer of solid-state telephone exchange equipment, **Bliss Electronic Corp.,** Sussex, N. J., has been acquired by **Communications Disciplines, Inc.,** subsidiary of NYC's Diversified Data Services and Sciences Inc., a full-service dp company... A Canadian financial holding firm, **PJ Industries, Ltd.,** has proposed to buy out **EDP Central, Inc.,** of Portland, Ore.... Merger of **Tabulating and Data Processing Corp.,** NYC, with **Datatab, Inc.,** same city, has been approved by the shareholders. Still known as Datatab, the surviving company will provide computer services in marketing, survey, letter and optical scanning... **HFS Manufacturing Co., Inc.,** and **Datakote, Inc.,** both of Inglewood, Calif., have been acquired by **Datatron, Inc.,** Santa Ana, giving the takeover company an estimated $300 million capability in the disc pack market ... Proprietors of **Pergamon Press Ltd.** in England have advised their stockholders to go the rest of the way with **Leasco,** which already has more than 2½ million shares in its bid for acquisition. In NYC, a specialty printing company, **Princeton Press, Inc.,** has agreed in principle to merge with **Allied Management & Systems Corp. H.A. DeFrance & Co., Inc.,** another typographic firm, is being acquired by **E.P.G. Computer Services, Inc.**... **Tabulating Services, Inc.,** will become **Automatic Data Processing, Inc., of Pittsburgh** as a division of that company... **DATA 100 Corp.,** Minneapolis manufacturer of computer terminals, has agreed to acquire **Royal Machine Industries, Inc.,** a hardware manufacturer in St. Paul... **The Hartford Insurance Group** in Connecticut

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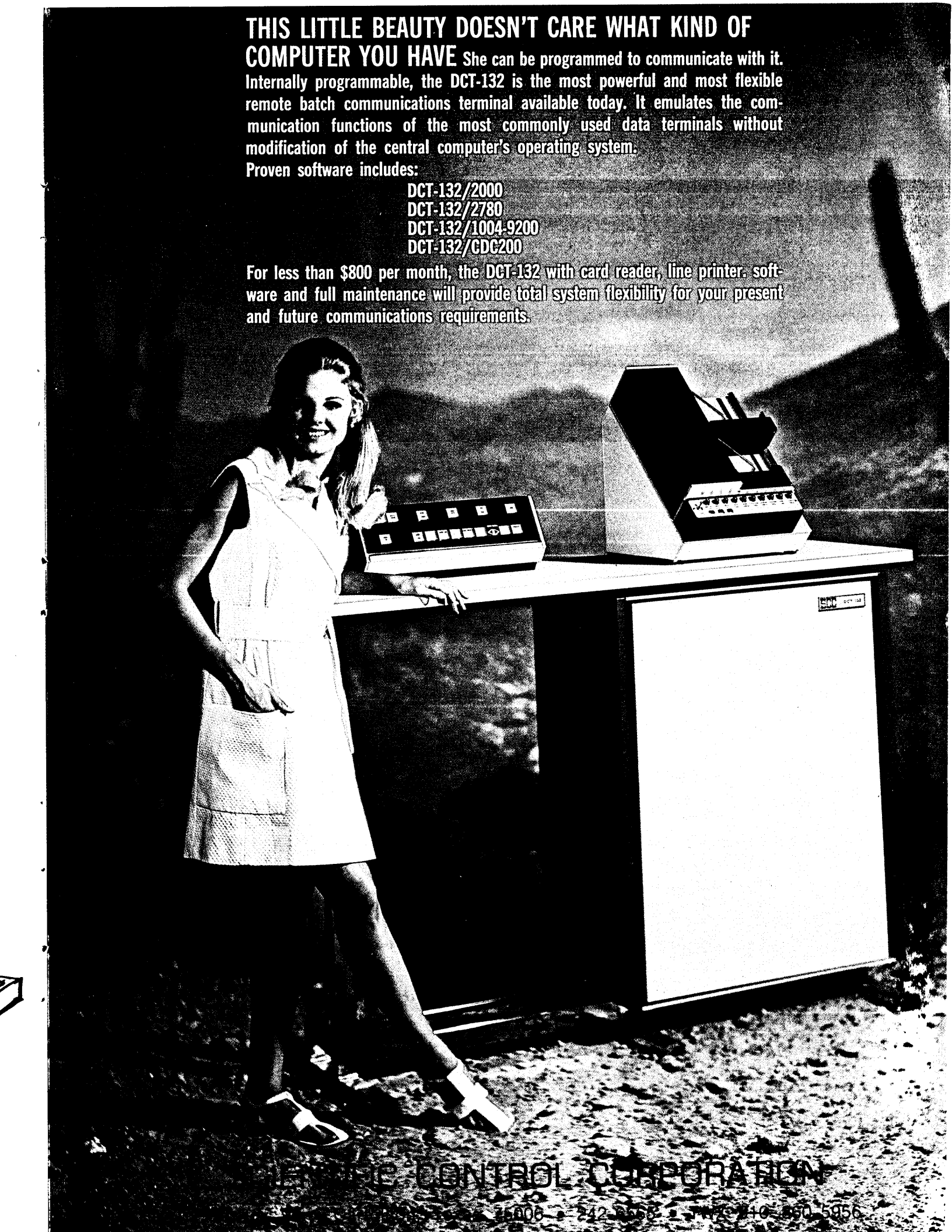

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has acquired a Tampa, Fla., concern, **American Agency Management Bureau, Inc.**, to furnish automated bookkeeping to insurance agents ... **Computer Measurements Co.**, Sylmar, Calif., manufacturer of dp electronic instruments, is becoming part of **Newell Industries, Inc.**, Sunnyvale ... **North Atlantic Industries, Inc.**, Plainview, N. Y., plans to go into the peripheral market with purchase of **Peripherals General, Inc.**, newly formed company of Cherry Hill, N. J.... Subject to shareholder approval, **Digital Techniques Laboratory**, Denver, will be merged with **Multidata, Inc.**, a Westminster, Calif., software firm ... **Data Architects, Inc.**, Waltham, Mass., has assimilated **Diamond Antenna and Microwave Corp.** in nearby Winchester ... **Management and Computer Services, Inc.** (MACS), Rosemont, Pa., has acquired **Tab Products of Delaware Valley**, which will operate as a sales division of MACS Computer Accessories, Inc.... NYC facilities of **Applied Computers International Corp.** will be used as a dp center by the company's new owner, **Facs Data Center, Inc.**, of Chicago ... **Automated Information & Management Systems, Inc.**, of Cincinnati has become a part of **Ballou Office Service, Inc.**, same city ... **Fabri-Tek, Inc.**, Minneapolis, has agreed in principle to acquire **Electronic Kits Supply Co.**, Los Angeles maker of educational materials for classes in electronics ... **Instrument Systems Corp.**, Long Island, has taken an option to acquire **Products of Information Systems**, newly formed information retrieval company in Newport Beach, Calif.... **Computer Utilization, Inc.**, of Austin has acquired a Dallas-based petroleum consulting firm, **H. J. Gruy and Associates, Inc.**... First acquisition of **Hilltek, Inc.**, a development company in Palo Alto, Calif., will be **R. A. Morgan Co., Inc.**, an optical information systems company in the same town. New merged name will be **Morgan Infotek** ... **USM Corp.**, Boston organization that makes chemicals, fasteners and shoe machinery, has acquired a majority interest in IRA Systems, Inc., a Waltham computer manufacturer. The agreement will permit IRA to go public in future ... A firm specializing in analyses of automobile dealership operations, **Auto Data, Inc.**, South Orange, N. J., has been acquired by **Automated Data Associates, Inc.**, of Rahway ... **Essex Systems Co.** has agreed in principle to merge with **Retrieval Control Systems, Inc.**, in New York. RCS makes business forms, as does Essex, as well as distributing mag tapes and discs ... **C.S.C. Franchising, Inc.**, Chicago, has secured rights to the Meditech Centers software program initiated by **Computer Services Corp.**, Des Moines.

• Programming Sciences Corp., New York, has compiled a report analyzing the impact of IBM's separate pricing announcement on the edp industry as a whole and the possible impact of future pricing announcements by IBM. The report also explores the effects of unbundling in such areas as hardware and personnel costs, and the training of personnel. It is scheduled to be published by the first of this month, for sale at a price "under $50." PSC is also offering to prepare a detailed report on the effects of IBM's announcement on a user's own specific installation. This custom report will include recommendations to management on aspects of the user's programs such as manpower recruiting, applications programming development, and equipment leasing and purchasing — all keyed to the effects of IBM unbundling. Cost will be determined by the size of the user's edp facility.

• Leasco Data Processing Equipment Corp. recently announced that it will stop purchasing new computers for lease to U.S. customers because of the high interest rate on loans required to buy additional equipment. Leasco will continue to acquire computers for its overseas customers, which accounted for over 30% of Leasco's leasing business for the first half of its fiscal year. Another factor in the decision is the increasing difficulty to obtain agreements from its customers for extended leases up to five years because of the pervasive rumors that a new generation of computers is on its imminent way — a rumor likely to persist until it happens, no matter how far in the future that may be.

• Strategic Time-Sharing, Inc., a subsidiary of Strategic Systems, Inc., is providing time-sharing service using the first commercial TSS-8 system, based on the PDP/8-I. STI thus joins the crowded New York City time-sharing sector, which already has more than a dozen t-s centers physically located in the city, with a system which may win acceptance through low-cost service. Rates for terminal connect time are $6.50/hr., with cpu time charged at the rate of "3c per unit." Storage costs $1.75 for each 2048 characters. Languages provided include BASIC, FORTRAN, FOCAL, and an assembler. The STI time-sharing service, known as STIDAC (Direct Access Computing), also includes a walk-in service for those who want to use the firm's on-premise terminals. Unlimited use and full-time accessibility are available to "heavy" time-sharing users at a cost of $1,000/mo. for a dedicated port into the computer. STI will also operate complete systems dedicated to specific users or industries.

• Computing and Software is carefully slipping into the time-sharing business. The files of the company's consumer credit clearance activities are now being converted to meet the needs of some customers. Although none of these customers is on-line yet, Mits Tamura has been hired as manager of on-line systems development for CSW's Western Computing Div. Tamura has been with IBM in Northern California for the past seven years, most recently as teleprocessing consultant for the S.F. Bay Area.

• According to "Soviet Cybernetics," a RAND Corp. publication, PL/I has been issued in a Russian version, based on the language's 1966 version 3. However, the version is a translation of a book, "The Universal Language, PL/I," and the translators complain that the higher level language description is unsatisfactory — "it is not formalized, and reflects the fact that the various sections were written by different people without sufficient standardization in approach or terminology." The translators paid tribute to the language's clear notational representations and its modular characteristics, but cited the use of English reserved words as a drawback in translation. There is nothing to indicate that the Russian version is an actual compiler being used in an application.

• Arcata National, of Menlo Park, Calif., has added a data communications div., headed by Don G. Thomson. Thomson stepped into his job Aug. 1 with a charge to expand the parent company into the "domestic real-time data communications system business," not as a builder of hardware but as an information transfer service company. (Arcata is already in the printing services business with its J. W. Clement Co. subsidiary, in information processing through its Butler Data Systems sub, in marketing research and in the timber business. Pending acquisitions of Atlantic Microfilm Corp. and of Kingsport Press, Inc., may further fill out the company's dossier.) Thomson was most recently an exec vp and general manager of an ITT subsidiary, ITT World Communications; he has also been president of ITT's general controls div. *(Continued on page 145)*

Job

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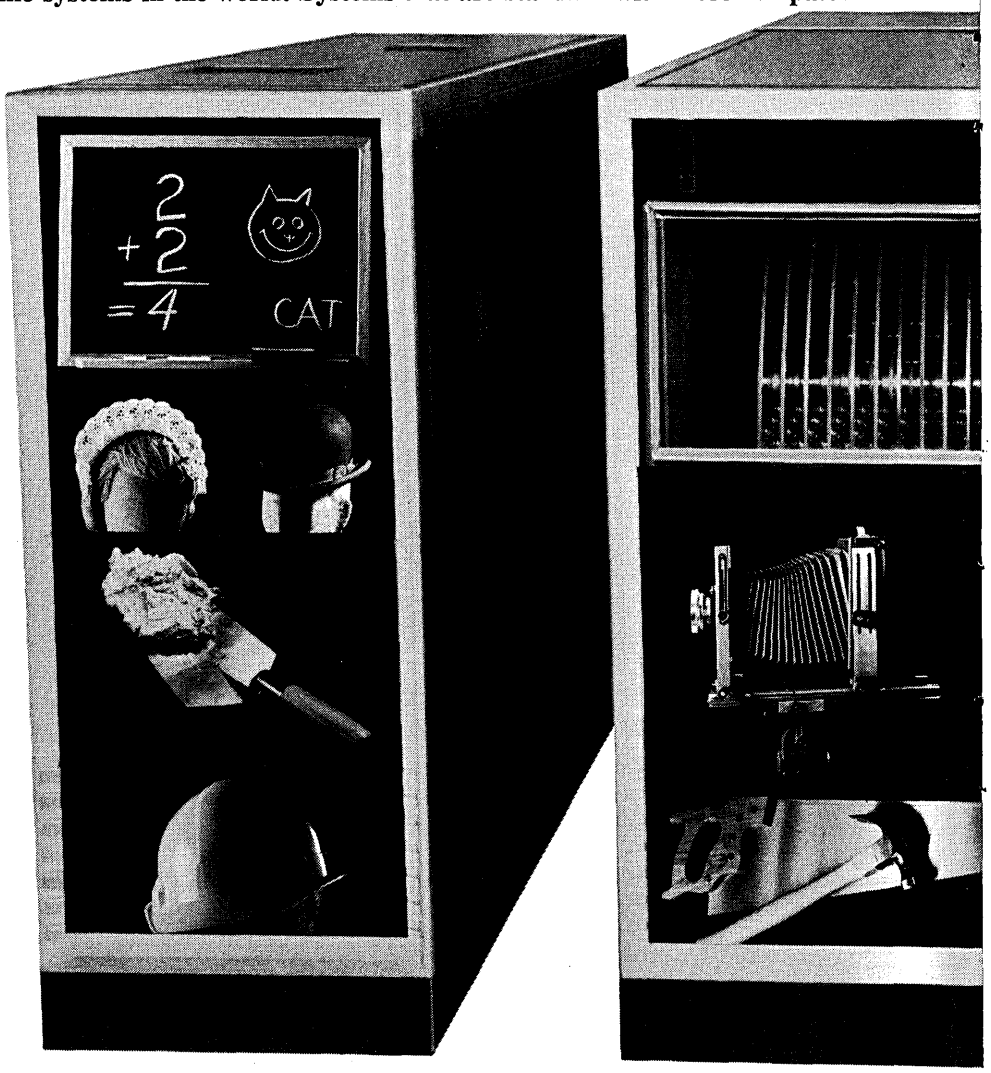

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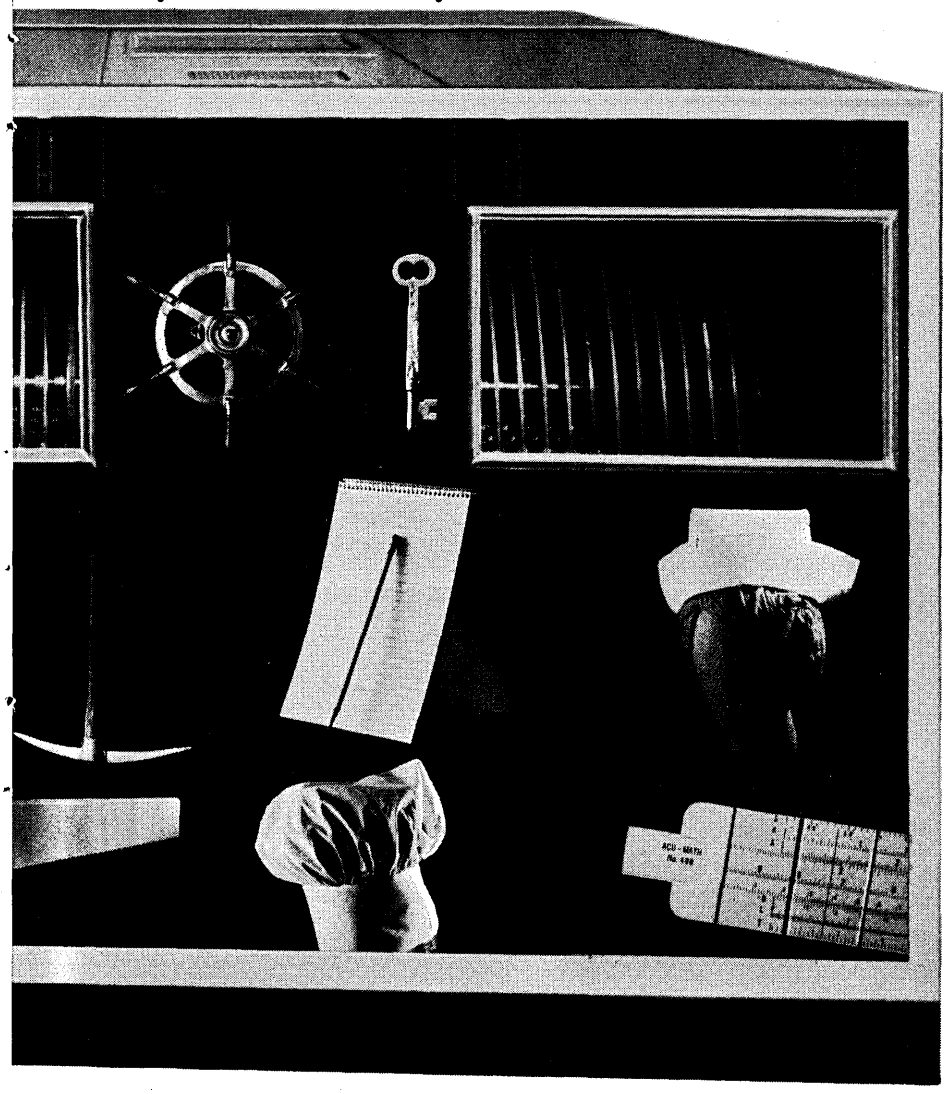

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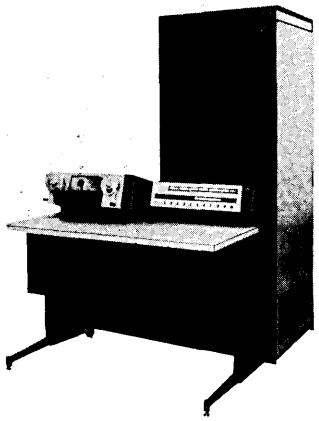

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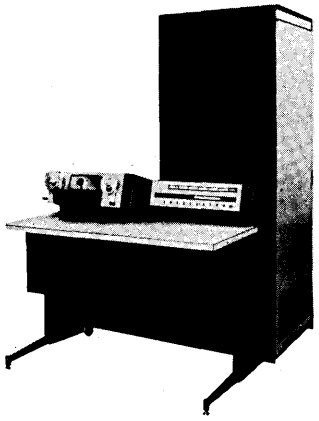

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• Two said-to-be-the-first-of-its-kind-in-Australia items: The National Bank will install a second 360/30 and 20 crt's in its new dp center early next year. According to the bank, the installation of this additional equipment will make it the first in Australia to introduce the concept of data entry through visual display units. Conversion of 140 branches is scheduled to be completed in early 1971. And Australia's first completely computerized diagnostic laboratory facility is being installed by the Institute of Medical and Veterinary Science in Adelaide. The system, valued at $250K, consists of a 24K CDC 1700, disc drives, mag tape units, card reader, and printers. Four remote typewriters will be linked directly to the computer from the institute's divisions.

• A group of students who are members of the R.E.S.I.S.T.O.R.S. (see June, '68, p. 92 and July, '69, p. 121) will publish the first TRAC TM language primer in the near future. The authors are interested in making immediate contact with all persons who have implemented TRAC language processors, especially nonstandard or extended functions, for possible inclusion in appendix. Contact Jerome King, Box 257, RR 1, Pennington, N.J.

• The Post Office Department is purchasing 10 new optical character readers from Philco-Ford Corp. for $5,635,000, doubling the number of OCR machines now in use in U.S. post offices. Installation is limited to larger post offices, since a volume of 250,000 pieces daily is needed to break even on the machine. The readers are said to offer savings to the post office of about $2/thousand pieces in comparison with manual sorting. Mail that is machine readable is tagged by mailers and taken directly to the readers. At rates up to 43,000 pieces an hour, the readers feed envelopes into letter sorting machines having up to 279 destination bins.

• A time-sharing network among nine Pennsylvania institutions is being launched this fall, supported by grants from the National Science Foundation and RCA. A $400,000 NSF grant was recently awarded to Middle Atlantic Educational and Research Center, the nonprofit organization setting up the network, whose members include the following colleges and institutions: Albright, Dickinson, Carlisle, Franklin and Marshall, Juniata, Lebanon Valley, and Wilson Colleges; Manheim Township School District; the Research Institute of St. Joseph's Hospital; and the Research Institute of the Lancaster Cleft Palate Clinic. The center, located at Franklin and Marshall College, has an RCA Spectra 70/46 system. RCA is underwriting two-thirds of the cost of acquiring the system with an $830,000 grant.

• Phil Kiviat has left RAND Corp., where he worked on the simulation compiler Simscript II, to form his own company, Simulation Associates, Inc., in Westwood, Calif. He will be joined in the venture by Arnold Ockene, formerly associated with the effort on the General Purpose Simulation System language at IBM, who will head up SAI's White Plains, N.Y., office. The new firm will engage in "the complete spectrum of simulation," providing services for education, business, and government.

• Scientific Resources Corp., Melrose Park, Pa., has signed a purchase agreement for $23 million worth of Scientific Data Systems Sigma 5 and Sigma 7 computers to be used for oil exploration and certain "overseas information services operations" initiated last month by SRC. The firm provides geophysical data processing systems, which will operate using SRC software on the SDS hardware. First deliveries of the SDS machines will begin this month, with fulfillment of the total order expected over the next three years.

• Honeywell has filed papers in Baltimore Federal District Court opposing Technitrol's motion to consolidate separate patent infringement suits on a magnetic data storage system into a class action against Honeywell, Control Data, and Scientific Data Systems. In addition to the representative three, the class action would also name over 200 firms alleged to have infringed on the same patent. Honeywell wants the suits in Baltimore dismissed and transferred to the U.S. District Court in Cedar Rapids, Iowa, where Technitrol has similar infringement suits pending against Collins Radio and Ex-Cell-O

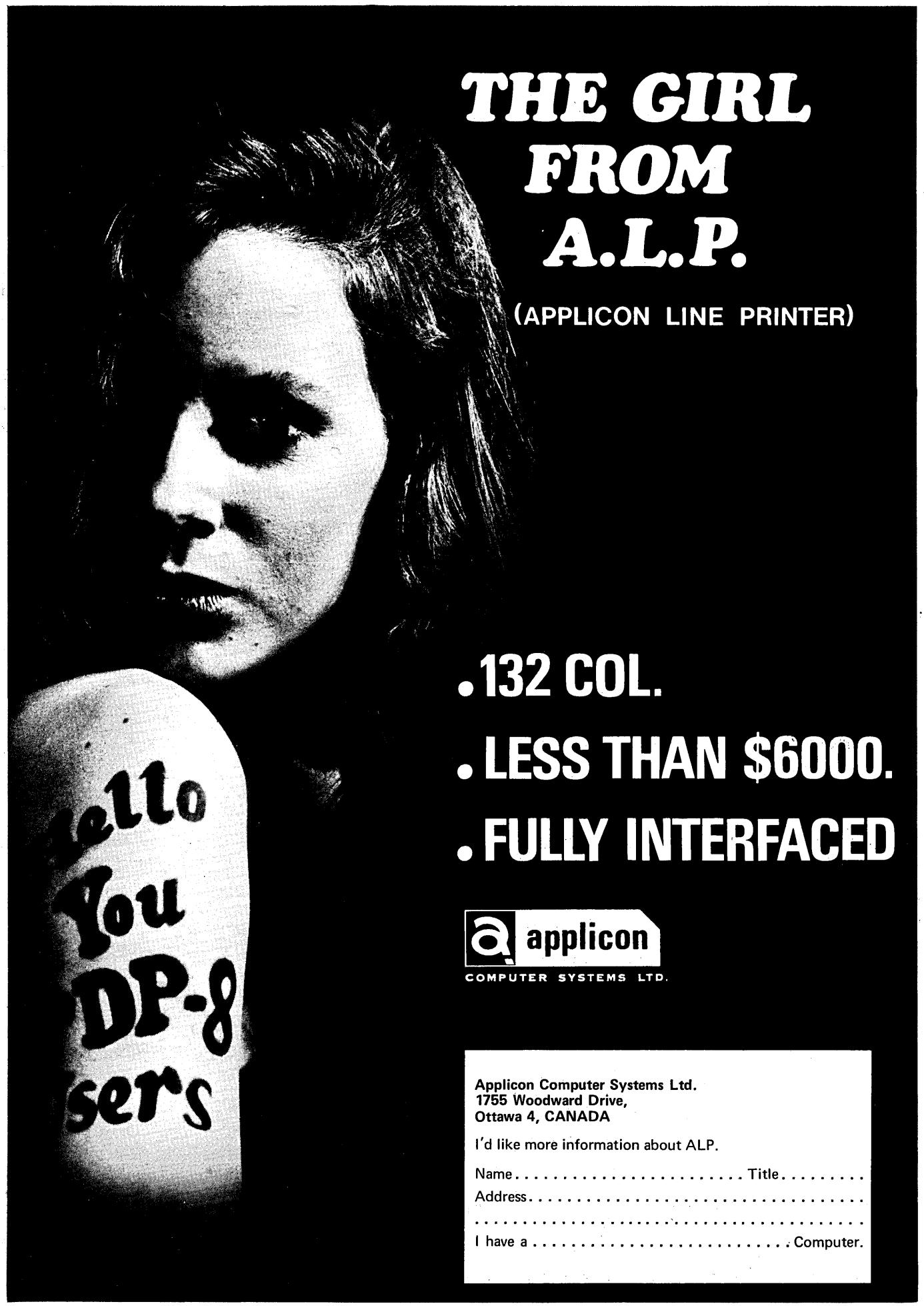
• A service for conversion of IBM 1401 and 7074 software to System/360 is being offered by CPU Management Advisory Corp., a wholly owned subsidiary of Commercial Programming Unlimited. The service is based on a series of proprietary software systems that can disassemble currently operational SPS or Autocoder object code into original source code and then translate into 360 DOS assembly language. The disassemblers include the assignment of original source labels and comments. The firm claims a translation efficiency of 90 to 99% accuracy. Cost of the service is about 60c per card for translation from a source deck to 360 assembly language, increased by an additional 20c to 30c for translation from object code to source code. Through association with other software houses, CPU also provides translation to COBOL.

• Direct Access Computing Corp. has become a partner in a consortium that will bring the first time-sharing to South Africa. Other members of the consortium are South Africa's six largest industrial organizations. An operating company, Computer Resources (Pty) Ltd., has been formed by the consortium and will begin commercial operations using a B5500 in Johannesburg next month. Operations are expected to be expanded early next year to Durban and Capetown.

• The Air Transport Assn. of America and the International Air Transport Assn. have announced that the Air Travel Card is getting a new magnetic stripe encoded with information needed to allow the card to be used in automatic ticketing machines. Prototype models of automatic ticketing machines are now being developed by several airlines and will be in limited use in some major airport cities before the end of the year. Eventually, the automatic ticketing machines will tie into the airlines' reservations systems.

• Control Data has announced that it will market computer time through its CYBERNET network to independent service organizations on a wholesale, retail or OEM basis. The service bureaus may buy time at any of CDC's 30 data centers and resell the time at a profit, or sell the results of the processing as is now being done.

• The American Trucking Associations, Inc., has established a Management Systems Committee to assist motor carriers in determining which data processing equipment and services is best for their own operations. The committee, composed of carrier representatives, offers assistance through its information and education, re-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search and development, and hardware and software activities. Soon to be completed is a *Handbook of Data Processing in the Motor Carrier Industry,* said to be the first reference work of its type ever compiled, since it records the state of the art of data processing for an entire industry.

• The computer aboard the Apollo 11 lunar landing craft "Eagle" used a stored moon model developed by Boeing under a $51,000 NASA contract. The model is an updated version of the one used for Apollo 10, which was also done by Boeing, but adds parameters to account for slight gravitational variations which result from the out-of-round shape of the moon and for "mascons." (Mascons are mass concentrations of material, possibly meteors, buried under the moon's surface.) These slight gravitational variations, if not compensated for, are sufficient to pull an orbiting ship as much as a mile or more away from an assigned 60-mile-high orbit.

• Hewlett-Packard has announced a $500 reduction (about 10%) in the price of its Model 9100A electronic desk-top calculator, introduced in March of 1968. Effective immediately, the calculator's price is $4400. According to HP, the 9100A's acceptance "far exceeded expectations," enabling the company to gain high-volume production and a substantial reduction in manufacturing costs.

• Burroughs Corp. in Pasadena, Calif., has established a training center for those classified as "unemployable" under the JOBS (Job Opportunities in the Business Sector) program of the National Alliance of Businessmen. Supported by the U.S. Dept. of Labor, the center will initially train electronic assemblers; later, on-line data entry will be taught. The program, averaging eight weeks during which time the students are paid and receive the usual company benefits for hourly employees, will train 270 assemblers over a two-year period. Classes are held in the early home ("They built our first computer right *there*!") of ElectroData. Burroughs has a similar program in Detroit, and there will be others if these projects are successful enough for both the trainees and the company to be sustained after government support ($2300 for each student-/employee staying on for 12 months) is withdrawn. The corporation's goal is to establish its own training centers in conjunction with each major plant. Burroughs is the largest commercial employer in Pasadena.

• Worldwide automatic switching centers have been completed and activated for the Defense Communications System (DCS) automatic digital communications network (AUTODIN). Meanwhile, the first high-speed electronic switching centers in Europe for the U.S. government's worldwide Automatic Voice Network (AUTOVON) have been dedicated. This network becomes fully operational in 1971.

• The Cyphernetics Corp., Ann Arbor, Mich., is now offering time-sharing services using a PDP-10 cpu. Software includes CypherLock, a secret code number which a user may employ in order to maintain confidential data in the system. CypherLock uses a special executive which introduces a redundancy pattern into the data in such a manner as to render it meaningless unless decoded by the individual user's CypherLock number. The firm claims that even its own employees would be unable to decipher files protected by CypherLock.

• A computer is worth 1 million telephone calls to AT&T. An IBM Model 50 and 17 IBM 2260 terminals at the common carrier's Cincinnati Long Line Department will handle engineer queries on design and production of new long-distance telephone circuits. AT&T expects the information system to speed phase-in of long distance circuits by months and even years.

• Caelus Memories, the disc and disc drive firm, has implemented an unusual "get a replacement disc pack *and* still keep your old one" guarantee. The policy is issued with Certus VI disc packs and is valid for a 90-day period from date of delivery. Caelus is sure that customers will not find an unflagged faulty track because, they say, the packs have been tested for spots that might lead to future errors as well as for existing errors. Caelus' prices for the guaranteed Certus VI packs are a little above average even at the low end ($350 for an "A" grade pack with up to 10 flagged areas, $425 for an "AA" with up to five, and $490 for an "AAA" with none — a very low yield end of the product line).

• Com-Share, Inc., has contracted Com-Pete, Inc., an Ann Arbor, Mich., neighbor, to develop and market "specialized" business programs on its time-sharing network. First product will be a petroleum distribution system. Com-Pete plans an auto locator program for car dealers and will also market a payroll program developed by National Payroll, Inc.

• It's time for "specific approaches" in the industrial control market at Digital Equipment Corp. DEC has grouped its control products — the PDP-14, numerical control equipment, control modules and custom control systems into the Control Products Group. Allan T. Devault is product line manager.

• "Investment Programming" is a service from Cullinane Corp., Boston, which involves the development of new programs for customers in a sufficiently general fashion that they can be afterwards distributed to other, noncompetitive companies as program packages. The programs are distributed on a "shared-income" basis, thereby enabling the original customer to recover some of the cost of having the programs written, and maybe even make a profit. The methods of program generation used by Cullinane are claimed to assure greatest transferability while not appreciably affecting run efficiency. These techniques include clearly defined main-chain processing and subroutines, with the use of segregated master files and report generators, and with company names and other information unique to the individual user stored as data rather than written into the program.

• Technical Computer Services Corp., Chicago, is a new 14-man firm which offers turnkey computer services to small- and medium-size firms which may now be using unit record or ledger equipment and desire to use a computer, but may have cold feet about the transition. Or possibly users who have had bad experiences with computers. TCSC hopes to solve their problems by providing the computer, software and maintenance, training of customer personnel, and, when desired, personnel to operate the computer system, under a five-year contract. The company is presently confining itself to IBM cpu's such as the 1130 and 360/20, but plans to develop some of its own peripherals. Software provided includes applications packages covering accounting, payroll, inventory and production control, management and financial

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procedures. As a prelude to the sale of a contract, TCSC will convert some of a prospect's manual procedures for processing on its own in-house 1130 for demonstration purposes. The firm is operating only in the Chicago area, but plans to open a branch in New York or Boston late this year; it expects to benefit from separate pricing.

• A $5.3 million contract for an automatic airport transportation system has been signed by the Port of Seattle Commission and Westinghouse Electric Corp. The system, expected to be completed in 1971, will include nine computer-supervised 106-passenger transit vehicles that will serve six intra-airport passenger stations.

• Honeywell has announced that National Computer Franchise Corp., Chicago, plans to purchase 20 H1648 computer systems valued at $10 million to set up franchised time-sharing centers in 20 major U.S. cities. Deliveries are scheduled through mid-1971.

• The State Univ. of N.Y. Downstate Medical Center, Brooklyn, awarded degrees to the first three graduates of a two-year program in medical computer science, intended for graduates of junior colleges. The curriculum includes courses ranging in content from hospital administration to the development of computer models of biological processes. One of the requirements for the degree is a thesis. According to Dr. Joel M. Stutman, associate director of the program, "Most people come to medical computer sciences from other professions. There are very few people who know as much about the whole medical computer sciences field as these students who are coming out with BS degrees. They have been trained by people in a variety of different specialties."

• A $5 million reservations system has been installed by Irish International Airlines at Dublin airport. Called ASTRAL, it serves 220 crt/keyboard consoles that link the offices throughout Ireland and Britain. It is based on two IBM Model 50 computers with a storage capacity of 600 million characters. The system stores data on reservations and services for 11 months in advance. It also records special requirements of passengers, such as wheelchair use, diet, menu, etc.

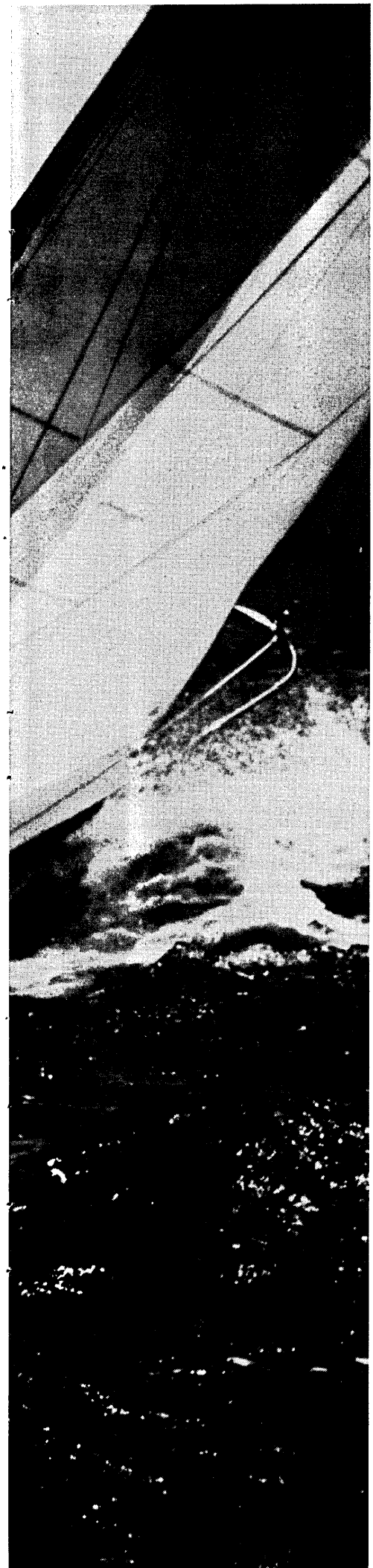
shortlines ...

Grants totaling $600K to six states have been dealt out by the Justice Department to develop a computer-based criminal statistics division. The exact amount to be used by each state — Arizona, California, Maryland, Michigan, Minnesota and New York — will be decided later by the states themselves, which could leave a few open ends, because they are supposed to contribute $400K of their own to make up a $1 million fund. Connecticut, Florida, Texas and Washington will participate in the plan for their own edification ... Scientific Data Systems' first Sigma 5 to be used in commercial time-sharing is operating at Transdata Corp. in Phoenix, performing both conversational t-s and remote batch processing ... Sydney's toteboards, favorite gathering place for Australia's legion of betting sports, will be computerized by IBM, which has won a $3 million contract from the Totalizator Agency Board (TAB) of New South Wales. Victoria and West Australia are already spoken for (by Control Data Australia and IBM respectively) and Australian Capital Territory (Canberra, an area like Washington, D.C.) has already called for bids, leaving only Queensland and South Australia as fair game ... Financial Technology, Inc., Dallas, has added Control Data Corp. services to its package. It has also changed its name from Data Automation Computing Co., but still has Delta Data Services as its subsidiary in New Orleans ... Another name changer is Computerbase, Inc., in Los Angeles (from Database, Inc.) ... Control Data will manufacture computer peripherals in Rapid City, S.D. Its decision to go there was based on "a good labor force, fine school system, the ... S.D. School of Mines and Technology" — and its closeness to Minneapolis ... CDC is also traveling to Toronto, Canada, to operate a computer school it maintains is the first manufacturer's public training facility there. And ADAPSO has decided there are enough Canadian members (22) to start a chapter there ... The Electronic Industries Association reports a hefty yearly increase in sales of semiconductor monolithic circuits (37.6% to $303 million), and integrated circuit packages, such as hybrid, and thin film devices ($20 million). But it is also exploring alternatives to the defense industry by special studies on space, marine sciences, law enforcement, civil rights, housing, poverty, pollution, education, health, internal security and balance of payments. The last is two-edged, showing a quarterly increase of 21.6% in exports, but a 39% increase in imports ... Burroughs Corp. is jetting 100 computers a week to England to keep pace with orders from several British banks for more than 8000 of its TC500 terminal computers. The machines go from Detroit to Glasgow every Friday, like weekend clockwork ... A third information systems center just to handle internal dp has been established by RCA at Cherry Hill, N. J. The others are in NYC and LA ... Ticket Reservations Systems, Inc. has changed its name to Ticketron, the better to compete with Computicket ... Univac has received its largest order to date from West Germany for real-time computers — two 1108's — to be installed at Hamburg. They were ordered by Germany's second largest mail order house, Otto Versand ... BOCOL (Basic Operating Consumer-Oriented Language) will be marketed by Consolidated Software, Inc., NYC. Fimaco, Inc. of Philadelphia introduced BOCOL in March, has installed it in 10 major corporations. CSI also will market PROMPT and AutoDiagrammer II, software packages devised by Aries Corp. of McLean, Va.... ITT Data Services has added COBOL to its time-shared Reactive Terminal Service ... Honeywell's Communications Center in St. Petersburg, Fla., has received an Air Force award to study and define a system for automated technical control of Defense Communications System (DCS) facilities ... Digital Equipment Corp. has opened its new European headquarters in Geneva, Switzerland, under the name Digital Equipment Corp. International; headquarters were formerly at the DEC manufacturing plant in Reading, England.

call for papers ...

Third International Symposium on Computer and Information Science, Miami Beach, Fla. December 18-20. Theme of COINS '69 is software engineering, and related papers are solicited, including pattern recognition, computer graphics control and simulation, programming systems, information retrieval, language processors and machine organization. Manuscripts should be submitted to Julius T. Tou, Univ. of Florida, Gainesville, Fla. 32601.

Third Asilomar Conference on Circuits and Systems, Pacific Grove, Calif. December 10-12. Sponsored by the Naval Postgraduate School, University of Santa Clara, and Stanford University. IEEE groups on circuit theory and automatic control will participate, and papers on these subjects are requested. Abstracts of 500 words and summaries (two copies of each) should be sent to Prof. Shu-Park Chan, Department of Electrical Engineering, Univ. of Santa Clara, Santa Clara, Calif. 95053. ■



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application

The early summer collision of the Australian carrier Melbourne with the U.S. destroyer Evans during South Pacific joint naval maneuvers resulted in the loss of 74 seamen aboard the aft section of the Evans. Although both ships carried experienced crews, the disaster underscored the dangers and costs of training personnel in the use of increasingly complex navigational, communications, and weapons systems. Even under the best of circumstances, exercises involving many ships, planes, and submarines are expensive. Reruns of problem situations are often impossible. Evaluations and analyses of operational exercises must await the inputs from all participating units, and critiques of trainee performance are delayed until long after the fact.

The Surface Ship Anti-Submarine Warfare Attack Trainer Device in San Diego is one of seven training systems being built for the U.S. Fleet ASW Schools by Honeywell Marine Systems Center/California. It is designed to make training in the use of sophisticated electronic systems more like on-line instruction without sacrificing combat environment realism. The dozens of pieces of equipment involved, from radar sets to torpedo launchers, must faithfully duplicate real consoles and scopes so that the trainees can move onto operational systems with a sense of familiarity.

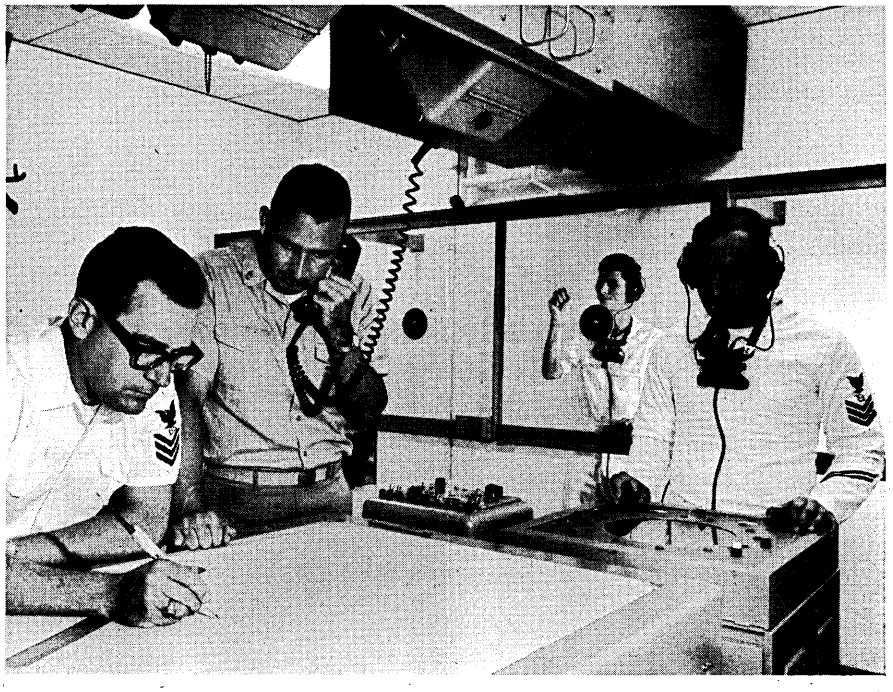
hardware

The trainer is built around a Scientific Data Systems 930 gp computer which is responsible for: (1) position and motion data generation for vehicles involved in simulated problems (which may include the subject destroyer, two friendly destroyers or cruisers, three support aircraft—fixed wing, manned helicopters, or a drone anti-sub helicopter called DASH—and two target subs); (2) simulation of weapon characteristics; and (3) support tasks such as maintaining displays and driving plotters.

The trainer occupies more than 3000 square feet of floor space, and is divided into an instructors' console and six training areas which duplicate the following on-board operating centers: underwater battery plot, combat information center, launcher captain's control station, conning station, computer and projector equipment room, problem critique and display room.

Normally three operators man the instructors' console. They select the ocean problem area, wind direction and velocity, course and speed of targets (which may be conventional or nuclear) and of support units. To complicate the problems, they may

The Combat Information Center looks and operates like a miniature war room with its own complement of radar, communications, and plotting gear.



program in malfunctions of missile launchers, missile payloads, or other equipment; and inadvertent "hits" on friendly ships are never locked out. Devices showing radar and sonar data, target and support vehicle position information, and weapon operation are part of the instructors' equipment. Target hit assessment is also made from this console, and at any time the instructors can "freeze" the action for a critique.

The attack problem response is made by trainees in the underwater battery plot, where realistic mock-ups of sonar, fire control equipment (torpedoes, depth charges, and DASH), and communications gear are operated. The simulated attack consoles, just as the real ones on ship, contain analog or digital logic for solving fire control calculations.

The combat information center contains computer driven plotters, radar repeaters, course, speed and wind indicators, and a sub alarm.

The launcher captain's control station permits the launcher captain trainee to "fire" the ASROC (Anti-Sub Rockets which can carry depth charge or torpedo payloads) or over-the-side torpedoes.

Ship movements are directed from the conning station. Also, before a simulated weapon can be launched by trainees in the underwater battery plot, the officer of the deck must approve by operating controls on the position indicator in the conning station.

The problem critique and display room contains an 8 x 8 foot screen on which distinct images and tracks for problem vehicles are displayed by two multiplexed plotting projectors.

All of the operating hardware in all of the stations is controlled by the 930 through a Honeywell-designed interface. The interface has two 24-bit I/O registers, a multiplexor (for receiving inputs from the instructors and trainees at their consoles), a distributor (for routing computed responses), and converters (for translating data into forms acceptable to the training gear). Conversions are made here from digital to voltage and digital to pulse for sonar and radar gear, from digital to servo commands for the "own ship" motion data converter, and to display-directing commands for the projector in the problem critique and display room.

software

Only the first 11K of the 32K core is used. Of that, 1400 cells are allocated to the executive, 900 to tables, and 500 to subroutines. There are eight other program segments: the "'own ship" motion segment, the target motion segment, projector, sonar, radar, fire control, weapon motion, and record/playback segments. All of the software was written in SDS's assembly language META-SYMBOL taking advantage of the Interlace hardware option for I/O cycle stealing.

The software is constructed around a six-level interrupt scheme. The highest priority level is assigned to the closed-loop servos used in simulating the target course, "own ship" course, and missile bearing. This interrupt is serviced every 250 msec. The next highest interrupt is assigned to radar simulations. It is serviced every 5 msec so that the radar screens are kept flicker-free.

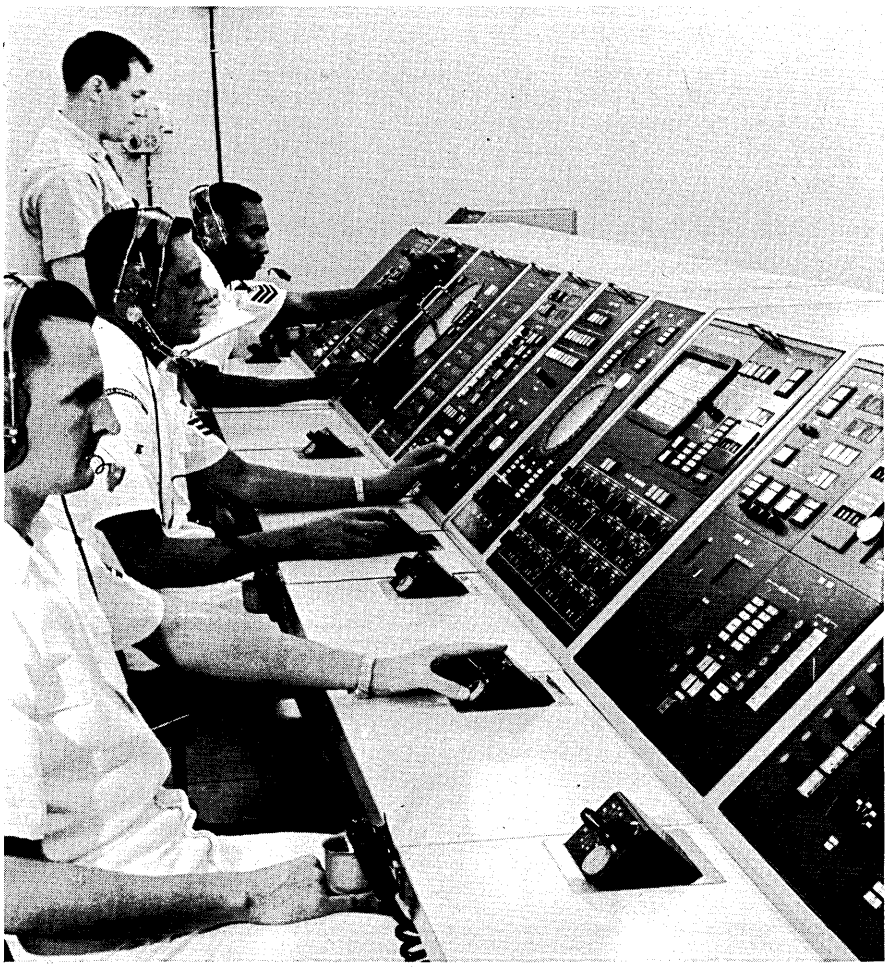
Priority levels three and four are assigned to the fire control program segment. Interrupt three occurs at the end of a sonar dwell pulse ("ping") and interrupt four comes in at the beginning of a new pulse. These interrupts trigger the program segment that drives the analog and digital fire control consoles. Two types of consoles are used. The digital M38 console computes the course and speed of the targets, given range and bearing information; the analog M53 is completely controlled by the 930.

The fifth interrupt, unlike the fourth which gets its timing from a selectable ping rate, is event-oriented. It services the projector displays. The plots are made by scribing lines and symbols on a frosted glass surface. The timing for the interrupt therefore depends on the time which was required by the plotter for drawing the last line segment or positioning the stylus.

The executive and most subroutines work on a one-second update cycle. The exec pulls inputs from the interface, processes instructors' console and helm orders, directs outputs to trainer equipment interfaces, and updates files. Every-second updating is sufficient for most of this, even for simulating the audio and visual responses of the sonar systems after accounting for water conditions and noise attenuation rates.

Various system subroutines are available to all program segments for performing functions such as radar coordinate conversion, table updating, and range computation. Space is also reserved for tables of present status and position data as well as history files for such things as sonar past positions and trainer inputs. ■

Three instructors establish the original problem parameters, such as ship and target speed and bearing, and monitor trainee response; they can also call in "malfunctions" or "freeze" the action for a critique.



machines that make data move

TELETYPE

data's wait-less wonder

Hold tight. It's Teletype's Inktronic® terminal. A data terminal many times faster than the ordinary page printer. Zaps 1200 words to the page per minute. Electronically. It's another answer from Teletype R&D for moving data economically at high speed.

* * * *

Off the ground and moving: Inktronic terminal. A space age terminal that doesn't tinker with time. And one time won't tinker with. Moves data on-line at 1200 wpm. And will have higher speed capabilities for tomorrow. Helps you get more in and out of the computer practically. And monitor high speed, tape-to-tape systems with new ease and economy. The line includes the KSR (keyboard send-receive) set shown here. And an RO (receive only) set. An ASR (automatic send-receive) set is coming.

Printing's unique space walk

The Inktronic terminal is different. There's no type-box. Prints through electrostatic deflection. Ink literally leaps to the page to form a character. For ink droplets carry a negative charge and are drawn to the page through a series of electrodes that cause it to trace out the shape of the character called for. Each character is made up of a number of dots.

No waste space

Inktronic terminal doesn't kill time or waste space on "fill" characters or buffer storage. It prints only the characters called for. Cleanly. And puts them on the line where you want them. You can print one character as readily as a few words or an entire line.

In orbit with ASCII

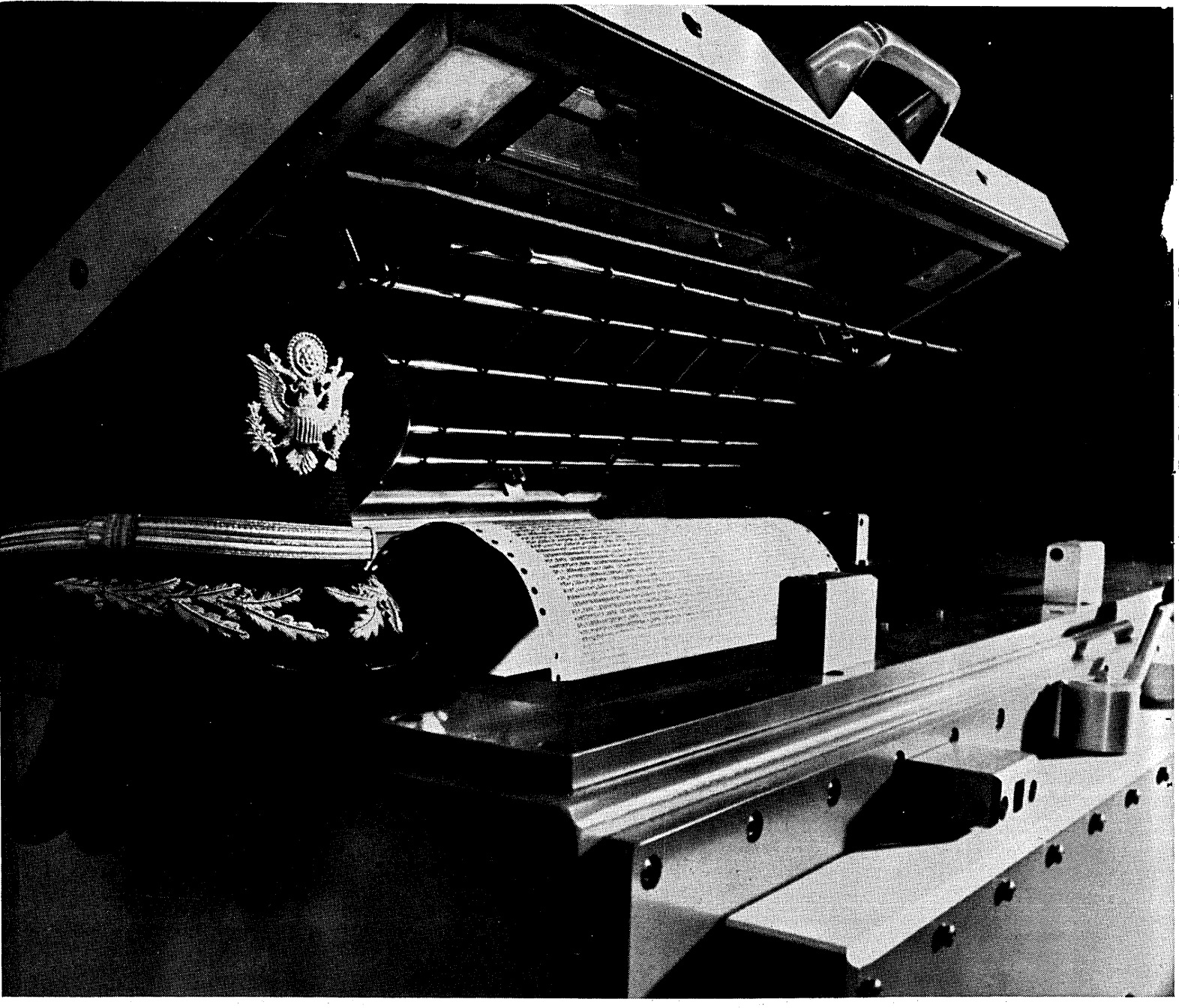
Inktronic KSR will generate up to 128 code combinations and can print 63 alphanumerics. Take your choice of an RO set with 5-level or ASCII code, or a KSR set with ASCII.

Keeps data tracking at less cost

The Inktronic terminal uses ordinary teleprinter paper. Inexpensive paper. A standard 8½ inch wide roll provides about 400 feet of data space. The ink Inktronic terminals use is inexpensive, too. One pint will deliver up to 15 miles of data. With a 1200 wpm capability these are important points to consider. Maintenance? Really low. The ink supply and guidance system has only one moving part. And you get more data on and off line faster which means greater economy, too.

The Inktronic is one of many exciting moves being made by Teletype R&D *in moving data at very little cost.* If you would like more information, contact Teletype Corporation, Dept. 81H, 5555 Touhy Avenue, Skokie, Illinois 60076.

See New Teletype Equipment at Booth 313 & 315 ACM Show



The 4910, our newest military Line Printer, rates a salute. It costs less than $40,000. It meets RFI MIL-I-16910. It operates in 0 to 50°C. It's a direct descendent of the fully-militarized RO-280/UYK you've specified when extreme shock and vibration are of prime importance. Because of our patented one-piece print hammer, the 4910 offers time-proven reliability and prints the straightest, cleanest line in the industry. For all the details call Bob Allen at 213/887-8000.

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CIRCLE 62 ON READER CARD

new products

multiple key to tape

There are many other multiple station key-to-tape systems marketed, but Data/Tape 2100 system is very little like any of them. Its approach to the key entry job is unique and offers some obvious advantages.

For instance, most key entry stations that are used to pool records from multiple stations onto a single tape have some kind of temporary display for the operator's convenience showing either the last character entered or some kind of code for it, plus the column number, and maybe a few things about the type of field. A few systems temporarily display the whole line. The Data/Tape 2100 method uses a strip printer to display permanently the information keyed. The only way to get a hard copy of the input from the other systems is to take the magnetic tape created to a peripheral processor of some sort and have it printed. That is sufficiently inconvenient that such key entry systems are generally used for applications where an initial hard copy is not required, as in compiling subscription lists.

Starting an input operation, the operator can call any one of 256 or more programs for the format. The data is edited as entered and errors are noted by a message on the 30 cps printed tape (which uses a printer supplied by Dian). After each good record is entered, the operator presses a "record complete" key and a small hole is punched in the tape. The paper record of the data (which now resides on a 64-track Data Disc, Inc., 1 megacharacter disc), is handed to a verifier. The verifier rewinds the tape on a Sight Verification Station and reads down the tape, record by record, positioning the information by pressing a foot pedal. (As the punched hole after the record is sensed, the tape stops for the operator to inspect. When she is done, she presses the pedal to go to the next record.) Errors are flagged by a second hole and corrected on yet a third "Update" Station. (The foot pedal used by the operator at the Update Station causes the paper tape to skip to the spots where the holes left by the Sight Verifier are.) Finally, in response to a command from a Supervisor's Station the finished file is dumped onto one of two Ampex TMZ tape drives.

There are other, not so obvious, differences in this system. The disc is written with variable length records using a high-density dual current reversal method and a read-after-write check (probably a "first" for a disc). The keyboards can be configured at the flip of a switch as typewriters or keypunches with an extra set of numerics. The vendor is even considering modifying the Computer Automation Inc. 816 processor to make it perform better in the configuration.

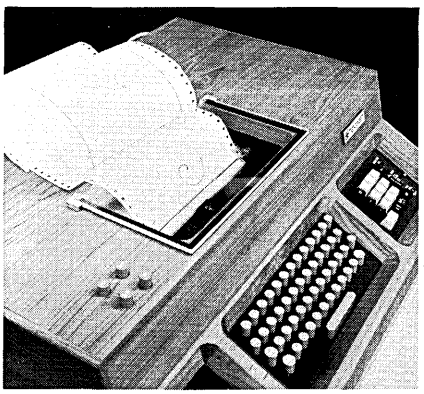
Software is included in the package for running statistics, checking operator efficiency, editing inputs, and keeping track of the number of slots left open on the disc.

The price for a 19-station system (14 input stations, three sight verification stations, one update station and one supervisor station) would run somewhere around $4,250/mo. or $150K for purchase. Such a package would include all of the pieces mentioned plus a page printer for the supervisor's station (15-25 cps). GENERAL COMPUTER SYSTEMS, INC., Dallas, Texas. For information:

CIRCLE 542 ON READER CARD

terminal with plotter

Buried in the teak cabinetry of the Model 3 Typagraph terminal are the rudiments of what once was a Teletype terminal, but the Model 3 has a good deal more hardware included,



and knows some tricks that no one ever tried to teach a teleprinter. One of the most obvious differences—and actually one of the most minor—is that the standard tty keyboard has been augmented with a small numeric key set placed on the right side. The paper tape gear is, as expected, off to the left side.

The second difference is much more important. The unit produces plots with a resolution of 0.020 inch. To do this, the print mechanism had to be taught to move up and down as well as right and left.

Plotting is driven by specially developed software that allows for labeling axes, using any character or symbol for the line element, adding axis lines and grid points, and scaling. The programs come in three versions for conversational use or for batch FORTRAN.

Printing and plotting can appear on the same page, and even the printing is highly variable. Normal print spacing is 90 characters per line, but anything from 20 to 120 per line can be chosen. Typing and plotting speeds are still only 10 cps, but the slew rate is listed as 4 ips. I/O is still ASCII. The unit sells for $6,000 or rents for $200/mo. Maintenance is through local contractors. TYPAGRAPH CORP., San Diego, Calif. For information:

CIRCLE 543 ON READER CARD

large-scale cpu

Control Data has announced the 6700, probably the largest computer released since their own 7600. The 6700, unlike the much larger 7600, is made up of existing components. A couple of years ago, to beef up their 6400, the powers that be at CDC decreed that there would be a dual-processor version and the 6500 was born. Using almost the same philosophy, the 6700 has been born of one 6400 cpu and one 6600 cpu. The resultant system is large and fast.

The 6600 acts as a primary processor. It has an eight-word instruction stack, ten arithmetic and logical units, 24 registers, floating-point arithmetic, etc., and a 300 nsec adder. The 6400 acts as the secondary cpu and has an arithmetic section, 24 registers, a one word instruction buffer register, and a 1.1 usec adder.

The 64-128K memory is organized in 4K banks and has a 1 usec major cycle time and a 100 nsec "minor cycle" time; both processors have access to it. An optional extended memory of up to 2 million 60-bit words has a transfer rate to central core of up to 10 MC.

CDC's large machine architecture is organized around peripheral processing units. These are programmable, 4K, 12-bit-word machines that share I/O channels. While the central cpu's are doing such things as arithmetic, logic, branching and indexing, the peripheral processors do adding, subtracting, I/O, cpu and memory access-

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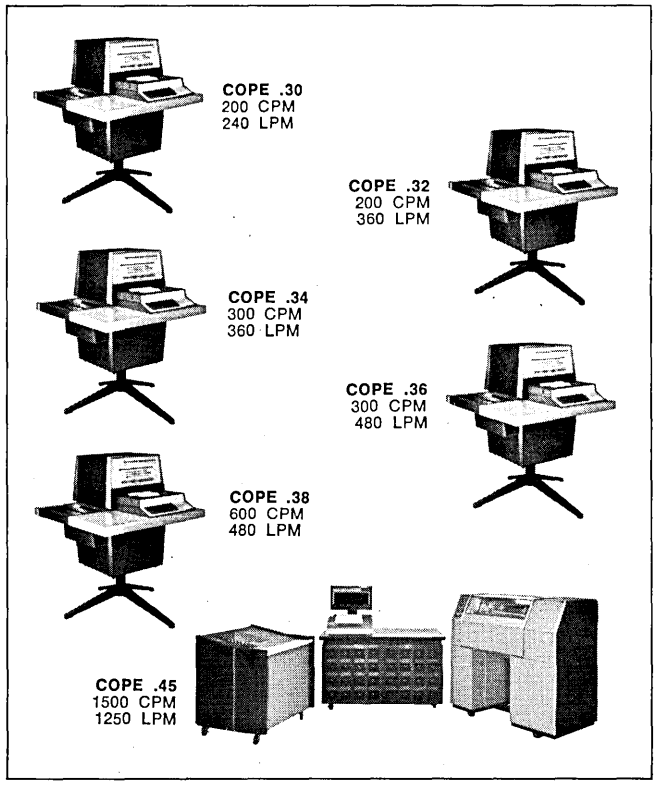

CII

COMPUTER INDUSTRIES INC

DATA COMMUNICATION SYSTEMS DIVISION

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CIRCLE 114 ON READER CARD

ing. The 6700 comes with 10 peripheral processors.

The 6700 will use all of the same software available for the rest of the 6000 series, including the SCOPE operating system, EXPORT/IMPORT for remote batch, INTERCOM for remote conversational processing.

The 6700 is rated, by CDC, as being 1.4 times as fast as a 6600. Its price tag runs about 1.1 times as much as the 6600, ranging in the area between $3,925,000 ($86,175/mo. on a five-year lease) for the 128K model 6713 and $2,560,000 ($61,875/mo.) for the stripped-down 64K model 6714. Maintenance prices run between $7K and $8K/mo. Software is—so far—still included free. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 544 ON READER CARD

multiple key stations

Canada has not had many computer gear manufacturers, although the number of computer installations there seems to be growing rapidly enough. That does not mean the climate is not right for manufacturing. For example, this vendor incorporated in July, 1968, and already has two significant products. One is a time-sharing system

built around a Hewlett-Packard 2116B computer which is claimed to be faster and cheaper than Hewlett-Packard's own offering. The second product, seen for the first time at the Montreal DPMA show, is Key-Edit.

Key-Edit is a multiple terminal data entry system something like the Computer Machinery Corp. and Realtronics offerings. The basic system comes with 4-16 keystations, a built-in Digital Equipment Corp. PDP-8, a drum for intermediate storage, and a mag tape drive. Each operator at each station has a display which shows the last character entered, a column number, and an indication of the type of field. A supervisor's console is included for calling off completed files to tape and

PRODUCT OF THE MONTH

electronic data sorter

Ask a man in a commercial dp shop how much of its time his computer spends in sorting, and you may receive an estimate as low as 30% or as high as 60%. One reason is that the computer is not very good at it—it has only one piece of hardware capable of making a comparison of two records, the cpu. In fact, the only machines really built for sorting are mechanical paper shufflers, variations of a punched card sorter theme introduced in the 1940's.

The Model 1561 Electronic Data Sorter is a new work. It includes in its 70 x 70 x 35 inch box a 1000-track, head-per-track Bryant drum and 100 comparators. From a hardware standpoint it is not very exciting—no edge of the state of the art technology. Packing density on the drum is only 700 bpi, and the resulting transfer rate is only 326KC. (For comparison, a hypertape IBM 2420 tape drive is good for 320-KC.) There is not much new about IC comparators, either.

What is new is that the 1561 Sorter can fake a level 17 OS sort routine (or Programmatic's PI SORT, or any other software) into giving it a 2.6 megabyte drum load of randomly ordered data and return it fully sorted (every bit) in 50-60 seconds. In a three-phase sort, such as OS uses, phase one is dedicated to forming record strings and the other two phases to merging those strings. The Sorter does almost all of the phase one job for the cpu, and significantly cuts the elapsed time and cpu cycles needed in phases two and three.

The Sorter does this by using its drum as 17 separate delay lines (but without addressing) and forming a record string up to 50-200 times as long as that normally generated. In effect, the sort routine is returned, for "merging," a single already-merged string.

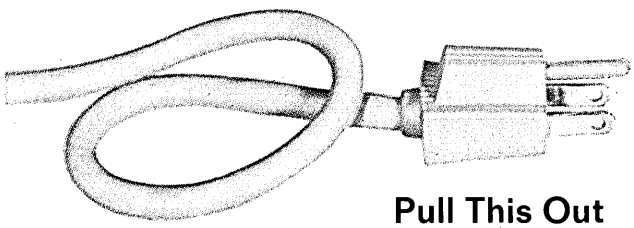
One smallish catch is that the data must be given to the Sorter most significant field first; sorting is actually done as if the data were huge binary integers. One not-so-smallish benefit is that—in a 100K record sort, for instance—the cpu can be freed for as much as 25%-40% of its time. It's a little like buying a faster cpu.

The 1561 connects to two selector channels on a /50 or /65 or even on a /40 and will probably do more good than anything else the dp manager could hang there. Even adding another IBM 2314 disc subsystem does not always speed up sorting. Adding another cpu might (that would add a second comparator), but the price of model 50 or 65 cpu's is high, and attendant operating and software problems are complicated.

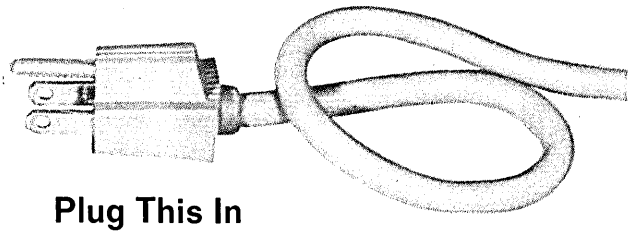
For the services of the 1561, a user must be prepared to part with some $300,000 or so, and he won't get to see one run for a while. However, an emulation run of customer data can be performed now, and deliveries are promised in 10 months. ASTRODATA, Anaheim, Calif. For information:

CIRCLE 541 ON READER CARD

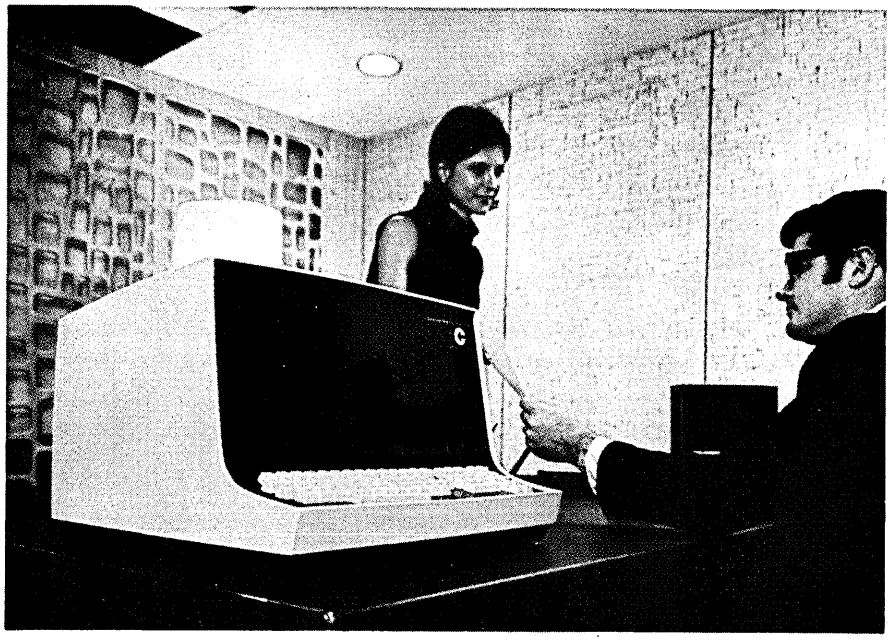
A Tip for Time Sharers
How to Reprogram for the Datapoint 3300



Pull This Out



Plug This In



It's that easy to substitute the Datapoint 3300 for your present data terminal. It's completely compatible with all time share services that now use teletypewriter terminals—no hardware or software modifications are required. And why would you want to change terminals? Read on.

The Datapoint 3300 is the first CRT data terminal designed expressly for the interactive time share computer user. We sat down and figured out what kind of low cost terminal device would enable the working professional and technical executive to communicate most effectively with a remote computer in the process of problem solution. Here's what we came up with.

The Datapoint 3300 utilizes a cathode ray tube screen to display program and file data you want to transmit to the computer — and to receive back the answers. It can accommodate 25 full lines, with 72 characters in each line, in a single display — 1800 characters in one viewing. With this screen, you can take in a complex problem situation at a single glance, make revisions, corrections or deletions for any combination of lines or characters via the keyboard; you can debug on-line; you can in effect make the computer an immediate and powerful extension of your own thought processes.

The Datapoint 3300 is engineered to cut out needless irritations and distractions. Display characters are easy to read, thanks to a high "refresh" rate, which renders each letter and figure totally stable and uniform. The machine is noiseless. No mechanical clatter to intrude upon your thoughts. You can transmit and receive problem and file data at up to 600 bps standard, and up to 2400 bps with optional speed buffer. Your productivity goes up, your "on line" time goes down. No longer are your thought processes shackled by the speed of a mechanical printer.

More: The Datapoint 3300 is styled for the modern office environment. It has the same base dimensions and weighs the same as an executive typewriter.

These are just a few of the reasons why we think you will want to pull the plug on your present data terminal. For further information on the Datapoint 3300, please write to: Computer Terminal Corporation, P.O. Box 6967, San Antonio, Texas, 78209.

Computer Terminal Corporation

monitoring the operation.

Operators can choose from programs resident in the cpu for their data entry, and their inputs are then edited according to the formats stored. Data records are standard at 80 characters, but may be expanded to up to 200 characters to meet customer requirements.

Peripherals for the system can include an IBM 2311 or 2314 compatible disc drive, making the system look like Logic Corp.'s key to disc set-up. A high speed line printer and card reader will also be included in the list of options.

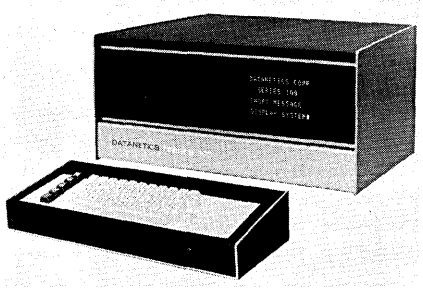
Apparently the business climate in the U.S. looks all right to them, for the principals in the company have an office in North Carolina, and in Washington D.C., and plan to have five in operation by fall, including one in Philadelphia and one in Newark. George Athanas is their U.S. marketing man.

The Key-Edit Series 100 is priced at about $1500/mo. for the cpu, drum, tape drive, and eight key stations. Additional key stations go for about $85/mo. and the optional disc drive is priced at something under $500/mo. Purchase prices have not been finalized, but will fall somewhere in the $90K bracket. Deliveries will take about 90 days. CONSOLIDATED COMPUTER SERVICES, Highpoint, N.C. For information:

CIRCLE 545 ON READER CARD

mini display

The trouble with most "desk top" terminals designed for use in a manager's office is that they are too big for the manager's desk and require a trained operator. The Series 100 display does have a few control keys, but not many. They include a NULL key for entering



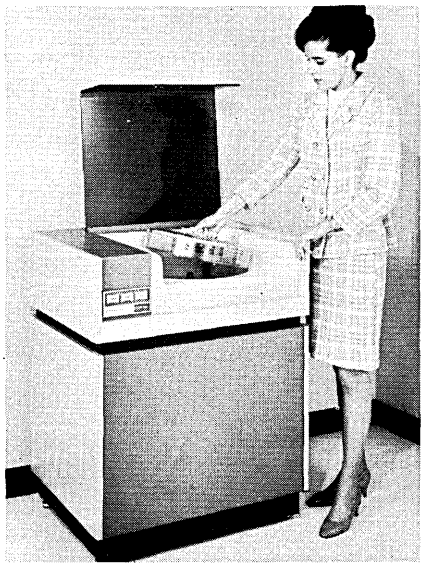
blanks, an ETX key for end of text signals, a HOME key to return the display cursor to the first character position, and a TRANSMIT key.

The crt shows four lines of 60 characters which are adjustable in height and width but are somewhere around 0.3 inches high. The screen size is only 3 x 4 inches, but the characters are formed from a 7 x 9 dot matrix, rather than a 5 x 7 matrix which is more common, and should be clear and stable. The character set includes 64 alphanumerics and symbols. The unit interfaces with a 201A, 103A, or acoustic coupler for transmitting ASCII. The price for the terminal is listed as under $1800. DATANETICS CORP., Redondo Beach, Calif. For information:

CIRCLE 547 ON READER CARD

automatic disc pack cleaner

The DP-10 is billed as the world's first automatic disc pack cleaner. It's compatible with all 1316 type disc packs, and is said to be easier to use than a home washing machine. It is complete-

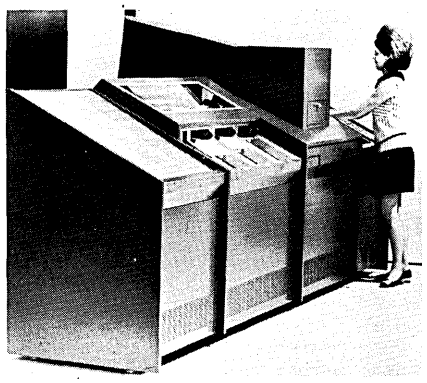


ly self-contained and operates off-line. Disc packs are processed in five minutes or less. Heart of the system is a pair of electromechanically operated wiping posts inside a pressurized cleaning chamber. The posts are fitted with lint-free pads which are impregnated with iso-propyl alcohol. After the cleaning operation, the residual cleaning fluid on the disc pack surfaces is evaporated by filtrated ambient air. Price is $2595, with delivery 60-90 days ARO. A second 2316 compatible disc pack cleaner, designated the DP-20, will be announced shortly. KYBE CORP., Brookline, Mass. For information:

CIRCLE 546 ON READER CARD

ocr system

Both ordinary type faces and hand-printed information can be read by the INPUT 2 optical character recognition system. When two lines of information are read at once (both kinds of data), the 2 will run through documents at a speed of 600 per minute, simultaneously sorting the documents and keeping tallies on an on-line printer. The unit's basic type face vocabulary includes 40 characters—the upper and lower case alphabet, 0-9, and four standard business symbols—but can be expanded to 120 characters in 10-character increments. The hand-



printed character vocabulary is less extensive; the machine recognizes the numerals 0-9, the letters C, S, T, X, and Z, and plus and minus signs. With these characters, users can print very much as they always do, because the machine defines characters by features such as curved lines, sharp corners and line intersections.

The unit handles documents from 3¼ x 3¼ inches to 4¾ x 8¾. Its three output pockets can be expanded to 12 if desired, and its 600 lpm printer to 1000 lpm. The INPUT 2's built-in controller has 8000 24-bit words of store.

The system is a lower-cost addition to the company's line and will sell for approximately $550,000 or lease for $14,050/mo. on a five-year basis. Deliveries are expected to be in the first quarter of 1970. RECOGNITION EQUIPMENT, INC., Dallas, Texas. For information:

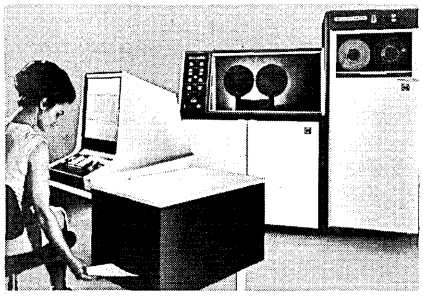
CIRCLE 548 ON READER CARD

burroughs com

Burroughs has become the first major mainframe maker to hop on the computer-output-microfilm (COM) bandwagon with the announcement of the Burroughs Computer Output to Microfilm system. Burroughs estimates that the market for COM equipment could be as much as $700 million over the next ten years. The BCOM microfilms data from magnetic tape at up to 96,000 cps, the equivalent of 23,000 pages of 11½ x 14 inch printout being converted to microfilm in less than an hour, on one 1,000-foot roll of film. BCOM is expected to be used for applications which require greater speed and economy in production of records than can be achieved with computer line printers. The portability and compactness of the microfilm rolls should also make it ideal for such uses as archival storage, the traditional task of

microfilm.

Information to be transferred from magnetic tape by the BCOM is displayed in printed page format on a crt. The data is then photographed by a microfilm camera either as lines of information or overlaid on replicas of business forms. The user has a choice of three character sizes for display of information: 135 characters per line with 64 lines per page, 67 characters per line with 32 lines per page, or 45 characters per line with 21 lines per page. Either 64- or 96-character alphanumeric sets may be used. The user also has a choice of either 16-mil-



limeter microfilm in 1,000-foot rolls, or a 105-millimeter microfiche camera. Among other options is a magnetic tape search program for selective recording. Four readers are available for locating and viewing information: a basic reader, a frame count reader with 21- or 26-bar coding, a reader compatible with random access coding, and a microfiche reader.

When copies of information displayed on the viewer are desired, an electrostatic printer makes 8½ x 11 inch dry copies on paper. Either positive or negative image copies are available, and variable printing density can be controlled by the operator. System safeguards include parity error detection, automatic re-read when an error is detected, and a line and page capacity monitor. Integrated circuit logic and modular construction are employed. BCOM prices range from $85,000 to $125,000, with rental of $1,890 to $3,290 per month, depending on configuration. BURROUGHS CORP., Detroit , Mich. For information:

CIRCLE 549 ON READER CARD

communications concentrator

The CC204/CC205 Data Concentrators utilize Honeywell cpu's to perform the data communication function for a time-sharing system. Use of the concentrator permits up to 96 low-speed data terminals to have virtually immediate on-line access to a time-sharing system or to other low-speed terminals in an information transfer system. The low-speed terminals may be local teletypewriters communicating via dc telegraph loops, or remote teletypewriters transmitting and receiving via modems at each end of a leased line or common carrier network. The data concentrator can communicate simultaneously with terminals operating at four different speeds within the range of 10 to 300 bauds.

Data collected from the terminals is assembled into message blocks and is then transmitted to the time-shared data processor, or to another remote data concentrator over half-duplex or full-duplex lines. The data concentrator is designed to interface with 201A or 201B data sets operating at 2000 or 2400 baud, respectively, but can be interfaced with other modems operating at speeds up to 9600 bauds.

The processor for the CC204 Data Concentrator is a Honeywell DDP-416 computer, and the processor for the CC205 is a DDP-516. Memory size is 8K words. When using the DDP-516, programming is restricted to the instruction repertoire of the DDP-416. Although Honeywell standard peripherals are not supplied, the standard I/O bus is not modified and may be used. The low-speed line multiplexer utilizes the Direct Memory Access in a demand mode, which may restrict the use of other high-speed peripheral devices, however. Provision is made in the concentrator for connection of an ASR 33 Teletype.

The transmission multiplexer handles channels in multiples of four, full or half duplex. Data transfers are under program control in both directions.

The low-speed line multiplexer handles lines in multiples of eight, up to 96 maximum, at a speed of up to 300 baud. Any line may be operated at any one of four speeds predetermined for the system. Selection of one of the four available speeds is performed under program control.

Processor time occupancy is said to be 40% for the worst case. Delivery requires five months. The price for the CC204 configured with 24 low speed lines was quoted as $67,000. COMPAT CORP., Westbury, N.Y. For information:

CIRCLE 550 ON READER CARD

2400 baud modem

The 2400 baud transmission of the QB24 modem is a measurement of information bits; the "actual" transmission rate, including error checking redundant bits, is closer to 3600 bps. The 2400 baud transmission, or 3600 if you prefer, can be further broken down by adding an optional multiplexing front end so that two 1200 baud or four 600 baud transmissions are included. With any of these means of transmission, dynamic line equalization and forward error correction are performed. The QB24 operates synchronously, either at half or full duplex, over voice grade lines. It is transparent to data and has an error rate of 1 in 10^6 using the phone company's data access arrangement. (With acoustic coupling, this falls to about 1 in 10^4.) Its high degree of reliability could allow users to drop a good deal of their error checking and retransmission routines. Unit-priced with an acoustic coupler at less than $3500, the QB24's will be delivered in four months. DATAMAX CORP., Ann Arbor, Mich. For information:

CIRCLE 551 ON READER CARD

crt terminal

The Datapoint 3300 and its matching tape cassette unit (the 3300T) must be the handsomest terminal units to be introduced yet, and their specifications look good too. The crt face will display 1800 characters in 25 lines of 72. The peripheral tape unit will store up to 200 of the 25 x 72 frames and ship them to a central site cpu at a rate of 600 cps over standard teleprinter terminal (ASCII) lines. Characters are formed from a 5 x 7 dot matrix and refreshed at a rate of 60 Hz.

The 3300's keyboard shows the

standard 64-character set and can include an extra 10 numerics. In addition to recording and editing displayed data from this keyboard, a "reproduce-local" mode may be used to scan the contents of the tape cassette at 60 cps (scrolling forward or backward), and a "reproduce-remote" mode is used for sending to a cpu or for file retrieval by the cpu.

An optional speed buffer can be added to the tape unit for $250 ($7/mo.) which boosts the transmission rate to 2400 baud. The 3300 CRT unit sells for $4500 ($145/mo.) and the standard, 600 baud, tape unit goes for $2250 ($85/mo.). The extra 10 numerics cost $125 ($4/mo.). A hard copy printer will be available later. COMPUTER TERMINAL CORP., San Antonio, Texas. For information:

CIRCLE 553 ON READER CARD

(Continued on page 164)

When we started comparing apples to apples,

we found that one of them was surrounded by an orchard.

PEC is the leader in the low cost digital magnetic tape unit field with more than a dozen versatile models. Ampex has but one, the TMZ.

PEC has faster ones, slower ones, smaller ones, less expensive ones, full format ones, special purpose ones, and even incremental. They're all IBM compatible. With all this abundance you're certain to find the tape unit best suited for your small computer, terminal, or data system.

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CIRCLE 39 ON READER CARD

new products...

disc cartridge

The surface of the 100 Disk-Pack has a tough coating that the manufacturer suggests can be cleaned with isopropyl alcohol; you won't find many vendors of six-high or 11-high packs suggesting that kind of treatment for their products. Built to be compatible with the IBM 1130 and the IBM 2310 disc drive, the 100 Disk-Pack reportedly meets or exceeds all specifications for the IBM 2315 single-disc cartridge. Used on the 1130, it provides storage for 512,000 16-bit words on 203 tracks; on an IBM 360/44, it provides storage for 1,171,200 bytes. Purchase price for the 14-inch disc cartridge is listed as $85. BASF SYSTEMS INC., Bedford, Mass. For information:

CIRCLE 558 ON READER CARD

graphics systems reports

Auerbach Graphic Processing Reports are a two-volume guide to alphanumeric and graphic display devices, microform display equipment, digital data records, and automatic photocomposition equipment. The reference service is designed as a single source for all of the facts required to evaluate image handling systems. The reports provide a description of the equipment, including software requirements and support, throughput and response times, interface requirements, key characteristics, limitations, and cost. In addition, the service includes comparison charts, special reports and tutorial discussions, users' guides, and a detailed glossary. Quarterly updates of the subscription service will provide coverage of significant developments. Price is $385 for a one-year subscription, with a renewal rate of $330 per year. AUERBACH INFO, INC., Philadelphia, Pa. For information:

CIRCLE 554 ON READER CARD

teleprinter terminal

The Series 720 model 10 Data Terminal is rated at 40 cps in printing. This is probably its most obvious advantage. It also prints with a moving 5 x 5 element stylus for forming dot matrix characters on heat sensitive paper; this adds the advantage of less moving parts. The unit has a 50-character buffer, expandable to 100 characters, which allows the operator to compose that much of a message on-line without tying up a phone line. For instance, with the added speed for printing and the buffer for input, an installation should be able to share a telephone circuit on a party-line basis and get twice as many terminals on it.

The model 10 responds to polling, addressing, or broadcasting by a cpu by flagging whether or not a message is ready to be transmitted. If the buffer is not full, the cpu can poll the next terminal. The unit understands the PTT/6 code (IBM's BCD 6-level code used on IBM 2740's and 1050's). It has a 54-character keyboard which does not include lower case alpha. Sale price for the device is listed at $5,950 ($141/mo. on a lease, including service). TEXAS INSTRUMENTS INC., Houston, Texas. For information:

CIRCLE 552 ON READER CARD

interactive display

Up to 2,000 cursive-stroke characters or graph segments can be displayed on the screens of ATC 2000 series crt terminals. The cursive writing technique is claimed to be (and logically would seem to be) much less fatiguing to read than conventional dot matrix and starburst stroke-formed characters. The standard character generator included in the ATC crt's can form the 64 ASCII characters. An option allows for adding lower-case letters and/or 16-line segments for limited graphic capability (for such things as bar charts).

The 2000's use the same software as the IBM 2848/2260's and are claimed to be perfectly compatible with the IBM 2701 teleprocessing data adaptor. Data is accepted or transmitted at 1,200, 2,400 or 4,800 baud, synchronous or asynchronous. A typewriter-like tab feature is included, as is automatic character addressing for getting to specific positions on the screen from the host cpu. A cursor indicates where the next operation will occur. If that cursor is positioned on a blank area, it will form a blinking character-sized box; if positioned on a character, it will cause the character to blink.

A delay line refresh memory with a capacity of 1,000 (2,000 optionally) characters is used to refresh the screen at 60 cps.

Two models of the series are produced, a stand-alone display (at $6,500) called the 2020, and a multistation version (at $3,600) called the 2030. MSI by Texas Instruments is said to make it all possible. ATLANTIC TECHNOLOGY CORP., Somers Point, N.J. For information:

CIRCLE 556 ON READER CARD

mini printer

The Beta Serial Incremental Printer is a 132-column asynchronous unit, designed to print a full 64-character ASCII set, including space, at up to 25 cps. The Beta is offered either as a free standing system or for table top

mounting, and is intended for use by mini-computer OEM's. The system is available in receive-only or in send-receive configurations.

Printing is performed by a Porelon ink-impregnated roller used with a rotating helical wheel and a single print hammer-actuator. Up to six-part carbon-interleaved or three-part carbonless forms up to 14⅞ inches wide may be accommodated. The Beta can be adjusted to print from 26 to 132 columns at 10 characters per inch, 6 lines per inch, and has a paper skipping rate of 25 lines per second. Prices for the receive-only and send-receive units start at $3300 and $3700, respectively, depending on configuration. SYNERDATA INC., Burlington, Mass. For information:

CIRCLE 555 ON READER CARD

selectric terminal

First product of a six-month-old, 20-man firm is the Tycom 20/20 Terminal System, which uses Selectric typewriters combined with a special baseplate and a separate logic console to make a teleprinter that won't frighten clerical personnel. The baseplate is a one-inch-high electromechanical unit which inserts between the typewriter mechanism and the Selectric base cover. Use of the baseplate allows the Selectric to transmit whatever it types as well as be turned on, off, and controlled by remote computers or other Tycom typewriters. Tycom accommodates all the typewriter's normal functions, both in send and receive modes, and retains all operating characteristics of the Selectric.

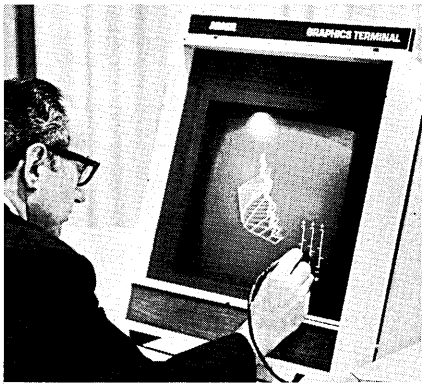
The system is controlled by the 12-key logic console, which operates over any two-wire system. It accommodates all functions of any model Selectric, including remote operation of tab set and tab clear, and the five IBM typamatic keys. Tycom sends and receives up to 135 baud (depending on code structure), provides parity on all transmitted and received signals, and has a 16-character buffer. The logic portion of the console is on four cards which employ IC's and MSI chips. All of the cards are removable for maintenance. One of these is the code card (ASCII, EBCDIC, or Selectric). When the card is changed, the code is changed. Each code card is priced individually and may be purchased as required. A nonprinting third case control feature allows full ASCII control codes to be input through the typewriter keyboard. Price for the complete system, including typewriter, baseplate, and logic console, is $4000, with reductions in quantity. Deliveries are scheduled to begin in the fourth quarter. TERMINAL EQUIPMENT CORP., Pompton Lakes, N.J. For information:

CIRCLE 557 ON READER CARD

graphics terminal

The AGT/5 interactive graphics terminal contains its own 32-bit, 4K core processor for image processing, display control, and communication formatting. The operator's console houses a 21-inch crt with light pen and controls. In contrast to other AGT models, which usually function as independent autonomous terminals, the AGT/5 is intended to be used primarily as a dependent graphics extension to medium-sized computers like the PDP-10, Sigma 5 and 7, SDS 940, 360/40, 44, and 50, and the CDC 3300, as well as the smaller PDP-9 and IBM 1130. Coupling to the computer may be done either directly or via telephone lines.

The standard systems software furnished with the AGT/5, called DSS, supports its display function. DSS includes a display file processor, a debugging routine, a text editor, and an assembler. Communications and formatting routines, specific to the computer being used, are added to this set



of programs. The user has access to the capabilities of the terminal via programs written on the computer. Image files are transmitted to the AGT for processing and display. Control files are used to activate the keyboard and the light pen, and to sample the function switches and any other interactive controls. The editor, assembler, and debugger are provided for support and maintenance of the communications and formatting routines.

Applications for the AGT/5 include seismic and physiological signal analysis, monitoring and editing in automated drafting systems, instructional aids, network analysis, etc. The AGT/5 can be field upgraded to any other model in the AGT line, each of which includes provision for magnetic tape and disc storage, a feature not available with the /5. A full set of graphics devices such as joystick, input tablet, and hardcopy recorder are available. Paper tape I/O and hardware character generation may also be added to the basic system. Memory can be expanded to 32K words. Price is $40,000, with delivery in four months ARO. ADAGE, INC., Boston, Mass. For information:

CIRCLE 559 ON READER CARD

mini process computer

GE has entered the mini process control market with a read-only-memory (ROM) computer selling for "under $10,000," which joins the PAC series of process computers. The new ma-

chine, called the GE-PAC 30, is intended for use in testing of electronic components, loading terminal automation, instrument control, process control, and sub-system controlling. Features include dual in-line IC's; plug-in modular design; and sixteen 32-bit instructions, with direct addressing to 64K bytes. For servicing, the standard ROM can be unplugged and replaced by a special hardware diagnostic ROM.

Two models are available, designated the 30-1 and 30-2. Both have software which is upward compatible between models in the PAC series. The major difference between the two models is in instruction execution times. The 30-1 costs less and is more flexible, due to the general-purpose organization of its micro-processor. The 30-2, with more commitment to hardware, is more powerful at the user level. A full line of peripherals are available for the PAC 30's, including teletypewriters, paper tape reader and punch, card reader, and interfaces. Bulk memory is planned later this year. GENERAL ELECTRIC CO., Phoenix, Ariz. For information:

CIRCLE 561 ON READER CARD

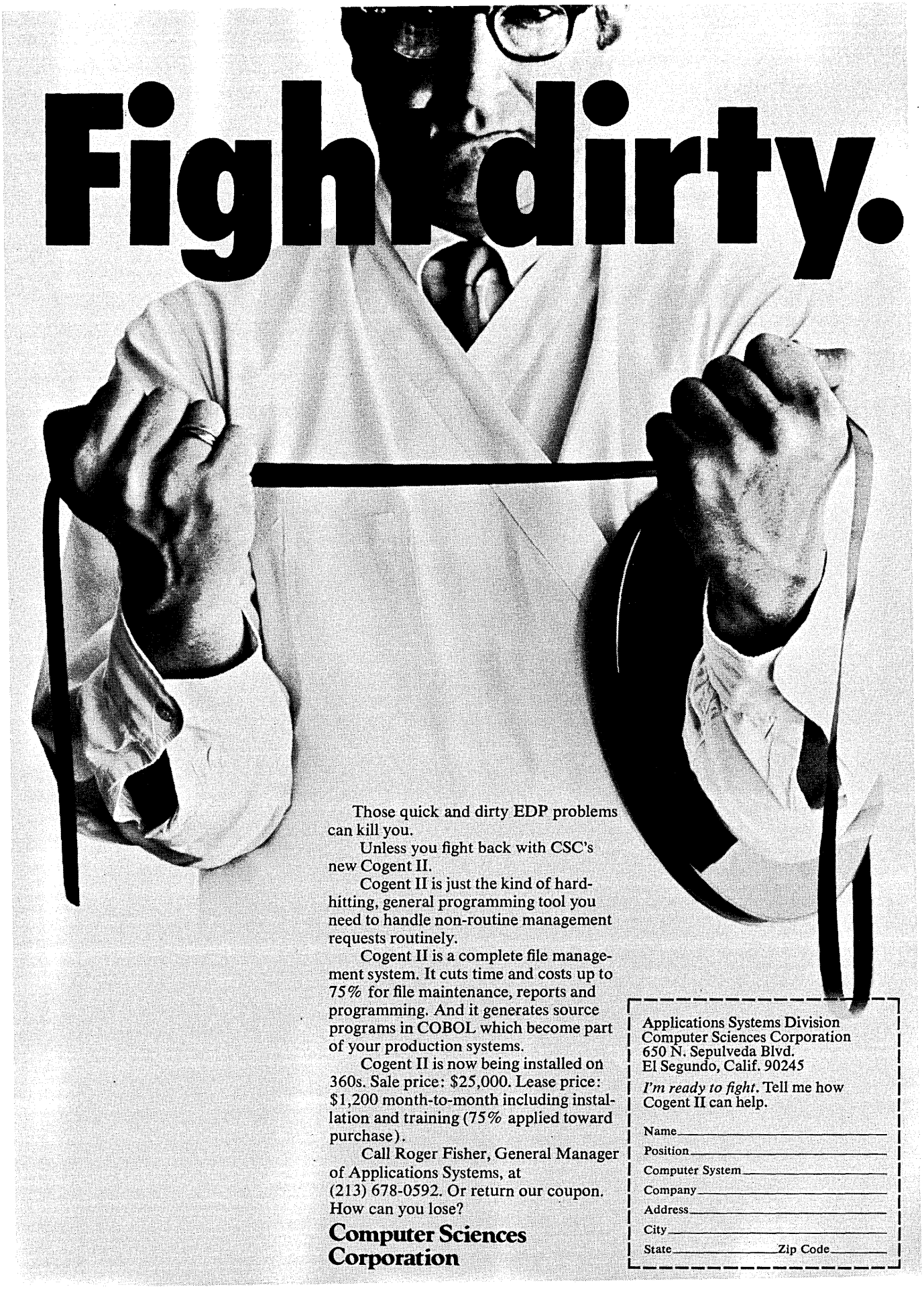
process control computer

The GRI 909 process control computer is designed expressly for process control, intended for the OEM market. It is a wholly dedicated system controller that will be integrated into the customer OEM's hardware and maintained by the OEM's field servicemen.

The 909 was designed with the traditional bus system across which peripheral devices are normally connected extended internally into the computer itself. Thus, the source and destination buses are not terminated at the computer I/O terminals. Instead, all internal operations in the 909 are handled by functionally designed elements that are connected between the same set of buses as are external devices, so that all internal and external elements are directly addressable using a "compiler-like" functional language rather than a mathematically oriented language. Thus, the programmer does not have to develop the involved command sequences that will translate process data into computer code, and then back again into instructions that the equipment or process can react to.

To expand the computer capability of the 909, additional functional operators can be connected across the bus structure by plugging in printed circuit boards in spaces provided for this purpose. These functional operator modules can add such capabilities as multiple arithmetic units, multiply/divide ability, binary/BCD conversion, and floating point arithmetic.

The 909 can be supplied without a main memory. A software library is available which has been "stripped of real time dependence," on the theory that with control systems, "there is no way to predict in advance what any customer's real time requirements will be." Full cycle time is 1.76 usec for a 16-bit word. Memory reference instruction is 32K directly addressable, not page oriented. Memory addressing modes consist of a direct mode, single address instruction, and an immediate mode, both using 32 bits (16 bit operand code, 16 bits address), and a deferred address mode using one level of indirect addressing with 32K of autoindexable locations. A Direct Memory Access channel is available on the same data and control lines as the programmed I/O channel. No DMA multiplexer is required for multiple DMA devices. A priority interrupt system has full capability to be used as a single channel interrupt or as a full hardware interrupt at the option of the system designer. Price is $3600 for the basic processor; $5500 with 1K of core. A system with 4K core, arithmetic unit, and an ASR 33 TTY sells for



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CIRCLE 560 ON READER CARD

plotter previewer

FASTPLOT is a pre-viewing device for incremental plotters, intended for use in producing interim plots during error-checking and correcting. It uses a Tektronix 611 tube for display, and connects directly to any computer equipped with an interface to an incremental plotter, making use of standard plotting software. FASTPLOT permits selection of a portion of the plot as small as one-eighth of the total plot, which is then magnified to fill the screen, by turning x- and y-axis knobs, and a magnifying knob. In this way the full accuracy of the plotter is maintained. The final hardcopy can be drawn on the plotter by throwing a switch and re-running the program. Price is about $11,000. Delivery requires 90 days ARO. DATATROL INC., Hudson, Mass. For information:
CIRCLE 562 ON READER CARD

analog acquisition

The RC 745 Datalogger contains the 16-bit Decade 70 computer. (Redcor gobbled up Decade not too long ago. Also, before acquiring Decade, Redcor had picked up some analog manufacturing people. Putting together both skills, analog and digital, the 745 is the product that might be expected.) The 745 is a 32-channel analog data acquisition system with a 4K, 860 nsec cpu. It comes with a multiplexer, an a-to-d converter, and an ASR 33 Teletype. Associated software includes FORTRAN IV, a data acquisition exec, a calibration histogram program, and peripheral handling and diagnostic routines. All of this is delivered for less than $20,000. REDCOR CORP., Canoga Park, Calif. For information:
CIRCLE 563 ON READER CARD

pert/cpm board

For those who would like to display a large PERT or CPM program chart for reference or for discussion purposes there is an alternative to having the network plotted. A magnetic PERT-O-GRAPH board, 4 x 6 feet, with 2 x 3 inch magnetic symbols is being offered for $295. The board's white surface accepts virtually any marking device. PERT-O-GRAPH could make some computer processing and plotting runs unnecessary. If it does, it will pay for itself quickly. HALCOMB ASSOC., Sunnyvale, Calif. For information:
CIRCLE 564 ON READER CARD

manual tape punch

An eight-key paper tape punch, for preparing eight-level control tapes, will make the machine operator's job a little easier. The model 58, so called because it can prepare five-channel tapes, too, has a typewriter-like space bar and a digital readout slot to show which frame is being punched, and is priced at $230. DATA DEVICES, INC., Studio City, Calif. For information:
CIRCLE 565 ON READER CARD

paper tape reader

The model TH154 paper tape reader handles up to 100 feet of fan-folded paper tape. Its reading speed is 650 cps, and its slew speed is adjustable from 200-850 cps, optionally. Prices start at $850 for a rack mount unit with power supply. CHALCO ENGR. CORP., Gardena, Calif. For information:
CIRCLE 566 ON READER CARD

a/d converter

The single-card ADC-F analog to digital converter is rated at 100 nsec for each level or bit comparison; it completes a 10-bit conversion within one usec using parallel approximation methods. Previous devices for rapid conversions have, reportedly, relied upon parallel conversion techniques which require much more circuitry since they involve breaking up the input into chunks and processing the chunks simultaneously. More circuitry generally means greater cost and less reliability. The single-card unit can, it is claimed, eliminate some sample and hold and some multiplex circuitry, too, due primarily to its added speed. A 10-bit version of the card is sold for $1990; an 8-bit version sells for $1680. ANALOG DEVICES, INC., Cambridge, Mass. For information:
CIRCLE 567 ON READER CARD

ink jet printer

The 960 Videojet is a non-impact printer utilizing a stream of controlled ink droplets to print 250 cps on conventional business forms. The 960 automatically answers the Data-Phone subset, and prints the information transmitted, and terminates Data-Phone calls, unattended. Its print rate matches the capacity of voice grade telephone lines. Character spacing and line length are set at 10 characters per inch and a line length of 136 characters. Character spacing is variable, however, from 5 to 15 characters per inch, allowing up to 204 characters per line. The unit accommodates the 60-character line common in communications networks.

The Videojet 960 printing process is based on ink being forced through a nozzle, causing it to break up into droplets. The nozzle is subjected to an ultrasonic energy source which causes the droplets to be regular in both size and spacing. Each droplet may be given a precise electrostatic charge at the instant it forms. If the droplet is to print, it is charged, if it is not to print, it is not charged and will be returned to the ink reservoir for reuse. Recirculation of unused ink allows the 960 to print for 40 hours using one quart of ink. Price is $7000, with reductions in quantity. Delivery requires 45 days. A.B. DICK CO., Chicago, Ill. For information:
CIRCLE 568 ON READER CARD

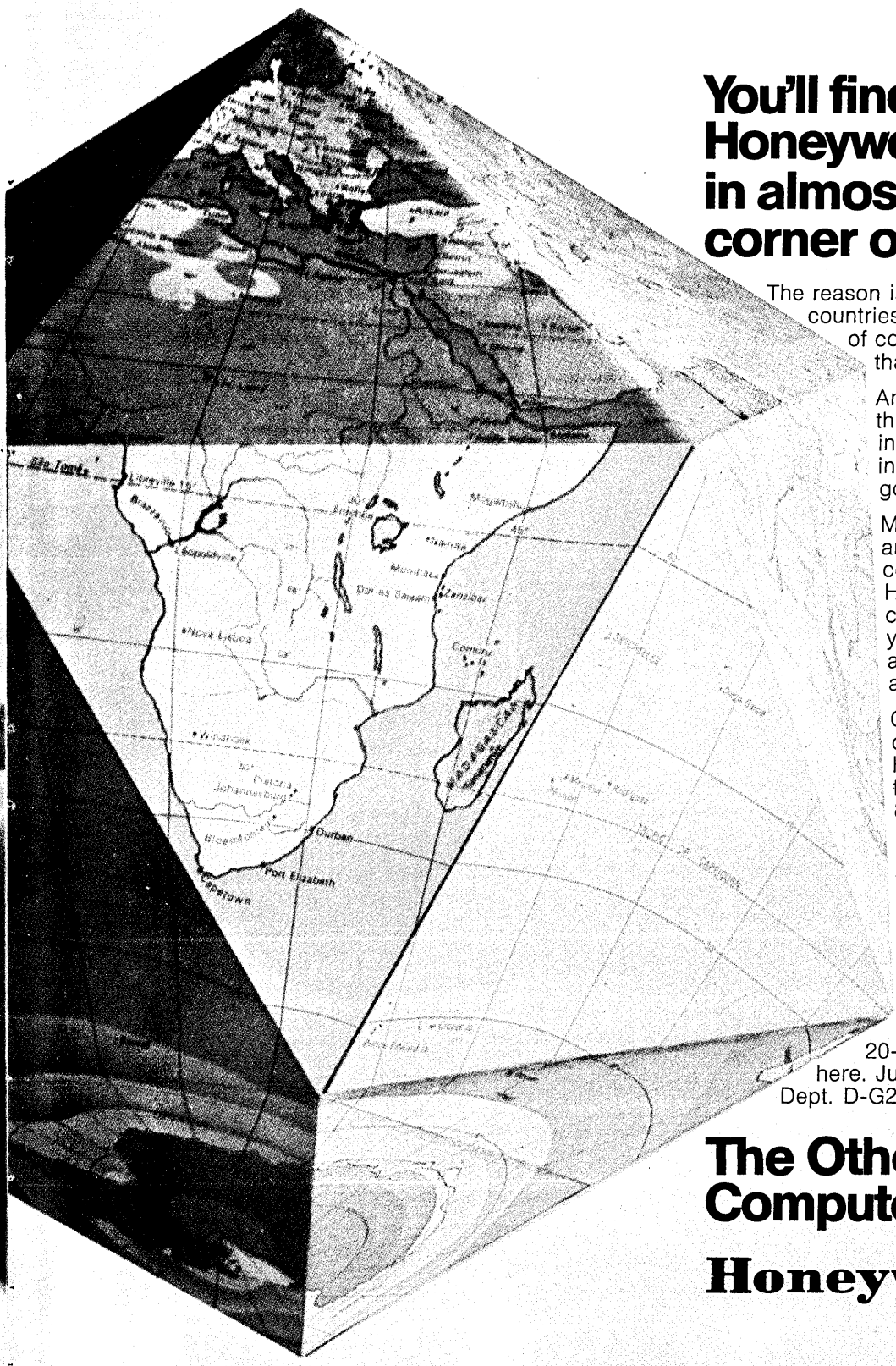
crt system

The Wand display system converts digital data into alphanumeric form at speeds up to 300 cps for display on standard television monitors. All input data is stored until it is either updated or erased. The Wand system is adaptable for applications including arrival and departure displays for transportation services, stock exchange communicators, process control readout, etc.

There are only two basic components to the Wand: a control unit measuring 19 by 10½ by 21 inches and one or more crt's. Options include keyboards plus various edit and flashing functions. The basic functions of the system are sufficiently modular to accommodate special configurations. Specifications include 5 x 7 dot matrix character format, 64-character set expandable to 128, display of up to 21 rows of 50 characters, and sequential input addressing. Input codes are 8-level ASCII, 6-level stock exchange ticker, and 5-level Baudot. Prices range from $5000 to $7000, depending on configuration. Delivery requires four months ARO. CANADIAN WESTINGHOUSE CO. LTD., Hamilton, Ontario, Canada. For information:
CIRCLE 569 ON READER CARD

automatic tester

Diagnostic information and GO/NO GO test results of communications equipment, radar, and in-flight computers is generated by the E8100 Computer Controlled Automatic Test System. Input for the system is obtained through



You'll find Honeywell computers in almost every corner of the globe.

The reason is that 39 branches in 11 different countries overseas specialize in sale and service of computers to provide the same backup that you'd expect in the United States.

And if you're the man who makes the decisions about computer installations in your company's international facilities, that's good to know.

Matter of fact, you shouldn't make any computer decisions without consulting Honeywell first. Honeywell, you see, is the computer company that asks what your data process problems are before they try to sell you a computer.

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And just so you don't forget about Honeywell's ability to compete for your international EDP business, we'd like to send you our special edition of R. Buckminster Fuller's Dymaxion Sky-World Map. Free. It assembles into a colorful 20-sided globe just like the one shown here. Just write Honeywell International, Dept. D-G2118, Minneapolis, Minnesota 55408.

The Other Computer Company:

Honeywell

an ASR 33 Teletype; output is through a printer and tape punch. The unit is controlled by a built-in 4K computer designed specially for the job. Working with a 24-bit word, it has hardware arithmetic including multiply and divide, and is driven by an engineering machine language whose instructions are typed directly into core. Rated as 15 times as fast as manual testing methods, the 8100 is priced from $50K to $300K. It will be shown for the first time at WESCON this month. EMERSON ELECTRIC CO., St. Louis, Mo. For information:

CIRCLE 570 ON READER CARD

crt's

Three character/curve generating crt terminals have been added to the product line by this vendor, the 400/12, 400/10, and 400/15. Each features 10-

bit resolution and a claimed data compression rate over conventional crt units of 100-1. The 400/12 uses a 70-key ASCII keyboard and a crt page size of 3,400 characters (85 char/line and 40 lines or 66 char/line with 50 lines). A total of 96 different characters can be generated in the standard set (special symbols are optional) using a full-duplex channel where data transfer is in 8-bit bytes. Interfaces for half-duplex channels, synchronous telephone-rate channels, and special cpu's are available. Base price for the 400/12 is listed as $7,400.

The 400/10 sells for $6,700 and is a local incremental vector graphics display unit capable of interfacing 8-bit lines at 100-2,400 baud, parallel/asynchronous. The display area contains 1K by 800 points; storage is provided for over 800,000 points. The 10 is the bottom of the model line.

The third unit, the 400/15, combines the 12 and the 10 in a single system at $8,400. It provides local vector and alphanumeric character generators, plus absolute and incremental communication capabilities. The 15 can interface phone lines for transmissions up to 2,000 cps. COMPUTEK, INC., Cambridge, Mass. For information:

CIRCLE 572 ON READER CARD

acoustic coupler

Most acoustic coupler users, like those connecting teleprinters to dial-up lines for time-sharing purposes, need a coupler capable of transmitting data and receiving output from a central site. They do not need the automatic phone answering ability or the two test modes included in the $650 DC/100, so they can buy the slightly less capable DC/101 for $550. Both couplers have a "carrier on" light to indicate that the volume of the incoming tone is adequate, and can operate at speeds of 300 baud. The tests circuits in the 100 are used to send a character from a tty keyboard and return it to the tty printer, thereby verifying the integrity of the coupler and of the tty, too. NOVATION, INC., Tarzana, Calif. For information:

CIRCLE 571 ON READER CARD

1130 real-time extender

The SYS 2113 extends the applicability of the IBM 1130 into areas such as data acquisition, telecommunication, and computer aided design, saving the user the expense of going to an 1800. The 2113 allows the 1130 to accept both analog and digital signals from sensing devices such as thermocouples, pressure and temperature transducers, flow meters, analytical instruments, and contacts. It permits the 1130 to provide digital and analog controlling signals for the user's controlling devices.

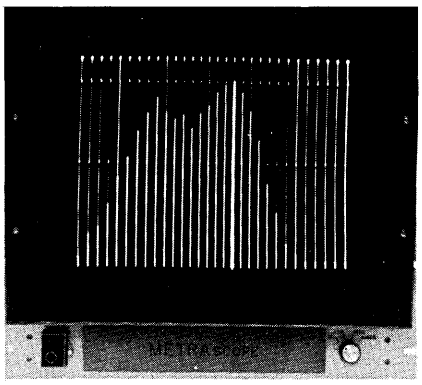
With the 2113-O, up to 24 I/O devices may be connected to the 1130 via the Storage Access Channel. The 2113-O forms the multiplexor link between the SAC and individual device controllers, and contains all the logic that is common to all device channels, i.e., it routes interrupt requests and input data into the SAC, distributes output data, strobes, device addresses, and other control signals to the individual device controllers. If more than 24 peripherals are to be connected to the computer via the SAC, a model 2113-1 Channel Control Unit Extender must be connected to one of the 24 ports of the 2113-O. A range of I/O devices and controllers are offered, including A/D and D/A converters,

crt's, multiple typewriters, Data-Phone interfaces, etc., supported by software that includes a real-time scheduling monitor. The extender can be added to any existing IBM 1130 that has a free SAC or SAC II channel. Prices start at $7500 for the 2113-O alone. SYS ASSOCIATES, INC., Fort Lee, N.J. For information:

CIRCLE 573 ON READER CARD

bargraph display

Up to 50 or more input channels, taken directly from thermocouples or other analog sources, can be sampled at a minimum rate of 40 Hz and displayed on the Metrascope 20 crt in bargraph form. Standard inputs are in the 5mv-5v range, but can be changed



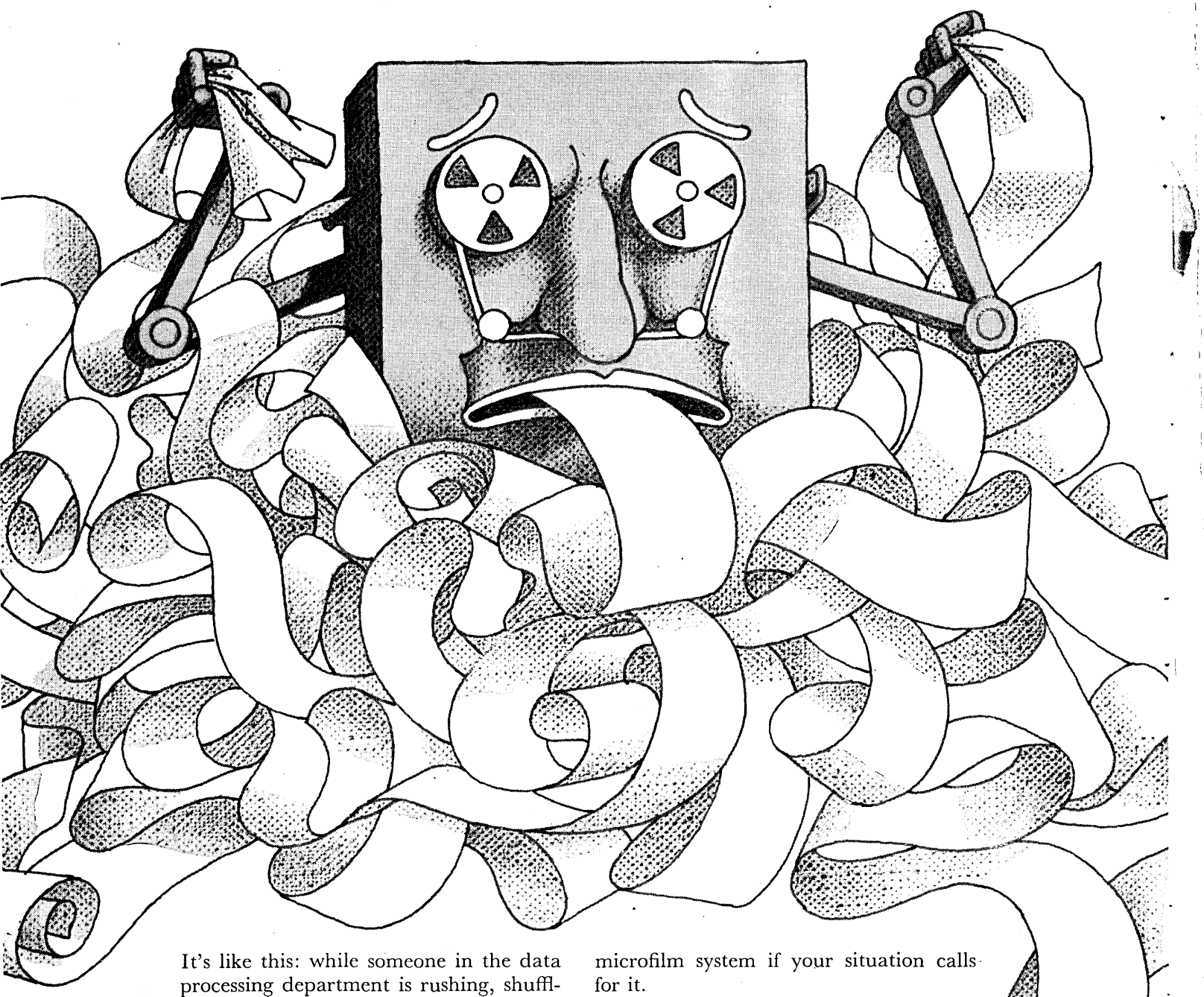
by a plug-in module. Alarms can be registered by brightening the appropriate data bar; similarly, every fifth bar can be brightened for reference purposes. The 20 inch display screen can be overlaid electronically with either of two grids; another plug-in module allows the grids, too, to be changed. The base price of the Metrascope is $3575 with channel multiplexing at $40 per channel. METRA INSTRUMENTS, INC., Mountain View, Calif. For information:

CIRCLE 578 ON READER CARD

magnetic tape system

The MTS 10/1130 is tailored expressly to IBM 1130 requirements. Completely plug compatible, the system uses the Kennedy model 3110 tape transport with interface matching 1130 I/O. The interface will handle one or two transports. A second transport can be merely plugged into an existing connector in the interface unit. Connections are made to the storage access channel for flexibility of operation. The 10/1130 provides data transfer rates up to 20KC. Standard features are two byte per word or packed operation (7-channel 1800 mode), character assembly/disassembly, record chaining, and parity check. Tape format is IBM-compati-

Your Computer needs a sidekick.



It's like this: while someone in the data processing department is rushing, shuffling, searching for a deck of tab cards or a magnetic tape, your super machine, the computer, is inoperative. The output is zero until the input can be found. Time is wasted. Money is squandered.

Remington Rand has the support your computer needs. Protective folders for master cards, fire-resistant file cabinets, Vis-U-Triever® units for alpha-numeric cross index, Lektriever® electro-mechanical filing system for tapes, cards or files — no one offers a broader line of computer accessories. We'll even install a complete microfilm system if your situation calls for it.

The unique thing about our data processing accessories systems is that they are unique. Since your computer set-up is unique to your business, the system that we recommend will be geared to suit your requirements, solve your problems — and yours alone.

Send today for a free copy of "Data Processing Accessories Systems," a complete listing of the computer sidekicks available. Remington Rand Office Systems Division, P. O. Box 171, Marietta, Ohio 45750. ®Reg. T.M. Sperry Rand.

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OFFICE SYSTEMS DIVISION

CIRCLE 212 ON READER CARD

ble, with either 556 bpi, 7-track or 800 bpi, 9-track available. Options include read-after-write check and fast search operation. Unit price is $12K; two decks, $20K. KENNEDY CO., Altadena, Calif. For information:

CIRCLE 581 ON READER CARD

digital plotter

The Graphic Data Model 71B digital plotter mates electronic writing and mechanical positioning to permit a line writing rate of from 4 to 10,000 ips. The system uses electrostatic paper which is written on by an electronic writing head comprised of a 10 by 10 matrix of wires. By appropriate addressing this head can write vector increments or complete characters.

The matrix design is said to permit unlimited character configurations to be easily programmed. Variable line width and intensity are also possible, together with a character printing speed of 80-100 cps. Digital electronics provide all control functions and the capability of generating vectors of any length. Format size is 11 by 17 inches. Spot size is .006 inch with positional accuracy of .005 inch non-accumulative. Price is under $27,000 including interfacing. Delivery requires 90-120 days ARO. GRAPHIC DATA, INC., Burlington, Mass. For information:

CIRCLE 574 ON READER CARD

1,024-bit memory

For code conversion, random logic synthesis, table look-up functions, and character generators, the MM522 MOS read-only memory is offered. Operating at a speed of less than 1 usec, the single chip provides its 1024 bits of information as either 256 x 4-bit words or 128 x 8-bit words, and is priced from $60-$96. NATIONAL SEMICONDUCTOR CORP., Santa Clara, Calif. For information:

CIRCLE 579 ON READER CARD

digitizing terminal

Digitizing is most often done by large-scale units with built-in cpu's, but that does not mean that smaller users do not require the capability. This premise, if proven correct, may put a new vendor on the map with the DT-1 Graphic Digitizing Terminal, a tty compatible small scale plot-to-cpu station. The DT-1's 10 x 15 inch surface has a horizontally sliding stylus mounted on a vertically sliding bar. The assembly is used to input three digits for each coordinate of graphical data through a tty. Operator controls are provided for also inputting program functions to format the data for subsequent replotting. The "unplotter" is priced at $5,885, which appears to be a "first" for this kind of capability. TIPCO, Littleton, Colo. For information:

CIRCLE 575 ON READER CARD

mag tape cleaner

The MTC-100 uses the conventional method of gently scraping the surface of the computer tape, but also employs a vacuum cleaner-like process that vibrates and sucks out dirt. A 10½-inch reel (2400 feet of ½-inch tape) can be cleaned in under four minutes. The unit sells for $1950. Delivery is 30-60 days ARO. P. G. FORET, INC., Sudbury, Mass. For information:

CIRCLE 580 ON READER CARD

analog-to-tty

For monitoring industrial or scientific applications where a single voltage or current output is produced, the model 3108 Analog-to-Teletype Coupler is offered. A small, 14-pound package, the 3108 can handle up to one input per second, and can be set manually to sample at 1, 2, 5, 10, 20, 50, or 100-second intervals. The operator can set the unit to take 1, 3, 10, or continuous readings. The Teletype record produced has a two-digit sample number and up to 10 three-digit plus overrange values. The standard input range is 0-100 mv or ma. The price is $1,595. BECKMAN INSTRUMENTS, INC., Fullerton, Calif. For information:

CIRCLE 576 ON READER CARD

impact printers

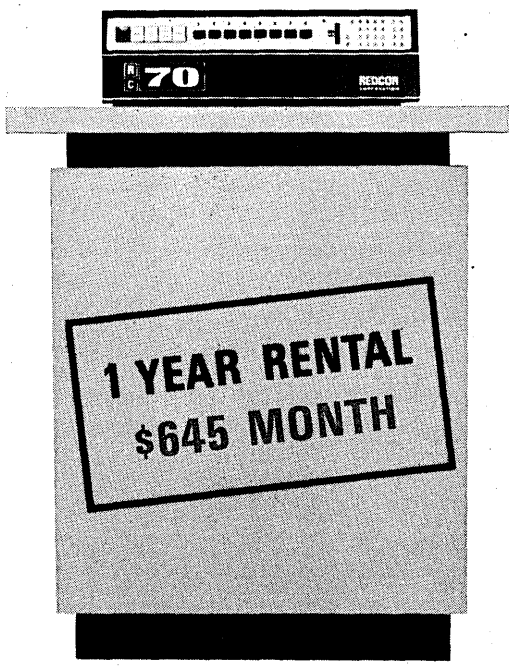
The Models 400A and 400B printers have rotating drum impact printing mechanisms and print 80 and 132 columns, respectively. They are available with 64 or 128 alphanumeric character sets with speeds of 1200 or 600 lpm. Both employ IC logic and LSI, and accept bit parallel, character serial data, using ASCII code. The 400A measures 41 inches wide, 47½ inches high, and is 29 inches deep, while the 400B is 46 inches wide. Prices are $14,250 and $17,850, respectively. Delivery requires four to six months. VOGUE INSTRUMENT CORP., Summit, N.J. For information:

CIRCLE 577 ON READER CARD

Rent the midi computer
at mini prices
— $645 month

RC 70

The Rentable MIDI*



Standard features include:

- 860-nanosecond cycle time
- 8K 16-bit word memory (user expandable to 32K)
- ASR 33
- High-speed multiply and divide
- Memory parity and memory protect
- Hardware fill switch
- Roll arrow feature
- Bi-directional index register

The RC 70 has no hidden costs—it does today's job and is user expandable in 4K increments to meet future requirements.

- Complete line of peripherals and interfaces available
- FORTRAN IV, Compiler, and Assembler
- Two-week delivery and field installation
- **PURCHASE: $21,500 (FOB destination)**
- **1 YEAR RENTAL $645 month**

***MIDI COMPUTER:** Submicrosecond 16-bit computer compactly packaged with megacycle throughput word rate for OEM and system requirements. The MIDI classification includes the RC 70, 516, SIGMA 2, 2116B, 810B, 1700, and as DEC says *the PDP 15.*

REDCOR CORPORATION

Complete Systems Capability / 7800 Deering Avenue, P.O. Box 1031, Canoga Park, California 91304—(213) 348-5892

new software

encyclopedia

Although not a software product, this publication should be mentioned here. "Software Packages: An Encyclopedic Guide" takes a couple of hundred of the best known software packages and briefly describes them. For each package offered, a specification sheet is given that describes the hardware needed, the operating system required, the documentation delivered, the program's age, language, and vendor. (Unfortunately a price is not always given.)

In addition to the spec sheet, a one or two page description of the subject program is appended. It describes—in narrative, not technical, form—the input, output, application, and performance claimed for the package. These pages do a good deal to make the specification sheets more meaningful. (For instance, count the inventory programs available for the 360/30.)

The encyclopedia is priced at $500, including a one-year quarterly updating service. Additional updates will run $400/year. The specification sheets alone are available for $185, including one year's updating. Subsequent updates run $125/year. Subscribers to the less expensive service will be given a 50% credit toward purchase of the encyclopedia should they desire it. SYSTEM INTERACTION CORP., New York, N.Y. For information:

CIRCLE 522 ON READER CARD

retrieval

The RSVP Version IV program (Report Service—Very Prompt) claims a high degree of efficiency because a generalized program is compiled for each custom report only once. Subsequent runs are load and go. Its unique feature is that the end user need not even understand a small subset of the program's COBOL language since a report booklet is provided in which the customer is given a choice of boxes to check and blanks to fill in. (Even little reminders are added throughout, such as "Is this a negative number?")

The program requires a 32K machine or larger with enough I/O capabilities to support sorting. RSVP IV will scan any file on any device that COBOL supports, and 30 user entry points are provided for handling non-supported file structures.

The version four program adds the facility for automatically generating JCL statements for the IBM DOS user, greater control over report format, and the ability to specify which portions of a file are to be scanned. The program is priced at under $10,000 including installation and maintenance. NATIONAL COMPUTING INDUSTRIES, Phoenix, Ariz. For information:

CIRCLE 523 ON READER CARD

planning

DEADLINE! is the name of a proprietary system developed for planning and scheduling computer center operations. The system can be used as a planning tool to evaluate equipment and configuration alternatives and to determine whether established deadlines can be met under varying workloads. The system also has the capability to evaluate staffing level, shift, and overtime alternatives, and to pinpoint imbalances and bottlenecks throughout the computer center.

Features include multiprocessing scheduling capability, consideration of primary and alternate equipment availabilities, consideration of inter-job dependencies and inherent physical delays, leveling of machine and manpower requirements, and schemes for handling job priorities and updating schedules. DEADLINE! is available for $7000 as a single computer center purchase right, or may be obtained on lease. It presently operates under OS/360, but versions for the Spectra/70 series and the CDC 6000 are expected shortly. SYNERGISTIC CYBERNETICS INC., Alexandria, Va. For information:

CIRCLE 524 ON READER CARD

debugging

Console Interface Program is said to reduce system integration and debug time on System/360 and Spectra/70 computers by as much as 40%. During program testing CIP intercepts any operator, program check, interval timer, or unrecoverable error (Spectra/70) interrupt and automatically displays the module name and the interrupt location in both absolute and relative values. The operator can then proceed to display core and registers both selectively and in total or, in a multiple module system, the individual modules may be displayed by module name. He may also modify core and registers, run the program from any desired location and stop at the designated location if desired, terminate the program with a normal halt, or automatically dump the module in error and allow the program to continue. Succeeding logic will be tested and debugged.

CIP may be used with BAL and COBOL programs and runs under IBM's TOS, DOS, or OS, and RCA's TDOS operating systems. Its output device may be a printer, tape, or typewriter. CIP sells for $1000, but is provided *free* for a 30-day trial period. WORLDWIDE COMPUTERS SERVICES INC., Hartsdale, N.Y. For information:

CIRCLE 525 ON READER CARD

360 testing

Testmaster COBOL/360 is a testing system which eliminates files from testing, makes job control cards identical for every test, and continues after an error is found, so that multiple errors can be pinpointed in a single run. The object code under test is identical to that which is used for production; it is not modified by statements such as TRACE or MONITOR. All testing instructions, including those for test data generation, are written in COBOL; all result values are printed in edited format. Testmaster presents the programmer with an exception report, typically reducing test output by 90%. Rental is under $275/mo. on a three-year lease. HOSKYNS SYSTEMS RESEARCH INC., New York, N.Y. For information:

CIRCLE 526 ON READER CARD

communications

IBM 2740 and 2260 terminals can be interfaced to an IBM 360/30 or larger using a program about half the size of IBM's standard software for the job, according to this supplier. "Standard software," by this definition, requires some 80K bytes for doing file entry and inquiry, maintaining terminal security, and logging I/O transactions by terminal. The On-Line Communication Software System can use 40K bytes for its network of 11 programs. Written using IBM's BTAM and QTAM to operate under DOS, the system maintains six permanent files and checkpoints for complete restart and error recovery. It is offered for $10K; installation, documentation, and training are included in that price. AMER-

new software...

ICAN SOFTWARE AND COMPUTER, Atlanta, Ga. For information:

CIRCLE 527 ON READER CARD

sigma 5 & 7 monitor

In addition to the standard Real-Time Batch Monitor features offered by SDS's older monitor, the new RBM executive can handle multiple user programs in the foreground, automatically checkpoint background operations if additional foreground memory is required, and call on an extensive library. Memory partitions can now be dynamically changed, and foreground tasks loaded from the background. Language processors supported include FORTRAN IV-H, Macro-Symbol, and the SL-1 simulation language. Service processors include a Rapid Access Data Editor and an Overlay Editor. The exec occupies 4K words of core, and requires a 16K system with an RAD (disc) file and I/O devices. Deliveries will begin this fall. SCIENTIFIC DATA SYSTEMS, El Segundo, Calif. For information:

CIRCLE 528 ON READER CARD

sigma 2 releases

The SDS people have been busy at their software tasks apparently, for they have introduced a batch of Sigma 2 software recently, including an upgraded version of the Real-Time Batch Monitor, a civil engineering package, and 130 scientific routines.

The Monitor, RBM-II, offers an upgraded debug package which allows users to insert code or dump instructions dynamically (the old debug was somewhat comparable to a "dump" instruction). RBM-II also has a character-oriented communications facility for translating between ASCII and EBCDIC, the Sigma 2's internal code. Finally, the monitor also offers an accounting subsystem for determining whose program has been tying up so much machine time, and for determining how much time is spent in foreground or background processing or idle. In spite of all these additions, the new monitor is smaller, at about 4½ -5½ K 16-bit words, than its predecessor.

The civil engineering package implemented is COGO (coordinate geometry), will take some 9-10K of core, and be used for such things as highway and bridge design. It is written in FORTRAN.

Also in FORTRAN are the 130 scientific routines. Included are: multiple linear regression, matrix arithmetic, Fourier analysis, etc. SCIENTIFIC DATA SYSTEMS, El Segundo, Calif. For information:

CIRCLE 529 ON READER CARD

digital filtering

This scientific package generates the parameters for lowpass, highpass, bandpass, and band reject digital filters. Users can opt to implement Butterworth or Chebyshev ripple characteristics in a number of ways. (Applications for this kind of processing are found in acoustics, communications, process control and some gp data reduction.) It digitally duplicates the characteristics of certain classes of electronic circuits for implementation on a computer. Called DIGIFIL, the program is sold in a package that includes one complete program and several copies of the major subroutine for tacking onto the user's own software.

Written in a subset of FORTRAN, DIGIFIL can be implemented on a 360/40 or larger machine. The source deck comprises about 1000 statements. A ten-year lease is offered for $1,500. Documentation includes a 60-page user's manual and a 30-page bibliography. UNIVERSITY SOFTWARE SYSTEMS, Los Angeles, Calif. For information:

CIRCLE 530 ON READER CARD

payroll

The OCC Self-Adapting Payroll System gets its name from its ability to accommodate several companies' data in the same computer run. Each company's payroll data is identified with a parameter card which also gives the pay period (which may be important for, say, the second paycheck of the month when medical insurance premiums are subtracted), thus giving the program one more thing to adapt to. Written in COBOL, the system includes some 17 routines, two or three of which use up almost 64K bytes of core each. Permanent files of company data and pay schedules are maintained; these profiles contain such information as state, city, and county tax formulas, and deduction names and frequencies. A free-form data input capability is used to alter the profiles.

The system requires a configuration that includes one disc drive, at least two tape handlers, and 64K bytes of storage. It sells for $8,000 and leases for $200/mo. on a minimum one-year contract. Five days of support are given, split between education and installation. Maintenance and customizing is extra. OCCIDENTAL COMPUTER CORP., Riverside, Calif. For information:

CIRCLE 531 ON READER CARD

inventory

Some of the items that the Materials and Supplies Inventory System is designed to handle are: management, engineering, cost accounting, general accounting, purchasing, warehouse bookkeeping with controls for inventory, forecasting with three models, exception reporting at various levels, and complete auditing. Written in COBOL, the system requires a 360/40 or larger machine (we bet the "or larger" part really comes in handy if you are trying to do even half of those things listed) and sells for $20K. Installation, documentation, and training are included in the price. PROCESS CONSULTING AND COMPUTING, INC., San Diego, Calif. For information:

CIRCLE 532 ON READER CARD

os/360 time-sharing

A time-sharing capability is being added to OS/360. Appropriately named CALL/360-OS, the new package will operate as a task under OS/360 MFT and occupy one partition of memory. BASIC, FORTRAN, and PL/I will all be available under CALL/360-OS. A terminal command language can be used to create and modify program files, define and redefine data files, compile and execute programs, and bring into operation programs stored in CALL/360-OS libraries. Minimum system configuration is a 360/50 with at least 384K bytes of main core storage, or a Model 65, 75, or 85 having a minimum of 512K bytes. CALL/360-OS is scheduled to be available in the second quarter of 1970. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 533 ON READER CARD

t-s for pdp-8

A time-sharing system written in FOCAL permits use of the PDP-8, -8/I, or -8/L to serve seven or more terminals. The system is designed for education and engineering applications, but is expected to find a variety of other uses. In addition to the PDP-8 cpu, hardware required consists of a 4K memory extension, and a 32K word disc. With additional core memory and other hardware options, the number of terminals can be increased to 16 and the system made general purpose, giving it the capability of using additional languages. Disc capacity can vary up to over a million words, depending on user requirements. In all cases, FOCAL permits the storage of programs in a common library on the disc.

The system is designed so that if a

user writes a program requiring more than his alloted space in core memory, that program can be broken into segments, and the needed segments stored on the disc. When it is time to call up this program, FOCAL first removes the segment that is in core, then takes the remaining segments from the disc, automatically chaining the program together in its proper sequence. There is common storage of up to five variables between segments. The system will be distributed gratis to PDP users, but in case you're lacking some hardware, prices are $12,800 for a PDP-8/I, $3500 for an extra 4K memory, $6000 for a 32K disc, $5300 for interfacing, and $7200 for six Teletypes. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 534 ON READER CARD

communications

Intercomm is a communication monitor which is billed as "the missing link in communications software." It's intended to aid the System/360 user in making the transition from batch processing to an on-line or real-time environment by performing three basic functions: (1) controlling the teleprocessing environment; (2) controlling the data and file handling environment; and (3) scheduling all the various application programs. The Intercomm interface takes advantage of 360 hardware features, the data management capabilities of OS and DOS, and the access techniques provided by BTAM and QTAM. Intercomm also permits a "total communications environment" with COBOL, BAL, PL/I, FORTRAN, APL, or RPG application programs. By functioning as a complete communications monitor, it is said to allow the user to concentrate on application development.

The monitor operates in a multiprogramming, multitasking, real-time or stand-alone environment. Background partitions can operate concurrently with the monitor, which may function either as a batch or teleprocessing supervisor. Intercomm assumes full responsibility for the I/O functions, the scheduling of application programs, and their full overlapped processing. Since the control of I/O data is handled by the monitor, "training of additional personnel is unnecessary in order to go on-line." Using Intercomm, "the transmission of input and output to or from a data file or an on-line remote terminal is completely transparent to the application programmer." The monitor runs on any 360/40 or above and costs about $50,000. PROGRAMMING METHODS, INC., New York, N.Y. For information:

CIRCLE 535 ON READER CARD

editing

A language with only 18 commands does not sound very powerful, but the vendor of Data Check Express says that it can cut the program size for editing routines by 85%-90% compared with COBOL. Similar reductions are claimed for FORTRAN and PL/I programs. Data Check Express is designed for data checking, validating, and correcting, and for file updating and restructuring. It is designed to operate on a 65K byte machine with two to six sequential I/O file devices (tape, disc, or card) and FORTRAN IV support. The program is claimed to be simple enough to master in a few hours, and is priced at $10,000. Additional system modules, for merging and table look-up, will be offered in the near future at additional cost. EXPRESS SOFTWARE SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 536 ON READER CARD

data center series

Small commercial dp users will have access to bookkeeping, operation control, and management routines packaged under the name of QUIK DATA if their local service bureau or time vendor, in turn, purchases the QUIK DATA programs from this franchiser. A group of highly nested FORTRAN routines, the package has been implemented in as little space as 6K characters on a GE 265 but is available for almost all machines. Included in the multiple part system are routines for payroll, accounts receivable, inventory, job scheduling, cpm, project forecasting, cash flow analysis, and many other functions. A completely canned batch of these runs the service bureau about $590/mo.

Unlike most software sold to or generated by service bureaus, QUIK DATA was designed to be franchised. It can become a part of a larger offering called FILEMASTER which includes scientific routines for digital filtering, computer graphics, statistics, etc. Among other past big scale applications of FILEMASTER, it was used in the Los Angeles Transit study for generating 1200 maps. Included in FILEMASTER, for the franchisee's benefit, are automatically implemented routines for figuring how much time each user has racked up on each program and what it should cost him. The series, including the QUIK DATA portion, typically rents for $1,500-$1,600, and might prove attractive to large aerospace, government, or manufacturing users as well as bureaus. DATASYSTEM RESEARCH AND ENGR. SERVICES, Santa Monica, Calif. For information:

CIRCLE 539 ON READER CARD

programming estimating

It's funny how programmers are often the last to take advantage of the compute power they have at their disposal. Give them a problem like estimating the number of man-hours it will take to code a program for a specific application, and they will probably try to figure it out in their heads. This program, called ESP for Estimating Source Programs, is designed to do that for them more accurately than they can. The user defines five levels of program complexity for commercial applications, and three levels of programmer competence, and gives programmer cost per hour figures (from $5 to $15 per hour), number of I/O files, data fields and print lines to be generated. ESP then churns out the estimated man-hours, estimated programming cost, and estimated number of source statements in the final code. The base price for ESP is $400, and that includes documentation and installation instructions. COMPUTER RESOURCES CORP., Dallas, Texas. For information:

CIRCLE 538 ON READER CARD

nonlinear programming

The Nonlinear Programming System minimizes or maximizes a general nonlinear function subject to linear constraints. It can handle problems of up to 60 variables and 120 constraints. For a convex nonlinear function, it will yield a unique solution. Programmed in FORTRAN IV, NPS should be compatible with almost any hardware. Installation, training and maintenance are all included in the $10K price. (An unusual lease price is listed as $5K/year. That makes it pretty definite that the vendor would rather sell.) A narrative description, I/O and file descriptions, user and operating instructions are also included in the purchase price. INNOVATION RESEARCH CORP., New York, N.Y. For information:

CIRCLE 540 ON READER CARD

DUST IS A 4 LETTER WORD

and your memory systems HATE it!

"Dust in our memory systems? NEVER...incoming air is filtered and we clean the systems regularly!"

DON'T BE TOO SURE! Microscopic particles *are* there...they may be building up on heads and drums or disks and lead *inevitably* to head crashes or drastically reduced disk or drum life! Hear what experts say:

"When heads smash onto the surface of a rotating disk or drum—instead of "flying" on a layer of air a few millionths of an inch above—magnetic material gets scraped off. Dust particles and mechanical instabilities are the chief causes of such crashes": Michael French, BCD Computing Corp., Deer Park, N.Y.; *Electronics,* May 26, 1969

"Disk packs do gradually become degraded from minute particle collisions between the flying heads and the disk surface. Even tiny particles of dust can cause abrasions in the disk surface which will eventually produce data errors": *Modern Data,* December, 1968

"The figures show that after the audit* was performed, system downtime for various reasons increased during normal working hours about 3000% (30 to 1) over the average for the previous three months": Peter L. Briggs, *Computerworld,* April 23, 1969. *(primarily cleaning in memory systems)

Where does DUST (microscopic particles) come from? It may be generated within the memory environment. It may be from leaks in the air filtration system. BUT, can you tell excess particles are there before a catastrophic head crash occurs? YOU CAN...by using a new, continuous method of monitoring for microscopic particles within the memory system. It involves a Royco particle counter that counts and sizes airborne particles as small as 0.5 μm. When the particle count accelerates precipitously you know *immediately* that something is wrong with either the filter or the moving parts. You stop the system and locate and correct the cause before costly damage occurs. Every major computer manufacturer uses Royco instrumentation in the design, production and testing of disk and drum memory systems. It pays off for them handsomely in lower costs!

YOU, TOO, CAN PROFIT FROM ROYCO! ONLY ROYCO OFFERS...

(1) Free demonstration of its particle counting instrumentation. (2) Site and equipment survey at a nominal cost. (3) Full complement of lease and purchase programs. (4) Technical familiarity with computer hardware.

Get further information! Please fill out this coupon and mail

ROYCO
INSTRUMENTS INC., 141 Jefferson Dr., Menlo Park, Calif.

Gentlemen: I am interested in particle monitoring of computer memory systems.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY_____

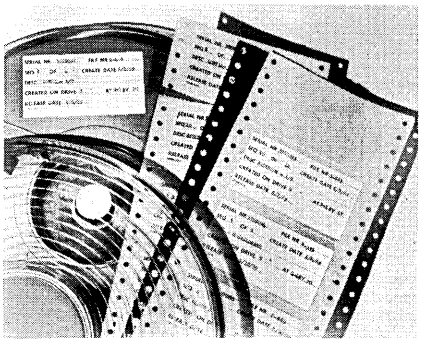
STATE_____ ZIP_____ PHONE_____

My interests are related to (please check)

- ☐ Design of memory systems
- ☐ Testing memory system manufacture
- ☐ Maintaining memory systems
- ☐ I am a user of memory systems

new literature

TAPE REEL LABEL/FILE CARD: Dual pin-feed form consists of an imprinted pressure-sensitive tape reel label and a carbon interleaved file card form upon which data is printed simultaneously.



The file card becomes a record of the work performed. These labels can be custom designed in several sizes and formats. Samples will be sent. ALLEN HOLLANDER CO/KIMBALL SYSTEMS, Belleville, N.J. For copy:

CIRCLE 500 ON READER CARD

INTEGRATED CIRCUITS: 86-page catalog describes the company's line of integrated circuits. Typical characteristics, as well as logics and schematics, are given for the 200 and 930 series of DTL circuits, the Ray I, II, III series of TTL circuits, and complex and linear circuits. RAYTHEON CO., Lexington, Mass. For copy:

CIRCLE 503 ON READER CARD

DATA TERMINAL: Four-page brochure describes the VDT-3 data terminal which operates over normal voice grade telephone circuits, replacing leased equipment and costly data lines. Designed specifically for time-shared computer applications, the transportable terminal includes a telephone/computer coupler and a tape reader/perforator as standard features. Only an AC outlet and a telephone are required for operation. Satisfactory operation can be maintained on telephone circuits having 20 db or less overall attenuation. Teleprinter and coupler specifications are given in the brochure. The VDT-3 can be delivered within 24 hours. VERNITRON CORP., Farmingdale, N.Y. For copy:

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OCR SYSTEM: Ten-page brochure describes the COC-5 five-bar optical character recognition system especially suitable for bank use that eliminates the need to produce an intermediate document for translation back to the computer when it is returned with payment. Original documents can be printed at 1200 lpm; the characters can be read at 1200 lpm, simultaneously and at the same speed as MICR. Equipment modifications for COC-5 can be made in a few hours. The brochure cites customer experiences in credit card, mortgage loan, and installment loan applications. GENERAL ELECTRIC INFORMATION SYSTEMS, Schenectady, N.Y. For copy:

CIRCLE 502 ON READER CARD

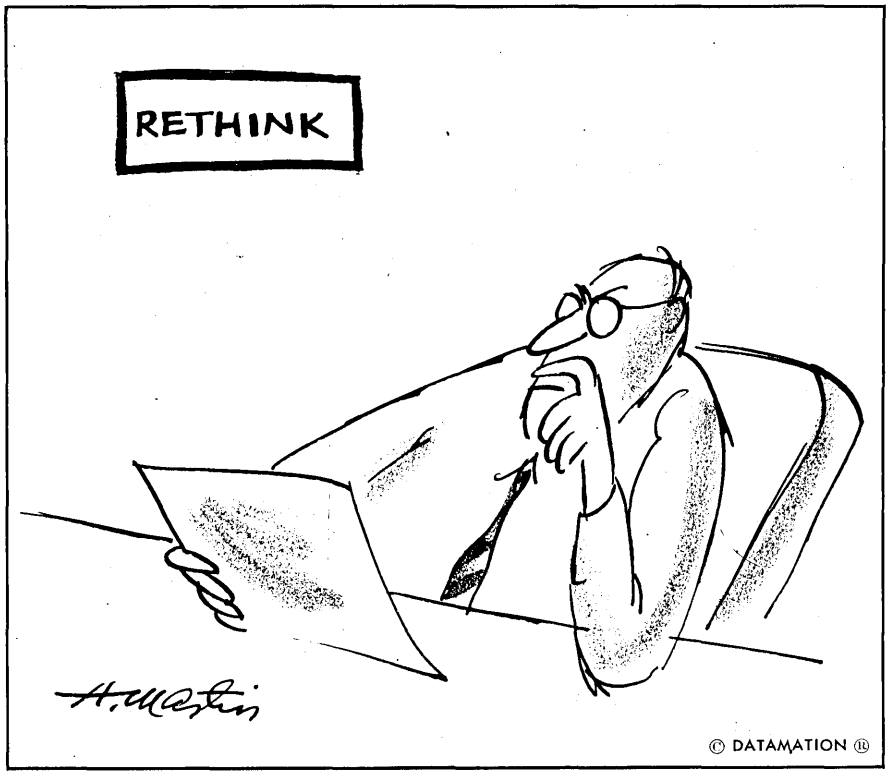
FILE MANAGEMENT SYSTEM: Bulletin describes PACK, a file management system for IBM 360's which allows accessing disced records either sequentially or non-sequentially, provides for maintaining generation data sets and backups without copying entire files, and services teleprocessing terminals. PACK requires knowing only seven verbs and works with any IBM-supported language. It automatically compresses records at write-time by removing strings of zeros and spaces and automatically reformats them at read-time, thus reducing disc space and computer time, the company claims, to less than 10% of current requirements. AUTOMATIC INFORMATION MANAGEMENT, Encino, Calif. For copy:

CIRCLE 504 ON READER CARD

INSTRUMENTATION HANDBOOK: 100-page brochure for users of electronic instrumentation contains technical and application information on subjects including magnetic tape recording/reproducing, oscillography, signal conditioning, magnetic heads. Glossaries, diagrams, technical articles, and product information are included. BELL & HOWELL, Pasadena, Calif. For copy:

CIRCLE 505 ON READER CARD

TELEPRINTER: Four-page brochure describes the commercial version of the AN-16 military/teleprinter. The SP-20 is a compact (4.6" x 8.75" x 8.31") lightweight (8.5 lbs maximum) unit that will accept input at standard



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DTμL logic levels in six-line, parallel, binary (ASCII) code, or serial entry. Printout of alphanumeric data (64 characters) on pressure-sensitive paper is at rates up to 1200 characters per minute. CLARY CORP., San Gabriel, Calif. For copy:

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SYSTEMS ANALYSIS TRAINING: Brochure describes a course designed to provide the new man to systems work with an intense exposure to the fundamentals of systems analysis and an immediate plunge into a real systems problem and solution. The first part of the training is a correspondence precourse that includes reading and written assignments. The second part is a workshop in which registrants apply principles when completing work projects involving a simulated organization's systems problems. This CORRESIMAR is produced and fulfilled under the direction of the Foundation for Administrative Research. SYSTEMATION, INC., Colorado Springs, Colo. For copy:

CIRCLE 507 ON READER CARD

COMMUNICATIONS POLICY: Volume I (518 pages) of "Regulatory and Policy Problems Presented by the Interdependence of Computer and Communications Services and Facilities" contains sections on policy issues presented by this interdependence, analysis of policy issues in the responses to the FCC computer inquiry, decision analysis of the FCC inquiry, and patterns of technology in data processing and data communications. Order PB-183 612. Volume II, 288 pages, contains sections on digests of the responses to the FCC computer inquiry, a preface to a theory of regulation, and a dynamic financial model of a utility. Order PB-183 613. The reports were done by the Stanford Research Inst. for the FCC. Cost: $3 each; microfiche, $.65 each. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

TIME-SHARING SUPPLIES: Eight-page catalog describes terminal products for time-sharing users. Products offered by the company include keyboard terminals with acoustically coupled data sets; special projectors for displaying time-shared computer output to large audiences; acoustic shields for quieting terminals; paper tape winders, unwinders, rewinders and splicers; paper tape storage devices; forms, tapes and ribbons for terminals; and other convenience accessories. REMOTE COMPUTING SERVICES, Glen Ellyn, Ill. For copy:

CIRCLE 508 ON READER CARD

DATA MANAGEMENT SYSTEMS: 198-page report done for the Defense Communications Agency surveys salient characteristics of a representative set of state-of-the-art data management systems. AD-684 707. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

ELECTRONICS MARKETING: 52-page selective bibliography of data sources for marketers in the electronics industry contains descriptive information on domestic and foreign periodicals, sources of statistical surveys, and selected services offered by research organizations. Categories of domestic sources include advertising- and subscription-supported periodicals; association journals; directories, handbooks and services provided by pub-

lishers; marketing, abstracting, and statistical reporting services; U.S. government publications and services; and selected forecasting institutes and consulting firms. Sources to aid in foreign marketing include those supplied by the U.S. government, periodicals and services of foreign origin, and periodicals of U.S. origin. Order *Ness Bibliography;* cost, $25. NESS CONSULTANTS, 422 Waverly St., Palo Alto, Calif. 94301.

AUTOMATIC MEASUREMENT: Sixteen-page brochure discusses the importance of digital data acquisition in various disciplines and the advantages of automatic data handling over chart recorder/visual/manual methods. Annual costs with multi-channel pen recorders are compared with the costs of the company's automatic-measurement methods giving computer-compatible results at the conclusion of a test run without need for human data reduction. Also discussed are five major points to be considered in selecting the best automatic-measurement system for a particular data-handling requirement. Printed tape, punched paper tape, magnetic tape or teletypewriter can be used for recording the data. VIDAR CORP., Mountain View, Calif. For copy:

CIRCLE 510 ON READER CARD

BADGE READERS: Eight-page brochure describes the company's line of ID badge readers, giving technical specifications, as well as typical uses and options. The badge readers provide a man-to-system interface using the standard plastic ID badges punched with a Hollerith code. They are designed for time-clock, credit, identification, access control, and cost control data systems. SEALECTRO CORP., Mamaroneck, N.Y. For copy:

CIRCLE 511 ON READER CARD

ENGINEERING PROGRAMS: Literature describes a set of programs designed to eliminate manual calculations from most civil engineering tasks. Four of the seven Integrated Civil Engineering System (ICES) programs are available on a time-shared basis in the Pacific Northwest. They are: COGO, for coordinate geometry; STRUDLE, for structural analysis; ROADS, for roadway design and quantity earthwork computations; and PROJECT, a critical path method for project control of manpower, equipment and materials. Scheduled for implementation to the system are: SEPOL, for predicting foundation settlement; BRIDGE, for designing bridges; and TRANSET, for predicting and analyzing transportation networks. EDP CENTRAL, INC., Portland, Ore. For copy:

CIRCLE 512 ON READER CARD

DATA ACQUISITION: Eight-page brochure describes the series 3900 ASTROVERTER data acquisition instrument that can be adapted to the desired application by changing the configuration of a family of 5″ x 5″ plug-in cards. The instrument is especially useful in real-time computer applications. A 12-page insert in the brochure gives complete specifications of the ASTROVERTER when used in five of its more than 1000 assorted circuit-card configurations: as a multiplexer, an A/D converter, a D/A converter, a sample-and-hold amplifier, and a differential amplifier. ASTRODATA, INC., Anaheim, Calif. For copy:

CIRCLE 513 ON READER CARD

ACQUISITION-MERGER STUDY: 81-page report, commissioned by the Governor of Wisconsin, is aimed at measuring employment and payroll growth of the acquired firms as compared to the rapid economic growth within the state as

new literature ...

a whole. The study should be of interest to instrumentation, automation and data processing company executives looking into present or potential acquisition or merger activities. While the study is directly applicable to Wisconsin, its findings may be projected to most other states, according to the author. Survey findings include effects on growth rate of employment and payroll, on business by local service organizations, and on relations between managements of acquired and acquiring company. Recommendations include possible legislative measures and more careful investigation of merger problems before they are undertaken. DEVELOPMENT COUNSELLORS INTERNATIONAL, LTD., New York, N.Y. For copy:

CIRCLE 509 ON READER CARD

COMPONENTS CATALOG: 344-page book lists, describes, and provides OEM pricing for a complete selection of the electronic parts and equipment available from 50 manufacturers. Products include connectors, resistors, controls, capacitors, S/C parameters, semiconductors, tubes, switches, relays, batteries, transformers, wire and cable, lamps and fuses, racks and cabinets, chemicals and tools, and test instruments. The catalog also includes services offered by the distributor, such as component testing, connector and subsystem assembly, custom marking of components, burn-in facilities, aging services, go/no data recording, and device selection. Letterhead inquiries should be addressed to TI SUPPLY, 6000 Denton Dr., Dallas, Tex. 75235.

DP FORMS: Portfolio of data processing forms contains samples of invoices, statements, checks, continuous income tax forms, management reports, tab report binders—both standard stock-type and specially designed—for use by dp service companies. SHELBY BUSINESS FORMS, INC., Shelby, Ohio. For copy:

CIRCLE 514 ON READER CARD

DATA SET: Four-page brochure describes the Transidata T202C data set which transmits and receives asynchronous serial digital data over private lines at up to 1800 bps and over the DDD network at up to 1200 bps. The T202C is end-to-end compatible with all Western Electric 202 type data sets and 801A and 801C automatic calling units. SANGAMO ELECTRIC CO., Springfield, Ill. For copy:

CIRCLE 515 ON READER CARD

SIGNAL AVERAGER: 24-page brochure describes the series 1070 laboratory instrument computer, the company's newest signal averaging system. Capabilities range from basic data acquisition to complex time-series analysis. A variety of plug-in modules and readout options, including crt numerical readout, are available. In addition, the system can be used with a general purpose computer. FABRI-TEK INSTRUMENTS, INC., Madison, Wis. For copy:

CIRCLE 516 ON READER CARD

LOGIC MODULES: 20-page brochure describes the 70 products in the company's line of digital logic modules, including 2MHZ, 5MHZ and 10MHZ logic cards and I/O modules. The cards are user oriented and are designed for general purpose system application. STANDARD LOGIC INC., Santa Ana, Calif. For copy:

CIRCLE 517 ON READER CARD

DATA COMMUNICATION SYSTEM: Two-page bulletin describes the Ultracom data communication system which, through the use of advanced time division multiplexing techniques, permits transmitting and receiving data from many terminals simultaneously through a single voice-grade line. ULTRONIC SYSTEMS CORP., Moorestown, N.J. For copy:

CIRCLE 518 ON READER CARD

DATA LOGGING: Ten-page brochure describes the series DL-100 data logging system that converts analog or digital data into computer-usable formats in punched tape, page printout, and other media. The system may be ordered with interfacing equipment compatible with almost any input and output characteristics found in data processing facilities. INVAC CORP., DIV. OF DIGITRONICS, Waltham, Mass. For copy:

CIRCLE 519 ON READER CARD

BIBLIOGRAPHY: 242-page Defense Documentation Center bibliography contains 186 references relating to the processes of information handling and the application of fundamental mathematical theory to the construction or better understanding of information systems. All documents listed are available from the Clearinghouse. AD-683 600. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

FILTERS: Four data sheets describe RFI filter models F-5120, F-5121, F-5122, and F-5177, recently recognized under the Components Program of Underwriters' Laboratories. The filters, designed expressly for use in dp equipment, provide maximum suppression of radio frequency interference and other extraneous signals. The literature contains data such as voltage rating, frequency, amperage, together with outline drawings and schematics. HOPKINS ENGINEERING CO., San Fernando, Calif. For copy:

CIRCLE 520 ON READER CARD

DB TABLES: This one-page (8½ x 11) technical information sheet should be of interest to systems engineers using decibels as tools for precise measurement. The tables provide per cent deviation of voltage and power to dB. PACIFIC MEASUREMENTS, INC., Palo Alto, Calif. For copy:

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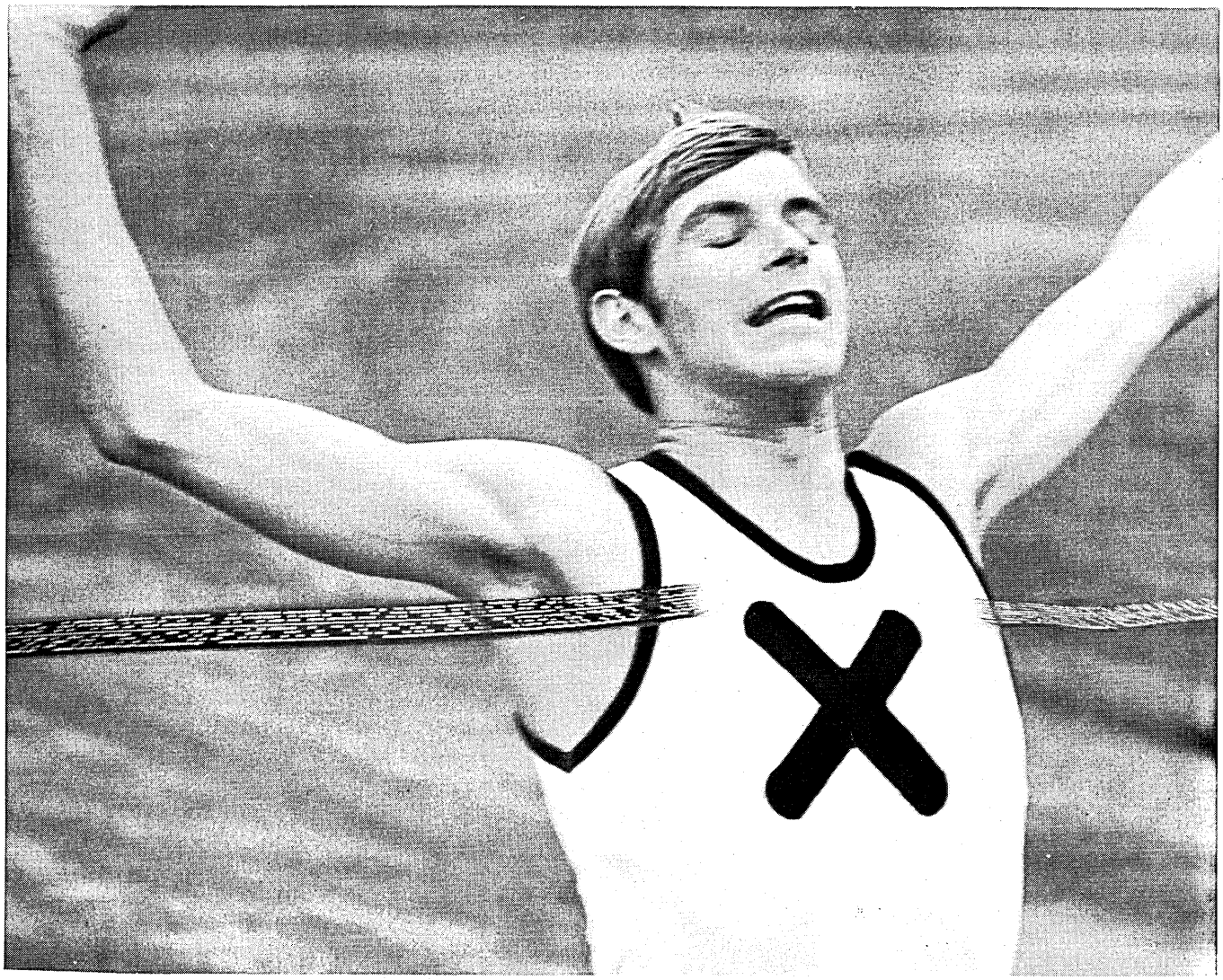

CIRCLE 167 ON READER CARD

world report

REPORT SHOWS COMPUTER SHORTAGE AT U.K. UNIVERSITIES

Universities in the U.K. found cold comfort in a report just published by the Computer Board for Universities and Research Councils. Reviewing progress to combat all-around shortages, the board comments that constraints on expenditure due to general economic conditions have hampered the first three years of a crash programme to set matters right across the broad spectrum of computing facilities needed by university departments, research institutions and higher education.

The crash programme was started after a survey made by a committee under Professor Bryan Flowers. His team concluded that a tenfold increase was needed in power by 1970 over the installation capacity existing at the end of '65. Less than half of this goal will now be realized. One outstanding reason for the failure to reach the target is that plans were based on promises from manufacturers on dates for completion of some big systems. These were machines which were to be located at regional centres—particularly London and Manchester—to service areas of high concentration of students, researchers and academic institutions.

The board considers all recommendations for machines financed from public funds. The requirements of most universities have been met by choosing British machines. Before the mergers in the industry to produce one major U.K. firm, ICL, this meant selecting equipment from ICT, Elliotts and English Electric. Four systems of U.S. make have been installed, a 360/65 for University College, London, a CDC 6600 for the University of London, and a 360/67 shared by Newcastle and Durham universities. An additional 360/44 was recently allowed for St. Andrews, Scotland, because of a very acute problem for machine time around Edinburgh and east Scotland.

Of equipment worth $27 million ordered in the first three years of operation, 15% has been for American machines. This includes rental terms for the CDC 6600.

In general, university machines are usually bought outright. At the time of the Flowers examination of needs, the IBM 360/92 and CDC 6800 were expected to become available within three to four years. On this basis recommendations were accepted for one of these systems to be considered for London and the other for Manchester for installation about the end of '68. Neither of these plans worked out and the board has now decided that the big machine announced last year by ICL, the 1908A, is as good a buy as other big systems available. But it will not be ready for another two years. So the original Flowers schedule for upgrading universities has fallen well short.

A section on the efficiency of usage and software for university computers has generated most steam from the vociferous academics. The report points out that the diversity of job mix in the university sphere makes the software problems nightmarish. It berates industry for the lack of standard system software for achieving even a near-optimum performance in the

(Continued on page 191)

Babel translated here

Our Biblical forebearers weren't the only technicians who couldn't build a stairway to the stars because of a language barrier. In data processing, we talk COBOL, FORTRAN, ALGOL, ADPAC, BASIC. Whatever the language, you still find yourself with a back-breaking backlog. ☐ When you have to get a system operating and meet schedules, the problems are complex enough without more of the same from your software supplier. ☐ At DMS, our specialty is simplicity. Our business arrangements are straight-forward to the point of being blunt. So our discussions get right down to the nuts and bolts of your system. ☐ If contract or program gobbledygook is slowing up work on your tower, give us a call. We speak everything but double-talk.

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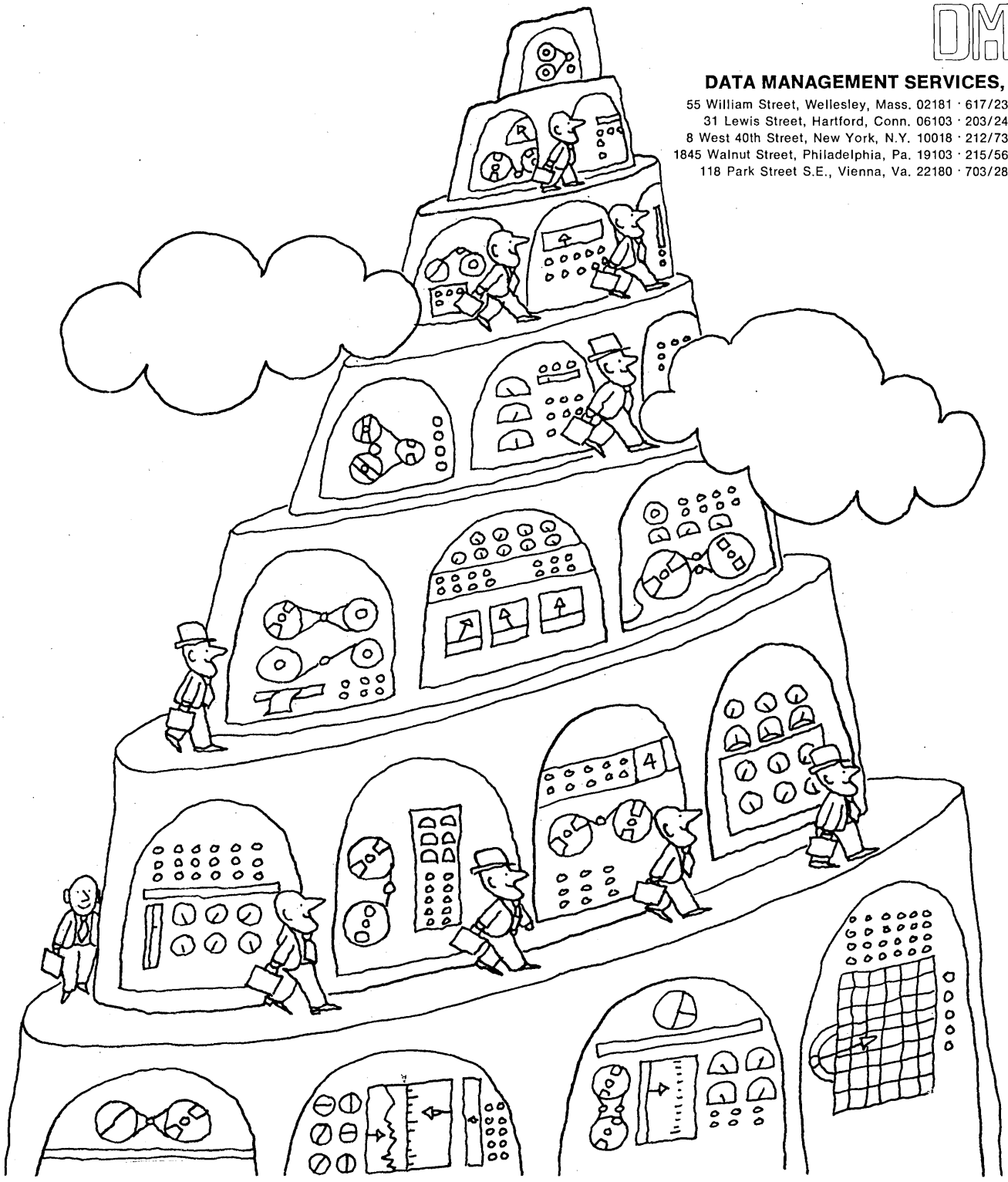


university environment. Specially developed in-house software—a feature of almost every department, let alone university—is considered laudable but an unsatisfactory answer to the problem. Duplication of effort and subsequent difficulties of development and software maintenance are listed as the evils of indiscriminate in-house work. Common agreement on a specification of university software requirements is proposed for representation to manufacturers. In fact, more coordination and cooperation in general between universities would go a long way to relieving difficulties, the board said.

As manufacturers cannot be expected to provide the special software needed by universities, a further recommendation is for negotiations to pay for hardware alone with a separate deal for software either from the equipment house or an independent. The idea has been put out for debate rather than stated policy as the members of the Computer Board are not unanimous in believing this to be a correct course. The cost of running university systems has always been worked out in a bit of an arbitrary fashion in the U.K. But the plan to introduce regional centres running a mass of time-sharing data intermingled with large batch dp jobs has made pricing of services a very live issue.

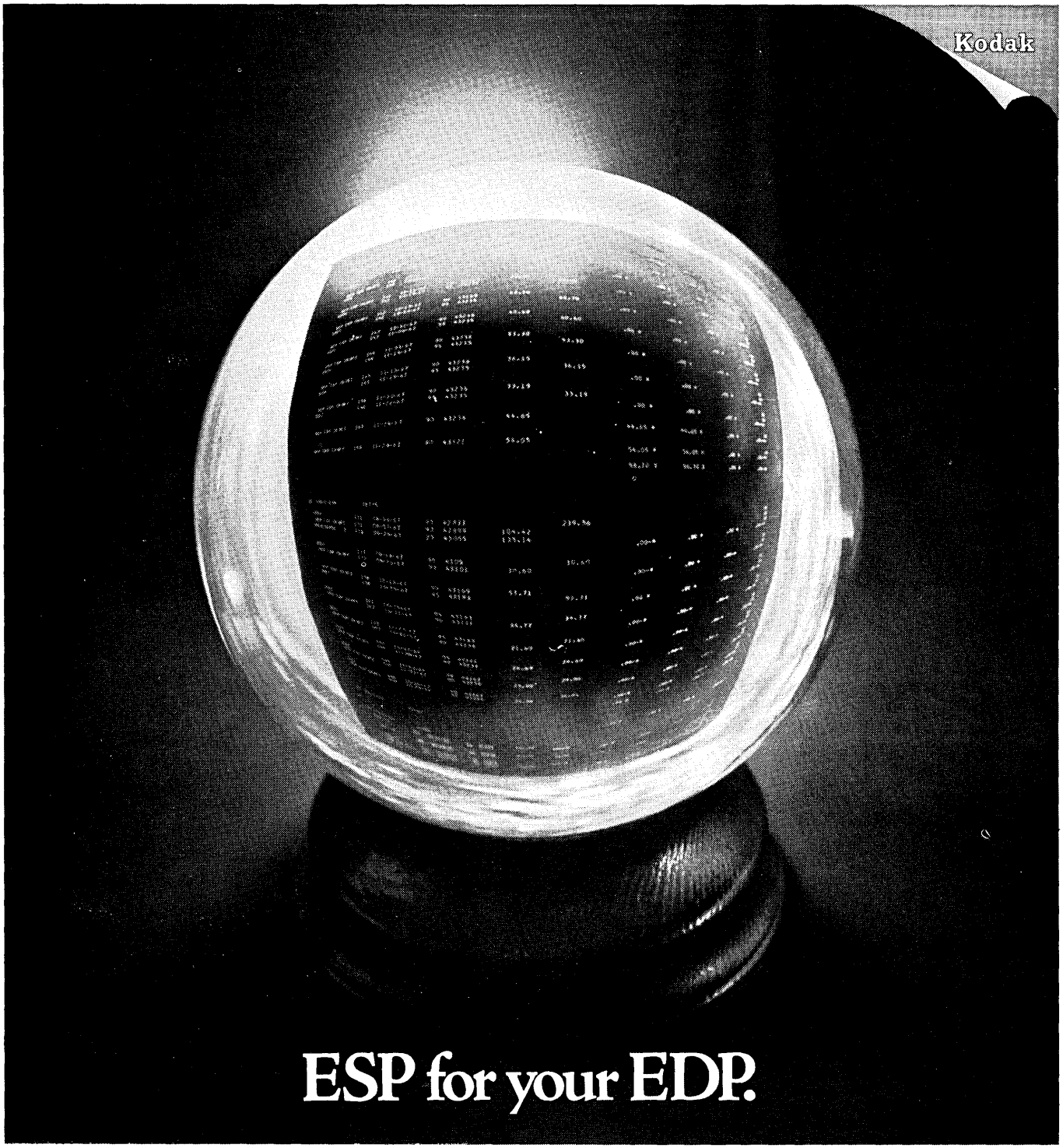
BRITISH WORRY ABOUT PRIVACY TOO

Renewed fears on the question of data banks and invasion of privacy were raised in the British Parliament. The Upper Chamber, the House of Lords, debated the subject with some heat. The issue has been brought to public attention by dissertations prepared by the opposition party's (Conservatives) law study group who would like safeguards such as protection of an individual's right to know what has been recorded about him and to be granted an injunction so that any incorrect information must be deleted. A similar proposition has come from a Parliamentary group from all parties who support the Council for Civil Liberties.

In the not unusual inconclusive termination of Lords debates, the Lord Chancellor (Lord Gardiner) said the Government would not want to put everyone on computer records just for the sake of it. But in some circumstances, such as an accident victim who was unconscious, there was an obvious benefit to be gained if his health record could be made instantly available to a doctor through a computer. However, the development of data banks was something to which considerable attention was being given and would have to be given in the future.

BITS AND DROPOUTS

The German manufacturer, Siemens, picked up one of its largest orders yet from the government of lower Saxony for a batch of 4004-45 machines to put all administrative work on an extensive system . . . By the end of the year, Honeywell forecast they will top the 1,000 mark on installations in Europe. About half the machines will have been built in the firm's Scottish plant . . . An independent hardware maintenance company to service the older machines has been started by Derek Royle, a former English Electric man. He has connections with Computer Resale Brokers, a third-party leasing firm. Royle's unit is Computer Field Maintenance Ltd.



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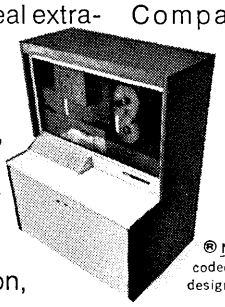

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washington report

WORLD PEACE THROUGH WORLD TRADE?

The Export Expansion and Regulation Act, based on S-1940, introduced by Senator Ed Muskie (June, p. 227), may open the door to Eastern Europe for American computer manufacturers. The bill was reported out of committee last month and is now being debated. Its intent is to ease restrictions on east-west trade and to clarify the rules governing such trade, now usually limited to second generation equipment.

Under the proposed legislation, goods could not be sent to an eastern country if they had military significance detrimental to U.S. security. Technologically advanced equipment could be exported to these countries, provided equally advanced wares are available from countries other than the U.S.

Two other bills pending in the House, Congressman Ashley's HR-11472 and Congressman Brown's HR-11563, would amend the present Export Control Act of 1949 to somewhat ease restrictions. Neither goes as far as the Muskie bill, however.

ADAPSO HOPES DIM FOR STRONG BANK HOLDING BILL

Latest ADAPSO woe is that the one bank holding company bill, which the organization had hoped would aid in their fight to drive banks from the edp service industry, has been watered down by the House Banking and Currency Committee. As earlier stated in the Royce Amendment, the bill would have limited banks to fields ''primarily related'' to banking; as now phrased, the wording is ''related'' to banking. Just what constitutes related activities is open to debate, but would probably include edp. The bill also includes a ''grandfather clause'' that permits banks already offering edp services to continue providing them.

Giving up on the Banking and Currency Committee, ADAPSO is now pinning its hopes on the possibility that further amendments sympathetic to data service organizations can be added later, assuming amendments will be permitted by the House Rules Committee. At press time the bill was still being hashed over by the Banking and Currency Committee.

HOUSE CONSIDERS LEGISLATIVE EDP

The House Administration Committee has formed a task force to evaluate the feasibility of a legislative information retrieval system. The group is composed of representatives of the GAO, Library of Congress, and the office of the Clerk of the House. The goal is to determine the scope of such a system before legislation is enacted.

COMPUTERITES FROM NAVY TEACH COBOL AT NIGHT

Several USASCOBOL proponents of the Navy Dept. have formed a COBOL-education firm, Data Technology Inc., Arlington, Va. It's a legal-moonlighting operation for the seven members, who are working on DTI after Navy hours. Among current and future offerings are public and in-house seminars for dp managers and programmers on the implications of standard COBOL. Principals include John Humphreys, Robert O'Connor, Richard Hampson, and George Baird—all involved in Navy dp management. And all have worked with Commander Grace Hopper, head of the Navy's programming languages division, who was a guest speaker at DTI's first public seminar.

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Here's why . . . We know and you know that the cost of software for a particular application can drive total systems cost to many times the price of the central processor and peripherals. That's why we've written more than 300 programs and sub-routines with more than 200,000 instructions for the 706. This library (it's growing every day) reduces the cost and time to prepare application programs, gives the 706 capability equal to large, more expensive machines and simplifies and minimizes cost of expansion. □ For facts about the hardware and software benefits of the 706, drop us a line or give us a call. Ask for Data File CB-175. Raytheon Computer, 2700 So. Fairview Street, Santa Ana, California 92704. Phone (714) 546-7160.

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Conversational FORTRAN-4K	393295
Real-Time FORTRAN IV	392957
Real-Time FORTRAN IV-8K	393297
SYM I/PREP Assembler	393304
SYM 520 Assembler	393294
SYM II Assembler	391878
System Loaders	
Absoluter-Linking-Disc	393255
Absoluter-Linking-Master	393253
Absoluter-Linking-Standard	393254
Bootstrap Loader	390363
Bootstrap Paper Tape	390364
Loader, Initial-Card	393259
Loader, Initial-Master	393258
Loader, Initial-Paper Tape	393260
Relocating Loader-Basic	390682
Relocating Loader-Disc	390012
Relocating Loader-Master	392294
Relocating Loader-Standard	390013
Resident Loader	391916
RTOS Disc Bootstrap Program	391917
RTOS Installation Program	392341
RTOS-Special Loader	392290
Input/Output Routines	
Buffer Unpacking Subroutine	390980
Card Punch Driver	390018
Card Reader Driver	390019
DIDS Driver	392975
Disc and Magnetic Tape Driver	391040
I/O Monitor	391476
Line Printer Driver	390020
Magnetic Tape Driver-DIO	393303
Plotter Driver	392295
Plotter Interface Routine	392306
Teletype Hi Spd Paper Tape I/O Dr	392292
Teletype Multiplexer Driver	391909
Monitors and Executives	
Monitor X-RAY	279988
Monitor-Master List	397175
RTOS-Real Time X-RAY	391881
X-RAY EXEC—Basic	390779
X-RAY EXEC—Standard	391305
X-RAY EXEC Basic Disc and Tape	390826

Monitors and Executives	Part No.
X-RAY EXEC Basic Reader—Punch	390964
Monitor Configuration 1 Standard	392297
Monitor Configuration 2 Standard	392298
Monitor Configuration 3 RTOS	392299
Monitor Configuration 4 Standard	392300
Monitor Configuration 5 RTOS	392301
Monitor Configuration 6 RTOS	392302
Monitor Configuration 7 Standard	392303
Monitor Configuration 8 Standard	392304
Monitor Configuration 9 RTOS	392305
Monitor Configuration 10 Standard	392312
Monitor Configuration 11 RTOS	392313
Monitor Configuration 12 RTOS	392337
Monitor Configuration 13 Standard	392969
Monitor Configuration 14 RTOS	392924
Monitor Configuration 15 Standard	392970
Monitor Configuration 16 Standard	392971
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Card Sequencer	392920
Card (Holl) to P.T. 703 (ASCII)	279590
Copy Program-Symbiont	393302
Disc Dump	390539
Library Extension Processor	391914
Loader Text Lister	391918
OP Code Statistics	392964
Paper Tape Library Reproducer	393241
Paper Tape Reproduction	392245
RTOS-Queue Processor	391879
RTOS-Sysgen 1	391876
RTOS-Sysgen 2	391877
Symbolic Program Editor	390941
System Editor	391915
System Generator	390297
Tape Dump	390540
Trace/Debug Package	391082

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Card Punch Test Per 61	390056
Column Card Reader Test Per 62	391882
Computer Hardcore Checkout	390003
Diag Adder Composite CPU 2	390389
Diag Logical Instr Detail	390403
Diag Memory-Brainwash 4K CPU 15	390332
Diag Part 1 Adder Detail	390388
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Diag Prim Instr Composite CPU 1	390392
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Magnetic Tape-DMA Test	390658
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Multiverter Histogram/Trnd Per 73	392252
Multiverter Interface Test Per 72	392250
Paper Tape/Punch Read Test Per 21	390444
Plotter Demonstration Test Prog	390659
Plotter Test	392307
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Teletype Multiplexer Test Per 23	392253
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BCD to Binary (4 Digits)	392984
BCD to Character Code (4 Digits)	392986
Binary to BCD (4 Digits)	392985
Character Code to BCD (4 Digits)	392983
Convert MP Float to DP Fix	392338
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Double Shift Magnitude	390017
DP Fixed Point, Add, Subtract	391083
DP Fixed Point, Two's Complement	390664
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Math Convert Fxd Pt to MP Float	391094
Math Dble Shift Arithmetic	391085
Math DP Fixed Point Load	391079
Math DP Fixed Point Store	391081
Math MP Floating, DP Fixed Compr	391088
Math MP Floating Load	391075
Math MP Floating Overflow	390015

less total system cost. Raytheon 706...

Math Library	Part No.
Math MP Floating Store	391077
Math MP Floating Underflow	390014
Math SP Cumulative Multiply	391101
Math Subr Storage Constants	391098
MP Floating, DP Fixed MPV and Div	391096
MP Floating Add, Subtract, Norm	391090
Natural Logarithm MP Floating Pt	390008
Polynomial—MP Floating Point	390016
Sin and Cos—MP Floating Point	390007
SP Divide	390665
SP Hardware Cumulative Multiply	392287
SP Hardware Divide	392286
SP Hardware Multiply	392242
SP Multiply	390663
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DO Loop Terminator	390048
Error Message	391890
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Overflow Flag Set	391913
Pause Subroutine	390055
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Run-Time Executive Non-Recursive	391912
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Sense Switch Test (SSWTCH)	390054
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Magnetic Tape Simulator	392330
Repetitive I/O Processor	392931
Run Time I/O Processor	391905
Run Time I/O Processor—Special	391906

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Integer+Logical to DP MP+Real	390024
Integer Add Sub and OR EOR	390037
Integer Negative Store	390040
Integer to Logical	390021
Logical Not	390038
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SP Integer Quotient and Remainder	391902
SP Integer Soft Divide Mode	392310
SP Integer Soft Multiply	392309
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Complex DP MP and Real to Integer	390023
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FORTRAN IV-Real and MP Oper.	Part No.
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Exponentiation X**Y	391895
Exponentiation X (Mid)**Y (Real)	391897
Floating Point	391903
MP Negative Store	390042
Polynomial	391892
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Exponential (EXP, EEXP)	390052
Hyperbolic Tangent (TANH)	392978
Max Value Real Mid Integer (MAX1)	391889
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Real MP+DP Absolute Value (ABS, EABS)	390045
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Exponentiation X**JJ	392955
Integer+Logical to Double Integer	391887
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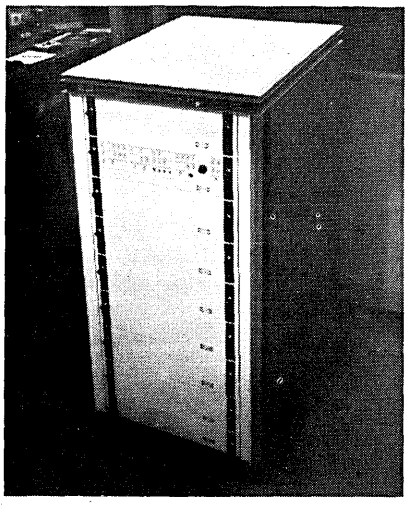

FORTRAN IV-Complex Functions	Part No.
Complex Conjugate (CONJG)	392271
Complex Exponential (CEXP)	392273
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Complex Modulus (CABS)	392272
Complex Natural Log (CLOG)	392274
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DP Polynomial	392949

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DP Exponential (DEXP)	392948
DP Natural Log (DLOG)	392947
DP Sign Transfer (DSIGN)	391910
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Application Programs	
Compositing Program	390302
Data Acquisition and Record prog	390876
Data Tab and Trend Program	392251
Horoscope Message Loader	392980
Horoscope Program	392974
LSI Test Control Program	391076
LSI Test Translator	391078
Petroleum Flow Data Monitor	392289
Playback Program	390789
Seismic Compositing System	390840
Seismic Software System	392244
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Wire Wrap-Form Factor Control	392293

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Data Move With Character Suppression	393322
Edit Print Format	393321
Get/Put Card Files	393314
Get/Put Tape Files	393315
Inventory File Control	393313
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Load Non-Serial Disc Files	393316
Monthly Transaction Register	393312
Move or Convert and Move Data	393318
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Sort/Merge-Control	393306
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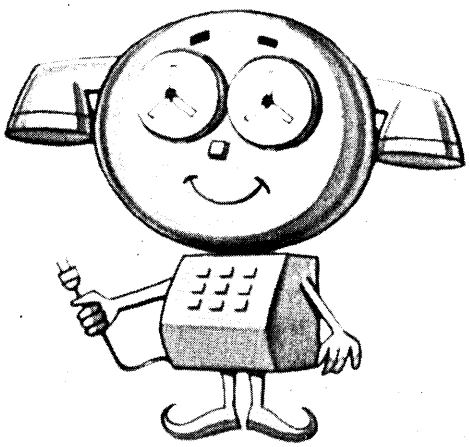
Shop Schedule Report System	393311

United Computing Systems creates a concept

(Next step: Creating a word to describe it)

telepution

tel'e·pu'tion (tel'ĕ·pyoo'shŭn) *n.* The science of solving problems at a distance. The meaningful dialog between men and centrally located computers, made possible by remote access terminals and telephone systems. [NL., Gk. *tēle* far, L. *putare* think.]—**Tel'e·pu'tian** **1.** Allegorical embodiment of the telepution concept. **2.** The happy result of the UCS wedding of advanced computers and a national communications network. Diet consists of problems devoured with prodigious appetite.



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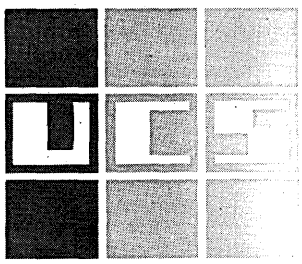

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result among computer folk was a series of yawns.

But now we learn that it really is new. They have just changed the names retroactively. So the former ''C-System'' is now known as the B-System. Except that, ah, the older former ''C-System'', the C-8401, is now known as the A-System.

Let's hope their next generation doesn't force further demotion of the A-System; it might end up as the 650.

TAPE DRIVE MARKET MAY SEE SOME BIG CHANGES

A tape recording method that has been around for several years is getting to the point where some commercial applications may show up in a year or two. A combination of analog and digital techniques, it has produced packing densities up to 30,000 bits/inch in laboratory versions and is now in standard use for airborne recorders.

One practitioner is Leach—now merged into Subscription Television, Inc.,—and they have just formed a division called Ardis to go after the commercial computer peripheral market. Several other companies are also active.

Here are some guesses on what sort of tape units this all may lead to. On the small end, a desk top unit about the size of a small portable typewriter, cartridge-loaded—but with a transfer rate of, say, 120kc at 7½ ips. On the big end, we've heard reports of demonstrations on standard-size drives at 9 million bits/second.

FIRM TO SPRING FIRST UNIT IN FALL

Almost ready to spring its first product after over a year of patient, silent development is Novar Corp., Mountain View, Cal.

It's a buffered on-line typewriter-cassette terminal featuring high-speed transmission, error correction, editing capability, compactness and low price: around $6K. The firm, headed by Datel founder Bill Bennett, spent 14 months developing its own cassette, is aiming at a market that could be $4 billion by 1972. Field test units were due out last month, full production slated for this fall.

ACS REFUGEES TRY ELECTRONIC ALCHEMY

Three key members of IBM's defunct Advanced Computer Systems Lab (see July, p. 121) have joined Tymshare co-founder and former exec. vp Dave Schmidt to form Multi-Access Systems in Santa Clara, Cal. The firm's plans are still a bit tenuous, but it's working on a large, slow core that can be made to look ''very fast. We'll undoubtedly build a computer someday,'' says MAS president Schmidt. The ACS refugees in the 16-man company include Russell Robelin, vp engineering, Dan Murphy, vp manufacturing, and Dr. Cesare Galtieri, head of systems architecture.

SCIENTIFIC CONTROL CORP. TO BOUNCE BACK IN FY '70

Plagued by $1.55-million losses for FY '69 on sales of about $7 million—caused by $2.3-million in product and marketing development costs and the ''reluctance'' of a couple of customers to buy some $1.8-million worth of gear—SCC points to a ''growing'' 7 megabuck backlog, a marketing staff of 75 folks and 12 field offices, claims FY '70 sales will ''approach'' $20 million.

In recent moves, John Baird becomes co-chairman

(Continued on page 199)

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(with Patrick S. Martin), leaving the presidency to ex-marketing vp Bill Lee. The firm will shortly announce a small-scale time-sharing system, the TSS-47, which will allegedly offer 1½-2 times the power of the SDS 940, handle 32-48 simultaneous conversational terminals for under $300K.

UNANNOUNCED EXPERIMENT GOOD NEWS FOR OCR FANS

A quiet experiment by a very large company to find out if the general public could adapt to OCR has turned up evidence that may startle those who are dubious about practical applications.

The company needed some information about its shareholders—well over 100,000 of them. They sent out a card to each that only needed signing, but they deliberately left a blank for the account number and asked each stockholder to fill it in. Brief instructions were given, and they were actually the rules necessary for handprinting numbers suitable for IBM's 1287 optical reader. For example: leave the number 4 open at the top; close the tops for an 8 or 9. Samples of acceptable printing were also shown—but that was the extent of the ''training.''

The result: 70% of the account numbers were read correctly on the first pass.

RUMORS AND RAW RANDOM DATA

The new wave of monster computers should soon be upon us, with Control Data's STAR rumored for first delivery in August, 1970, and a second in early 1971. Honeywell's Computer Control Division is rumored to be readying a ''large'' 32-bit machine, a follow-up to the 632; it's already contracted Computer Usage to do some systems programming for it. Texas Instruments is said to be hard at work on its ASC system in the giant class and there are rumbles from Burroughs and, of course, IBM . . . Latest reactions to the great unbundling: IBM competitors see a golden opportunity to sneak in the price increases and stay bundled. Pitch to the customers: how can you ever do your budgeting if you can't tell in advance what your total costs will be? RCA is rumored to have given GSA a separate pricing schedule with maintenance prices higher than before . . . Word says IBM is talking to Potter again about a license to use Potter's patented Adlogic, a technique for achieving higher bit-packing densities on tape. Fits in with IBM's drive for higher price/performance I/O for generation 3.5. Potter, by the way, attributes ''more than 1/3'' of its tape drive sales to its marketing arrangement with Management Assistance—even if it has had to slap a temporary COD on deliveries to MAI . . . Univac is said to be readying a mag tape cartridge drive ($100-plus) for its low-cost Uniscope crt series, and sources think either CDC or Honeywell will also enter the area very soon. Univac also plans a new larger Uniscope with a 2K character crt (others are 500 and 1K). Yet another Univac product is rumored to be a ''ready'' ruggedized tape drive of interest to the speed/reliability-conscious commercial market. It'll cost over $40K, run at 800 bpi, have a capability of going to 1400 bpi . . . Dartmouth Prof. John Kemeny will be the featured speaker at the opening session, Sept. 11, of a lecture series on ''Computer, Communications and the Public Interest,'' sponsored by Johns Hopkins in Wash. D.C. . . . Alberta Martin, Datamation receptionist, placed sixth in the 200-meter hurdles in the recent national AAU finals.

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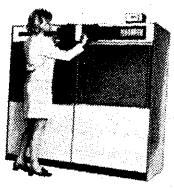

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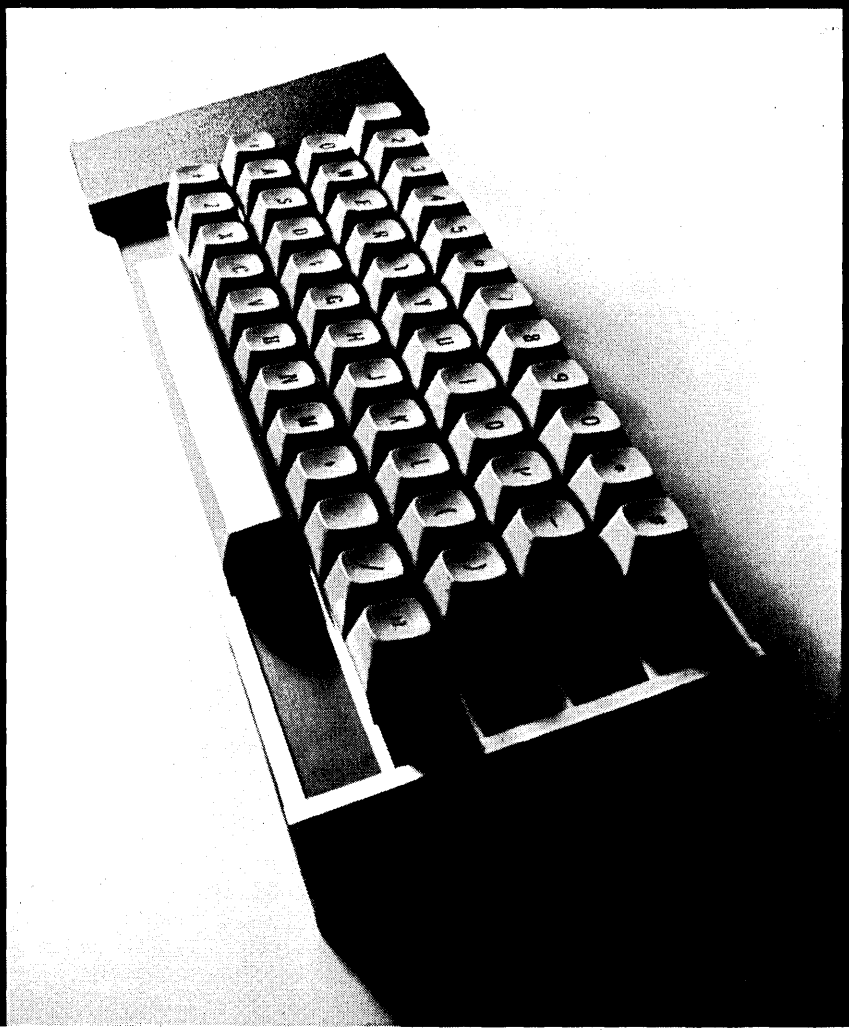
people

Systems Engineering Laboratories, closing a record-high year in revenues and net profit, has announced that president **A. G. Randolph** has been appointed chairman of the board and former vp of marketing, **Sheldon P. Eglash,** succeeds him as president. . . . **William D. Bubb** has been appointed manager of technical planning for time sharing and data services on Burroughs' Corporate Product Management Staff. He had been western region technical manager of the company's Business Machines Group. . . . **Col. Earl I. Seekins,** Special Assistant to the Commanding General, U.S. Army Computer Systems Command, and a pioneer in automating Dept. of Defense supply operations, retired from the military Aug. 1. **Lt. Col. George R. Fullerton,** formerly director, Combat Service Support System Directorate, HQ, U.S. Army Computer Systems Command, has been reassigned as Commanding Officer, U.S. Army Computer Systems Support and Evaluation Command, Ft. Meyer, Va., where he will be responsible for establishing and reviewing specifications for adp equipment contracts before they are awarded to private industry. . . . **Dr. George Schussel** has been elected vp/Financial Systems Div. of Informatics Inc. He had been general manager of the Information Systems Div. of Brown Engineering, Huntsville. . . . Officers of ITEL Corp., formed recently by the merger of SSI Computer Corp. and Statistics for Management Data Processing Corp., have been announced. SSI president **Peter S. Redfield** is president and chief executive officer, and SFM president **Leon Weisburgh** is chairman of the executive committee. Other officers are **Fred H. Merrill,** chairman of the board, and vp's **Gary B. Friedman, R. Douglas Norby,** and **Murray L. Pfeffer.** . . . **Charles R. Sage,** formerly vp and director of SHARE Research Corp., Santa Barbara, Calif., has been named coordinator of automated library services for the three state universities of Iowa. . . . The board of directors of Data Automation Design, Inc., Woodbridge, Va., has announced the selection of **Robert J. Gardner** as president and **Arthur J. Liedel** as exec vp. . . . Data Products' president **Erwin Tomash** has been elected chairman of the board of Stelma, Inc., a subsidiary of Data Products. . . . **Peter J. B. Stevens** has been named president of Leasco World Trade Co. Ltd. **Stanley Abes** has been selected to succeed him as president of Leasco Europa Ltd. . . . **Robert W. Callan,** formerly vp and gm of Pillsbury Management Systems, Phoenix, has been named vp in charge of Academy Computing Corp.'s new Software Sciences Div., headquartered in Santa Barbara, Calif. . . . **Hasan Ozbekhan,** whose resignation from SDC was announced in June (p. 39), has joined King Resources Co.'s new Computer Systems Div. management staff, Los Angeles. . . . **Warren E. Burton,** formerly exec vp, has been elected president of Computer Leasing Co., succeeding board chairman **R. D. Holland** who had held both positions. . . . **Dr. Melvin E. Conway,** formerly manager of peripheral systems research for Univac and most recently an independent consultant in the Boston area, is a principal in recently formed Telefile Computer Corp., Waltham, Mass., which is in the data utility business. . . . **Gifford K. Johnson** has been elected exec vp and director of American Biomedical Corp. and president of Management Systems Corp., a subsidiary. He is president and chairman of the board of trustees of the Southwest Center for Advanced Studies and former president of Ling-Tempco-Vought. . . . **Clifford L. Hayden** has been elected president of Mainstem, Inc., Princeton, N.J., a wholly owned subsidiary of Management Information Systems, Inc. Mainstem serves motor vehicle fleet operators with computerized maintenance management systems. Prior to joining the company, Hayden was a consultant to the Venezuelan government, engaged in instituting a fleet maintenance and management program for the Minister of Public Works. . . . **James R. Mellor** will head the newly formed Information Systems Group of Litton Industries, which includes the Data Systems, Litcom and Datalog Div.'s of the company. He is a Litton vp. . . . **S. J. Dahle,** formerly president of Stan Dahle and Assoc., a market consulting firm, has been elected president of Strategic Automated Systems, Inc., NYC, and a member of the board of directors of the parent company, Strategic Automated Systems International. . . . **Dr. Lewis M. Branscomb** has been nominated as Director of the National Bureau of Standards to succeed **Dr. Allen V. Astin,** who is retiring. . . . **Raymond E. Schultz,** formerly IBM industry marketing manager, has joined Holiday Inns, Inc., as director of information systems. He will direct the Holidex reservation system and manage the computer complex. . . . Management Science America, At-

If you have more brains than money...



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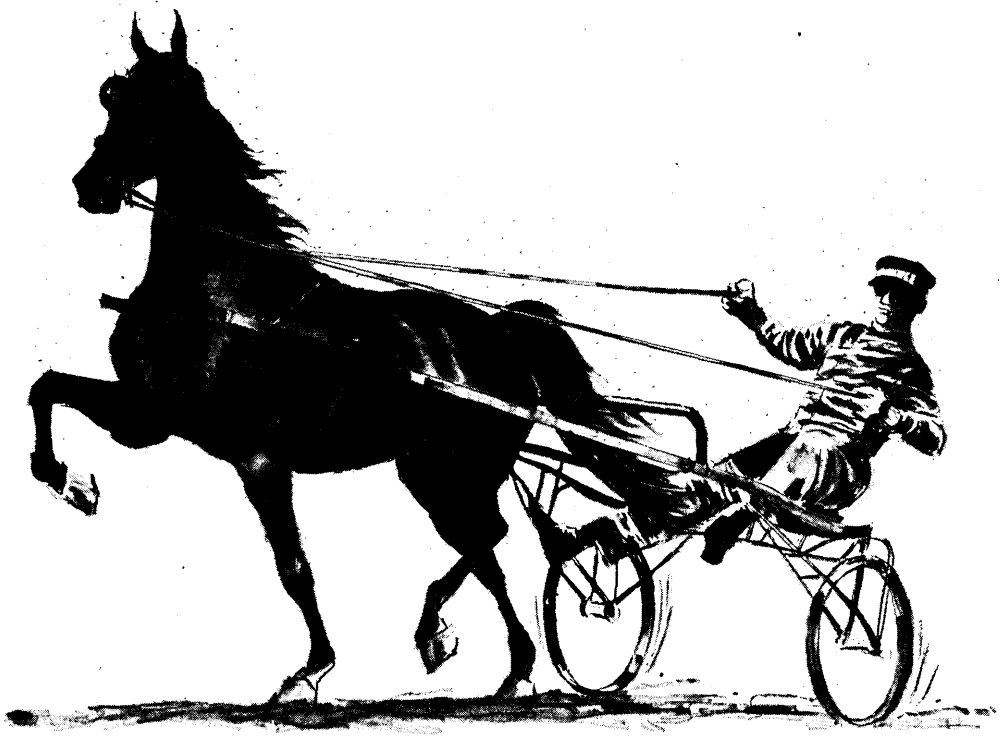
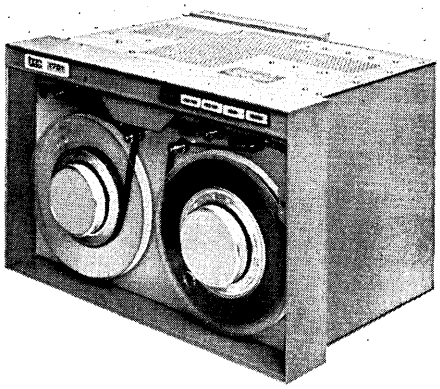
lanta, has appointed **Jesse T. Hudson** president and chief executive officer. He replaces **James C. Edenfield,** who was elevated to vice-chairman of the board. . . . At Univac's DP Div.: **Julian V. Bilski,** most recently director of operations and planning, has been named director of manufacturing; **John P. Kiernan,** former director of R&D for the Federal Systems Div., has been appointed director, planning and operational services; **Donald O. Neddenriep,** an 11-year Univac veteran, has been named director of planning and control; and **Nate Pearlman** has been appointed manager of the newly formed Special Systems Group. He has been with Univac for more than 12 years. . . . **Paul Williams, Jr.,** president of Boothe Computer Corp., has been elected chairman of the board of Compterm Corp., Phoenix, Boothe peripheral manufacturing subsidiary. . . . **David R. Stott, Jr.,** formerly manager of international market development for Ampex, has joined Data Memory Inc., Mountain View, Calif., as director of international operations. . . . **Robert James,** formerly with the Information Supplies Corp. subsidiary of Pryor Computer Industries, has been named vp/gm of Pryor Computer Time-Sharing Corp., another subsidiary. . . . **Gene K. Beare,** formerly president of Sylvania Electric Products Inc., a General Telephone & Electronics Corp. subsidiary, has been elected exec vp-manufacturing and a director of the parent company. . . . **Cyrus R. Vance,** who served for one year as a U.S. negotiator at the Vietnam peace talks in Paris, has been elected to the board of directors of IBM. **Ralph L. Palmer,** an IBM fellow since 1963, has been elected a company vp and is now special assistant for technology to **Frank T. Cary,** senior vp and gm of the Data Processing Group. . . . **A. R. Haworth,** most recently account representative in Army communications programs for RCA's Information Systems Div., has joined Datel Corp. as assistant to the president of Datel and its subsidiaries. . . . **Paul Taylor,** who for some reason was given the title of exec vp for Information Industries Inc. in the June issue (p. 242), is really director of personnel administration. **Wm. J. McLaughlin** is the executive vice president. . . . **Paul A. Strassmann** has joined Xerox as manager of corporate systems. For the past five years he held the same position for Kraftco Corp. . . . **F. Joseph Van Pollelen,** a Fairchild Camera and Instrument Corp. vp, has been named gm of the corporation's Semiconductor Div. ■

The TCC 1701 Incremental Tape Recorder is a High Stepper



The TCC 1701 Tape Recorder is a high performance unit capable of incrementally recording at rates up to 1000 steps per second and above, 7 or 9 track, 556 or 800 BPI formats.



The versatile, IBM compatible recorder can also read and write synchronously up to 37½ inches per second.

The low inertia rapid start/stop tape movement necessary for high incremental recording rates and precise computer format are achieved by use of a single capstan drive shaft and motor control assembly.

Its applications in general purpose processing include data acquisition, small computer input/output, remote terminal and data conversion use.

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The new EM-T1 Thermal Page Printer utilizes a principle developed by NCR which converts electrical signals directly into characters or symbols. Non-impact printing! It prints 300 words per minute with heat. The only noise you hear is the rustle of paper. A five by seven dot matrix head prints 96 alpha (upper and lower case) numeric and symbol characters on a low cost thermochromic paper which won't flake, peel or abrade. You can't smear it, it's insensitive to light and it will reproduce in any common paper copier. The EM-T1 requires only 50 watts power and weighs approximately 10 lbs. It is quiet (including no RFI), exceptionally reliable and amazingly fast.

Unit Features & Specifications

Physical: 11 1/2"W. x 9 3/4"D. x 3 1/2"H. Approx. 10 lbs., no mechanical printing elements.

Code Format: ASCII Serial Input (Parallel and additional codes available).

Line Length: 80 columns.

Electrical: 50 watts operating, 16 watts idle; 115 VAC, 50-60 Hz; 230 VAC, 50 Hz.

Speed: 300 words per minute, 30 cps.

Applications: mobile communications; fixed and portable terminals; communications printing; small systems page printer; output writer for computer consoles.

For more information, write for EM-T1 spec sheet.

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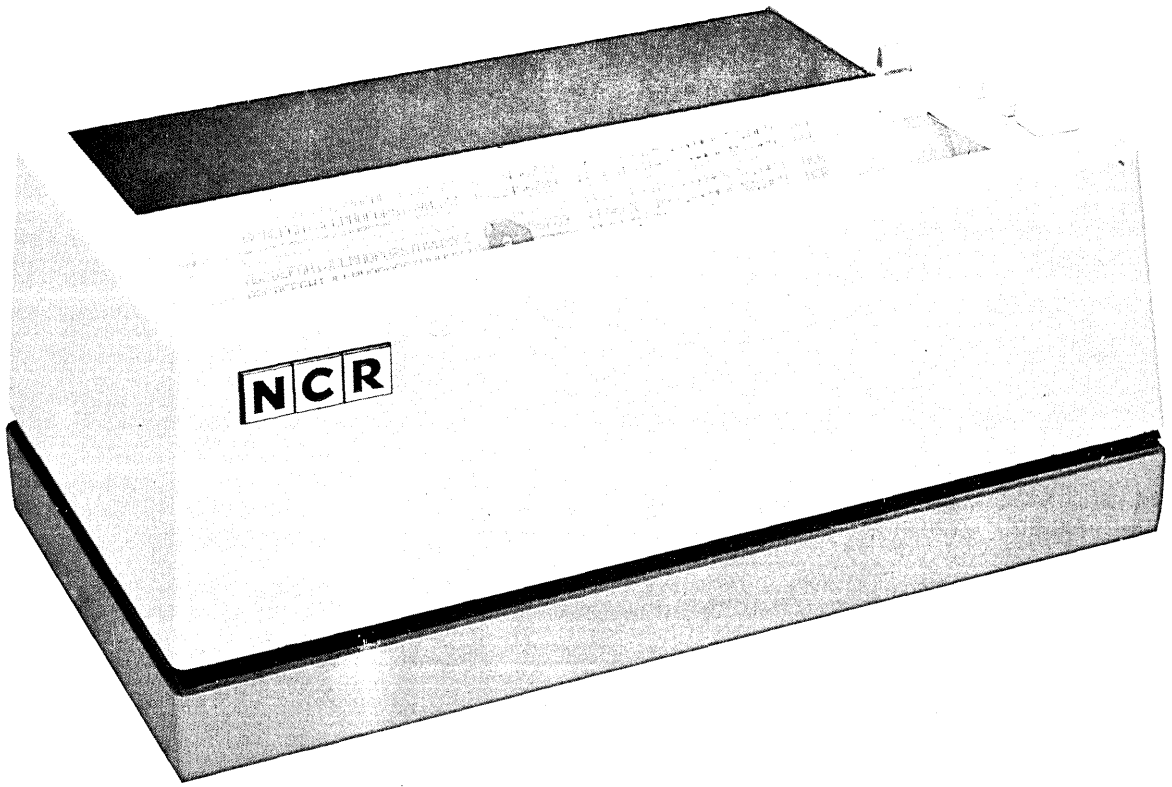

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Time-shared input cuts data preparation costs 50%.

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By time-sharing the data from 60 or more keyboard operators simultaneously, significant savings in data station costs of as much as 50% can be achieved. Costs drop to as low as $4300 per data station for a typical 60 station system. For large data preparation installations, the time-shared input is the only economical way to go.

Data entered into the LC-720 is processed by a small digital computer and stored on an IBM/360-compatible magnetic disc that provides the advantages of bulk storage and high speed random access of data. The problems associated with punched card handling or the mounting, pooling, merging and unmounting of magnetic tape reels are eliminated. All data is conveniently and economically stored in an IBM 1316 disc pack for direct high speed input to your modern data processing system. Naturally, an IBM/360-compatible magnetic tape is also provided with the system as standard equipment.

The LC-720 KeyDisc System also offers for the first time, data verification requiring one input pass only through the system, in addition to the normal technique of verification requiring two different operators. Record size is infinitely variable by each operator from 1 to 120 characters long and the system stores a large library of 30 or more different format control programs, all available simultaneously to any and all operators.

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LOGIC CORPORATION

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books

***The Art of Computer Programming, Volume 2, Seminumeric Algorithms*, Donald E. Knuth, Addison-Westley Publishing Co., Reading, Mass. 1969. 624 pages, $18.50**

This book is the second volume of a seven-volume set entitled The Art of Computer Programming. The rather curious title, Seminumeric Algorithms, is attributed to the very symbolic nature of the algorithms with which it deals.

A knowledge of programming, preferably assembly language programming, is a prerequisite for reading and understanding this book. A reader with a very broad programming knowledge will best absorb the concepts and techniques discussed. Though not absolutely essential, a degree of mathematical proficiency is helpful in understanding portions of the book. A reader mathematically inept will encounter sections which will bog him down. These sections, however, may be skimmed or skipped entirely, with only a small loss in the comprehensibility of the remainder of the material in the book.

Two chapters comprise the book. The first deals with and is entitled Random Numbers. Historical methods for generating random numbers and accepted current methods, most notably the linear cogruential method, are discussed. Numerous methods of testing random number generators are included. The material in this chapter is well presented, easily read and should be of interest and utility to anyone concerned with the use of random numbers in computer programs.

The second chapter entitled Arithmetic deals with number systems, floating point calculation, multi-precision algorithms, number base conversion, rating arithmetic, polynomial arithmetic, and power series computation. Dr. Knuth states that system programmers often consider these topics to be in the realm of numerical analysis while many numerical analysts would assign them to the systems people. This state of affairs can and often does lead to the employment of methods far from any optimum in "built-in numeric packages." A user cognizant of what he invokes when he uses such system features as the complex arithmetic package may in many instances be able to avoid gross inefficiencies (for aesthetic reasons if time is of no import).

The author discusses several special purpose algorithms which, when applicable, greatly increase computational efficiency when compared to more conventional means. For example, the reader might be startled to find that the fastest way to multiply two general n x n matrices does not necessarily involve n^3 multiplications.

The material in this book is quite relevant to most aspects of programming and is well presented. With the thought that this book might be used as a text for a college course, Dr. Knuth has included exercises after each section along with correct answers in an appendix.

Seminumeric Algorithms is a worthwhile addition to any programmer's library. —DAVID A. MATTA

***Encyclopedia of Library and Information Science, Volume 1*, by Allen Kent and Harold Lancour (editors), Marcel Dekker, New York, 1968. 676 pp. $45 (subscription price, $35.00).**

Information science is comprehensively treated in this first volume of a projected 18-volume encyclopedia. The purpose of the editors is to set forth the history, development, relationships and interdependencies of the fields of library and information science, record the current state of the art, and balance theory and practice. For over a quarter of a century, librarians have had to rely on Milkau's *Handbuch der Bibliothekswissenschaft* (4 vols.) and Landau's *Encyclopedia of Librarianship* (3rd edition, 1966) which emphasized British practice. Neither work included information science. U.S. librarians were excited, therefore, when the University of Pittsburgh's Allen Kent and Harold Lancour announced that this encyclopedic work was being planned. To insure an international viewpoint, an advisory board of 32 members was appointed, of whom 13 are from outside the U.S. and five are colleagues of the editors at Pittsburgh.

The first volume of the *Encyclopedia* has now appeared ("A to Associac."), and some indication of the approach, scope, contributors, and format is evident. Of the 73 contributors of signed articles to this volume, four are British, two Russian, with one each from Brazil, Denmark, Africa, and India; 63 are American, of whom 12 are at Pittsburgh.

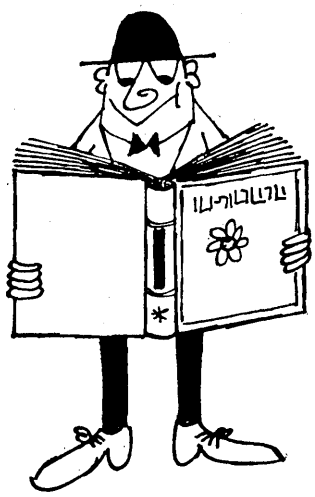
Information science articles account for two-fifths of the first volume, including Jean E. Sammet and Robert Tabory's "Artificial Languages" (24 pages + 1½ page bibliography), T. W. Sze's "Analog Devices" (20 + 1), Joseph H. Kuney's "American Chemical Society Information Program" (17), and Ching-Chung Li's "Adaptive Systems" (7 + 2½). Other contributors are Harold Borko, Simon

books ...

Newman, Joshua Stern and Robert S. Taylor.

There are some curious omissions. The American Society for Metals is in, but the American Society for Testing and Materials is not (despite its responsibility for the early development of CODEN). The American Institute of Biological Sciences is omitted, as is the American Psychological Association's Project on Scientific Information Exchange.

Of course it is not fair to judge the work on the basis of one volume. Nevertheless, the divisions of the Special Libraries Association are treated separately while those of the American Library Association are grouped together in one 34-page article. A first-



rate article on academic library buildings, by Ralph Ellsworth, is the only one under the heading, "Architecture, Library Building," which raises the question of where special, school, and public library buildings will be treated. "Africa, Libraries in" is a heading which is used, while "Arabia, Libraries in" tells the reader to "See under specific countries."

Other evidence of inadequate editing can be cited. If "Abbreviations" is worth 11 pages, is "Ambiguity" to be treated in two? Aslib (Association of Special Libraries and Information Bureaux) gets three pages and the American Association of Law Libraries, 13. "Art Libraries and Collections" runs to 44 pages, while "Agricultural Libraries and Collections" grew to only 7. Of the contributors, about half have their academic degrees listed but the others were forgotten.

Despite these quibbles, the *Encyclopedia* promises to be a very useful work when completed. In general, the selection of topics and authorities is good. The format is pleasing, if quite

open, and the illustrations seem good. About one-half the articles lack bibliographies, but where they are included they cite recent works. The Index volume will doubtless draw together and maximize the information otherwise scattered. Perhaps for subsequent volumes greater attention can be paid to editing the articles for style, level of sophistication, and length. As the first work ever to attempt to gather information on the two fields, it will serve well both documentalist and librarian.

—WM. R. ESHELMAN

book briefs

(For further information on the books listed here, please write directly to the publisher mentioned.)

***Studies in Feedback-Shift-Register Synthesis of Sequential Machines*, by Robert L. Martin. The MIT Press, 50 Ames St., Cambridge, Mass. 1969. 195 pp. $12.**

This is the 50th volume of a monograph series designed to present significant pieces of research that are larger in scope than journal articles but normally less ambitious than finished books. The book investigates the synthesis of sequential machines with a special circuit form, the feedback shift register. The three main areas researched are in the equivalent-state problem, diagnosis of sequential machines, and related circuit forms. The book is addressed to graduate students and engineers who have an interest in switching circuits and logical design. A knowledge of modern algebra and partition theory is required for the later chapters.

***The State-Variable Approach to Continuous Estimation with Applications to Analog Communication Theory*, by Donald L. Snyder. The MIT Press, 50 Ames St., Cambridge, Mass. 1969. 114 pp. $7.50.**

This is the 51st volume of a monograph series designed to present significant pieces of research that are larger in scope than journal articles but normally less ambitious than finished books. The purpose of this book is to develop a general theory of the estimation (or recovery) of a random process that has been nonlinearly transformed and also corrupted by noise. The theory is applicable to numerous practical systems involving message transmission and estimation, such as radio communication, radar, sonar, radio astronomy, and automatic control. ■

recruitment advertisers' index

For the convenience of those readers interested in professional opportunities, we have gathered in the following pages the advertisements of these industry firms and professional placement agencies:

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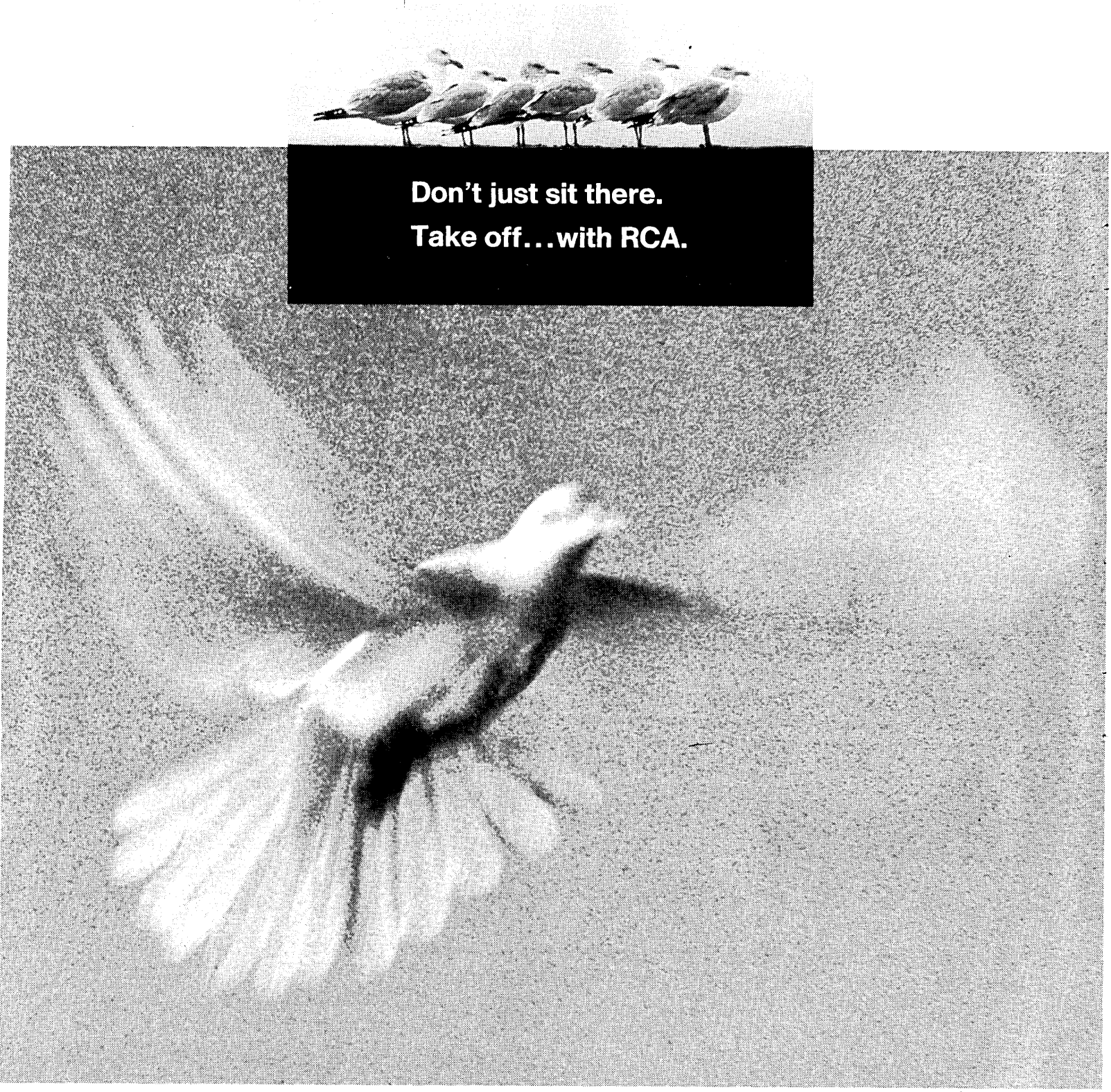

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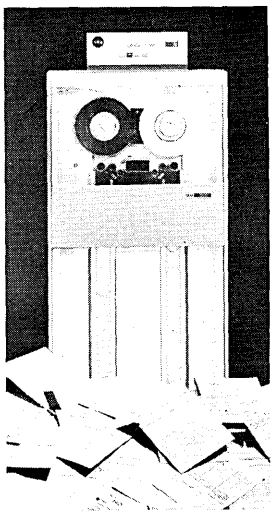

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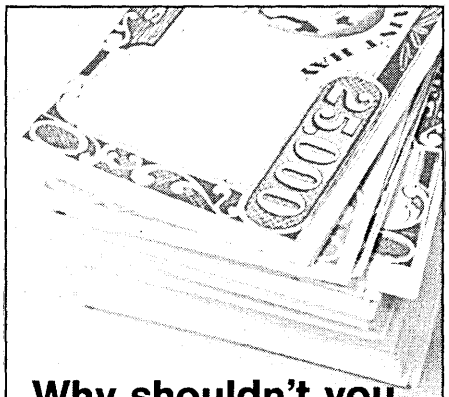

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Naturally there's never any fee with NMR. And we only release your identity if we have your OK. So fill in this form and send it along to us with your latest resume.

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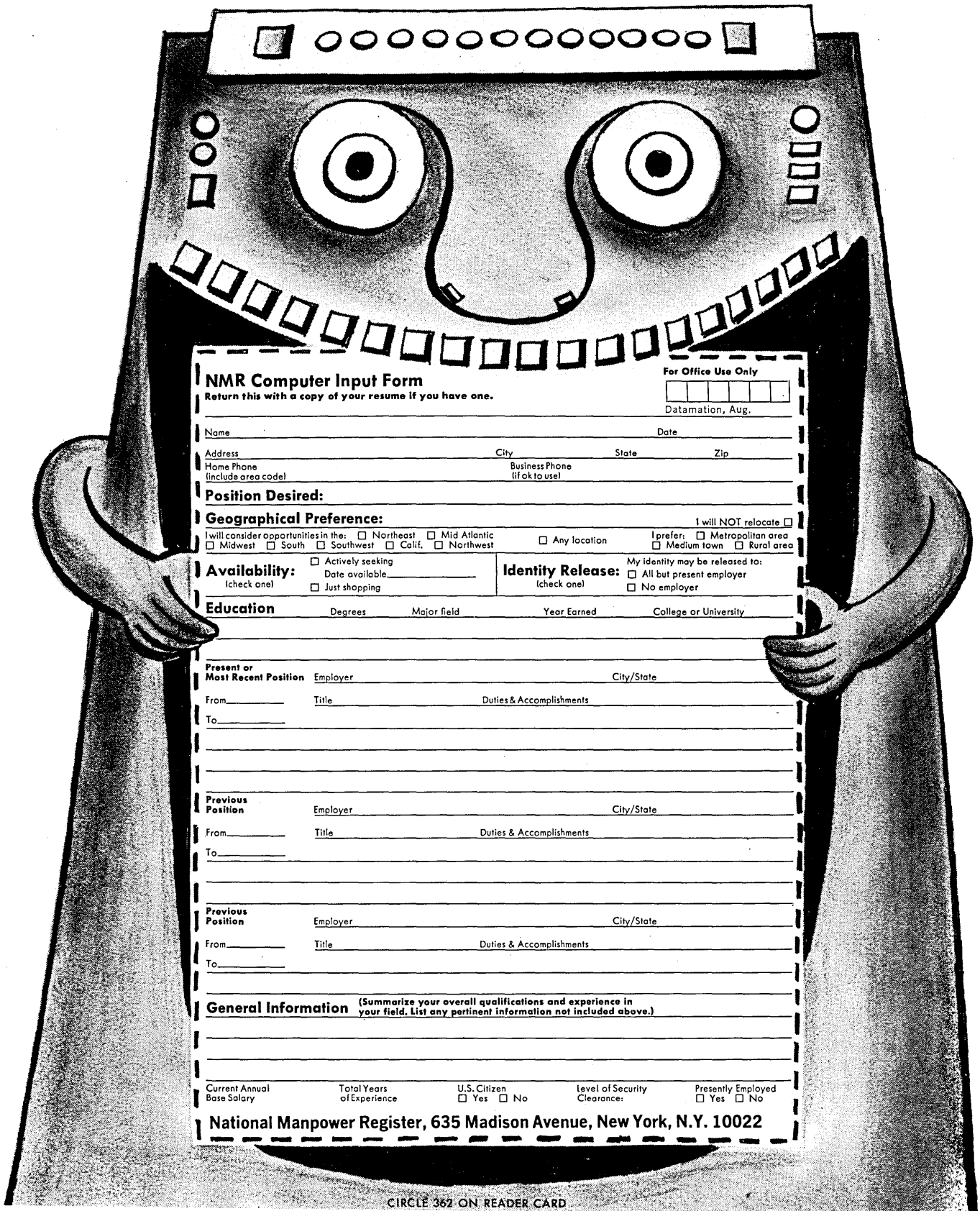

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Position Desired: _____

Geographical Preference:

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Availability: (check one) ☐ Actively seeking ☐ Date available _____ ☐ Just shopping

Identity Release: (check one) My identity may be released to: ☐ All but present employer ☐ No employer

Education Degrees Major field Year Earned College or University

Present or Most Recent Position Employer City/State

From _____ Title Duties & Accomplishments

To _____

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From _____ Title Duties & Accomplishments

To _____

Previous Position Employer City/State

From _____ Title Duties & Accomplishments

To _____

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National Manpower Register, 635 Madison Avenue, New York, N.Y. 10022

CIRCLE 362 ON READER CARD

letters . . .

(Continued from page 29)

roughs Corporation and the Medi-Data system a real disservice by the second and third sentences of the statement he made concerning our Medi-Data system (May '69, p. 39). These are completely false, misleading, and in my opinion warrant correction.

The statements I am referring to are as follows: "Unique among the four systems mentioned above is the Medi-Data concept, in that it avoids the use of real-time processing. This system records messages in the computer for periodic updating. Output reports are produced on a regularly scheduled basis each hour. Because of this approach, Medi-Data costs are reported to be significantly less to the hospital user on a per-patient-day basis than costs of the other large-scale systems."

Our system has always been in real time and we are actually on-line with the hospitals on that basis now. Everything that we have to do with the patient, starting from admitting, surgery scheduling, and then completely through the nurse's station and the X-ray departments, is real time based on 168 hours per week operation.

Currently we are converted on admitting and surgery and are up fourteen hours per day, seven days a week. Nursing goes on in the fourth quarter.

ROBERT E. KENYON
Burroughs Corporation
Charlotte, North Carolina

Sir:

Mr. Singer's survey of computer-based hospital information systems is an enlightened treatment of the area. A conclusion drawn at the end of the survey is of particular interest.

The survey deals with the use of computers for both direct medical care applications and general business applications. The author states that the computer at this point is still basically a business office tool, rather than an aid in medical treatment. There is no mention of the reasons for this direction. The reasons why might have been the prime conclusion of the survey.

Hospital information systems today are substantially business oriented and not medically oriented because medical care centers have in effect given business applications a higher priority. And this despite the fact that the quality of the physical and emotional care of the patient continues to take number one precedence. The author's use of the term "bread and butter" in association with general business edp systems may be interpreted as an implication that they do not perform a vital role in meeting the number one objective of health care institutions.

In the use of edp, the medical care industry, as with other industries before it, is learning how to crawl before it can walk. Represented on the medical boards of control and on financial committees of health care institutions throughout the U.S. are some of the cream of medical and business executive talent. This breed of executive recognizes systems developmental priorities. Unsnarling third-party paper work, ensuring integrity of patient billing, speeding up collection of receivables, simplifying input to and retrieval from medical laboratory and pharmacy records, avoiding mix-ups in bed availability, and maintaining close control over the financial condition of an institution must take priority, although not precedence, over the more sophisticated, direct medical care applications such as patient screening, diagnosis, and monitoring systems. Ultra high performance automobile engines, for example, become nothing but conversation pieces when teamed with low performance wheels and tires. Financial stability and controls enable our medical institutions to "go."

VINCE FAJER
Fargo, North Dakota

pro abm

Sir:

In answer to Dan McCracken's letter (July '69), I do not happen to agree with those who oppose the ABM system in terms of national strategy or in terms of national priorities, inasmuch as I believe that our overall security will be significantly enhanced by this new weapons system.

I am not close enough to the technical aspects of the question to be able to make intelligent judgments, though I do believe that there is an analogy between this effort and our man-in-space effort in the sense that both are very ambitious technological undertakings of which computers form an integral part and both require the functioning of computers under circumstances where their performance cannot be completely live tested in advance. I am hopeful that the computer support for the ABM system will prove as effective as that which has been forthcoming in the Mercury, Gemini, and Apollo space missions.

Finally, I do not believe that computer professionals should employ their expertism as a vehicle to insinuate themselves into questions of public policy. Rather, I think they should restrict themselves to comment on specific technical issues where they are able to make an expert contribution.

I realize that there are two sides to this question, and that there are those

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Here at Univac, we understand how important it is for a programmer to work on an important problem like cancer.

So when you join us, we don't put you to work on meaningless, open-ended programs. We put you to work on meaningful, well-defined programs. And you don't just mark time. You make significant contributions. And you're not rewarded just because of your years of service. You're rewarded because of the excellence of your service.

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letters...

who conscientiously hold that scientists are obliged to address themselves to broad policy questions which rely —at least in part—on technological capability for their solution. It is my belief, however, that computer specialists, like atomic scientists and other professionals, should contribute their technical expertism as professionals and keep this separate from their views and activities as private citizens.

ROBERT V. HEAD
Los Angeles, California

at the controls

Sir:
The article "Management Controlled Information Systems" (June '69) touched the basic common problems in data processing systems, and identified the major components of business data processing. But it failed to mention the role of the edp auditor and his responsibilities in system planning.

I doubt that the systems analyst working with the user could develop an effective system with accent on control, without active participation of the edp auditor, unless the systems analyst has auditing background.

My experience for several years in this area convinced me, with much regret, that a great majority of systems analysts happen to be programmers, who have very little concept of controls.

GABRIEL TASHJI
Continental Can Company, Inc.
New York, New York

orbituary

Sir:
Your cartoon (June '69, p. 57) would have been much funnier, except that Mercury—which has an orbit inside Earth's—can never go retrograde. Only a superior planet can exhibit this motion, as Earth overtakes it during the year. Try Mars!
DOUGLAS E. ALDRICH
Midland, Michigan

Cartoonist Henry Martin replies: Except for the word "economy," I took that sentence out of a horoscope magazine.

flow gently

Sir:
James Doody's letter (June '69) implies great hazard in calling a FORTRAN subroutine from PL/I. While it is always true that there is danger in using non-guaranteed facilities, the problem is not as severe as he suggests.

There are two relatively straightforward ways to communicate from PL/I to FORTRAN.

1) FORTRAN NAMED COMMON to PL/I STATIC EXTERNAL structure. The main problem here is that a dummy array must be the first item in the NAMED COMMON block to take up the space of the PL/I structure dope vector. Beyond that, only the data types and arrangements of the elements need be of concern.
2) CALL (with arguments) has no serious problems in the PL/I to FORTRAN direction. (The other direction poses considerable problems but has been successfully handled using a general interface routine. Reference on request.)

RULES: A) Pass only variables, not constants.
B) Pass arrays by reference to the first element (e.g. A(1, 1)). This avoids the dope vector problem.
C) FLOAT DEC (6) = REAL*4
FLOAT DEC (16) = REAL*8
FIXED BIN (31) = INTEGER*4
COMPLEX FLOAT DEC (6) = COMPLEX*8
D) Subscripts are used in reverse order in the two langauges (e.g. FORTRAN A(5, 1,3) = PL/I A (3,1,5)).

More can be done but the above is sufficient for using most FORTRAN computational subroutines including SSP.
RICHARD H. KARPINSKI
San Francisco, California

wary software

Sir:
Applied Data Research's suggestion to the patent office that proprietary software can be protected by making each cpu serial number addressable by the program is not new (May '69, p. 136). We suggested it to IBM last July and got politely turned down.

Our proprietary software package, DOCUMATIC, is already using an analogous feature which we feel discourages copying of the system. The system prints at the top of each page the customer's name. DOCUMATIC checks to make sure the name has not been changed; if it has, the system malfunctions.
GARY MOKOTOFF
Data Usage Corporation
Fort Lee, New Jersey

We forgot, last month, to point out that all but one of the photographs used with our review of the Spring Joint Computer Conference (July '69, p. 59) were taken for DATAMATION by Stanley M. Naftaly, well known computer specialist. Sorry, Stan.

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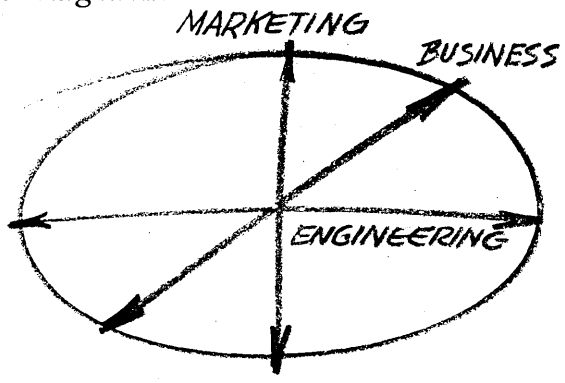

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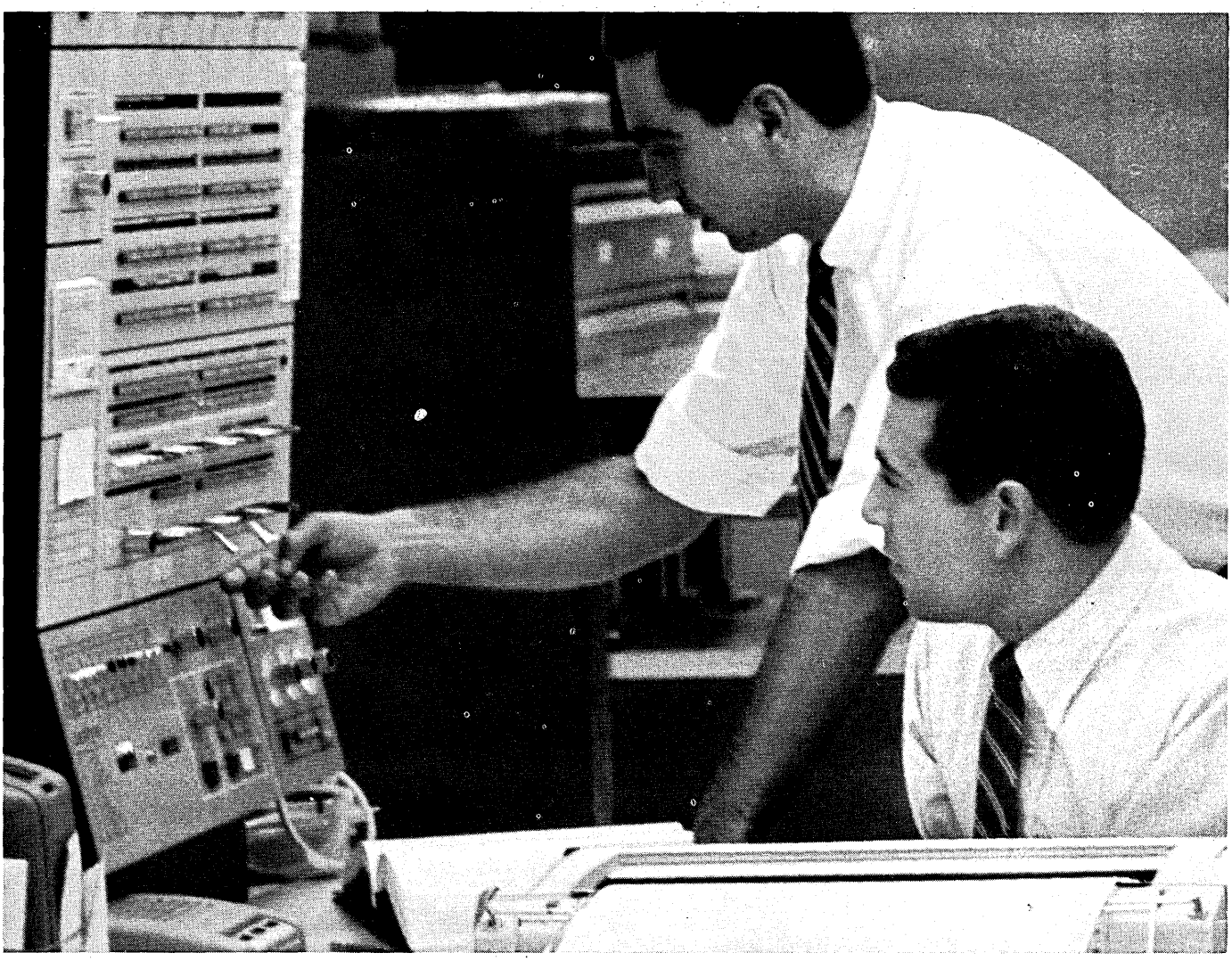

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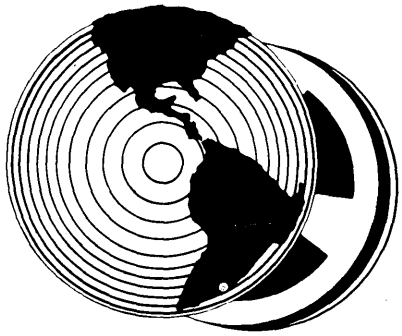

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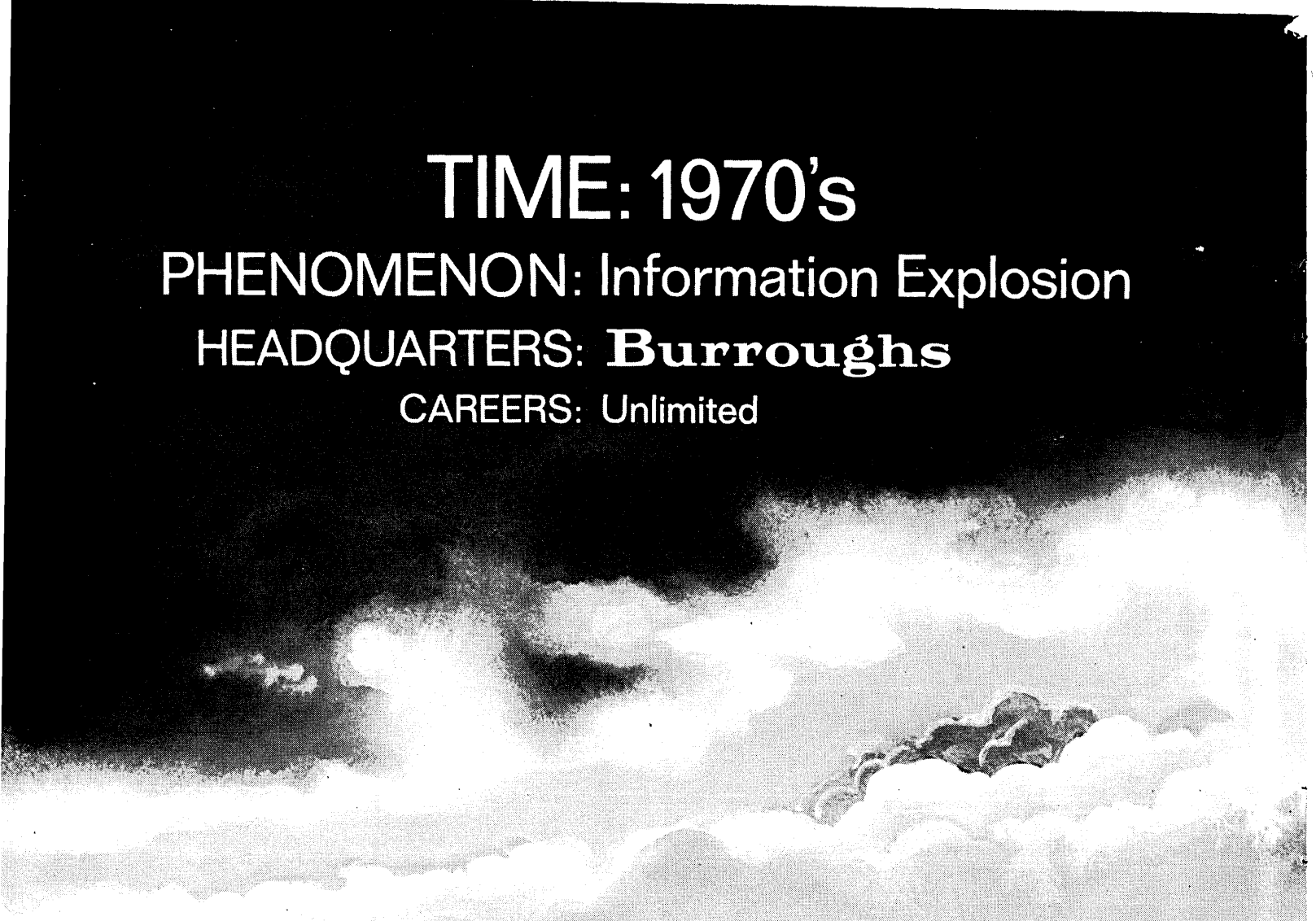

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The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

ESCAPE TO REALITY

Along with nearly everyone I approve the advantages to be realized from the further integration of computers and communications. Some speak of it as a marriage; if so, it will take more planning than we have done so far to keep this marriage from floundering! Observe the following:

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Know what it is? It's a cross section of a twisted pair of wires, a very basic element of communication systems. Seen from this aspect, the data communication system does not know who or what is on the receiving or sending end unless the establishment of the hookup, or linkage, defines these explicitly. This is why such extensive work has been undertaken in the standardization of data communication control procedures, facilitating movement of data from one place to another. However, we may still be blind to the format and meaning of the data. This is why much work is overdue on data descriptive languages. Let us consider the time when we have full standards for both communication procedures and data description. Are we then in full control? Absolutely not!

The reason is that we have an inventory of almost $40 billion in mechanically recorded data and software, and well over 99% of it is not accompanied by any explicit description of what it is —either in encoding or format. Data communication, as we speak of it now, occurs via public utilities. Therefore, using computers adjointly requires that data and programs have public (explicit) identification (this does not exclude reverting to a private mode later, just as personal defenses may be dropped once we establish that we are communicating with a friendly party). Obviously we won't wish to keep the full inventory of software, but what should be done to salvage some[1] of the rest?

Anyone who thinks that we can move overnight to these new standards (when they arrive) is out of touch with reality.

There is information loss from problem analysis to programming, from source to object program, from a complete form of the data to the keypunching m on the card (e.g., $23.57 to 2357), d from the logical file structure to the ysical file structure determined im- itly by the equipment and the pro- m. Miracles are still difficult to find, there is a workable mechanism that offers graceful coexistence and eventual conversion to a unified system. It is called "ESCape."

ESCape (abbreviated ESC) is a character which should be universal (although it may be difficult to add to certain 6-bit codes). In the 7-bit codes of ISO Recommendation 646, and ASCII, it is represented by: 001 1011. When ESC is encountered, the normal (implicit) meaning of the following data stream is disabled. However, the following characters have R646 meaning until an "ESCape sequence" is completed. This sequence consists of ESC, a number of intermediate characters (I) and a final character (F). The characters (I) and (F) are selected from the ISO code and are mutually exclusive sets. The best description of this mechanism is found in ECMA (European Computer Manufacturers Association) Document TC1/69/14.

Most present usage for ESCape sequences is for changing the meaning of the coded character set following. Thus: ESC & (F) indicates that the message which follows is not in ISO (ASCII) code but rather in EIA code RS 244 for numerical control of machine tools. EBCDIC, packed numeric, floating point for binary, etc., should all have their particular ESCape sequence.

Perhaps a more important usage is the indication of data formats (eight intermediate characters remain unassigned now for 3-character sequences).

As an example, I have proposed that every magnetic tape label begin with: ESC / 1. This says to read the label according to the first USA Standard for Magnetic Tape Labels. If some day we should wish to amend the standard for such labels, how would the software accept data from tapes labeled in the original way and also tapes labeled the new way? Simple, for the new label form begins with: ESC / 2.

Suppose that Social Security permits updating of filings via communications systems. Disc packs have formats different from magnetic tapes, yet looking at that twisted pair

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how would the Social Security computer know how to accept the data, unless perhaps disc packs had the ESCape sequence ESC / 5?

Here ESC/ triggers a programmed

[1] Obviously if program a data are inextricable as in the formatted re H/write commands c FORTRAN, this may be ery difficult. In mo cases special conversion runs may be necessc

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table lookup to see what subroutine should be used to read the particular format identified.

Coexistence demands recognition, yet I have stated that present data and programs are not recognizable out of context. Suppose that the computing world were to follow these steps:

1. ESCape sequences are proposed and registered for the various data and program forms that are fairly common (less common forms need only the private and unregistered sequences, indicated by two or more intermediate characters).
2. Software is modified to detect omission of these sequences, labels, etc. The original or other programmer is requested to supply the missing information.
3. Software replaces the implicit form of the data or source program by the explicit form. Mixed alphanumeric and packed numeric data are physically separated by ESCape sequences, where formerly only the program knew where the split was. Probably no use is made of such identification at this time, and actual control may be bypassed.
4. This process occurs for a number of years, and more and more data and programs are converted to explicit identification. New data and programs are created similarly. After some years the conventions and standards are really established.
5. New software systems are designed to operate with identification control. Data and software are recognized either as standard, or as nonstandard of a certain, identified type. If nonstandard, the system determines:
   a. That it can handle the representation and format, and possibly convert it to the standard in the process, or
   b. That it cannot handle it, and must call for help.

I hope the industry agrees with me that this is a practical approach and should be undertaken. It doesn't work 100%, but then it works much more than 0%. Don't forget, the communications industry found out long before we entered the act that having self-identified devices makes things a lot simpler!

—R. W. BEMER