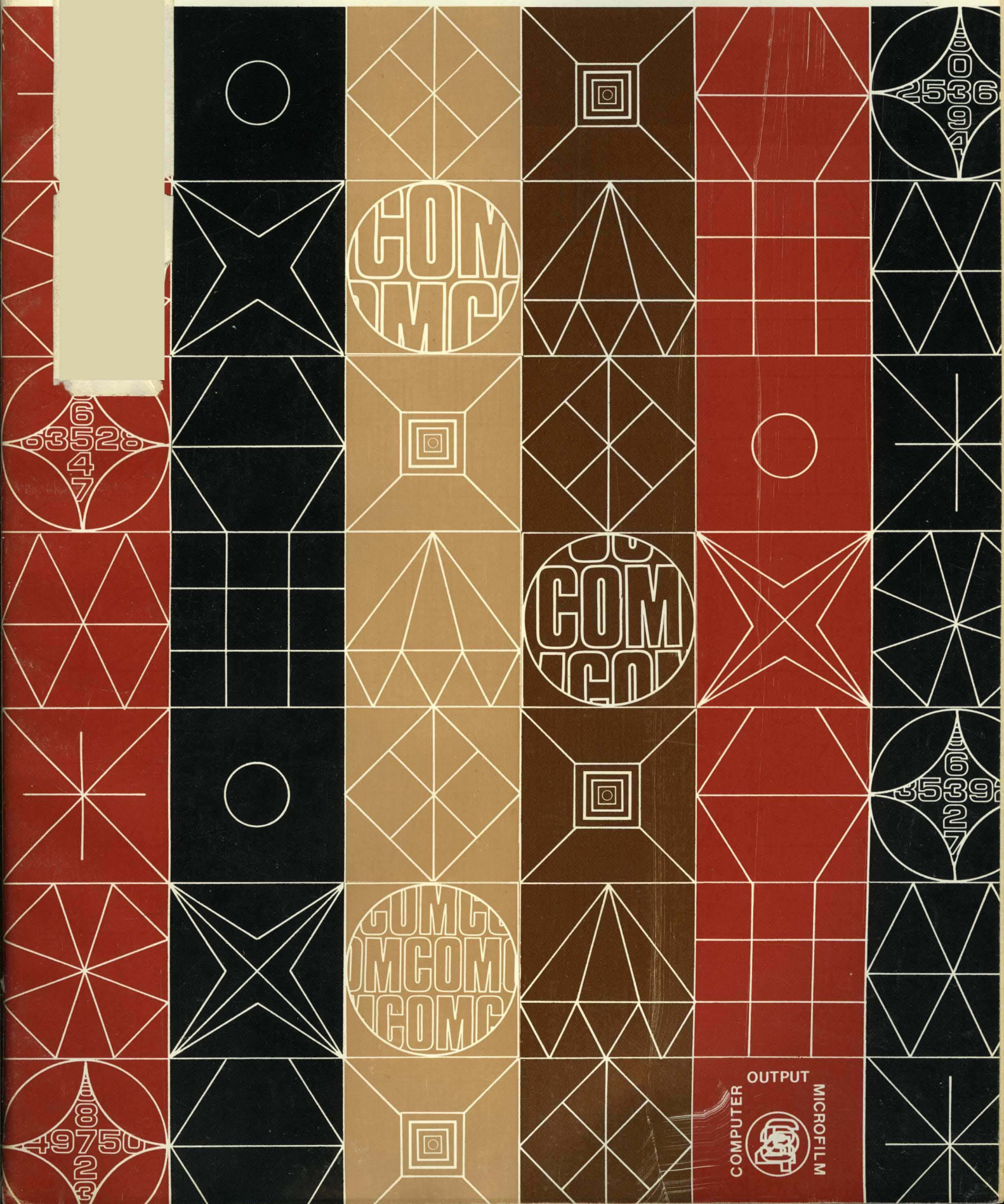
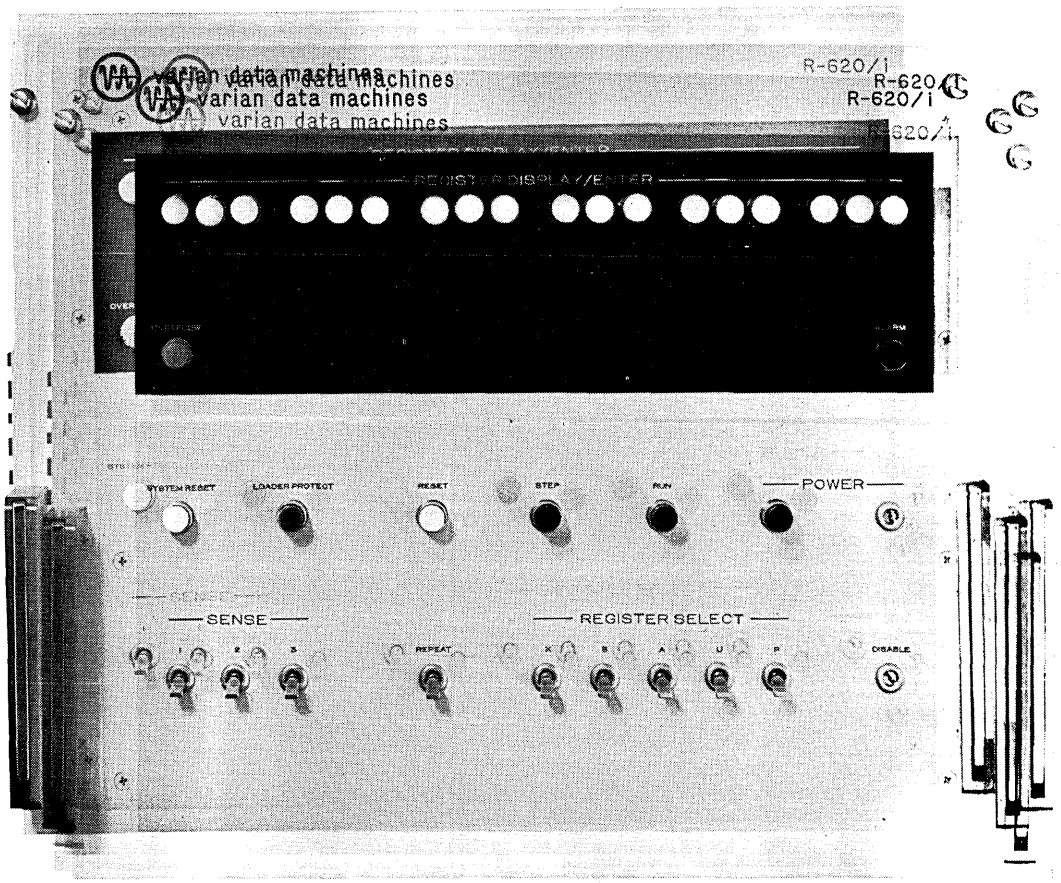
DATAMATION®

69

December



Nothing'll shake this computer. It's Varian's new ruggedized R-620/i.



Specifically designed for mobile and permanent applications under extreme environments, the Varian R-620/i is a systems-oriented, general-purpose computer that offers highly reliable operation. Functionally identical to the popular Varian 620/i—over 700 are in worldwide operation—the ruggedized version can be used on shipboard, truck-mounted GSE, or in hazardous military and industrial environments, withstanding vibration, shock, humidity, dust, corrosion and all the other curves nature and environment pitch at it.

This versatile, powerful computer features ceramic integrated-circuit reliability, easy interfacing, compactness, choice of 16- or 18-bit precision, and a high-temperature memory that can be expanded up to 32K words.

Other features: fits standard RETMA enclosure...Control-panel disable keylock keeps out knob-twisters... Remote front panel.

Because the Varian R-620/i and 620/i are functionally identical, software packages are interchangeable between the two. So you gain the advantage of the large library of software that has been field-proven by the many 620/i's now operating. You also gain one of the most extensive service and maintenance organizations in the small computer field. Price: $16,900. Write for full information on the Varian R-620/i.

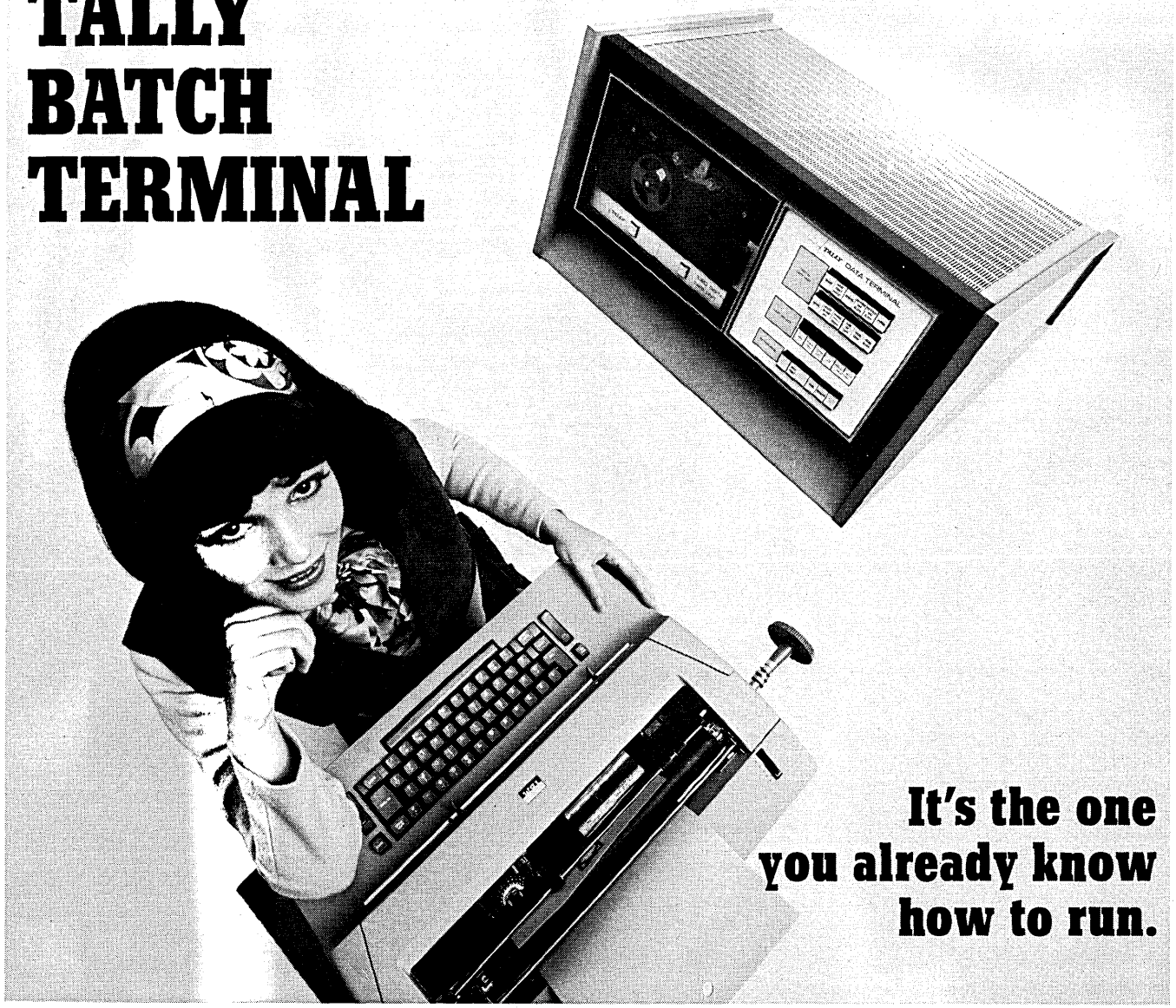
varian data machines

a varian subsidiary
2722 Michelson Drive/Irvine/California 92664
(714) 833-2400

SALES OFFICES: U.S., Downey, San Diego and San Francisco, California; Washington, D.C.; Atlanta, Georgia; Chicago, Illinois; Waltham, Massachusetts; Ann Arbor, Michigan; New Rochelle, New York; Fort Washington, Pennsylvania; Houston, Texas. INTERNATIONAL: Australia, Belgium, Canada, France, Germany, India, Italy, South Africa, Sweden, Switzerland and United Kingdom.

CIRCLE 1 ON READER CARD

PRESENTING THE TALLY BATCH TERMINAL



Everybody who types already knows how to run the fastest batch terminal on the market. As a non-labor byproduct of your regular office typing routines, data is entered on the Tally 1021 Batch Terminal.

At the end of the day or any other convenient time, you can transmit at 1200 words per minute to any size computer. The Tally 1021 Batch Terminal gives you full error control, variable record length, reuseable media, two way communication, code flexibility, simplicity of operation, proven reliability, and operating economies. Options include computer interface, paper tape reader, cardreader, and computer compatible mag tape recorder.

Your Tally Batch Terminal comes with the works, all tape formatting, parity checking, switching, and tape control functions. As a matter of fact, all you add is the girl.

TALLY®

For complete information, please write or call Tally Corporation, 8301 South 180th Street, Kent, WA 98031. Phone (206) 251-5500. TWX 910-423-0895. Or contact one of the regional offices: New York: 45 N. Village, Rockville Centre, NY 516-678-4220. Chicago: 33 N. Addison Rd., Addison, IL 312-279-9200. Seattle: 8301 South 180th St., Kent, WA 206-251-5500. Washington, D. C.: 1901 Ft. Meyer Dr., Arlington, VA 703-525-8500. England: 6a George St., Croydon, Surrey (01) 686-6836.

CIRCLE 54 ON READER CARD

Only Sanders can format, display and input complicated source documents...

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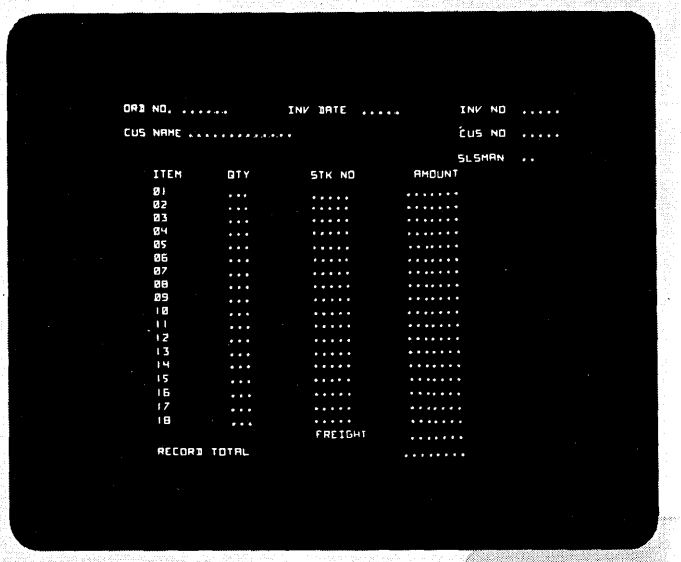
2	52341	CASTINGS	1.00	2.00
24	14572	GEARS	1.50	36.00
		FREIGHT		57.00
				478.50



Take a look at that invoice. It might fit on 20 punched cards. Perhaps some of the key-to-tape units around might be able to handle it in 10 segments. But Sanders has a better system. The System 6000* Display Data Recorder.

The operator taps a key. Instantly, a replica of the source document—we call it a format—appears on the screen. Then the operator simply types information into the blanks. Logically. In the same order and position as on the original source document.

Notice two things. First, the System 6000 recorder has room for the complete record—up to 1024 characters. Then, observe how the unique dual-intensity feature calls attention to the variable data. If there's an error, it's easy to spot. Corrections are done by overtyping.

Once all the data is correct—and only then—the operator enters it on computer-compatible tape. Incidentally, there's no tape pooling because up to 12 units can share the same reel. And the operator can select many formats from a changeable tape cartridge.

Let Sanders help get data into your computer. In one piece. Call your nearest Sanders sales office, or contact Marketing Manager, Data Systems Division, Sanders Associates, Inc., Daniel Webster Highway S., Nashua, New Hampshire 03060. Or call (603) 885-4220.

SA SANDERS ASSOCIATES, INC.

*TM, Sanders Associates, Inc.

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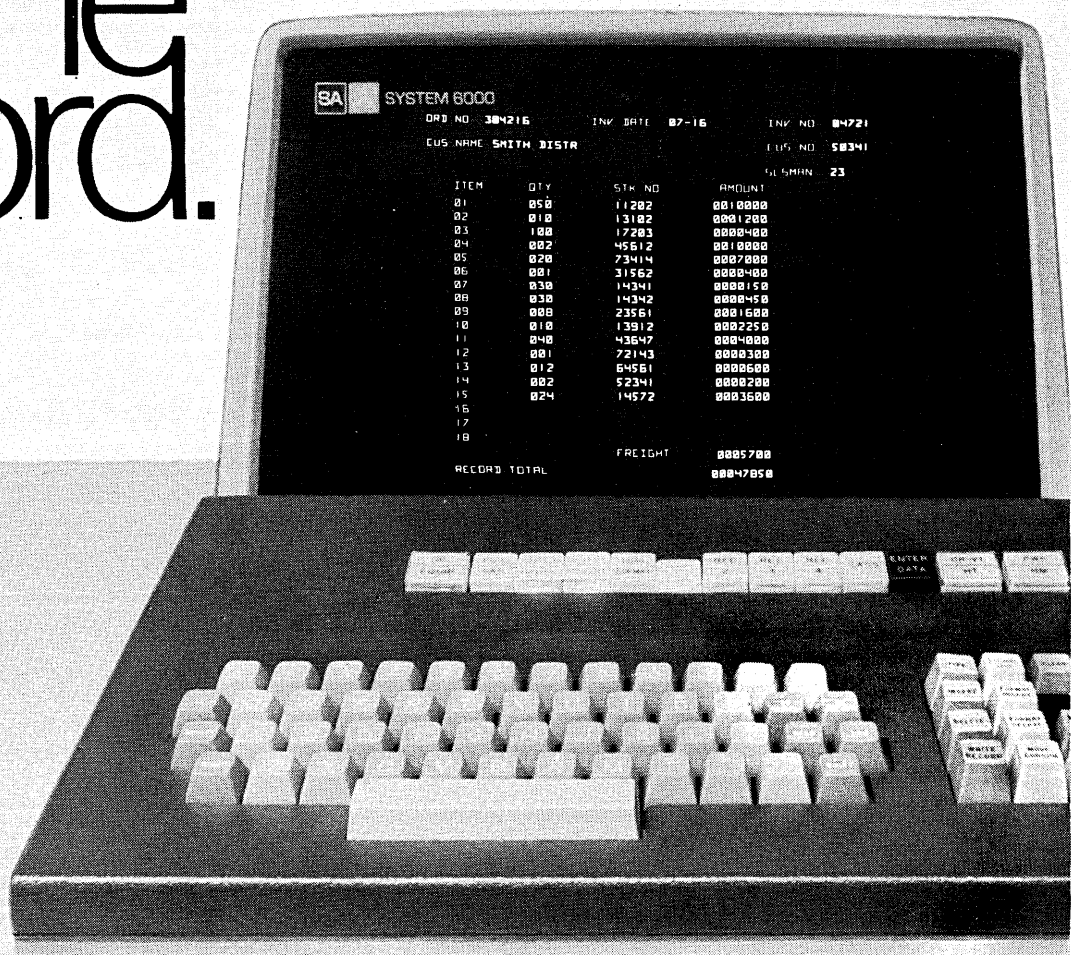
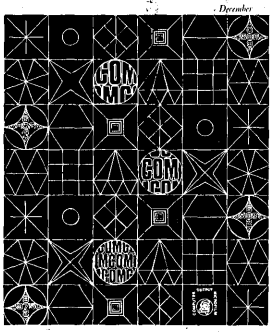
without breaking the record.



CIRCLE 47 ON READER CARD

DATAMATION.
December



december
1969

volume 15 number 12

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If you think DIGITAL only makes small computers, how come the PDP-10 lets 63 users develop programs, run real-time experiments, and process multiple batch streams – simultaneously?

PDP-10:
Interactive time-sharing, batch processing, and real-time operations simultaneously. 3 levels of monitors. Re-entrant software. Seven user languages. On-line debugging. Modular expansion. All forms of bulk storage. Communications equipment. Real-time interfaces. Write for a brochure.

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digital
COMPUTERS · MODULES

CIRCLE 20 ON READER CARD

DATAMATION® 69

december 1969

volume 15 number 12

datamation departments

machines that make data move

TELETYPE

data's wrong righters

Today's data boo-boo is a costly thing. In time, money, and wasted man-hours. Teletype is doing something about it. Has a host of terminals, accessories and options that deliver data right and right now.

You're looking at the Teletype Model 35 ACS (Automated Communications Set) with a verifier control. A terminal that does an exceptional job filling out business forms on-line with utmost accuracy.

It can verify all or any portion of fixed data (company name, address, etc.), variable data (dates, prices, quantities, etc.). And it verifies character by character. Stops operation immediately when tape is incorrect. When the operator omits a character, adds too many, or types the wrong one. And it enables her to take corrective action immediately.

The result is an error-free composite tape. One that can be used to transmit on-line to remote Teletype equipment, computers, or other ASCII compatible business machines. Model 35 ACS literally keeps wandering minds and flying fingers from goofing up the most complex of business forms.

Control over transmission errors

Teletype also offers a number of solid state logic modules that can be added to Model 33, Model 35, Model 37, Telespeed and Inktronic® terminals to detect invalid vertical parity on low and high speed circuits.

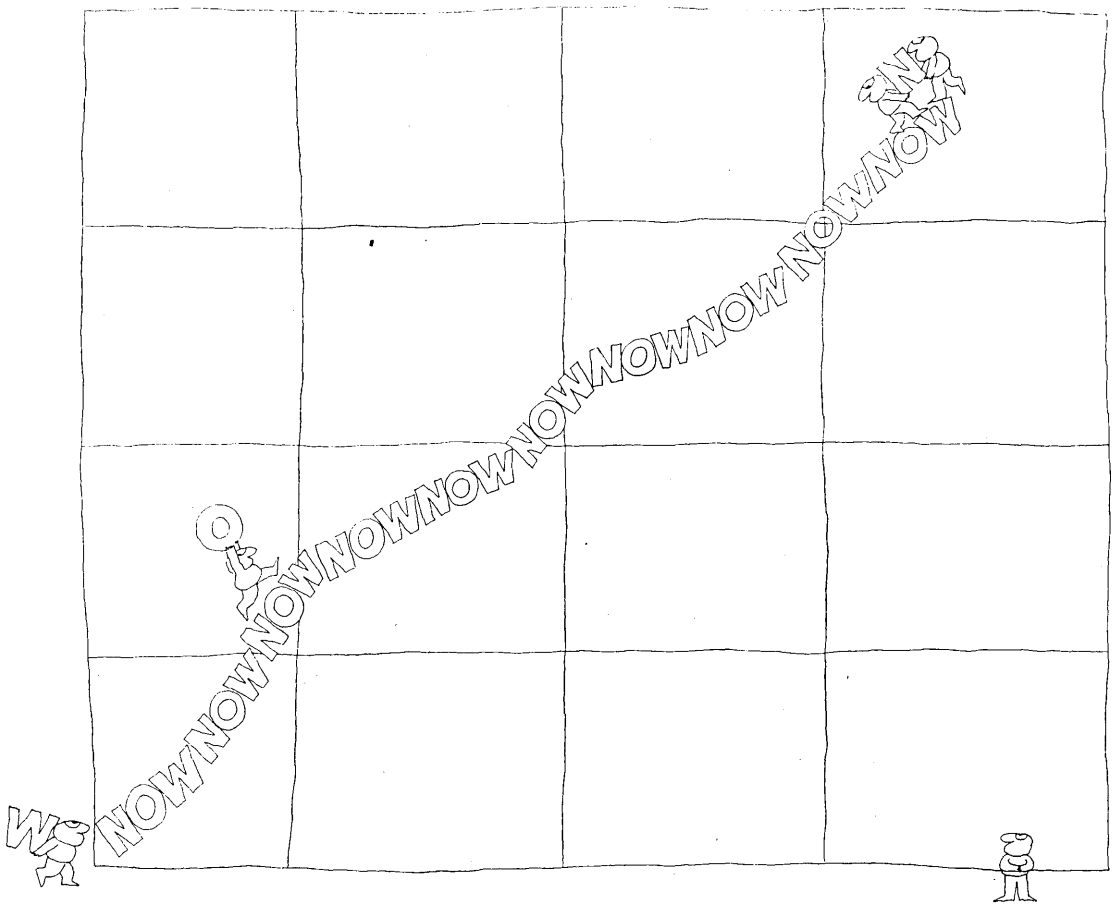
We call them "Stuntronic Accessories." They accept distortions as high as 45% and regenerate the signal with no more than 5% distortion. Minimizing erroneous printouts due to misread signals. Some will even locate individual vertical parity errors in both page copy and paper tape by having the terminal print out or punch a preprogrammed substitute character.

Stuntronic Accessories do much more than error control duties, but this is an important function. Something well worth looking into if you are concerned about errors creeping into your data system.

Detecting errors in high-speed tape transmission

For high-speed tape-to-tape transmission, Teletype's Telespeed 1200 EDC set offers exceptional error control. Sends and receives at 1200 wpm. And has horizontal and spiral parity detection. Corrects errors automatically. Adding optional vertical parity detection increases detection and correction capability to 99.99%.

Teletype's error control story is really much broader than this. And if you've been bugged by data that isn't coming through the way it should, contact Teletype Corporation, Dept. 81M, 5555 Touhy Avenue, Skokie, Illinois 60076.



Make now count.

Now has a new meaning in modern business.

It means now.

Not "lately." Or "pretty soon." Or "when they get it tabulated and typed."

But now, this instant. It's meant that ever since Univac captured now with general purpose, multiprocessor systems such as the UNIVAC® 1108.

The total systems design of the UNIVAC 1108 hardware and software components insures the integration of real-time, demand and batch processing in a classical time-sharing mode. The UNIVAC 1108 Executive System utilizes multiple nanosecond central processors, modular main storage, and high speed auxiliary storage to give you required responses in the now.

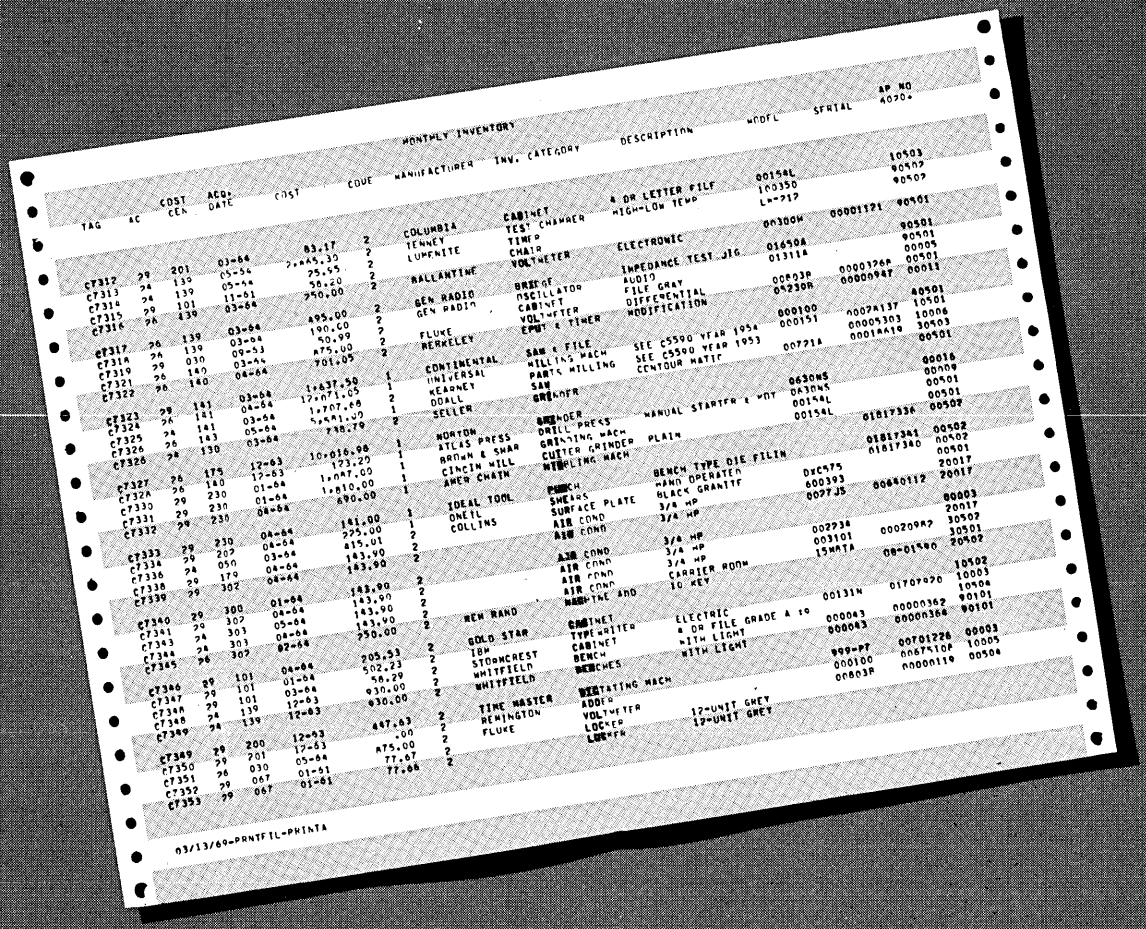
The system provides interfaces to the user that permit utilization of real-time programming, interactive-conversational demand processing, and local and remote batch processing. All of the facilities of the UNIVAC 1108 will adjust dynamically to the multi-programming operations of these environments either singly or in any combination.

Ask a Univac representative about the many advanced features of the communications-capable 1108 II System. The peripherals it can handle. The systems design and training support that come with it. The software packages and application programs that are available.

And call him today. Univac can help you capture now—starting now.

UNIVAC SPERRY RAND
FIRST IN REAL-TIME INFORMATION SYSTEMS

Unplug the computer



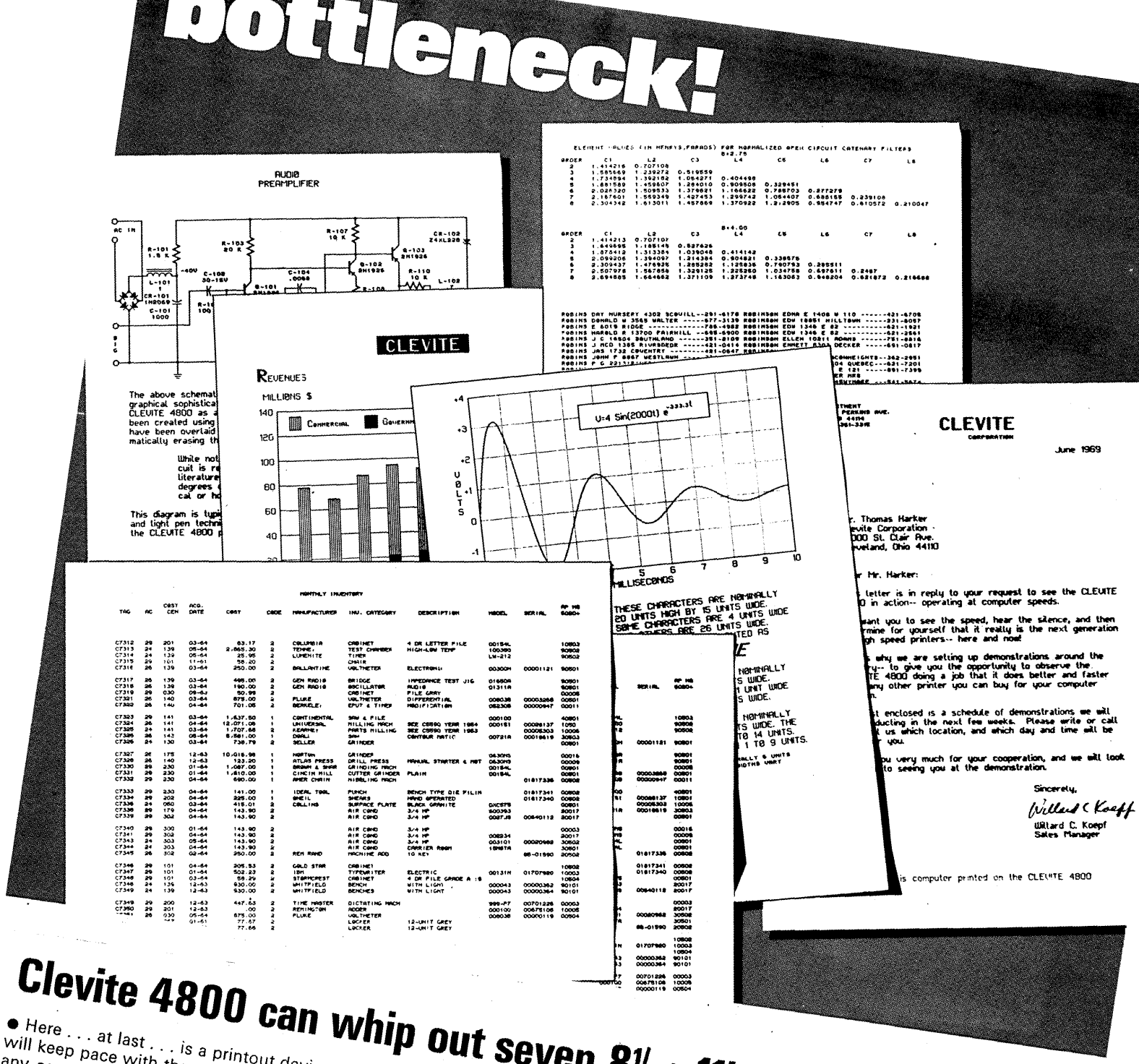
MONTHLY INVENTORY

TAG	AC	COST CEN	ACQ DATE	COST	CODE	MANUFACTURER	INV. CATEGORY	DESCRIPTION	MODEL	SERIAL	AP NO 4070-
CF312	29	201	03-64	83.17	2	COLUMBIA	CABINET	4 DR LETTER FILE	00158L		10503
CF313	24	139	05-54	2,445.30	2	JENNEY	TEST CHAMBER	HIGH-LOW TEMP	100350		90502
CF314	24	139	11-61	25.65	2	LUMENITE	TIMER		L--217		90502
CF315	29	101	03-64	350.20	2		CHAIR				
CF316	26	439		990.00	2	RALLANTINE	VOLTMETER	ELECTRONIC	0030DW	00001121	90501
				495.00	2		BRIDGE		016504		90501
				190.00	2	GEN RADIO	OSCILLATOR	IMPEDANCE TEST JIG	013114		90501
				50.99	2	GEN RADIO	CABINET	AUDIO			00005
				475.00	2	FLUKE	VOLTMETER	FILE GRAY	00803R	0000326R	00501
				701.05	2	BERKELEY	EPUT & TIMER	DIFFERENTIAL	04230R	00000947	00013
CF317	26	139	03-64					MODIFICATION			40501
CF318	29	030	09-53						000100	0007A137	10501
CF319	29	140	03-64			CONTINENTAL	SAW & FILE		000151	00005303	10006
CF321	26	140	04-64	1,637.50	1	UNIVERSAL	MILLING MACH	SEE C5590 YEAR 1954		0001A419	30503
CF322	26			12,071.05	2	KEARNEY	PARTS MILLING	SEE C5590 YEAR 1953	00721A		00501
				5,491.29	1	ODALL	SAW	CONTOUR MATIC			
CF323	29	141	03-64	738.79	2	SELLER	GRINDER				00016
CF324	24	141	04-64				DRILL PRESS				00009
CF325	24	143	05-64			MORTON	GRINDING MACH	MANUAL STARTER & POT	0630W5		00501
CF326	26	130	03-64			ATLAS PRESS	CUTTER GRINDER	PLAIN	DAYTON5		00501
CF326	26			10,016.98	1	BROWN & SHAR	MILLING MACH		00154L		00501
CF327	26	175	12-63	173.20	1	CINCIN MILL	PUNCH		00154L	01817336	00507
CF32A	26	140	01-64	1,847.00	1	AMER CHAIN	SHEARS	BENCH TYPE DIE FILIN			
CF330	29	230	01-64	1,810.00	1		SURFACE PLATE	HAND OPERATED		01817341	00502
CF331	29	230	04-64	890.00	1	IDEAL TOOL	AIR COND	BLACK GRANITE	DXC575	01817340	00501
CF332	29					ONEIL	AIR COND	3/4 HP	600393		00501
				141.00	1	COLLINS	AIR COND	3/4 HP	0097J5	00680112	20017
CF333	29	230	04-64	225.00	2		AIR COND	3/4 HP			20017
CF334	24	050	04-64	415.01	2		AIR COND	3/4 HP	002734		00803
CF336	29	179	03-64	143.90	2		AIR COND	3/4 HP	003101	0002098?	20017
CF338	29	302	04-64	143.90	2		AIR COND	CARRIER ROOM	15HATA		30507
CF339	29			143.90	2		MACHINE AND	10 KEY		08-01590	30501
				143.90	2						20502
CF340	29	300	01-64	143.90	2						10502
CF341	24	302	04-64	143.90	2						10003
CF343	24	303	05-64	143.90	2	NEW HAND			00131N	01707020	10504
CF344	24	303	08-64	250.00	2		CABINET	ELECTRIC			90101
CF345	26	302	02-64			GOLD STAR	TYPEWRITER	4 DR FILE GRADE A 10	000043	00000362	
				205.53	2	IBM	CABINET	WITH LIGHT	000043	00000364	90101
CF346	29	101	04-64	502.23	2	STODNCREST	BENCH	WITH LIGHT			
CF347	29	101	01-64	56.29	2	WHITFIELD	BENCHES		999-PF	00701226	00003
CF348	29	101	03-64	930.00	2	WHITFIELD			000100	0067A10R	10004
CF349	24	139	12-63	930.00	2				00803R	00000119	00504
			12-63	487.63	2	TIME MASTER	RESTATING MACH				
				.00	2	REMINGTON	ADDER				
CF349	29	200	12-63	475.00	2	FLUKE	VOLTMETER	12-UNIT GREY			
CF350	29	201	05-64	77.67	2		LOCKER	12-UNIT GREY			
CF351	26	030	01-61	77.66	2		LOCKER				
CF352	29	067	01-61								
CF353	29										

03/13/69-PRNTFIL-PRINTA

In the time it takes a line printer to pound out one oversize page of printout...

bottleneck!



Clevite 4800 can whip out seven 8½ x 11's!

- Here . . . at last . . . is a printout device that will keep pace with the output capability of any computer on the market.
- It's Clevite 4800 . . . a totally new electrostatic hardcopy printer that delivers 4800 lines per minute. That's up to seven times the printout you can get from most line printers and from ten to twenty times the output of usual photographic hardcopy techniques. And the pages you get are a convenient 8½ x 11".
- Consider these other advantages:
- *Alphanumerics and graphics*—words and pictures . . . simultaneously . . . directly from programmed computer input signal.
- *Permanent paper*—special, high-contrast . . . won't curl, yellow or get brittle.
- *The sound of silence*—infinitely quieter than impact line printers.

- *Reliable*—no impact means less wear and tear on parts . . . less maintenance and little downtime.
- *Economy*—priced at or below printers that can't come close to the performance.
- *Versatility*—generates wide range of fonts from smallest matrix on up; in many weights, sizes and faces.

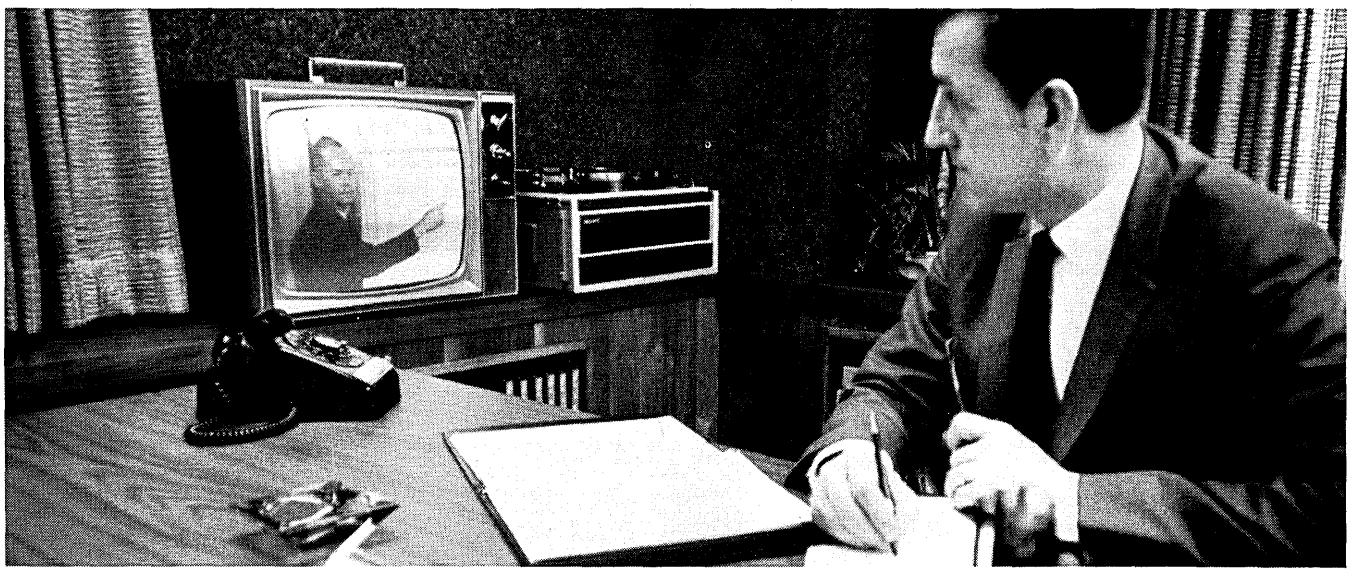
Talk about a breakthrough in computer printout and you're talking about Clevite 4800. Check with your computer people. Then check with us.

Graphics Division,
Gould Inc., 3631 Perkins Ave.
Cleveland, Ohio 44114.

CIRCLE 174 ON READER CARD

GOULD CLEVITE

Train anyone, anywhere, anytime



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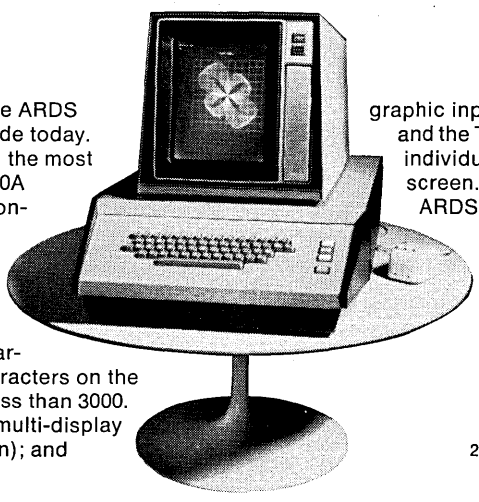
ADVANCED SYSTEMS INCORPORATED

THE STATE OF THE ARDS



Computer Displays Inc. states it like it is. The ARDS 100A is the lowest cost graphic terminal made today. Combining third generation electronics and the most advanced display technology. The ARDS 100A offers a complete graphic station in a self contained desk-top console. And it gives you a picture absolutely free of flicker and drift. Why? Because the ARDS 100A uses a new, direct view storage CRT that doesn't need refreshing. You get higher resolution, better visibility, and easier readability of characters. The ARDS 100A offers over 4000 characters on the screen. Competitive display stations offer less than 3000. And there are exciting extras, too. Like the multi-display option; right margin detect (automatic return); and graphic input options. Including the Mouse, Joystick, and the Tablet. In addition, the ARDS has 1.5 million individually addressable locations for data on the screen. And an independent input-output system. ARDS has successfully performed on more than 20 different computers. The price for this gem is under $8000. Compare that with other terminals that sell for $30,000-$250,000. Remember too, the ARDS 100A is made by Computer Displays Inc. That means delivery today. Not tomorrow. Why not give your regards to ARDS.

Computer Displays Inc.

223 Crescent St., Waltham, MA 02154, (617) 899-0480

CIRCLE 117 ON READER CARD

Buddy, can you spare a byte?

That's a dirty tape for you. It'll put the bite on your computer every time. Dirty tape causes data drop-outs. And drop-outs cost you money. Bum deal.

RCA Computer Tape helps computers lead more productive lives.

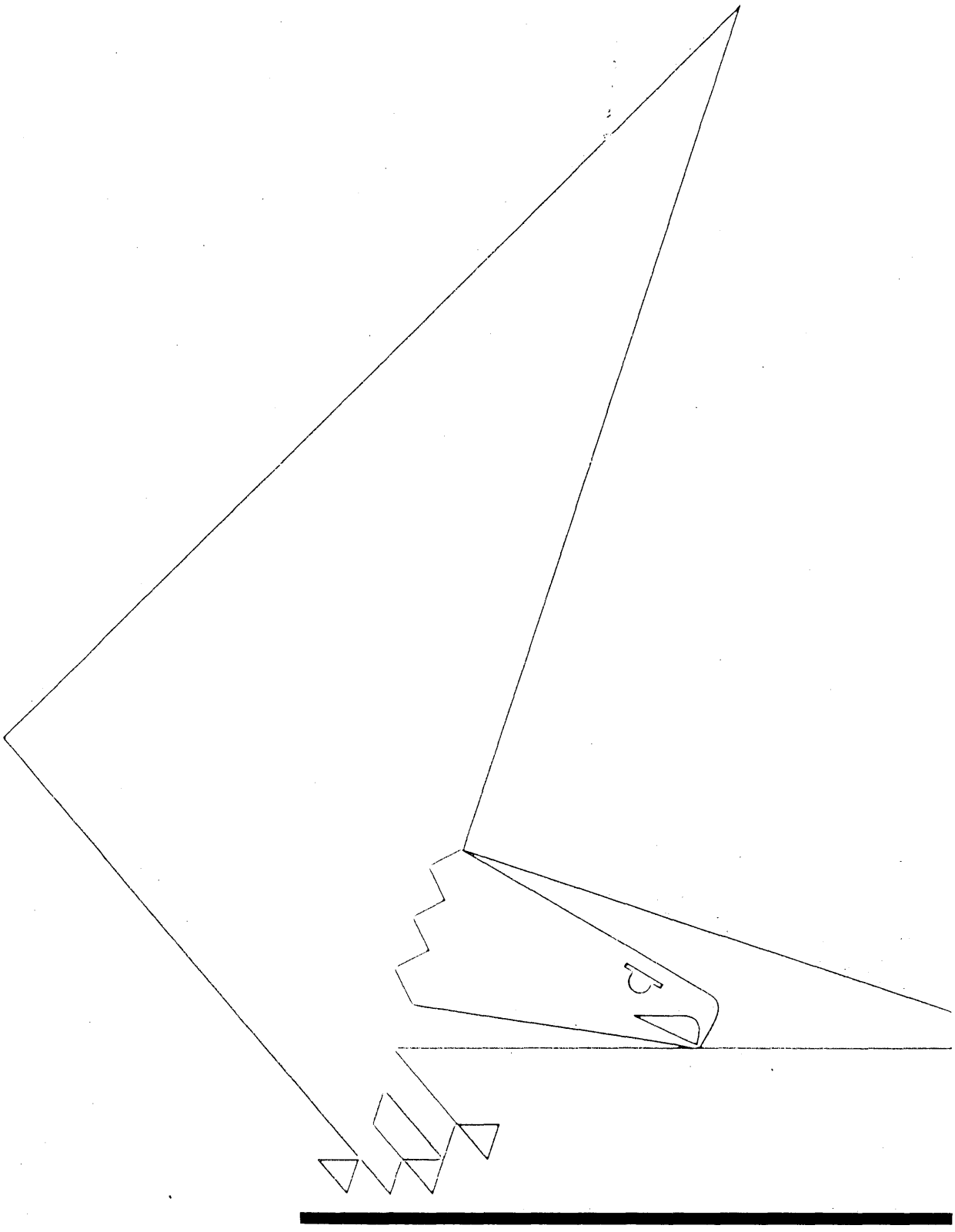
It's a special formulation that starts cleaner. Every inch of every reel is tested and certified in the cleanest of white room conditions. (We believe statistical testing is begging the question.) And it stays cleaner, longer.

So? Fewer drop-outs, more efficient computing.

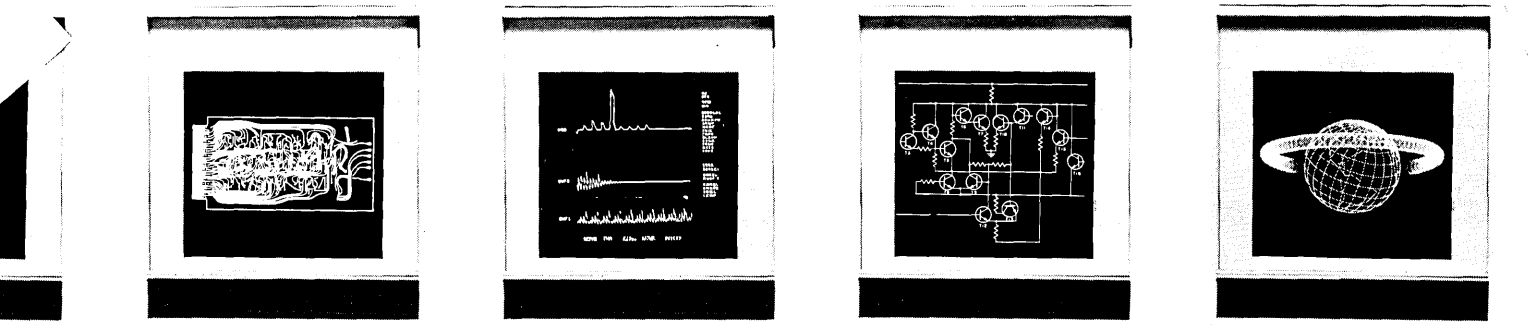
Show your computer what the good, clean life is all about. Write RCA Magnetic Products, 201 East 50th Street, New York, New York 10022.

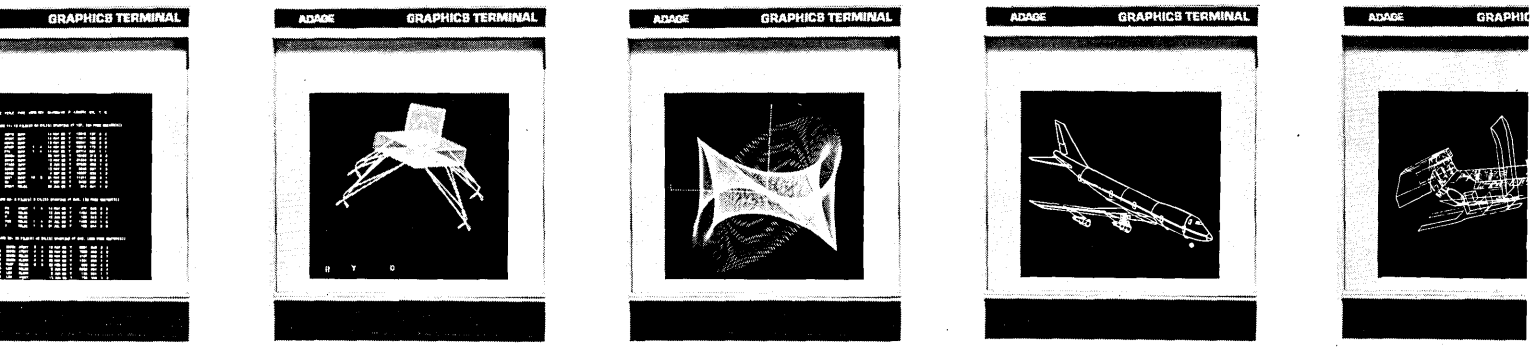
The first step is clean tape. Ours.

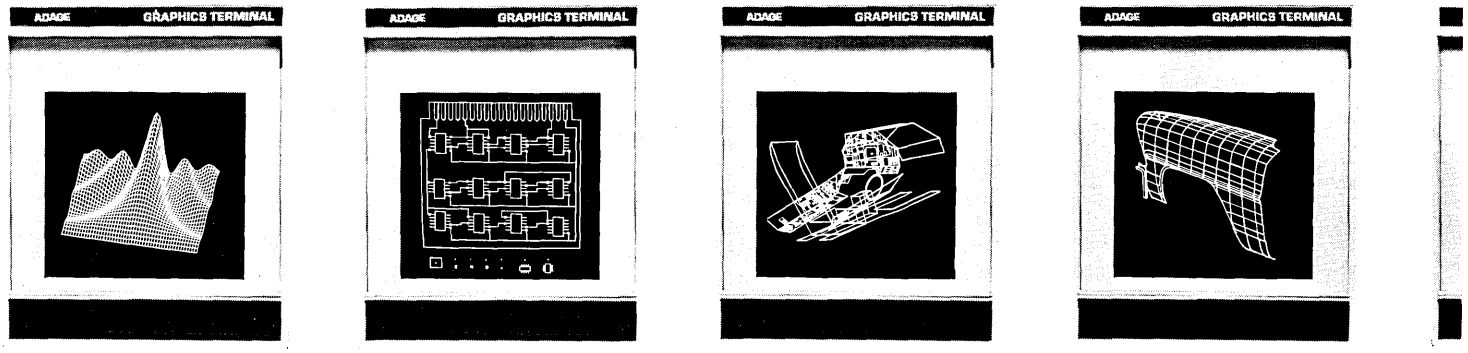
RCA Computer Tape



U.S. MAGNETIC TAPE COMPANY HUNTLEY, ILLINOIS 60142







Looking for interactive graphics? Shop Adage first.

We're not an interactive graphics supermarket, but we're beginning to look like one. That's because we are the only company marketing a full line of standard off-the-shelf graphics terminals covering a broad range of price and performance.

Because of our experience in many fields, we can provide you with the best and quickest solution for your specific application. Adage Graphics Terminals are now in operation in government facilities, the oil industry, processing and manufacturing plants, aerospace, and in university research laboratories. Applications range from three-dimensional dynamic simulations to information retrieval and decision making. And from automating PC-board production to supporting engineering design of new aircraft. Our terminals are being used for computer-aided signal analysis, for geophysical data reduction, and for geological contouring.

Maybe we are an interactive graphics supermarket!

When you consider its features, it's easy to see the reasons for the wide-spread use and acceptance of the Adage Graphics Terminal. The AGT is a general-purpose CRT display system designed especially for interactive graphics applications. It has a digital display processor, display generation hardware, and a large screen CRT console with a full set of operator controls. An AGT has extensive built-in image manipulation capability, it normally includes magnetic tape or disk storage, and it's always supplied with comprehensive systems software. These result in a terminal with a high degree of autonomy: an AGT can be connected to a central computer system without burdening the response time or arithmetic capabilities of the central system, or it can be used in a stand-alone mode.

Model AGT /10 is designed for efficient handling of two-dimensional displays. Images can be continuously expanded or reduced or moved about on the screen. The AGT /30 is configured to optimize its use in applications involving dynamic display of three-dimensional images, i.e., such images can be rotated, translated, and scaled with picture changes made from frame to frame. The AGT /50 is our super-powered model with a variety of extra display modes. It can generate very complex dynamic pictures containing up to 8,000 line segments. AGT's start at $60,000.

One very nice feature – any model can be upgraded in the field. So, if your problem expands, so does your terminal.

If you're in the market for interactive graphics, shop our supermarket first. Write to our Super Market Manager. Adage, Inc., 1079 Commonwealth Avenue, Boston, Massachusetts 02215, (617) 783-1100.

adage
Computer
Graphics

CIRCLE 15 ON READER CARD

calendar

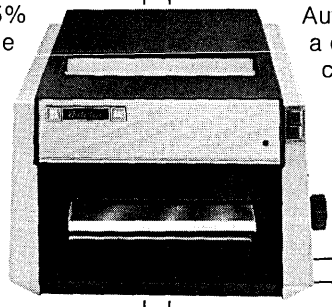
DATE	TITLE	LOCATION	SPONSOR/CONTACT
Jan. 14-16	3rd Annual Simulation Symposium	Tampa, Fla.	Annual Simulation Symp. P. O. Box 1155, Tampa, Fla. 33601
Jan. 19-21	Computer Software & Peripherals Conference & Show	New York City	COMPSO/Bernard Lane Computer Expositions, Inc. 37 W. 39th St., New York, N. Y. 10018
Feb. 5-6	Systems Engineering Conference	Dayton, Ohio	AIIE 345 E. 47th St., New York, N. Y. 10017
Feb. 25-27	Annual EDP Conference	New York City	AMA 135 W. 50th St., New York, N. Y. 10020
March 23-25	Info-Expo-70	Washington, D.C.	Info. Indus. Assoc. 1025 15th St. N. W., Washington, D. C. 20005
March 23-26	Int'l Convention & Exhibition	New York City	IEEE 345 E. 47th St., New York, N. Y. 10017
April 8-10	Numerical Control Annual Conference	Boston, Mass.	NCS/Lawrence Levine Hitchiner Mfg. Co., Inc. Milford, N. H. 03055
April 10-19	Electronics Fair	Tokyo, Japan	Int'l Commerce Bur./ U. S. Commerce Dept. Washington, D. C. 20230
April 14-16	Computer Graphics Int'l Symposium	Uxbridge, England	Brunel Univ./R.D. Parslow Computer Sci. Dept. Uxbridge, Middlesex, Eng.
April 28-May 1	Nat'l Microfilm Convention	San Francisco	NMA 250 Prince George St., Annapolis, Md. 21404
May 5-7	Spring Joint Computer Conference	Atlantic City	AFIPS 210 Summit Ave., Montvale, N. J. 07645
May 13-15	Educational Data Systems Convention	Miami Beach	AEDS/Dr. Henry Fox 3525 N.W. 79th St., Miami, Fla. 33128
June 1-3	Info Processing & Operations Research Joint Conference	Vancouver, B.C.	IPS, CORS/Session 70 1177 W. Hastings St., Vancouver, B.C., Canada
August 25-28	Western Electronic Show & Convention	Los Angeles	WESCON/Don Larson 3600 Wilshire Blvd., Los Angeles, Calif. 90005
Sept. 1-3	25th National Conference	New York City	ACM/Sam Matsa IBM, 410 E. 62nd St., New York, N. Y. 10021
Oct. 5-9	Computer 70 Int'l Exhibition	London, England	BETA 109 Kingsway, London, W.C.2, England

The Datafax "Electronic Mailbox"™ by Stewart-Warner.

The best Facsimile Transceiver on the market today.

THE FASTEST

The "Electronic Mailbox" is 25% faster than any other available facsimile transceiver. An 8½" x 11" document is sent over the dial network in 4½ minutes versus 6 minutes for the competition. This reduces your telephone toll charges. With a self contained paper supply, there's no wasted time loading for each transmission. No limit on message length.



OUR MACHINE

MOST AUTOMATIC

Automatic answer. . . Automatic disconnect at the end of a call . . . only the "Electronic Mailbox" has a telephone coupler which answers and hangs up automatically, unattended. A stack feed document loader transmits 50 documents with no one in attendance and hangs up automatically after the last copy. Savings in clerical time and tempers are substantial.

OUR COUPLER

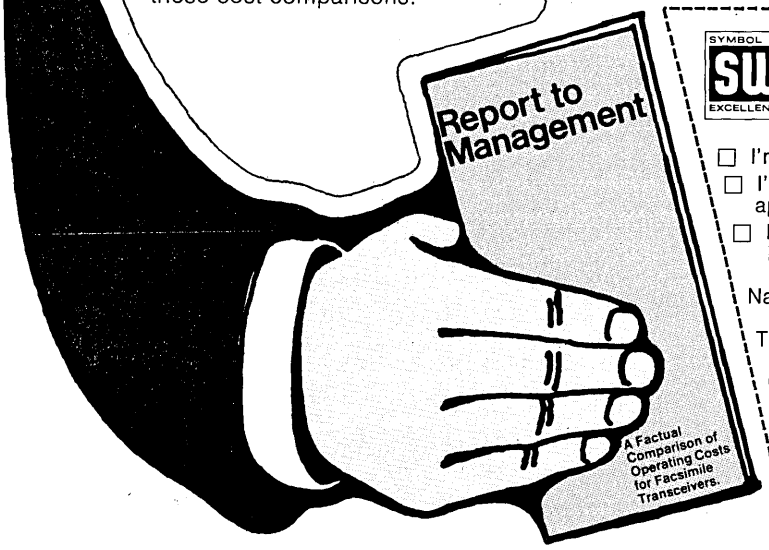
EASIEST TO USE

No drums or folders to load, levers to pull, or hatches to open . . . no complicated controls. Anyone can operate the "Electronic Mailbox" . . . even the boss, while Sally is on her break.

OUR SYMBOL

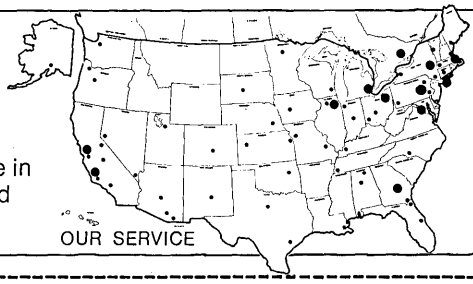
LEAST EXPENSIVE

Because the "Electronic Mailbox" is 25% faster than competitive machines, the more copies you send the more money you save. If you send only 4 pages per day, your total monthly facsimile cost would be approximately 7% to 11% less than with competitive units. With every additional copy your savings become greater. Our Management Report expands on these cost comparisons.



SERVICE EVERYWHERE

Stewart-Warner offers Datafax facsimile service in over 70 United States and Canadian cities.



OUR SERVICE

SYMBOL OF SW EXCELLENCE **STEWART-WARNER CORPORATION**
Datafax

1300 N. Kostner Ave.
Chicago, Ill. 60651
Phone (312) 292-3000

☐ I'm sold. Please deliver_____units on_____(date).
☐ I'm interested. Please have a salesman telephone for an appointment and demonstration.
☐ I need more information. Please send me my Management Report on Facsimile Cost Comparisons.

Name _____
Title _____
Company _____
Address _____
City, State & Zip _____
Telephone _____ Ext. _____
D

WANT TO SEE WHAT YOU ARE TALKING ABOUT...
CLEARLY AND IN PERSPECTIVE?

PICTURE LDS-1 IN YOUR PLANT

Combining high speed line display with fast graphic processing, Evans and Sutherland Computer Corporation's Line Drawing System, Model 1, is uniquely capable of displaying very complex objects. It lets you and everyone else see what you are talking about!

The Evans and Sutherland Display Processor is the only link needed between the data base in the main memory and the picture on the scope. The LDS-1 extracts graphic information directly from the data base without costly central processing unit programs. For the first time, you can see the data base in perspective in real time!

LDS-1 performs real time rotation and translation, real time perspective presentations, and real time clipping and scaling required for magnified views without any central processing unit software.

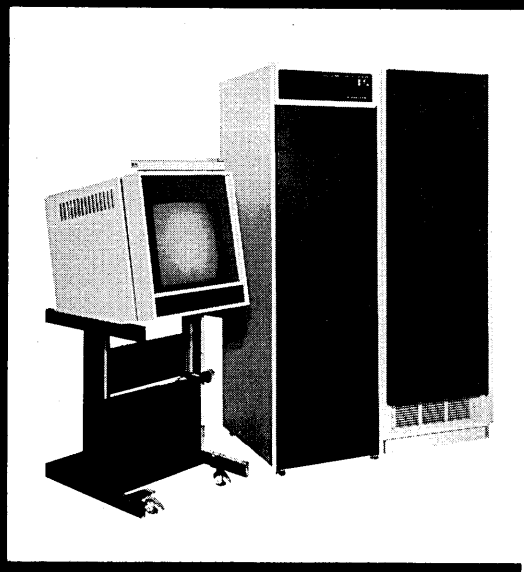
Use of the Evans and Sutherland Line Drawing System, Model 1, with a special hand viewer called the Lorgnette provides detailed displays in stereo and color.

The Evans and Sutherland LDS-1 enables the user to display effective drawing areas of more than an acre and still "zoom" in to examine a 10-inch square without loss of resolution. Clipping can be performed 100 times faster than with software. It displays 2,500 line pictures in 1/30th of a second, but it can process a data base many times larger.

LDS-1 can be used as a subsidiary time-shared processor to drive currently existing remote scopes. It also can be installed on any scientific computer.

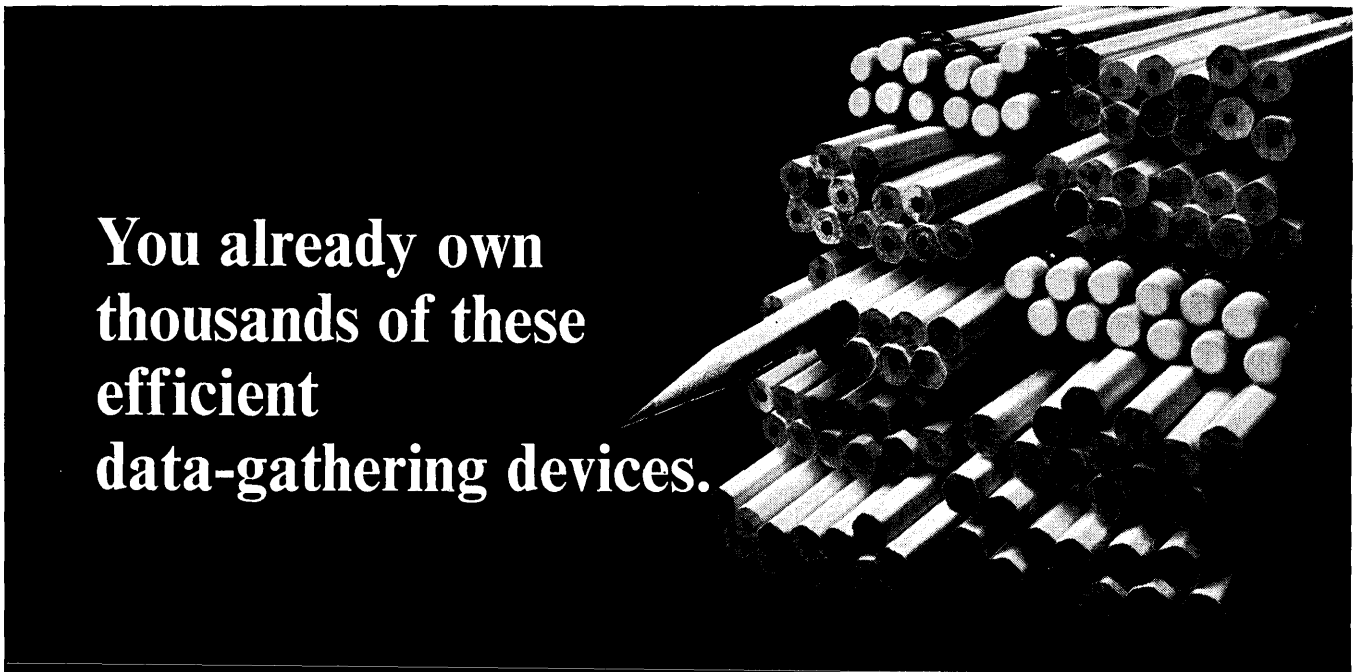
We would like you to have the complete picture of our Line Drawing System.

For more information, contact: Evans & Sutherland Computer Corporation, 3 Research Road, Salt Lake City, Utah 84112.



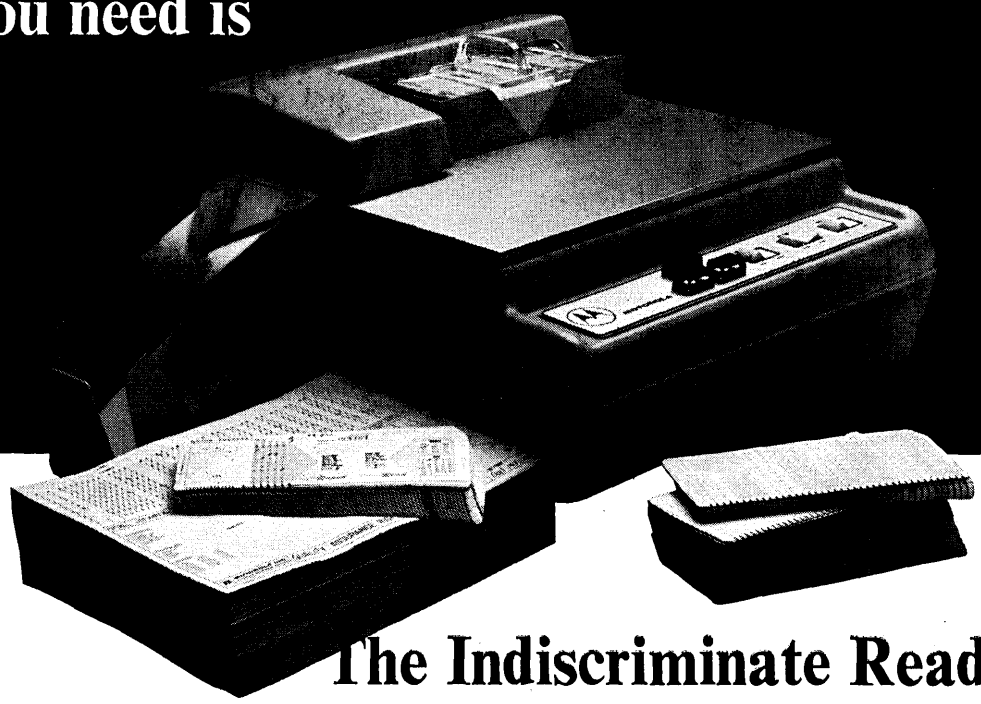
EVANS & SUTHERLAND COMPUTER CORPORATION

CIRCLE 120 ON READER CARD



You already own thousands of these efficient data-gathering devices.

To make them computer-compatible, all you need is



The Indiscriminate Reader.

Pencils. Ordinary, everyday pencils. No special training required to use them.

The Motorola Indiscriminate Reader reads ordinary pencil marks. On tab cards. On page-size documents. On snap-out forms. On any kind of document, really, that you might need.

It also reads keypunched data. And pre-marked data. All three combined, on a single form, if you like.

It outputs to mag tape, teleprinter, or to standard modems for remote communications.

Surprisingly, The Indiscriminate Reader doesn't cost an arm and a leg. To buy or to lease. Prices start at $3600. Lease rates are similarly moderate.

Spec sheets and application data are yours for the asking. Drop us a note. Pencil will do just fine. Motorola Instrumentation and Control Inc., Subsidiary of Motorola Inc., P.O. Box 5409, Phoenix, Arizona 85010.

MOTOROLA *Information Systems*

4381

Give it to your boss before he gives it to you.

MEMO

to: M.B.

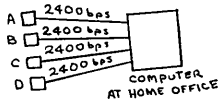
from: J.S.

subject: Communications System Reconsideration

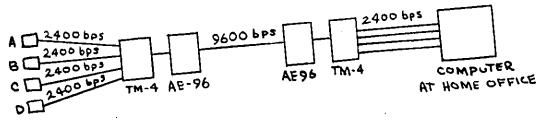
date: October 1, 1969

I've been doing some analysis on the system reconfiguration we've discussed and thought you might be interested in the results.

CURRENT LAYOUT



PROPOSED LAYOUT



CURRENT MONTHLY MILEAGE COSTS FOR A SINGLE 3002 C2 LINE (Interstate)

first 100 miles	next 150	next 250	next 500	TOTAL COST - 1,000 MILES
$156	$248	$289	$412	$1105

TOTAL MONTHLY COSTS FOR CURRENT SYSTEM: $1105 x 4 lines = $4420

TOTAL MONTHLY MILEAGE COSTS FOR PROPOSED SYSTEM: $1105

SAVINGS PER MONTH WITH PROPOSED SYSTEM: $4420 − $1105 = $3325

TOTAL COST OF CODEX CT-4 TERMINAL (AE-96,TM-4)

$13,975 (AE-96) $5,070 (TM-4) = $19,045 per terminal

TIME NECESSARY TO RECOVER INVESTMENT:

$38,090 per CT-4 system
$ 3,325 savings per month

$38,090 ÷ $3,325 = 11.4 months

We will recover investment in 11.4 months and every year thereafter, we will save $39,900.

12 × $3,325 = $39,900

Please return with your comments. J.S.

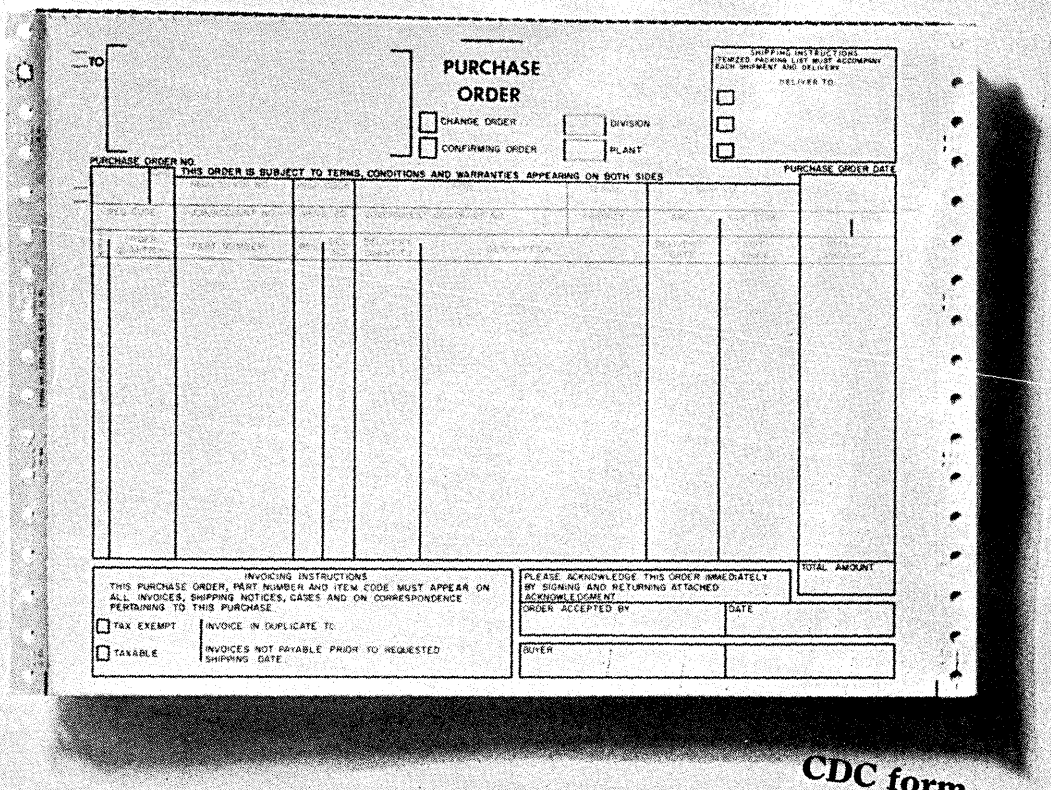
MB/jm

For all the information you need to prepare your own memo, write Oliver Sudden, Marketing Manager, Codex Corporation, 150 Coolidge Ave., Watertown, Mass. 02172. Tel. (617) 926-3000 telex: 92-2443.

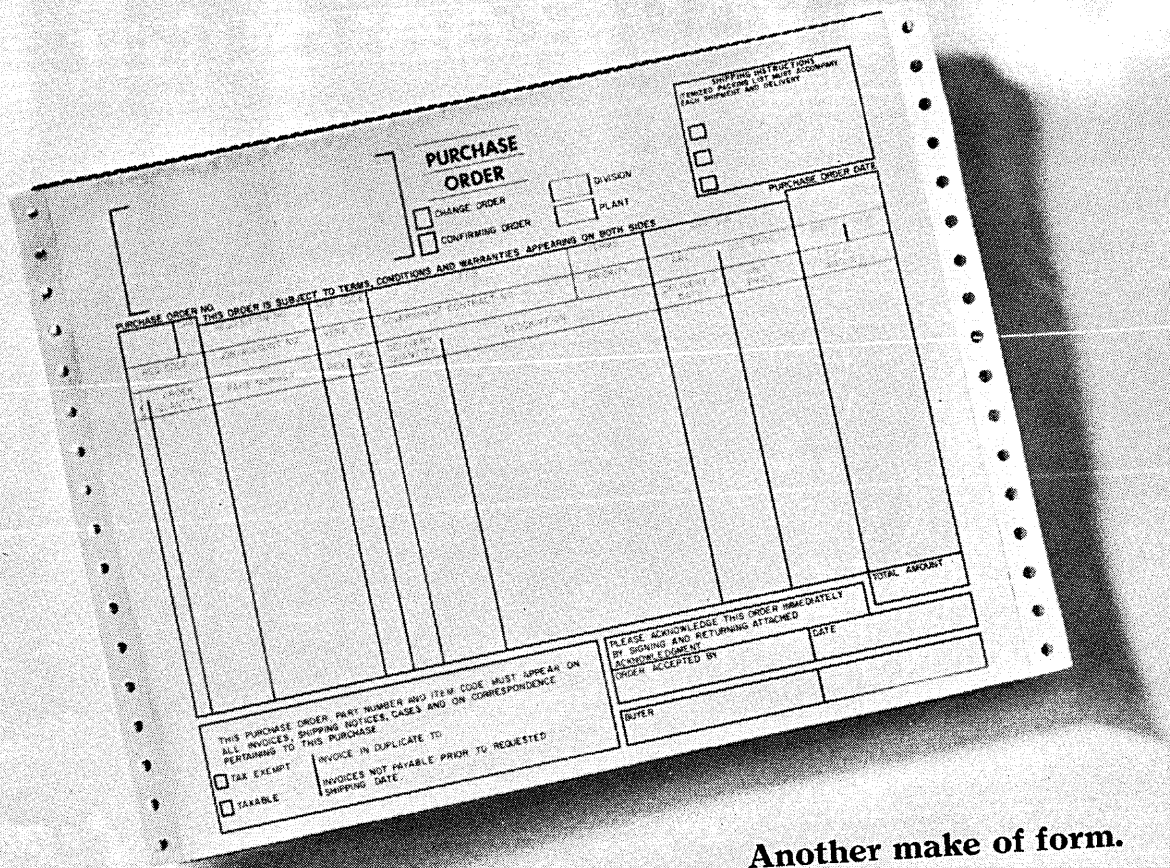
codex corporation

CIRCLE 148 ON READER CARD

Scan these OCR forms.



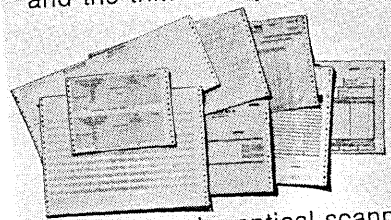
CDC form.



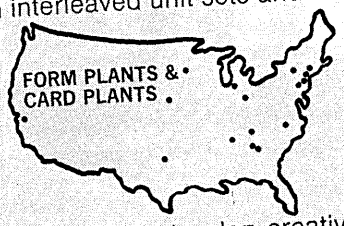
Another make of form.

See the difference?

Both forms look pretty much alike. But there *is* one subtle difference. The one on the right won't work. It's printed on the wrong type of paper with an improper ink formula, the spacing isn't precise and the trim is off just a hair. It may not be a bad form for some uses. But it's not right for optical scanning.



That's a problem you (and your OCR equipment) *won't* have with Control Data. We make optical scanning systems. And we also make forms for just about every conceivable data processing application. With that kind of background, we know what an OCR system requires to operate efficiently and trouble-free. And we're supplying OCR forms that *work* to users across the nation in a variety of sizes and styles including continuous forms, carbon interleaved unit sets and cut sheets.



If you have a forms problem — for an OCR or any other kind of data processing system—let us know. We have the experience and know-how to develop creative forms that will simplify your operations — cut costs, time and paperwork.

Write or circle the number below today. We'll send you all the details, and put you in touch with a Control Data computer supplies specialist near you.

CONTROL DATA CORPORATION

Business Products Group
Dept. 131
Control Data Corporation
4570 West 77th Street
Edina, Minnesota 55435

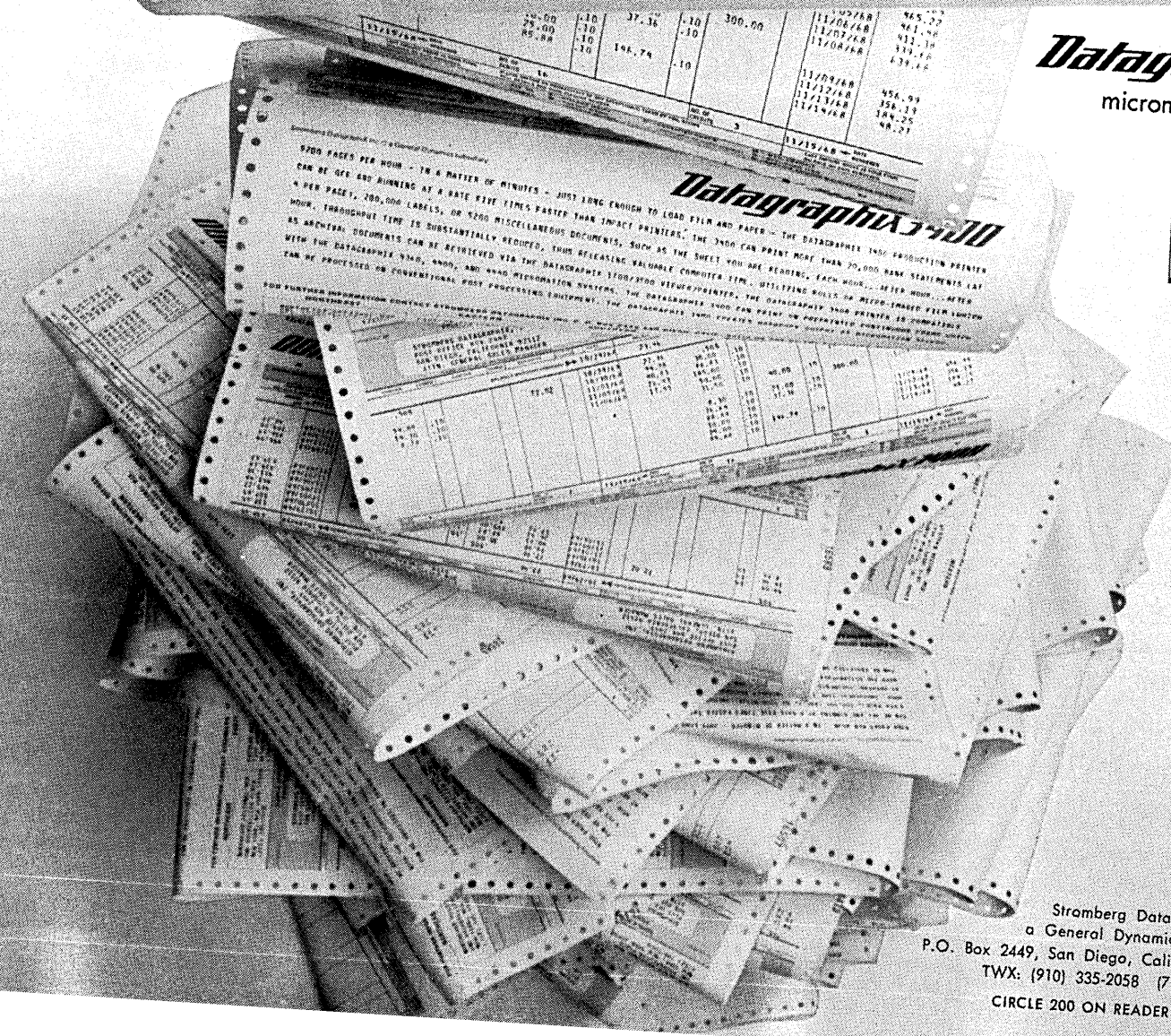
CIRCLE 162 ON READER CARD

how to get an extra 28,000 lines per minute out of your computer

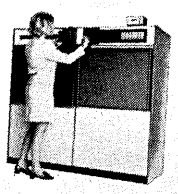
Use a 30,000 line-per-minute Micromation printer. Considering the limitations of your present impact printer (1100 or 1200 lpm), you're getting short-changed 28,000 lines every minute. That's not all. Compared to impact printing, Micromation is roughly 27 times faster, takes 1/18th the computer time, slashes the cost of paper supplies 87%, and reduces storage 99%. Factor these ratios out of your operating overhead and you'll achieve an annual savings running into 6 figures or higher.

Unequalled speed brings fresher information to decision makers. Using a corporate-wide retention and retrieval system which accesses any of thousands of pages in seconds. And the first practical means of immediately communicating computer generated data anywhere. For external distribution, paper copies can be produced from data film at 5,200 pages per hour. In just one hour, you can get out 20,000 bank statements, 200;000 labels, or 5,200 direct mail pieces on preprinted, multi-colored forms.

Only one company offers the complete family of machine systems; service centers; Kalvar dry film processing; all associated supplies; systems and software support; worldwide maintenance. Discover what Micromation can do for you. Contact our local office or National Sales Manager, James P. Whitfield.



DatagraphiX
micromation systems



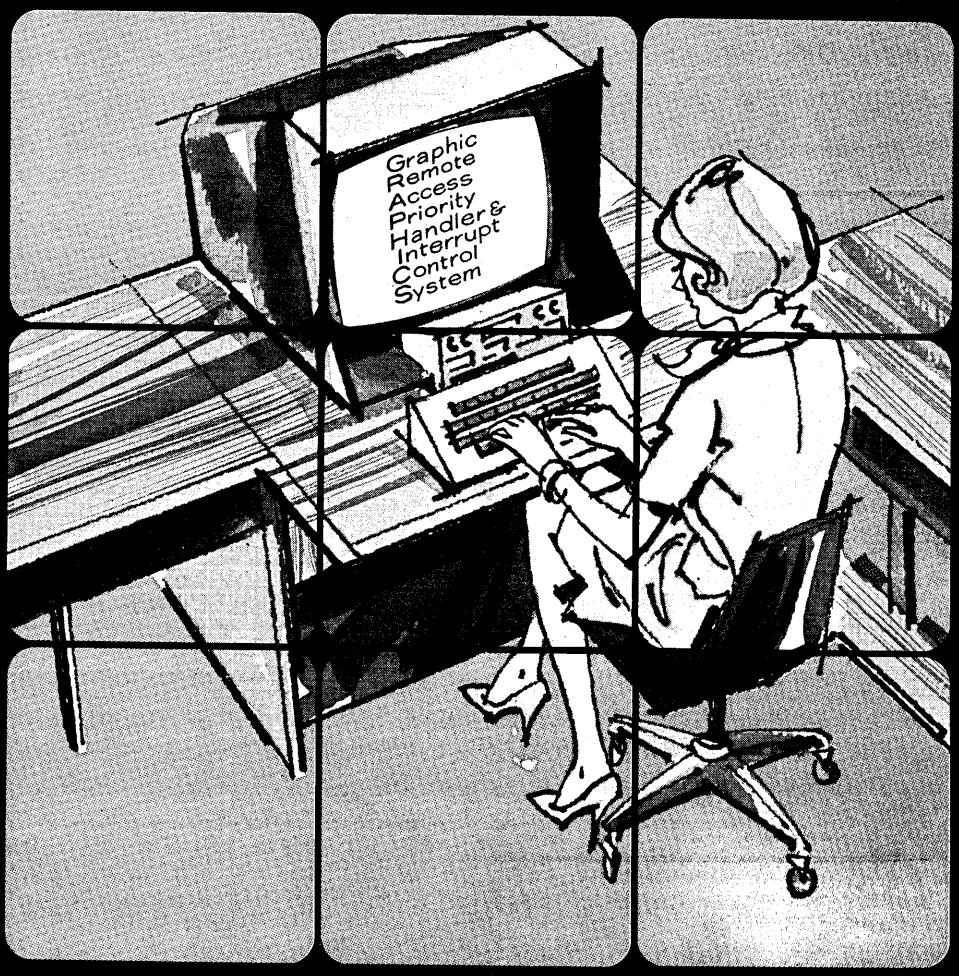
Stromberg DatagraphiX Inc.,
a General Dynamics subsidiary,
P.O. Box 2449, San Diego, California 92112
TWX: (910) 335-2058 (714) 283-1038

CIRCLE 200 ON READER CARD

three weeks to complete graphics support

GRAPHICS: a complete package for all key-driven terminals

- Interfaces with existing operating systems
- Operates in stand-alone or multi-programming environment
- Simple, standard, program interfaces
- Low core requirements
- Queued interrupts by function
- Privileged access password handling
- 'Page' storage and retrieval
- Process overlay control
- For any COBOL compatible system with local or remote graphics access
- Application description manual
- User's guide
- Complete program documentation
- Three weeks of on-site user assistance
- Installed user references on request



tsi

CIRCLE 141 ON READER CARD

Write or Phone:

turnkey systems inc.

one eleven east avenue, Norwalk, Connecticut 06851
(203) 838-4581

What would you do if your top programmer were activated tomorrow?

Without instant documentation for your programs you'd be in trouble. That's where our Quick Draw comes in. Quick Draw is a programming tool that uses the power of your own computer to produce documentation for your programs. It produces flow charts, format listings, and cross references to data names and paragraph names. And it does it faster than your programmer could hope to. So fast, in fact, you save up to 30% of present programming costs. Quick Draw was developed especially for use with COBOL, FORTRAN, BAL, as well as other assembly languages. And it's applicable for most computers. Interested in having a reserve force of your own? Just send the coupon. No obligation of course.

NCR

THE NATIONAL CASH REGISTER COMPANY, DAYTON, 45409

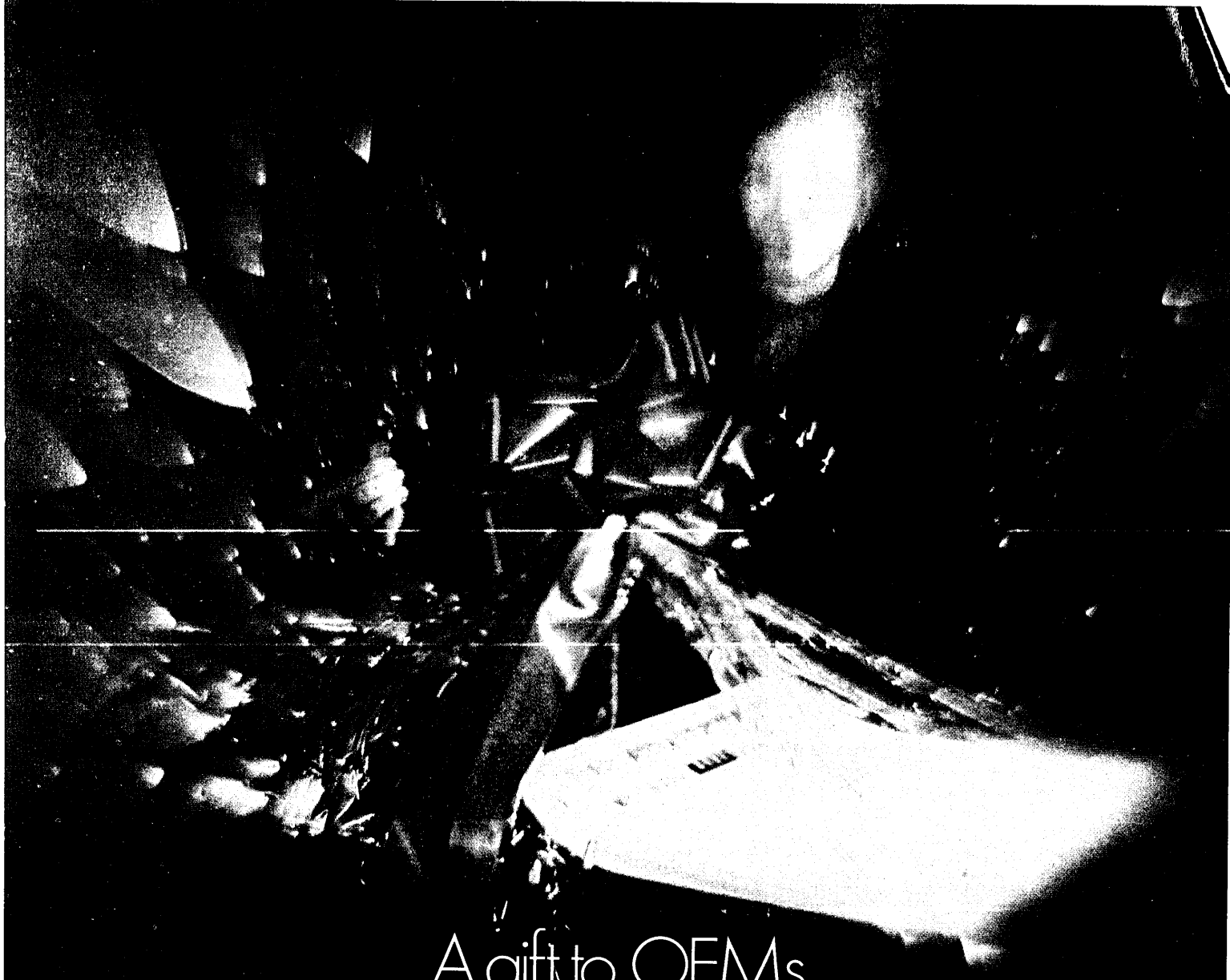
Tell me more about Quick Draw.

Mail to:
NCR — Quick Draw
Box 111 — Walnut Street Station
Dayton, Ohio 45412

Name
Title
Company
Street
City
State
Zip

CIRCLE 50 ON READER CARD

FOR HONEYWELL CIRCLE 57 ON READER CARD →



A gift to OEMs that doesn't end with the holidays. That's Ultramation.

The gift is money . . . in the form of two unique financial arrangements on the Honeywell 316 computer.

One, a quantity discount deal that saves you plenty. It entitles you to a provisional discount based on your *estimated* requirements over several years. Dozens of OEMs are already taking advantage of this arrangement.

The other, a spare parts kit you can lease instead of buy. It can save you a bundle.

That's Ultramation . . . the ultimate in computer savings to OEMs.

The H316 is a bargain to start with: First under $10K, 16-bit computer with big computer company back-up. More peripherals than anyone else. Worldwide support. Plenty of proven software.

You'll probably want rack-mountable or table-top models more than the glamorous version pictured here (and in the Neiman-Marcus Christmas Catalog and major consumer magazines).

Find out more about the gifted H316 and the unique financial arrangements for OEMs. Write Honeywell, Computer Control Division, Framingham, Massachusetts 01701.

The Other Computer Company:

Honeywell

If your office isn't exactly surrounded by good keyboard operators, we can train as many as you need.

We specialize in increasing the productivity and accuracy of computer input equipment operators—experienced employees as well as new operators.

For example, when the Book-of-the-Month Club moved its offices to Camp Hill, Pa., they discovered there weren't enough keypunch operators available. So they called us in. And we trained the operators they needed from scratch. In just three weeks.

We increase the productivity and accuracy of existing operators, too. We do it by reducing operator errors by 50% to 80%. And by increasing speed from 15% to 40% with corresponding expense savings.

Computerworld concluded, in an independent study, that the average increase in operator productivity is 22%.

So it's no wonder that top Fortune companies like AT&T and Mobil Oil use our services. So do 4 of the top 5 banks listed by Fortune. And 8 of the 10 leading insurance companies.

We train for whatever type of keyboard-operated equipment you have. Keypunch, magnetic tape, typewriting, CRT, calculating, etc.

How we do it.

KTI has the specialized talent, techniques, and materials. Also, our training is "operator oriented" instead of "machine oriented."

Where we do it.

KTI is unique. We do not operate schools or conduct classes in the usual sense. We work only with employers.

KTI trains on-the-job or off-the-job. Our professional instructor will work with your operators on your own equipment and primarily on your own documents.

What it costs.

The amount varies. But savings in the first year usually exceed five times the investment. So the service pays for itself in 9-13 weeks.

Free consultation or appraisal.

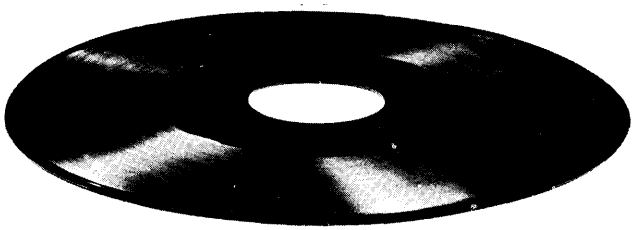
For a free consultation about KTI, or a brief appraisal of your present operators, write or call us. Then, you can have as many great keyboard operators as you need. No matter where you're located.

Keyboard Training Incorporated

We make your operators as good as your equipment.

292 Madison Ave., New York, N.Y. 10017. (212) 889-2430.
Nationwide: Boston (617) 742-3522. Chicago (312) 298-4170.
Cleveland (216) 762-4431. Detroit (313) 352-1133.
Hartford (203) 249-9309. Los Angeles (213) 386-5650.
Philadelphia (215) WA 2-8651. San Francisco (415) 552-3980.
Washington, D.C. (202) 638-3890. Toronto (416) 225-2535.

ON A PLATTER



New "juke-box" digital data input/output puts your data on records-for pennies a copy.

You can now get your digital data on records! Sturdy. Compact. Tamper-proof. And for only pennies a copy.

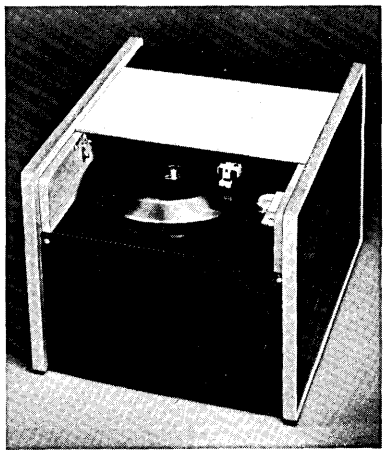
Pressed into a vinyl base like an ordinary "hit" record, data on a platter is part of a new concept in data distribution, storage and retrieval—the first of a new generation of low-cost digital data products from EG&G.

As a random access mass-storage peripheral to CRT terminals and small computers, the DATAPLAYER* Terminal gives you on-line random access to alphanumeric or digitized graphic data stored on DATAPLATTER* Digital Records in any machine readable language. Capabilities include standard data bases, subroutines, instructions and complete computer programs.

**Trademarks of EG&G, Inc.*

A 7-inch DATAPLATTER record can store up to 5 million bits per side, accessible in seconds. On-line random access to a hundred or more records in a "juke-box" type changer could provide billions of data bits for CRT display, computer memory transfer, or hard-copy printout in 15 to 30 seconds. Data transfer rate is nominally 16 Kilobits per second (2,000 bytes).

Look into this new, low-cost subsystem for your data processing. A free sample of the DATAPLATTER *record mailed to you in an informative "booklet album", is yours for the asking. Write EG&G, Inc., Systems Development Division, Crosby Drive, Bedford, Mass. 01730.*



DATAPLAYER Terminal is a compact, solid-state, stand-alone peripheral. Individual plug-in boards contain stylus assembly and turntable, power supply, input and output interfaces, and control electronics.

EG&G
SYSTEMS DEVELOPMENT DIVISION

Suddenly more and more top executives are discovering the rewards of ComputerTime Marketing

Time Brokers Inc. is the *pioneer* company in computer time marketing. They can help you use computer equipment more profitably—your own or somebody else's. They know the computer time market better than anyone. And no other specialist in marketing computer time serves so many blue chip firms coast to coast. Read on.

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TBI brings buyer and seller together

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Time Brokers Inc. brings buyer and seller together. They've been doing this since the pioneer days of computer time marketing so they know every bump in the road. *And they never forget* "time is money," *for buyer and for seller.*

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TBI makes bargains for you

But Time Brokers Inc. are not mere middle men and record keepers. They are *businessmen,* out to serve you. They have the uncanny ability to bargain successfully for computer time. They can evaluate configurations, shift availabilities and size of jobs. They know all about storage space, job responsibilities, maximum and minimum usage, location, terms and credit.

They can tell sellers why it pays to make their equipment available to spot time buyers as well as regulars. They can tell buyers how to cut set-up time to a minimum. And they know down to the last detail all factors which affect availability and price.

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To help every top executive know more about computer time marketing, Time Brokers Inc. publishes *"Computer Time Report."* This quarterly report contains detailed information about computer time availability and prices. This is the report many in the industry call *the last word in computer time marketing.* You can get it free by mailing the coupon below.

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Svend Hartmann
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Datapoint 3300 and friend
A new thrust in time sharing

Computer Terminal Corporation proudly announces its 3300T Magnetic Tape Unit to expand the capabilities of its Datapoint 3300 remote data terminal for time sharing use. We believe it to be a milestone in the growth and acceptance of the time sharing concept.

Styled as a companion unit to the Datapoint, the 3300T utilizes replaceable tape cassettes each capable of storing 800,000 characters. The development of this tape unit with its substantial storage capacity greatly expands the practical usefulness and range of applications for the Datapoint 3300.

With the 3300 Magnetic Tape unit, the Datapoint 3300 becomes a much more useful tool for "interactive" time sharing users who must work with large masses of data. Availability of the 3300T will greatly expand the number of commercial and business organizations which can effectively utilize commercial time sharing services. The large masses of data normally associated with commercial data processing can be readily stored on the 3300T's replaceable cassettes, and then displayed on the Datapoint's CRT screen, edited locally and transmitted to the central computer.

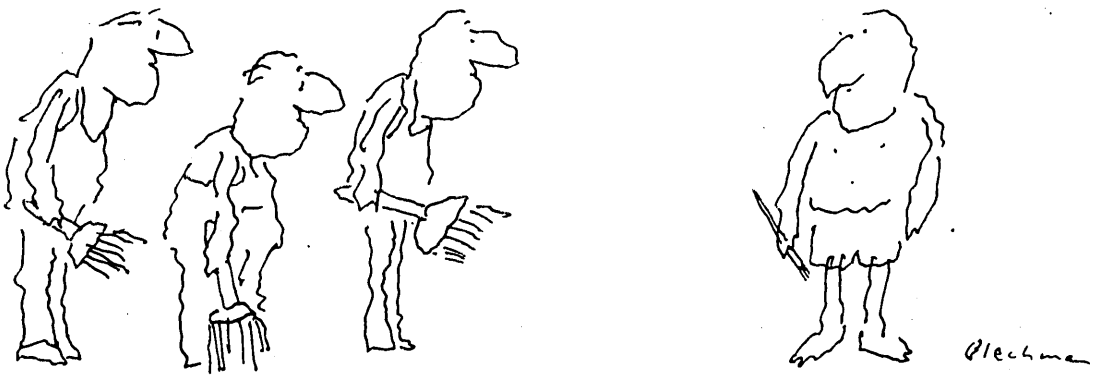
The 3300T is essentially a cartridge tape transport with storage buffer and the controls needed to provide 1.) on-line data storage, 2.) off-line message preparation, 3.) high speed off-line message retrieval (with lines displayed on the screen in either "Forward" or "Reverse" directions), and 5.) editing capability.

In use the 3300T is located immediately adjacent to the Datapoint. The two-unit system retains all the other features associated with the Datapoint alone, which includes complete interchangeability with standard teletypewriter equipment, totally self-contained (no control unit required), high speed data transmission capabilities, a high capacity and flexible CRT display, easy to read characters, solid state construction throughout, modern styling, and a 64-character keyboard set. Ten key numerical keyboard and speed buffer above 600 BPS remain optionally available.

Both Datapoint 3300 terminal and the 3300T tape transport are consciously styled to be compatible with modern office decor. If you're now using a time sharing service, or would if available service included a remote data terminal system which could readily accommodate large masses of information, our system is for you. For further information, contact the regional office nearest you or write Computer Terminal Corp., 9725 Datapoint Dr., San Antonio, Texas 78229.

REGIONAL OFFICES: 3807 Wilshire Blvd./Los Angeles, Calif. 90005/(213) 380-2497 • 7851 Metro Parkway/Minneapolis, Minn. 55420/(612) 727-1344 • 1815 N. Fort Myer Dr./Arlington, Va. 22204/(703) 524-6455

Computer Terminal Corporation
A TEXAS CORPORATION



PDP-15 is a Picasso at a House Painter's Union Hall.

Nothing against house painters. Or unions. But in the world of middle size, middle-priced computers, PDP-15 is different. It is monitor controlled. It comes in 4 versions to fit applications and budgets. It is expandable. And its software is complete — including an advanced package — and proven in 400 computers already in the field. Write.

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Digital Equipment Corporation
Maynard, Mass. (617) 897-5111

letters

morlocks and bagels

Sir:

It would seem that neither Dr. Hardin ("An Evolutionist Looks at Computers," May, p. 98) nor any of those who have written in about the Morlocks and the Eloi have bothered to actually read H. G. Wells' "The Time Machine." Your readers may be amused to know that the Eloi were meat animals, human cattle bred and herded by the Morlocks to serve as food. The implication that Wells pictured his Eloi as an intellectual elite is altogether unfounded. "Beautiful people," yes, but only as a result of being bred for tenderness. They had the intellectual level of five-year-old children and were capable of little more than singing, dancing, eating, and, presumably procreating.

Shame on Messrs. Hardin, Maurer, Klugh, Thompson, Wrigley, and Kuch for a perverted misapprehension and for aid and abettal thereof! And a soduk* to the editor for not calling attention to this egregious obfuscation!

FRANK CHAMBERS
Princeton, New Jersey

*Opposite of . . .?

Ed. note: Sorry, can't give it to him right now . . . he's out singing and dancing and eating, etc., etc.

apollo follow-on

Sir:

The News Brief published in DATAMATION (Oct. p. 169) on the problem in the Apollo guidance computer during the lunar landing of Apollo 11 is essentially correct but the suggested cure ignored many of the other constraints that must be considered when designing or selecting a computer for a system like Apollo. These other constraints have equal or higher priority than the computational speed. A slow computer can accomplish the mission even under overload conditions as was demonstrated during Apollo 11 landing. The Apollo Computer was designed and programmed with the capability of performing the high priority tasks first and causing low priority tasks to wait for periods of reduced activity. During the landing, the computer was eliminating low priority tasks and was signaling the astronauts of this fact via the alarms.

The other constraints that your News Brief ignored are the physical size, power consumed, reliability, and availability. There is *no* computer available even today that can match the Apollo computer's computational capacity and still meet these other constraints. Under peak conditions, the computer operation is within 10% of the overload conditions, but if the other constraints were not met, Apollo 11 would not have flown. The Apollo Computer has 38,000 words of memory and extensive interfaces, yet occupies under 1 cubic foot, consumes less than 70 watts of power and weighs about 70 pounds. In addition, it has successfully passed extensive qualification tests and has demonstrated a MTBF of greater than 12,000 hours. To meet the requirements of qualification tests, software development, and flight schedule, production computers had to be available in 1966. It is true that using the computer technology available in 1969, a smaller computer could be designed with more capacity and speed but the resulting production computers, ground support equipment, and software would not be available before the present Apollo program is complete.

ELDON C. HALL
MIT Instrumentation Laboratory
Cambridge, Massachusetts

cracking the code

Sir:

With reference to Tom Pittman's letter in the November issue about IBM's having flubbed by selecting a BCD representation as the card code for System/3, may I offer the following observations:

1. It seems obvious that the card code is designed for binary representation (2 octal digits). The table is:

Octal		Octal		Octal		Octal	
00	SP	20	0	40	-	60	}
01	1	21	/	41	J	61	A
02	2	22	S	42	K	62	B
03	3	23	T	43	L	63	C
04	4	24	U	44	M	64	D
05	5	25	V	45	N	65	E
06	6	26	W	46	O	66	F
07	7	27	X	47	P	67	G
10	8	30	Y	50	Q	70	H
11	9	31	Z	51	R	71	I
12	:	32	&	52	!	72	¢
13	#	33	,	53	$	73	.
14	@	34	%	54	*	74	<
15	'	35	—	55	)	75	(
16	=	36	>	56	;	76	+
17	"	37	?	57	¬	77	|

2. This is *not* a 6-bit subset of EBCDIC. The rule to get System 3 code from EBCDIC is:
   a. Substitute ! for [
      Substitute ¢ for]
   b. Substitute SP for 0, 0 for -, - for &, & for |, | for SP, and then change | to }. Sort of a round robin, utterly unjustified unless this is a deliberate example of cypher-ilke substitution to lock in the users.
   c. Interchange the columns left to right, so that A is octal 01, J octal 21, / octal 41 and 1 is octal 61. Again a round robin.

   Perhaps IBM can furnish a device to convert System 3 card files to card or other media files for 360 usage, but the different collating-sequence guarantees that they will be in the wrong order for the customer's usage.
3. Note that octal 57 and 77 are the famous characters of PL/I. Could this be a clue? Why only a right brace and not a left brace?
4. The closest code IBM has to this one is that of the 305 RAMAC, which is an exact subset, with the exception of < instead of □.

It would seem that Mr. Pittman is wrong—it's worse than he thinks.

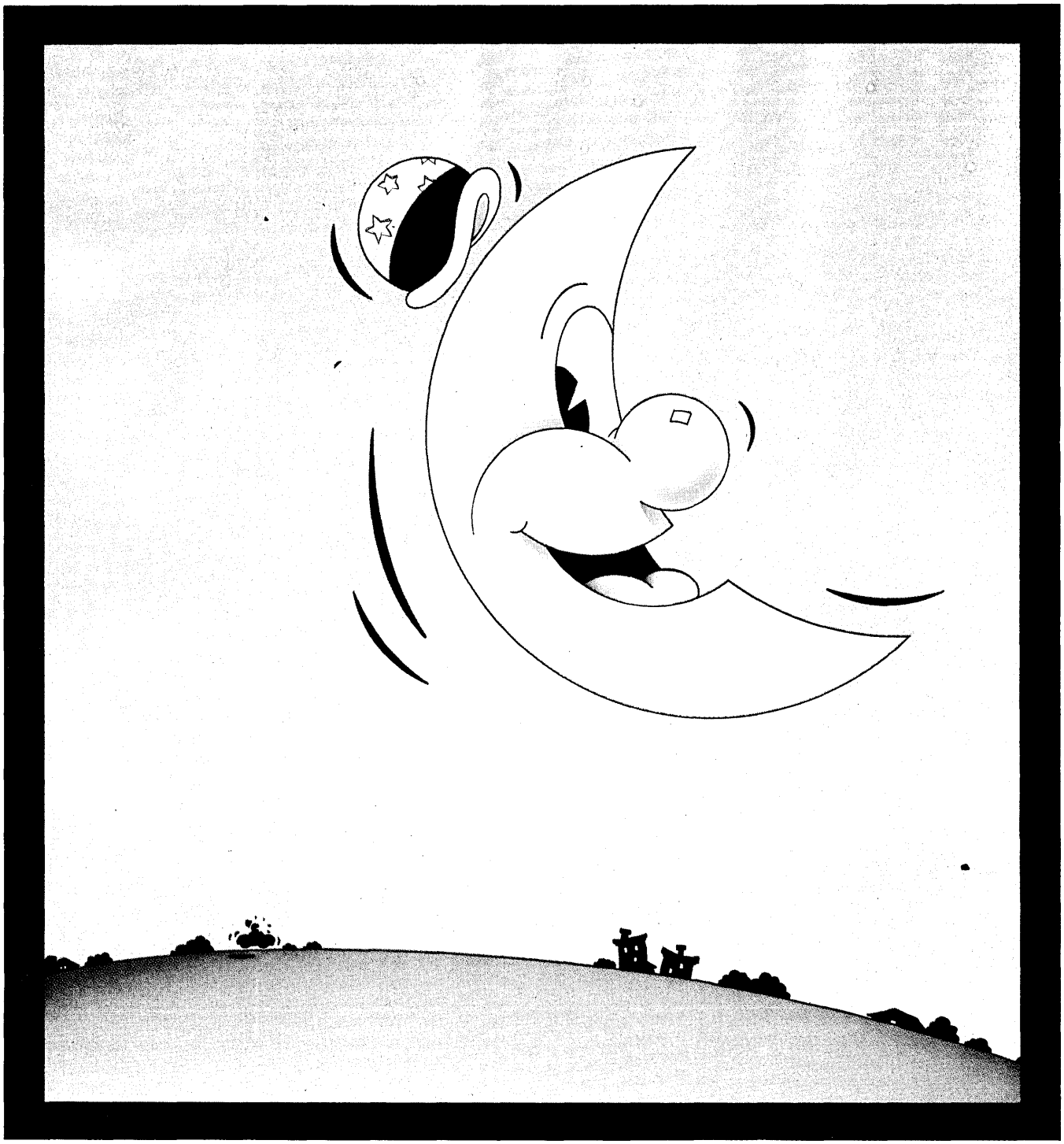
Name withheld by request

his and irs

Sir:

I am a computer enthusiast. A programmer for over twenty years, I start my computer day in the morning shower. Computers are great, but I really worry about blind faith in the human use of these devices, particularly since it just happened to me again.

Returning from a business trip to Europe, I found a notice from the IRS, Ogden, Utah, to the effect that "you made a mistake in arithmetic and owe us $1380—pay up four days ago." As a computer user, I wasn't worried about my capability in arithmetic—the machines do that for me—but I am getting a little too old for such shocks to my heart. So with pencil in shaking hand I worked backward from the taxable income figure that the computer gave and found a curious coincidence—the difference just happened to be *twice* the amount of a rental business loss. In other words, the input operator forgot to enter a minus sign! And just this set the ponderous wheels (or chain) in motion.



An expert talks about Beta's new computer output microfilmer.

Beta's been around awhile. And big people are always asking them to take on way-out projects. Like me, for instance. I used to be a big cheese. In fact it wasn't until just recently that some people came up here and found out what I was really made of. And naturally they had to tell the world.

That's where Beta came in. All those pictures you saw on your TV set came down in the form of scrambled electronic impulses. This cathode ray tube of Beta's unscrambled them and created the picture that was televised to you. Now Beta's using that same CRT display system in their new computer output microfilmer. The Beta COM 600. Which is like marrying digital technology to microfilming. And what happens is that you can put all your records right from your computer on microfilm and retrieve them in no time. It'll print out inventories, accounts, daily transactions, etc. twelve times faster than impact printers. And graph them, too. Remember the name: Beta Instrument Corporation, 20 Ossipee Road, Newton Upper Falls, Mass. They're the kind of people you ask to do a job and they give you the moon.

letters...

This was worse, of course, than the time they underpaid me at Lockheed because the 604 board had only two positions for the income tax deduction, on the supposition that salaried employees would not have more than seven exemptions.

The point of this is that I would like to make a collection of stories about human blind faith and misuse of computers, not to harm the computer industry or the users, but rather to help prevent, if possible, further misuses. Therefore, I ask your readers if they would be willing to send me whatever stories they have along this line. Because they may be published, I would ask for their signatures as believing them to be true, as well as a source for verification. For examples, I give two more incidents from my own experience.

1. Univac used a 7090 FORTRAN program which gave answers over the full range of floating point numbers, 10^{38} to 10^{-38}. Unfortunately, the 1107 mushed out below 10^{-22} and gave nothing but zeros. Seems that the engineer and his wife thought it was OK to trap on underflow in the *less* significant part of the result. I didn't, and we changed seven machines already in the field.

2. Univac was trying to sell the U.S. Army an 1107 to replace 3-initial equipment. In compiling a FORTRAN source program that was running on this equipment, the 1107 compiler gave a diagnostic to the effect that there was an entry in the middle of a DO loop. A noncom, upon checking, was forced to admit to the general that it was true, for three years of wrong answers. (Of course I feel better now, since DOD has said that *their* ABM programs will work. Possibly a new general.)

R. W. BEMER
General Electric Company
Mail Drop M-2
13430 N. Black Canyon Hwy.
Phoenix, Arizona 85029

Ed. note: Bob Bemer is a respected and well-liked member of the industry, so drop mail in M-2.

chip shot

Sir:

We read John Wessler's October article (p. 147) on Cogar and its monolithic memory products with interest and enthusiasm. It was generally accurate and fairly reflects the thrust of the business; however, the stated yield projections may be misleading in that yields not only vary with time, but also vary widely with chip complexity. The yield for a six-circuit monlithic-memory support chip may well be several times that of our 4,096 bit ROM chip at the same point in time. It should also be noted that it is not our practice to speculate upon the yields of any other manufacturer.

ROBERT M. MEADE
Cogar Corporation
Poughkeepsie, New York

core respondent

Sir:

Mr. Michael von Schneidemesser is right in noting (Letters, Nov. '69) that the 3,000 IBM 360's in Europe differ as a group from their domestic counterparts. The European versions on a percentage basis have fewer auxiliary capabilities and limited core storage—both the predictable result of many relatively new dp organizations making a modest start.

Still, I cannot accept this as a total obstacle to the purchase of software packages. Europe has a number of sophisticated systems with large core that can readily accommodate packages. As an example, Parson and Williams (*Scandinavian Computer Survey, 1968*) determined that Scandinavia has considerable systems capability in 360s. A quick check of the first page of their data (p. 18) shows 19 IBM 360's with internal core storage as follows:

Internal Core	Number of Systems
8K	7
12K	1
16K	3
32K	4
35K	1
64K	1
128K	1
262K	1

While the majority are, as Mr. Schneidemesser notes, small, some are clearly not.

I checked this situation with R. C. Dickinson, Marketing Director for ARIES Corporation. Mr. Dickinson recently returned from Europe where he demonstrated the PROMPT Management Control System and AUTODIAGRAMMER II Flowcharting packages for franchisees and customers. He reports successfully running the 32K AUTODIAGRAMMER II system at four separate sites in France, Denmark, and Switzerland and feels that the market is sufficiently developed for modest sales of 32K COBOL packages. As users upgrade their systems, he anticipates more sales in the future.

Thus, while I agree that all IBM 360's in Europe are not part of the existing market, a number of systems can probably handle current packages.

JOHN J. HAMPTON
Baltimore, Maryland

creeping error

Sir:

A typographical error has apparently crept into A. R. Worley's excellent article "Practical Aspects of Data Communications" in the October issue. In the discussion of baud rates on page 62, the unit code for stop is defined in terms of the duration of the information bit. Therefore, the solution for bit time should read:

$$(6+1.42)x = 100$$
$$x = 13.5 \text{ ms} = \text{bit time}$$

HAROLD J. BARTON
Boston, Massachusetts

glinski's glitches

Sir:

I was most interested to read "Computing in Canada" by Prof. G. S. Glinski in your September issue.

Professor Glinski paints a rather dull picture of the Canadian computing industry. Nothing could be further from the truth as there have been many exciting developments in the last twelve months.

Professor Glinski quotes from the Census of Computers in Canada (1968) indicating there are some 1,613 computer installations in Canada. Our "Market Facts & Media File," which contains 1969 census information from the Information Processing Society of Canada as of May 1, indicates that the total number of computers in Canada is some 1,928 . . . even this is incorrect as there were some 70 units not reported on.

You will be interested to know that, contrary to Professor Glinski's statement re publications, there is a lot of activity here in that as of November 1, some 12,000 individuals involved in the data processing industry in Canada will receive their first copy of *Canadian Datasystems*, the first publication of its kind in Canada.

JOHN GREENHOUGH
Canadian Datasystems
Toronto, Canada

Professor Glinski replies: All "exciting" pictures of computing activities can be found in the newspapers. How could I know about Mr. Greenhough's esteemed publication if it didn't appear until November? My data was taken from the 1968 Census because it was the only one available at the time of writing.

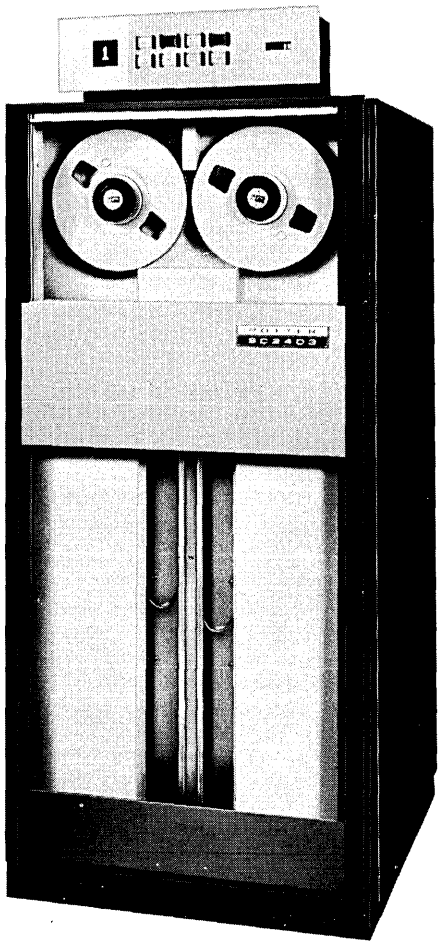
hauteur

Sir:

The September issue of DATAMATION was as colorful as ever and using equivalent words for *computer* does show the international nature of computer science. However, a Frenchman *might* use the word *computeur*, but virtually never *calculateur* (the word used on the cover) unless referring to a desk calculator. The common word is *ordinateur*.

LEON H. HERBACH
New York University
Bronx, New York

We design it. We manufacture it.



Now...we sell it, we service it, we lease it, we guarantee it.

For years, Potter has been designing IBM compatible tape drives. We've manufactured thousands of units. We've just begun selling direct to the data processing user. Now you can get the world's best tape drive straight from Potter. With service (all those years have given us an edge), low maintenance (those thousands of units sure work well), and solid reputation (we've been pretty successful helping others put our products in their products), you aren't picking a *peripheral* peripheral manufacturer but the largest and most mature independent around.

Potter's famous Single Capstan Magnetic Tape Drives are completely interchangeable in IBM 360, 1450 and 7000 systems. A low inertia, single capstan design protects tape during high speed starts and stops. The precision tape path plus a read/write head that retracts during rewind and load insure longer tape life, shorter loading time, and lower cost. Don't settle for second best—specify Potter magnetic tape drives for your IBM EDP system—the most reliable, the most economical, the most available.

Call today!

Potter Instrument Company, Inc., East Bethpage Road, Plainview, N.Y. 11803, 516-694-9000, TWX 510-224-6485.

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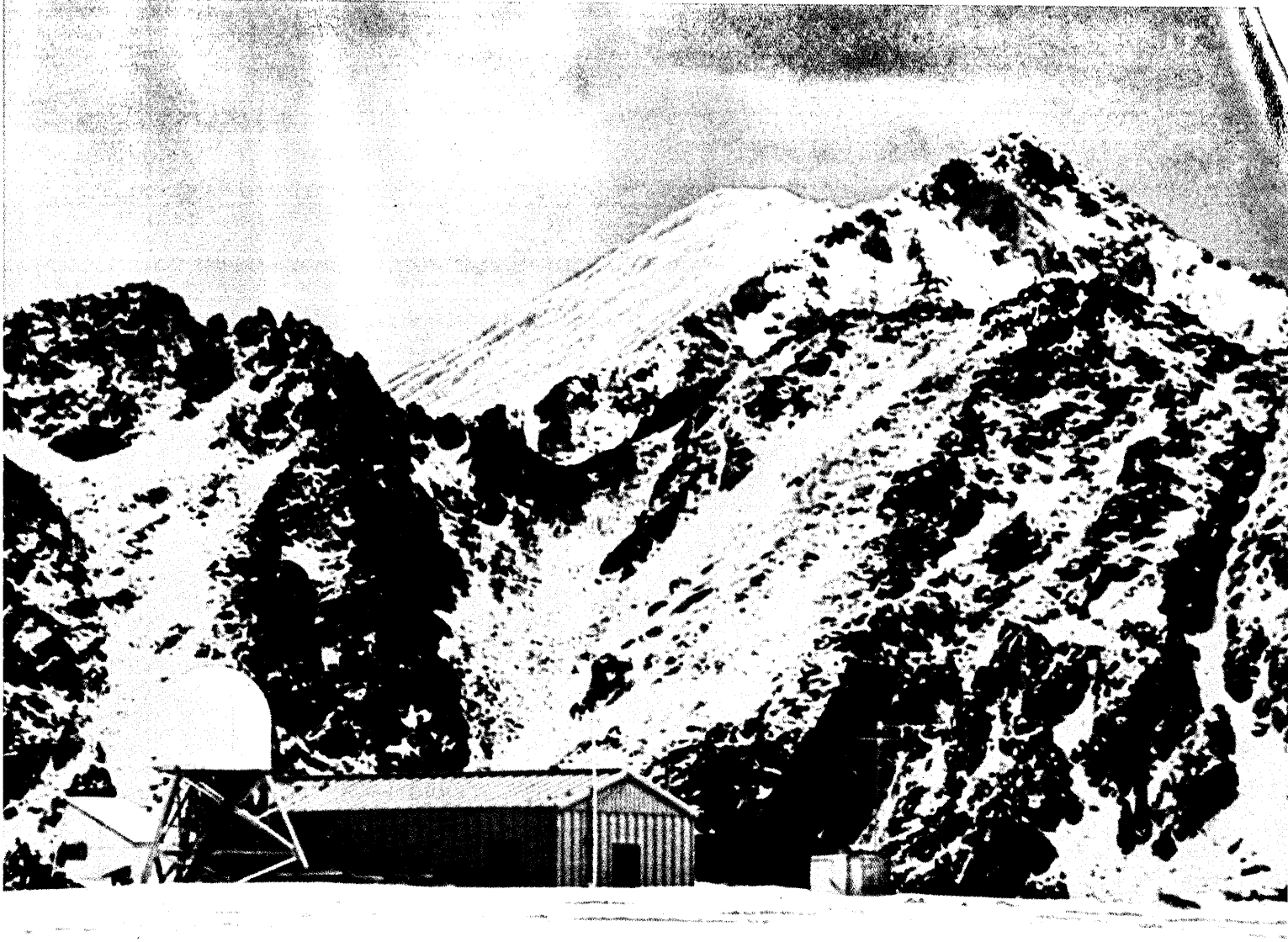
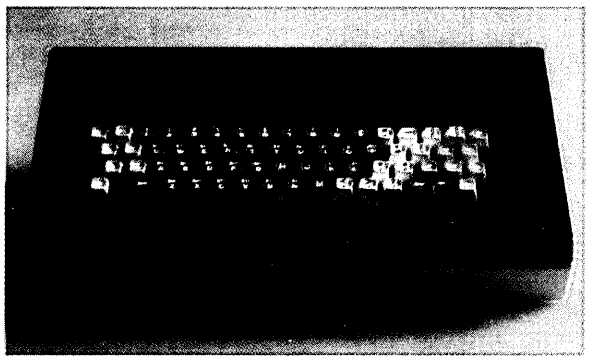


Our solid state keyboards are for locations that are expensive to go back to.



Service calls, especially to remote locations, can cost half again as much as the original cost of the keyboard.

Our inexpensive solution to this expensive problem is our new keyboard. It's all solid state.

In fact, it's the world's first use of an integrated circuit as a keyboard switching element.

Codes are transmitted electronically, not mechanically. So there's no need for mechanical linkages, electromechanical parts, contacts, buffer circuitry or any of the moving stuff that normally wears out and causes malfunctions.

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MICRO SWITCH can supply all standard and custom key arrays. Each with the same touch and spacing as a regular keyboard.

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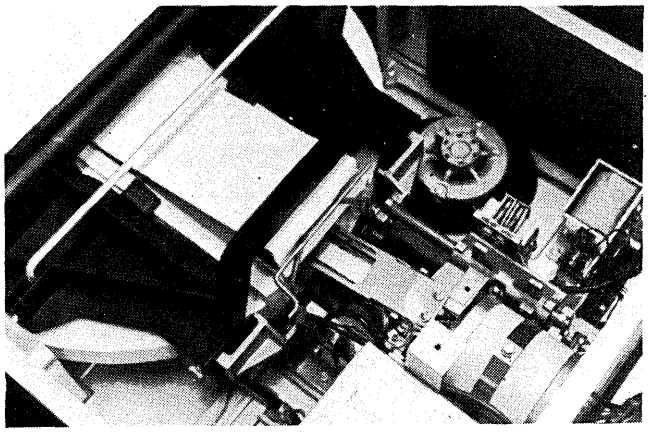
CIRCLE 65 ON READER CARD

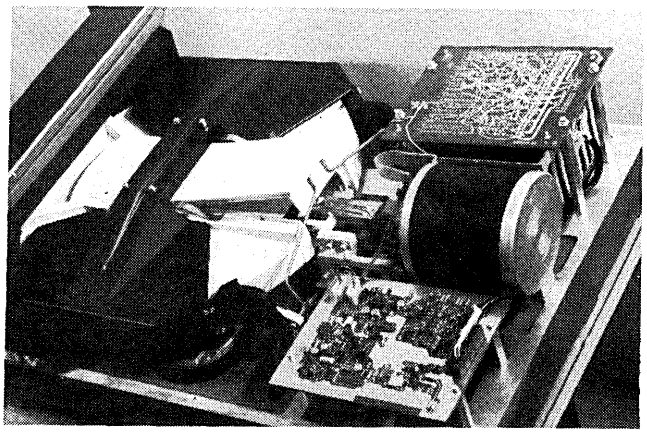
For 1130 users only:
"SPEED"

IBM 1130 DISK DRIVE



AVERAGE SEEK TIME: 500 Milliseconds
DELIVERY: 6-9 Months

CHI 1105 DISK DRIVE



AVERAGE SEEK TIME: 30 Milliseconds
DELIVERY: 2-3 Months

Let the CHI 1105 disk drive add performance to your 1130.

By the time your eyes have reached this word (6 seconds), a CHI 1105 disk drive would have performed 200 average seeks while your installed IBM disk drive would be on seek number 12 or 13.

If you have multiple IBM disk drives with the IBM multiplexer on order or are contemplating such a purchase, perhaps you are more concerned about months than milliseconds. CHI's delivery schedules for the 1105 and multiplexer control are 2-3 months compared to the current 6-9 months waiting period for the IBM combination.

Aside from these two major differences the CHI 1105 disk drive and multiplexer control are very similar to the IBM disk drive in many aspects; in fact you can switch disk packs between systems with complete compatibility.

Advanced compatible software has been written to support the CHI 1105. Disk oriented user programs can run up to 10 times faster with no modification. This increase is in addition to performance gains due to CHI's faster seeking speeds.

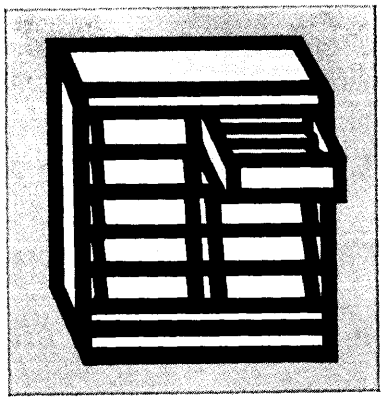
The CHI 1105 is available as a high performance single disk unit at about $500/month; also, in configuration with a low cost, high performance line printer, the CHI system will completely replace an IBM DISK-1403 printer combination. CHI equipment can be installed in addition to any IBM disks already on your system. All it takes is IBM-SAC II.

You can save yourself milliseconds, months, and even a few dollars. Circle the reader card for more details on service, lease prices and deliveries. By the way, if you are an average reader, a CHI 1105 would be on seek 2343 while IBM's drive is still back on number 141 or 142.

COMPUTER HARDWARE INC. 617 19th STREET, SUITE 2, SACRAMENTO, CA 95814 / (916) 446-3361

CIRCLE 187 ON READER CARD

TAME WILD CARDS



EVEN NEW SYSTEM/3

Tab Card Files are your only safe, sane, sure way to beat the wild card game. Keeps cards clean, orderly, right where you need them. We've got a wide selection, including ten, fourteen and twenty drawer models. Card files are just one of over 700 computer companions available from your local Tab Products representative. Call him for a complete catalog presentation. Tab Products Company, San Francisco, California

TAB
PRODUCTS CO.

CIRCLE 53 ON READER CARD

Bet your computer can't keep up with our plotter.

Statos 5 is a real-time plotter. We mean 75,000 bytes per second real-time, using 8-bit bytes. And most computers, even the largest, are hampered by program and competing-output demands, priority interrupts, etc. So they could hold an on-line Statos 5 back a bit.

This plotter takes only 1.92 milliseconds to plot an entire line of 1024 discrete points. You can program your computer to arrange the data in graphs, bar charts or diagrams, in shades-of-gray pictorials or even in alpha-numeric columns. The plot you see here is a geophysical contour map of magnetic fields reduced to half size.

In Statos 5 nothing moves but the paper transport, pulling a 15-inch-wide chart past 1024 or 1400 motionless styli, depending on the model. Digital electronic pulses do the work. They record the data electrostatically on plain white paper. Permanent images appear moments later. With a resolution of up to 100 points per inch and an accuracy of ±0.1%.

When you want high speed data output right now, Statos 5 delivers on-line. Magnetic tape, as well as some computers, may slow it down to about half speed. Ask for proof. For location of your nearest Varian representative, call or write to the Graphics and Data Systems Division, specialists in systems and subsystems for digital data processing. 611 Hansen Way, Palo Alto, California 94303. Phone (415) 326-4000.

varian
graphics & data
systems division

CIRCLE 136 ON READER CARD

FOR AMPEX CIRCLE 78 ON READER CARD

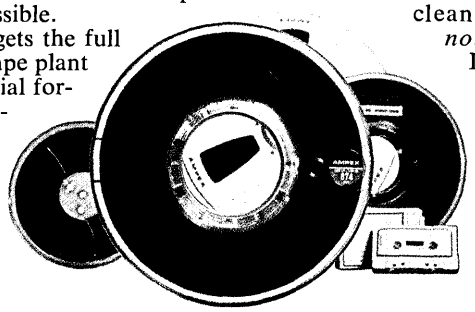
Photo and Carol, courtesy Wells Fargo Bank

Computer programmer Carol Ching expects magnetic tape to work. As long as it's error free, she can ignore it. To make sure she *does* ignore it, we've tailored our 870 Series CATT tape to provide a product as trouble-free as possible.

Every reel of Ampex 870 CATT tape gets the full treatment in the world's most modern tape plant before it ever sees a transport. Our special formulation and manufacturing process eliminates data destroying dropouts. A proprietary finishing process makes this Ferrosheen® tape flawlessly smooth for longer tape and head life. Precision slitting eliminates skew problems and edge debris that cause transient errors.

Then, just to ensure there are no manufacturing defects, we completely test every inch of every computer tape. For the final touch we superclean every reel of tape during final winding, hermetically seal it in a canister and pack it in a tape safe while still in our clean room—*a lot of work in order to go unnoticed!*

If you've got something you want to record—if you want to *get* the results and forget the tape—come to the people who pioneered the tape recording industry. Call or write: Ampex Corporation, Magnetic Tape Division, 401 Broadway, Redwood City, California 94063.



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From the original painting by Neil Boyle

POSEIDON

Business data systems are still being designed and programmed to produce oceans of data, most of it useless to top management executives. We design and implement systems to produce information that management can *use* to improve operations.

We can do this because, in addition to the computer sciences, our professional staff represents more than 40 areas of knowledge: business, economics, the physical, life and behavioral sciences, and most branches of engineering. We probably already have knowledge in your field; but we believe that only by knowing about *your* operation and *your* people can we design a business data system for you.

A brochure, *Computer Systems Design and Implementation,* describes our capability. For a complimentary copy write to Dr. Rue W. Harris, General Manager, Management Data Systems Division.

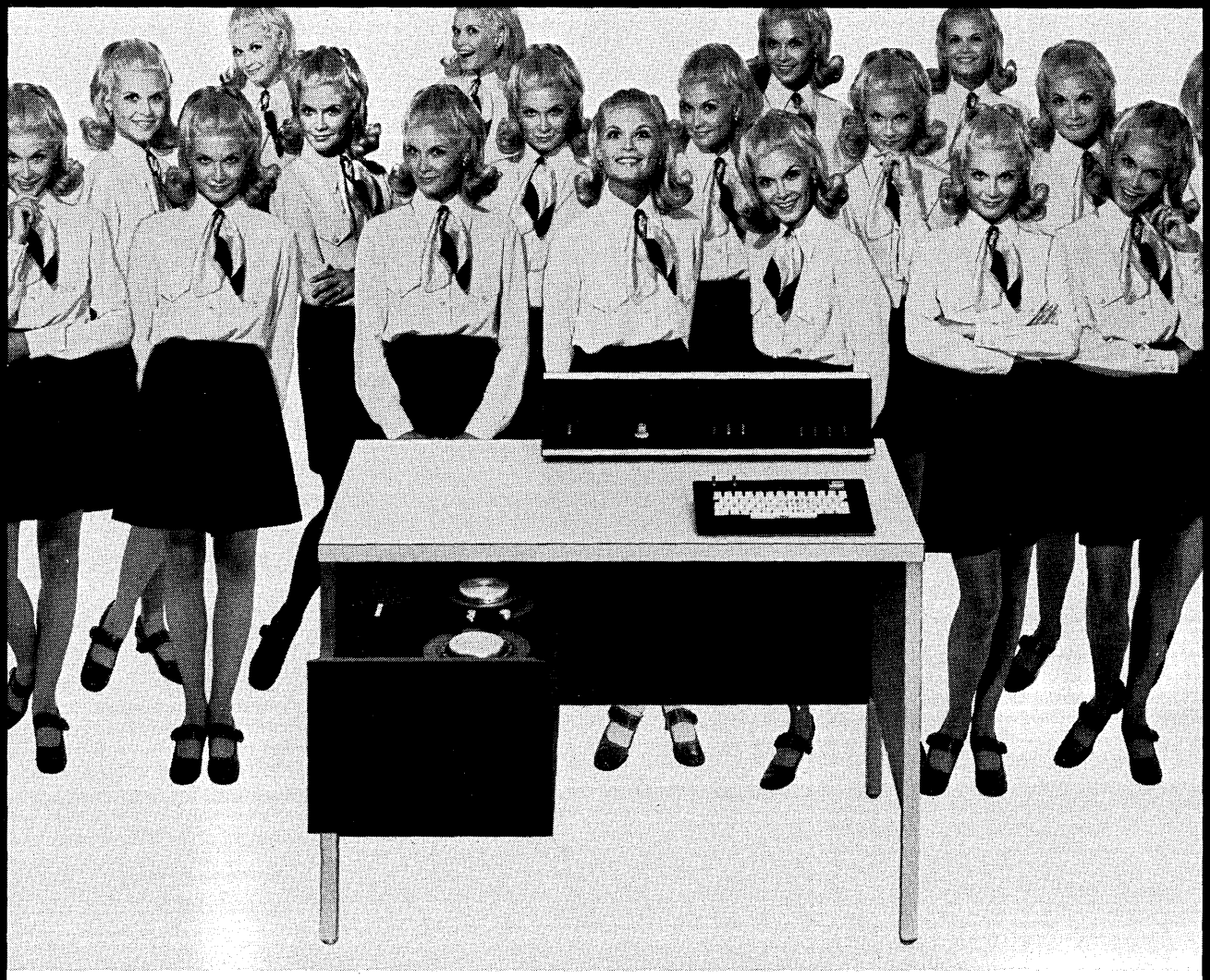
PLANNING RESEARCH CORPORATION

Home office: 1100 Glendon Avenue, Los Angeles, California 90024

An Equal Opportunity Employer. Candidates are invited to write to the Administrator for Professional Staffing.

Why select Sangamo Data Stations for keyboard applications?

They multiply operator productivity.



Sangamo keyboard-to-tape Data Stations are the easiest to learn and operate. Thanks to alpha-numeric display, there are no Octal or EBCDIC codes to learn. Electronics are 400% faster than similar equipment. Doubles as a verifier; magnetic core memory allows fast, easy correction of operator-sensed errors. Human engineered for greater operator comfort and efficiency; tape threading takes mere seconds. There's more desk-top work space, more leg room. Memory display is in line with keyboard—no head turning. Operates more quietly, and operators appreciate the personal belongings drawer. Now being delivered in two series: DS-7000 and DS-9000. Demonstration? Call or write:

Information Systems Division, SANGAMO ELECTRIC CO., Springfield, Illinois 62708

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These men believe in the importance of excellent higher education.

They know it can't be maintained without increasing business support.

Many large corporations and small businesses are contributing generously to colleges and universities. The men who head these businesses are urging others to join them—with larger investments—or by starting a company aid-to-education program.

Business needs college talent in increasing quantity. But rocketing costs are causing a financial crisis for colleges and universities that could impede educational progress.

If your business has not recently evaluated the self-interest importance of investing in higher education, it should do so now.

Tuition, on the average, covers but ⅓ the cost of a college education. More help from more businesses is needed to contribute importantly to the other ⅔.

Give to the college of your choice.

Special to management—a new booklet of particular interest if your company has not yet established an aid-to-education program. Write for: "How to Aid Education," Box 36, Times Square Station, New York, N. Y. 10036.

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Graphic Output Instantly

Datatrol Fastplot 1200

Economy

Fastplot 1200 cuts cost per plot by reducing computer and programmer time. Use the time to produce more plots or turn your computer to other profit making applications.

Call or write for more information to Datatrol, Inc., Dept K-3, Kane Industrial Drive, Hudson, Massachusetts 01749.

Versatility

Since Datatrol Fastplot 1200 exactly simulates an incremental plotter, it connects directly to the plotter interfaces and uses standard plotting software. Versions of Fastplot 1200 are available for 12″ and 30″ plotters.

Datatrol Inc.

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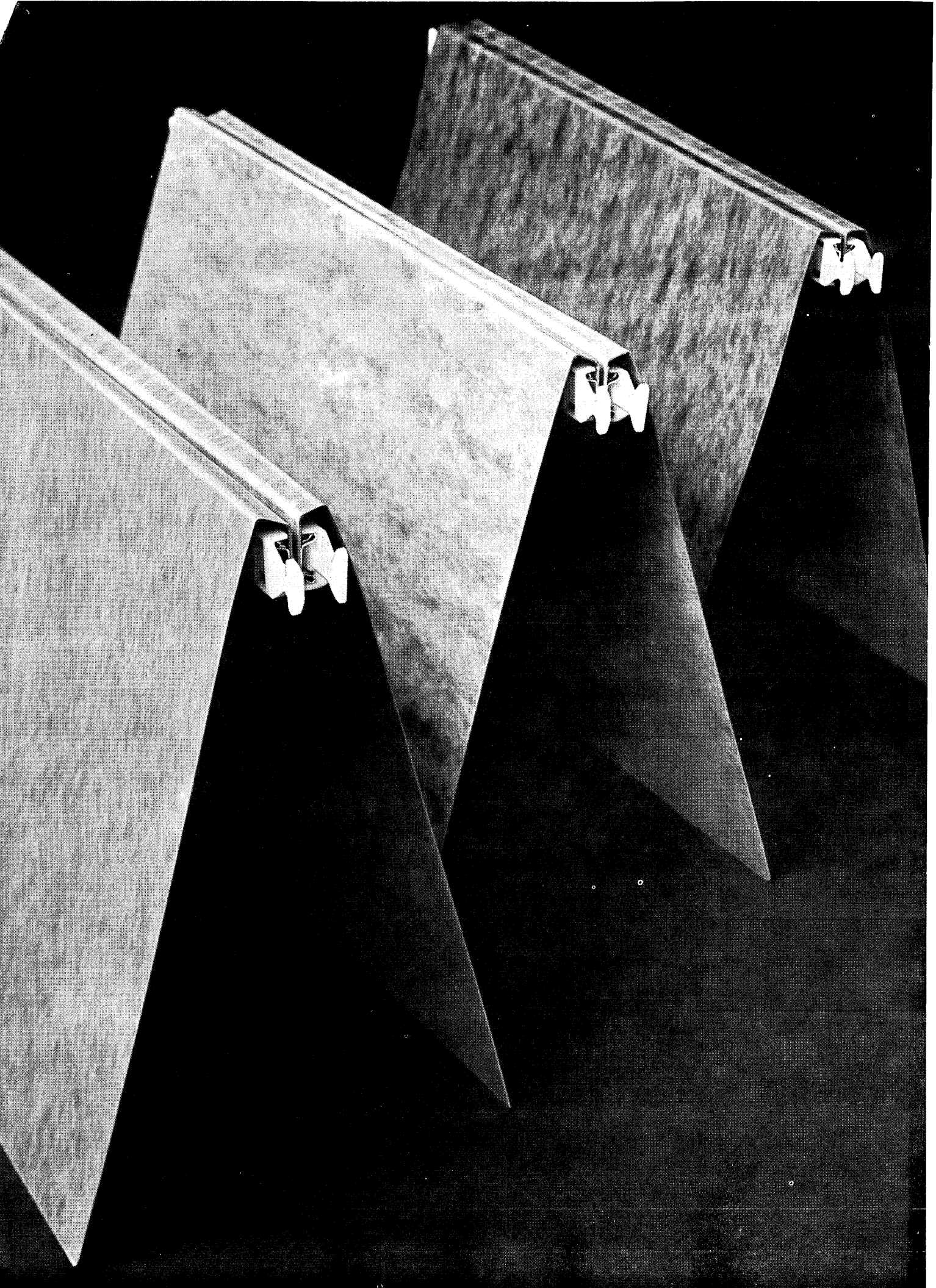
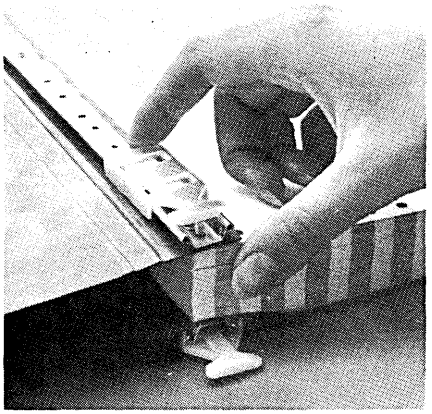


New housing development.

It's the new National Data Reference Control System, the simplest, most complete record-keeping system ever designed for computer printouts!



Here, for the first time, is a *total housing system* of data binders and compatible hanging devices and accessories fully integrated with a complete selection of floor and desk-top referral and retention units. No more improvised binding or hanging methods, no more make-shift storage arrangements.

The heart of the new system is National's exclusive Hang-A-Ref™ Binder designed to simplify the binding and hanging of burst and unburst printouts. A unique sliding hook extends to hold the binder in suspension or slides back into the binder for easy carrying and reference. A secondary connector unit called Slide-A-Ref™ is used in tandem with the versatile binder to provide easy hanging and to permit users to slide bound printouts in and out of desk or floor storage stations.

The National Control Rack 900™ Series of attractive, sturdy floor and

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Get the complete facts now. Ask your National representative or mail the coupon for free color brochure.

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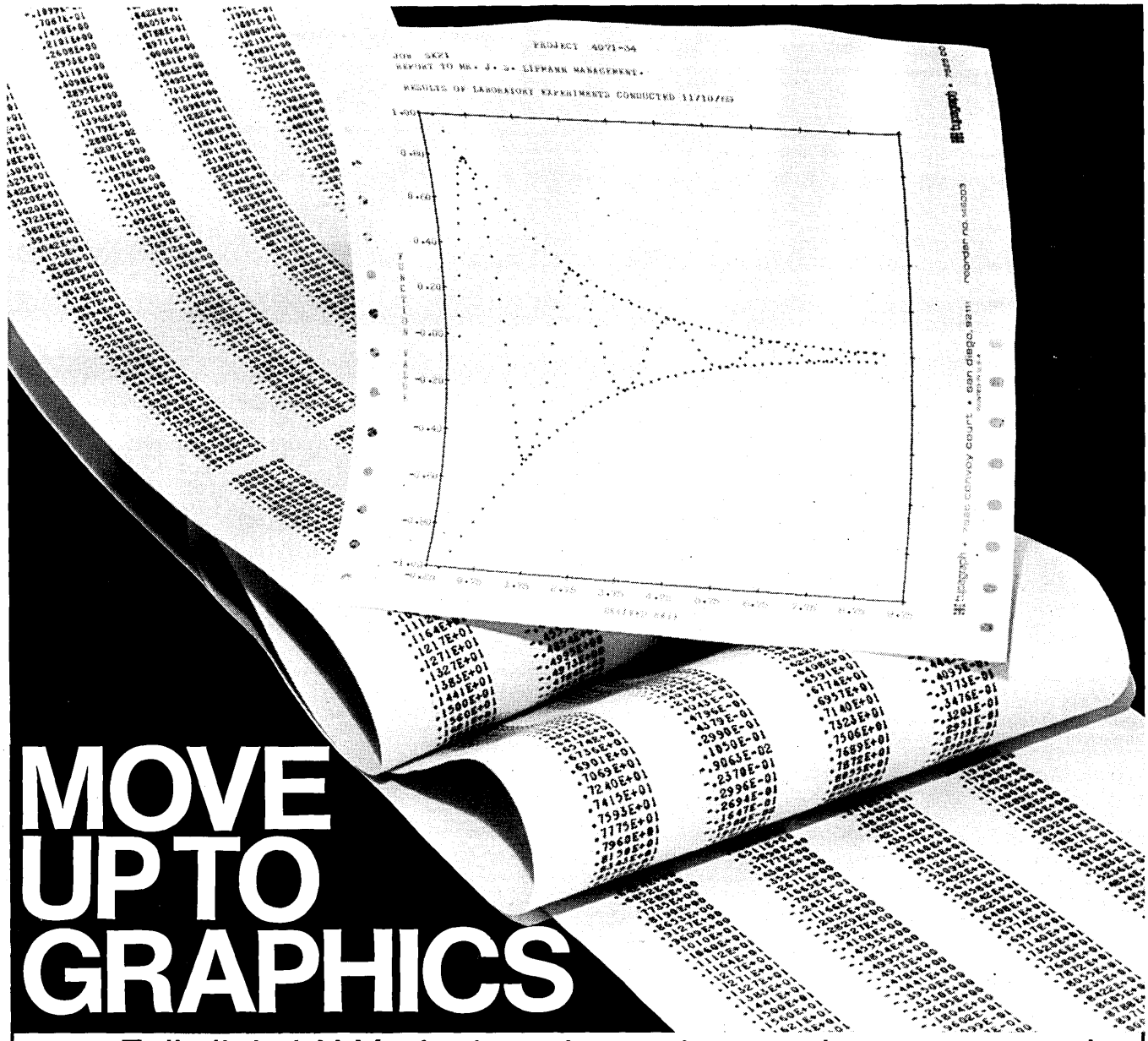


MOVE UP TO GRAPHICS

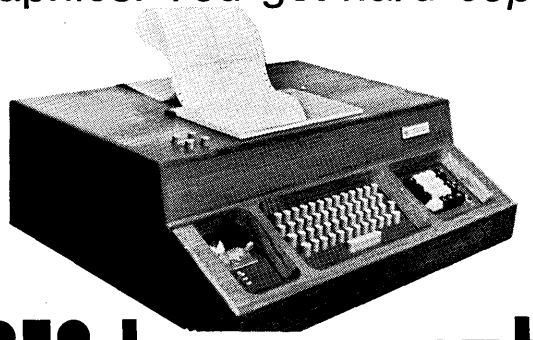
Full digital X-Y plotting *plus* typing *on the same page* is now available to you for only 10% more.

Replace those hard-to-comprehend tables of numerical data with easy-to-comprehend graphics. You get *hard copy,* ready to reproduce.

The Typagraph Model 3 is a drum plotter which uses a typewriting head instead of an ink stylus. Thus, it is the only computer terminal that plots graphs and types text *on the same page* and types graphics characters instead of drawing them.

Further, in the time-share environment, your Typagraph *plots faster* than any other plotter or CRT available. And Typagraph software is now operational with the Time Share companies that are serving 75% of time-share users.

You can add plotting capability *instantly* — The Typagraph Model 3 is plug compatible with a standard teletypewriter. You may continue to use your present programs without change, and there is no charge for the Typagraph software which provides the additional plotting capability.



typagraph tm

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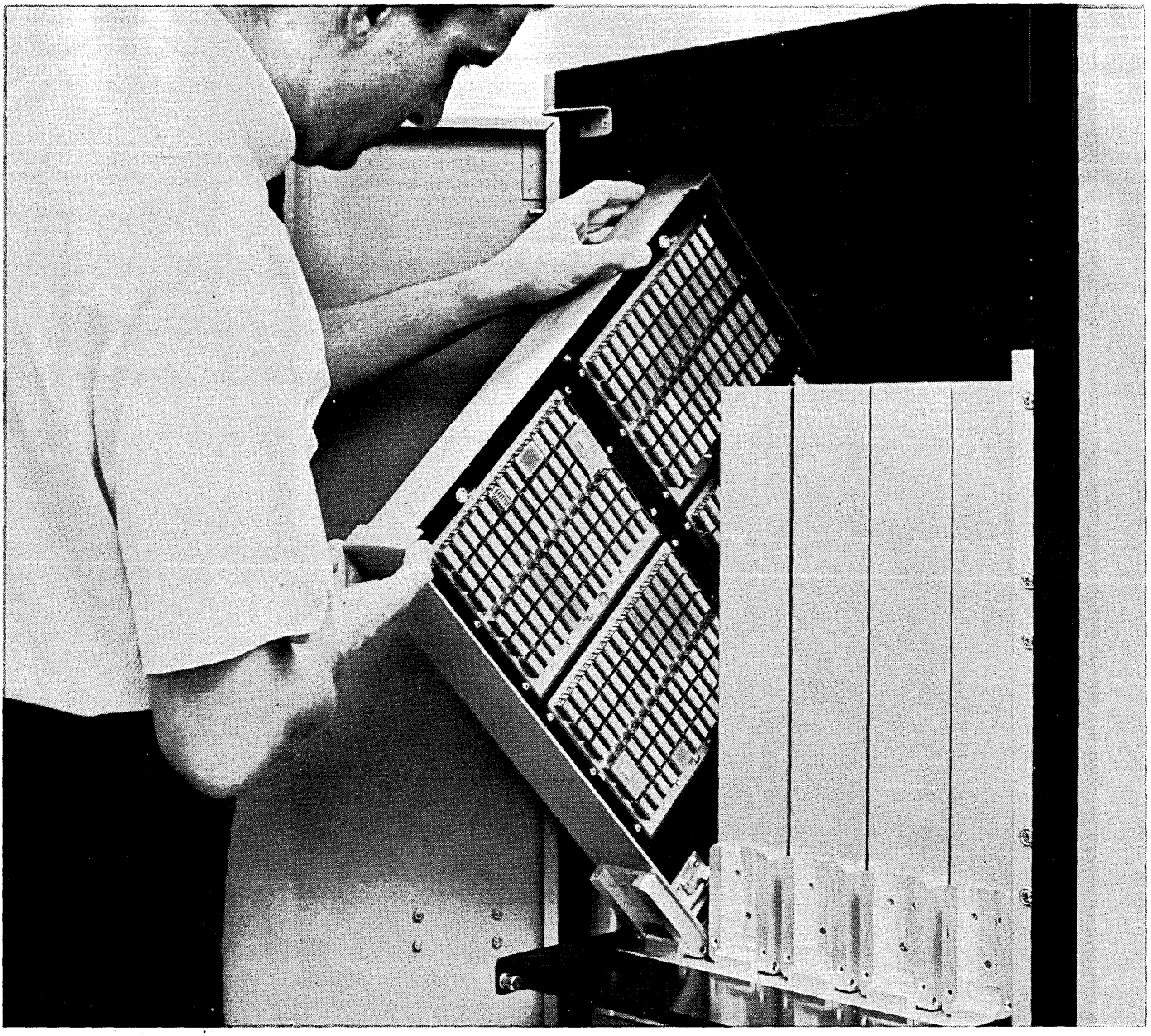
san diego, california 92111 (714) 279-5690



Real FFT

(not imaginary)

You've heard about Fast Fourier Transform "paper tigers" and "black boxes" priced out of this world. The new TIME/DATA 90 System is real — ready now with interface to your computer for: Fast Fourier Transforms and Auto Spectra, with a choice of Spectral Averaging, Linear Windowing, and Quadratic Smoothing. Or, use the System as a free-standing unit if you prefer.

TIME/DATA's 90 cuts computer processing costs from 100 to 1,000 times . . . processes a 1,024-word data frame in 28 milliseconds . . . offers 20 KHz real-time bandwidth . . . and its options will suit your needs.

The price is right — *not* out of this world!

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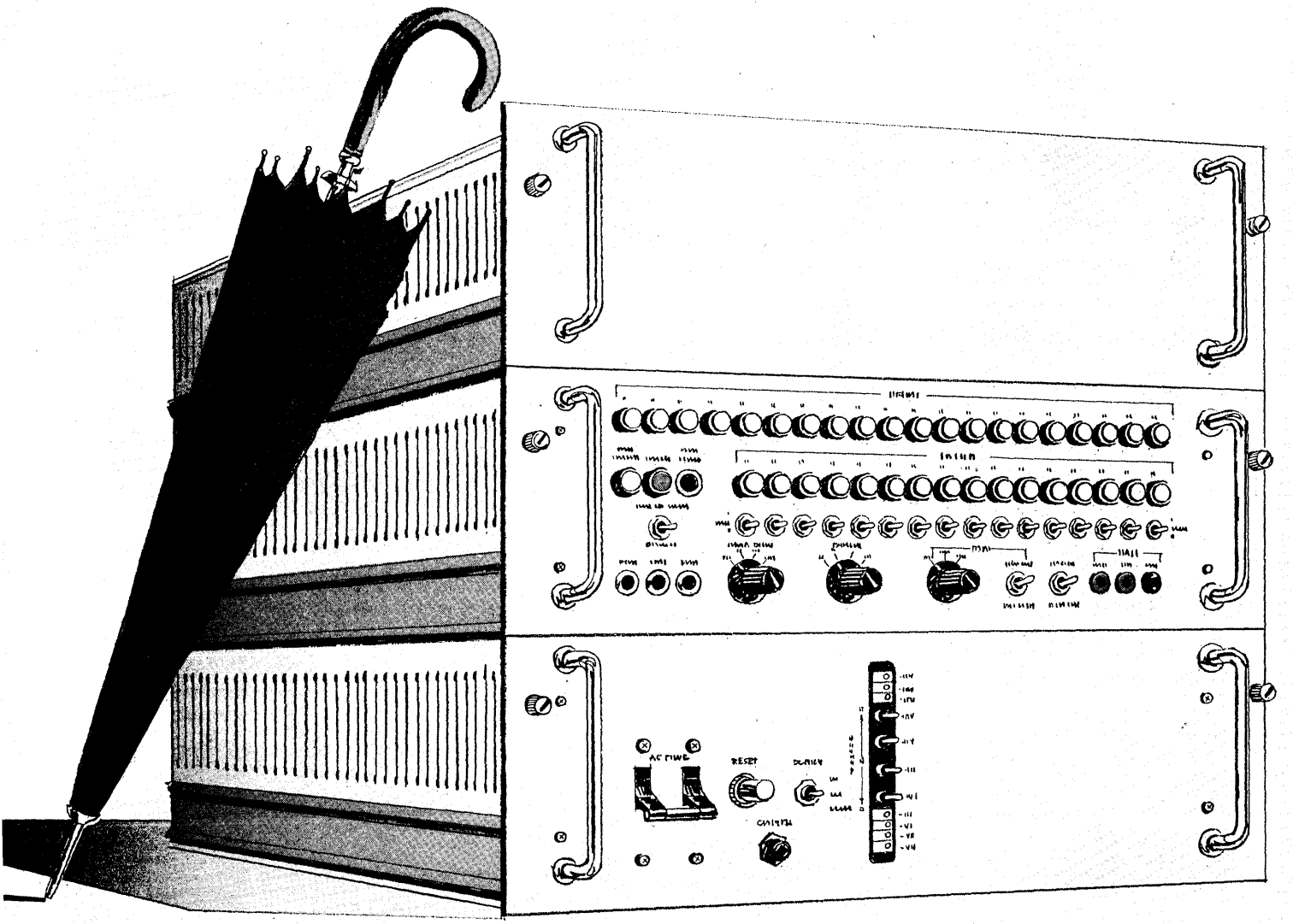
CIRCLE 28 ON READER CARD

Tightwad millionaire.



Ampex 3DM-2000 Core Memory squeezes 5 million bits into 27 inches of rack space.

For an exceptionally low price. But with many valuable features. The 3DM-2000 has versatile modular construction for easier maintenance. Computer-aided worst-case circuit design for outstanding reliability. Power on-off sequence circuits for data retention. All of these are standard, at no extra charge.

The memory system is field expandable without internal modification or loss of speed. All modules simply plug together for a maximum capacity of 10 million bits packing more data per inch of rack space than any other memory in its price range.

For more information, contact: Ampex Corporation, 9937 W. Jefferson Blvd., Culver City, California 90230, a leading world source for core memories, tape memories, cores, stacks, and arrays. Telephone: (213) 836-5000.

Your computer counts on us.

AMPEX

The new UNIVAC® DCT 500 Communication Terminal.
You can't think of the high performance apart from the low price.
Or the low price apart from the high performance.

The low price.

The new UNIVAC DCT 500 provides performance capabilities normally only associated with high-cost EDP printing systems, but at the price of conventional teletypewriters.

Rental prices begin at $80 per month for the RO version, or $90 per month for the KSR version, including maintenance. Purchase prices range from $2880 to $3265, and quantity discounts are available to original equipment manufacturers.

The addition of an optional paper tape reader/punch subsystem gives you ASR capabilities. A built-in 103 compatible modem, among other special features, means you get significant savings when compared with common carrier rates.

The high performance.

The UNIVAC DCT 500 operates at 2 to 3 times the speed of teletypewriters. It is an asynchronous keyboard/printer terminal providing up to a 132-column EDP format and 5 carbons.

At remote locations it enables you to perform business as well as scientific and programming functions. It operates quietly in office environments. Design simplicity assures high reliability.

Write for more information on the new UNIVAC DCT 500 terminal to: Univac Division Sperry Rand Corporation, P.O. Box 8100, Phila., Pa.

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FIRST IN REAL-TIME INFORMATION SYSTEMS

You're looking at output from the first great product by Path.

A new non-impact communications and computer printer that's so unique it makes other high-speed printers old fashioned.

Our first product, the Path 1200. Which works on a new but relatively simple electronic-optical technique. And does away with the things that cause trouble in other printers. Like ion guns, ink deflectors, cathode ray tubes and special paper in non-impact printers. And the hundreds of mechanical parts in impact printers.

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The Path 1200 is simple, lightweight and compact. Over 80% of its parts are electronic. And the few mechanical parts are simple rotational drive mechanisms.

Speed and Quality.

It's fast. Producing single copy output at 1200 lines per minute.

The text you're reading now is our output. Enough said?

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The Path 1200 is virtually noiseless. In fact, we've built a pleasant "hum" into it just so you can tell when it's turned on.

New Economy.

Because of its unique advanced design, the Path 1200 costs much less to buy than other printers. And much less to run. On the average, about 75% less to buy. And, while other printers cost $30 to $75 a line, ours costs $6.

So why put up with old fashioned, noisy, unreliable printers when you can own the Path 1200 for less? For more information write: Path, 20 Beckley Ave., Stamford, Conn. 06901. Or phone:(203) 348-4245.

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We find new ways to apply what's already known.

Let an EMR equal-opportunity computer open the door for you!

When you have full cycle times as low as 500 nsec, you can let everybody in the door. That's what makes the new EMR 6100 Series preprocessing computers ideal as "front-end" hardware for large time-sharing Central Processing Units. And with memories expandable to 32K, these 16-bit machines can take on the routine tasks of most of the customers waiting to get on the big CPU.

But without proper software and I/O hardware, large memories and fast cycle times still can't guarantee real-time processing. That's why EMR developed ASSET, an unusual Real-Time Executive that is ideal for the multi-programming tasks of preprocessing. Standard modules handle job and I/O queuing, interrupt control, dynamic core allocation, and shadow-time batch processing. In addition, you get real-time FORTRAN IV and a macro-level assembler called ASIST to perform routine data processing prior to computer entry.

If you want more information on how you can eliminate that long line up in front of your CPU, call or write our Marketing Manager, EMR-Computer, 8001 Bloomington Freeway, Minneapolis, Minnesota, 55420 (612-888-9581).

"the system builders" **EMR COMPUTER**

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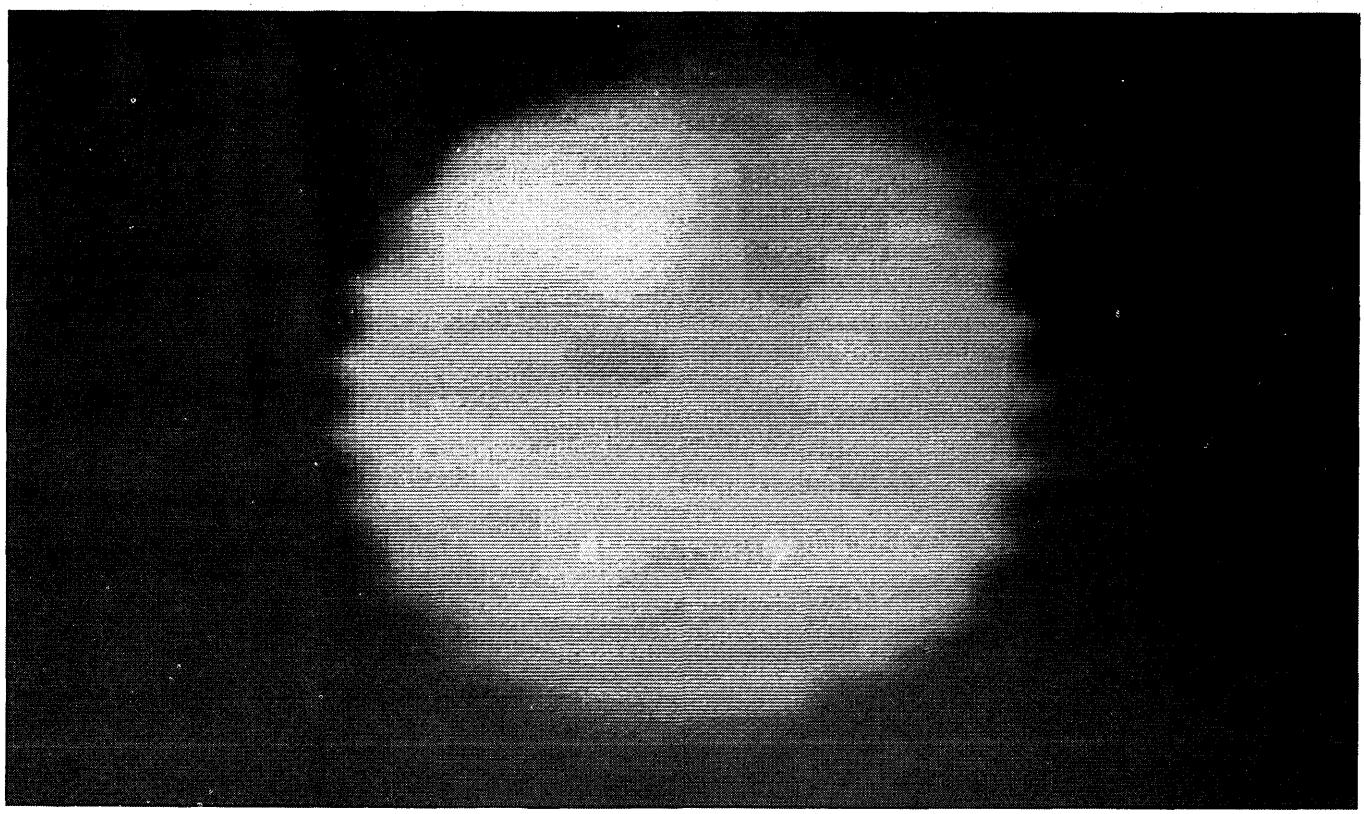

CalComp puts the sun out in 3.1 minutes flat.

It's not doomsday, exactly, but it's almost as weird.

What you're looking at is a *drawing* of what a radio telescope sees when it looks at the sun.

A computer-controlled CalComp 835 plotter drew it on microfilm for The Aerospace Corporation in Los Angeles.

The people at Aerospace need a large quantity of sun complexion maps like this one for their study of the sun's radio burst mechanism.

And by using our 835 plotter, they get them fast.

In fact, the 835 can draw at a rate of 100,000 plot increments a second. Because it draws with modulated light. On microfilm.

(With a choice of five fully automatic microfilm camera options.)

What's more, CalComp microfilm drawings can be viewed separately, like ink and paper drawings.

Or in sequence for time-lapse motion picture studies.

CalComp is the leader in computer graphics.

With sales, service and software in 34 cities. And the greatest variety of plotters in the world.

Including compact drum plotters. Giant flatbed plotters. And in our 800 series, plotters that draw not only on microfilm, but on microfilm *and* paper.

So if you have a computer that can't draw, call your nearest CalComp man today.

He can help you with just about any graphic problem under the sun.

Including the sun.

CALCOMP

TEACH YOUR COMPUTER TO DRAW.

California Computer Products, Inc.
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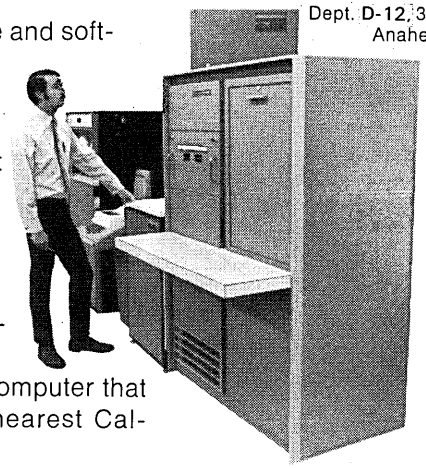
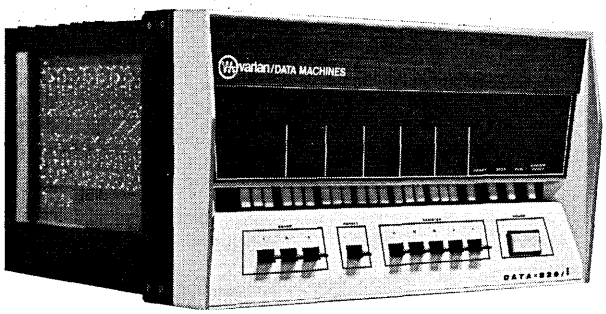


The leading 16-bit computer is now $9950.



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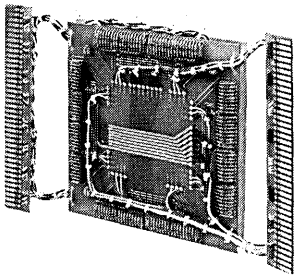
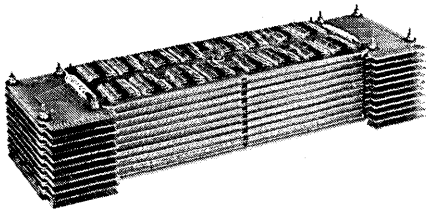
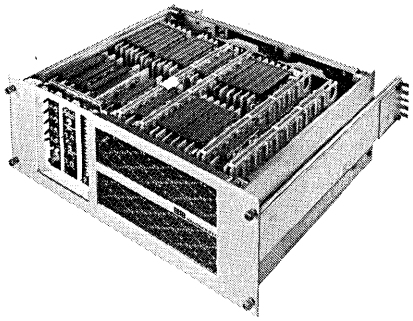
Who else but Electronic Memories



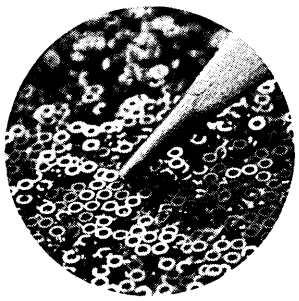
Rugged design for ground based mobile equipment, **NANOSTAK 020** commercial memory stack. High speed 850-nanosecond full cycle time for 4K memories. Features 3W, 3D organization with word capacities to 16K by 40. Built-in reliability and dependability. Available with wide temperature range cores for operation in severe environments.



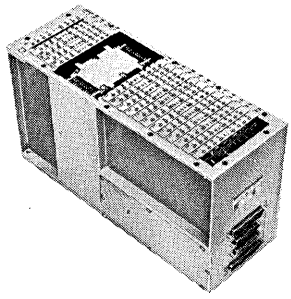
Perfect for high speed, large capacity mainframe memory systems... **NANOSTAK 3020**...technology breakthrough in 3W, 2-1/2D stacks. Stackable, compact size is an amazing 25% of competitive planar stacks and offers a significant advantage in form factor for system packaging. Extremely fast 650 nanosecond cycle time for 8K or 16K by 40, or 32K by 20 word memories.



High speed commercial memory system —**NANOMEMORY 2600**. Full cycle time of 600 nanoseconds, and word capacities of 16K by 18 or 8K by 36. It's all done with a second-generation 2-1/2D drive system with efficient circuit and logic design, for reduced component count and high MTBF, and wide operating margins—the real feature of the 2-1/2D configuration. It is easily expandable in the field, and comes in a standard 19" rack.



Five new memory cores for your next stack or system. All are medium or high drive, all coincident current, and all are fast switching for your high speed applications. Four new cores available in 18 mil, 20 mil, and two types of 30 mil sizes for use from 0° to 70°C. Also, a new wide temperature range 18 mil core for severe environments of −55° to +100°C.



Compact, ATR compatible memory system **SEMS-6** for use in military and rugged commercial aircraft applications. Reliable performer is optimized around 8K or 16K with maximum capacities of 8K by 40 or 16K by 20. Full cycle time of 2 microseconds, with access time of 700 nanoseconds. Meets MIL-E-5400, low power consumption and lightweight.

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Only Electronic Memories, the technology leader, could introduce five important new memories at once. Each one offers significant advances to provide you with faster, more reliable, and lower cost memories. Each one is loaded with outstanding new design features to give you faster access, larger capacity, and more economical operation. From cores and stacks to megabit memories, Electronic Memories has the memory products for your next, faster, more powerful computer system. For more facts and figures, just write.

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Time Share vs.

Remote Batch

It's all the same to us.

Only a software-configurated machine could do it. The IC-7000 is available in whatever shape you want it, when you want it, with optimum characteristics in any configuration because the hardware is designed and built so the shape is in the software. Immediate process-to-completion. Scheduled process-to-completion. Or multiple use through many terminals on-line simultaneously. No wired-in limitations in any mode.

This is a fourth generation interactive computer with a 256K-36 bit word core. It is the first time-sharing computer to handle overhead in an economical manner while number-crunching tasks are slammed through tremendously fast, optimized areas. Each user has up to 64K words available in core and can control access to his files at security levels up to 'inviolate.'

Search your memory with tight or loose addressing. "Get me all **m**'s with an **n** and anything with **x**, **y** or **z**." Dynamic time slicing allows programs of self-modulating queue times to pre-set optimums and you can tie into TTY, CRT, Selectric, Friden, concentrators or even other computers. The IC-7000 handles FORTRAN, COBOL, BASIC and assembly language without degradation in any dialect. And you can mix or match subroutines from different languages within the same program or build your own program language.

If it makes a difference to you, we'd like to send you detailed information and full pricing/leasing schedules. Call Bill Otterson, Vice President of Marketing or any of our sales offices.

Standard Computer

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Philadelphia: (215) 563-6350; San Jose: (408) 294-7150;
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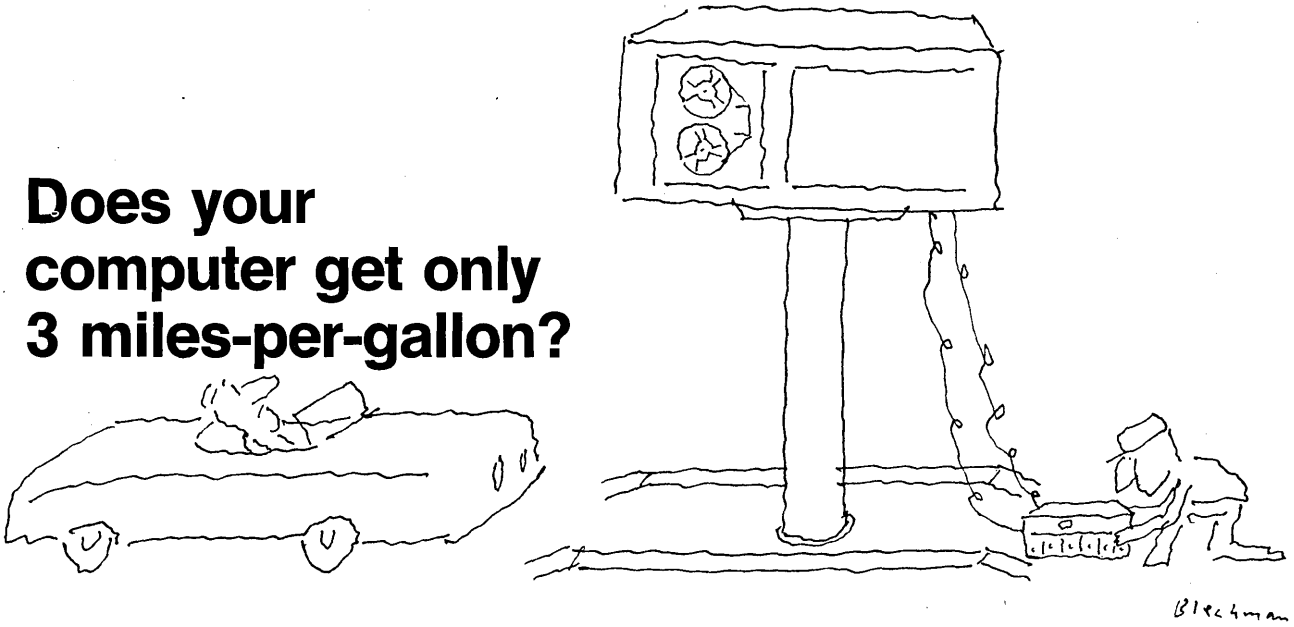
All software for the IC-7000 was developed in conjunction with Call-A-Computer, Inc.

Does your computer get only 3 miles-per-gallon?



Probably, and if it were your car, you'd find out what's wrong.

But because it's your computer, you think there's no way of finding out.

There is now. It's the Series 7700 Computer Performance Analyzer. We built it because we think your computer should be made to work at least as efficiently as your car. And, we back the hardware with a combination of people and documentation that allows us to tailor a full analytical service to meet your needs.

CPA
a CRi company

Hardware

The Series 7700 comes in a variety of configurations and sells from $4960. It can monitor up to 18 different computer functions simultaneously and do it without costing you any machine time.

Its output will tell you specifically what your utilization factors are. How efficiently you are using I/O. How much time goes for supervisory functions. Which units are overworked or under employed.

The connection between the Series 7700 Computer Performance Analyzer and your computer is a set of universal high impedance probes, that do not in any way interfere with your system operation.

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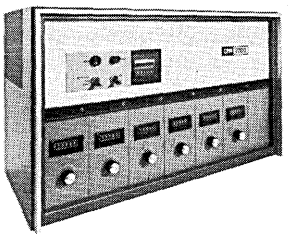
With each Series 7700 Computer Performance Analyzer, CPA provides application instructions and full systems documentation. In fact, present users tell us the manuals alone are worth the price of the unit.

People

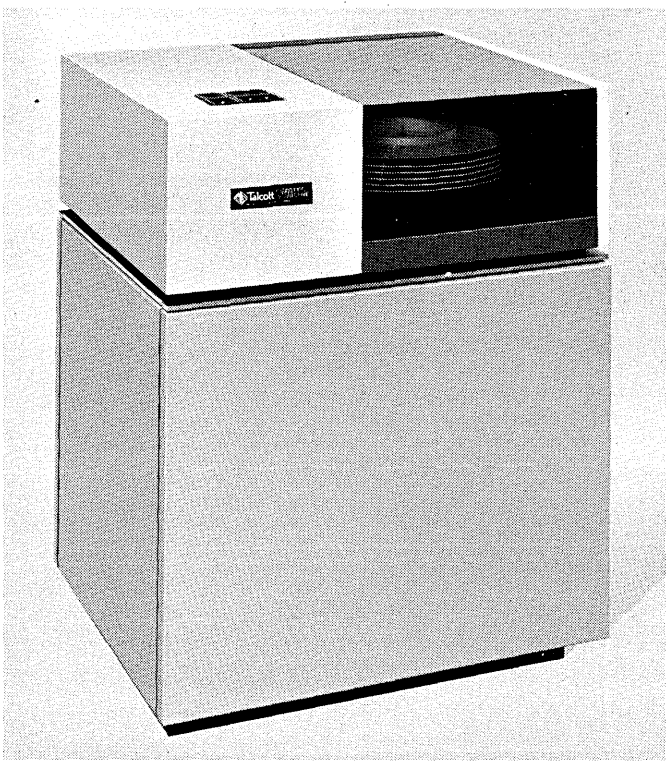
The people who run the Series 7700 can be your people or our people. Our complete documentation shows your people exactly how to use the system. But if you'd like, our people will come around to help with the analysis. It's all negotiable.

We'll send you a lot more information and a sample application if you'll write: Computer and Programming Analysis, Inc., 1103 Kings Highway North, Cherry Hill, N.J. 08034. You can call us at (609) 667-8500 or cable CPANIC. Or, if your car's finally out of the shop, drive over and see us.



CPA Series 7706 Analyzer $4960.

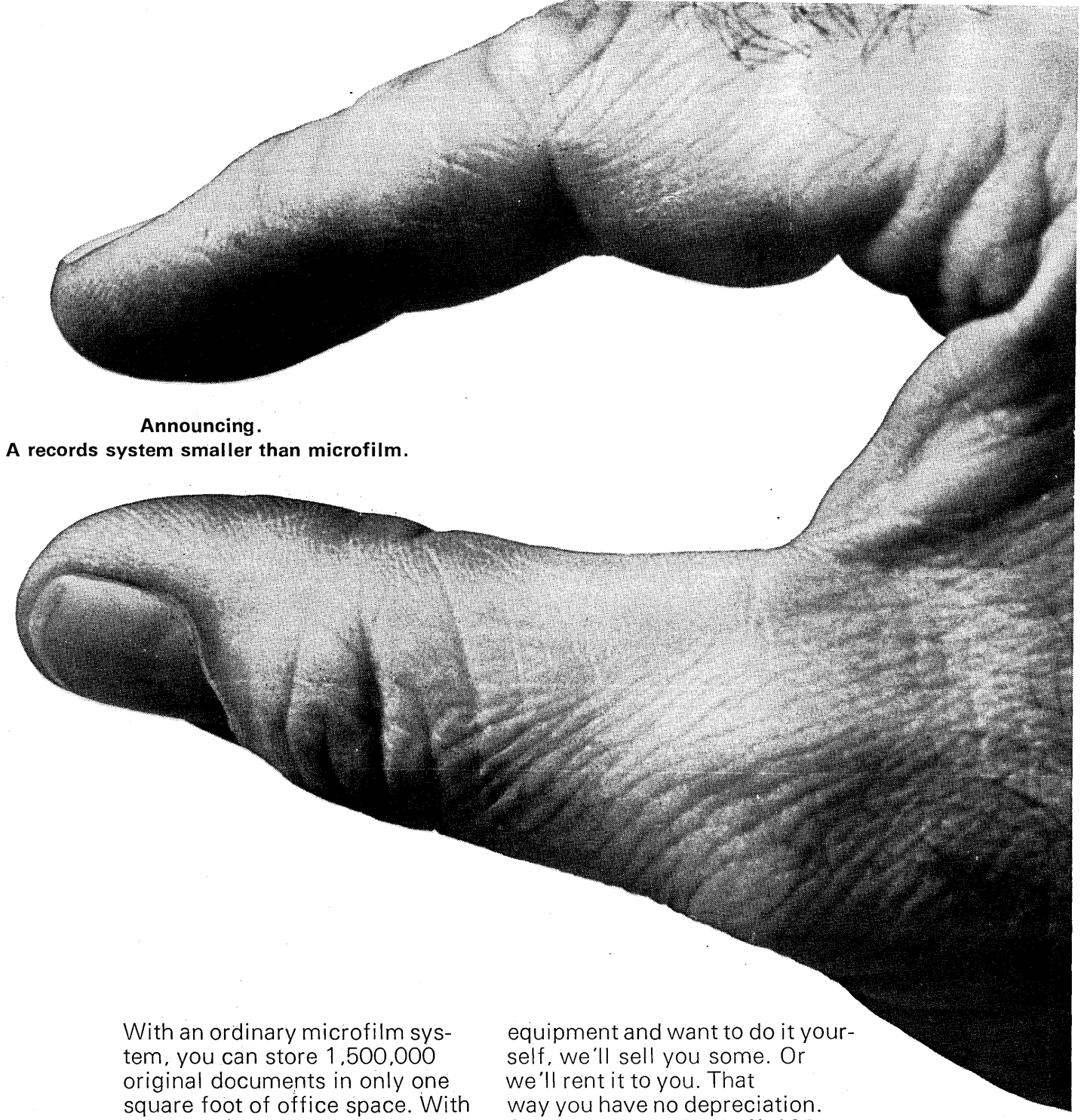
$10,000 REWARD!



When you consider the fact that there are no premium charges for extra shift work on the Talcott 9311 Disc Drive, you can quickly calculate even greater savings than this on just a three-year lease. But that's just for one unit. In actual use, you can connect up to eight 9311's to one 2841 Control Unit. They can even be intermixed or directly interchanged with the 2311 or similar disc unit. Complete plug-to-plug compatibility. The Singer Company, Friden Division has engineered the 9311 to give greater reliability—with a unique servomechanism instead of a hydraulic system. Now consider this: dependable service by the worldwide Friden Customer Service Organization; leasing arrangements to give you maximum savings by Talcott Computer Leasing. Ready to "unbundle" your 2311's? Contact your local Friden office or write: Friden Division, The Singer Company, San Leandro, Calif. 94577.

Talcott

TALCOTT COMPUTER LEASING
Division of James Talcott, Inc.
1290 Avenue of the Americas, New York, N. Y. 10019



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A records system smaller than microfilm.

With an ordinary microfilm system, you can store 1,500,000 original documents in only one square foot of office space. With our system, you need practically no space. Or equipment. Or extra people. We'll take care of everything. With Remington Rand Microfilm Contract Service.

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Remington Rand Microfilm Contract Service operates from more locations across the country than anyone else in the business. Contact an office near you. Or write for our twelve-page brochure. Remington Rand Office Systems Division, P. O. Box 171, Marietta, Ohio 45750.

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OFFICE SYSTEMS DIVISION

CIRCLE 185 ON READER CARD

Wright LINE

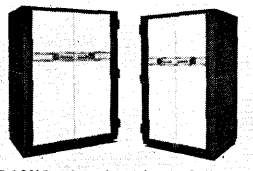
Everything for data processing...

...except the computer

NEW **TAPE CLEANER** removes loose oxide, dust and other contaminants from magnetic tape. Contaminants are shaken loose by sixty cycle per second pulsing vacuum vibration and are carried away from the tape by a powerful vacuum. Exclusive Vac-U-Torq drive assures proper tape tension at all times and eliminates danger of spilling tape. Complete dual pass cleaning on 2400 ft. reel takes less than four minutes.

For complete details, circle readers' service number 108.

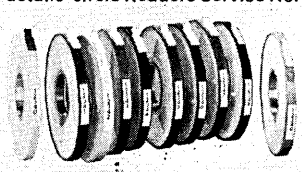
GOLD STAR FILES The most beautiful and versatile card files available. Line includes three wide files and counter-top model with plastic-laminate surface. For details circle readers service no. 103



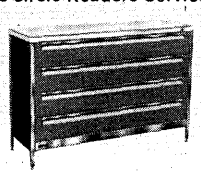
DATA BANK A "double safe" vault for the protection of vital records stored on tape or disks. It carries an Underwriters 150°, four hour label. Four models available.
For details circle Readers Service No. 101

COUSTI-COVER reduces keypunch noise level by as much as 75%. Hinged transparent acrylic cover allows easy access to keypunch.
For details circle readers service no. 104.

PORTABLE CARD PUNCHES for punching cards and plastic cards. Printing punch has tab stops and prints and punches simultaneously.
For details circle Readers Service No. 105



TAPE-SEAL® SYSTEM The safest, easiest handling, most economical method of storing tape. Line includes cabinets, trucks and accessories.
For details circle Readers Service No. 106



DISK PACKS AND DISK PACK STORAGE 1316, 2316, and 2315 Disk Packs with Data Coat Surface and a complete line of storage units to give you maximum safety and protection.
For details circle Readers Service No. 102

Wright LINE
DATA PROCESSING ACCESSORIES

160 GOLD STAR BOULEVARD, WORCESTER, MASSACHUSETTS 01606
A DIVISION OF BARRY WRIGHT CORPORATION

From Tel-Tech

3 new modems

New design approach yields top performance and reliability... no adjustments required

Tel-Tech has taken some new and very novel approaches to data set design. The result: three Bell compatible modems that are small in size, small in price, and yet absolutely superb in performance and reliability.

The new Tel-Tech modems are maintenance-free. There are no adjustable components. There's no tuning, tweaking. . . even at the factory.

The TT-103, TT-202 and TT-201 are designed to transmit data up to 300, 1800 and 2400 bps. Their compactness makes them ideal for integral terminal installations. And it doesn't take much of a rack to mount a hundred. You can also get desk-top units for stand-alone applications.

You can depend on these elegantly simple modems. And their simplicity keeps the price low.

For information call or write:

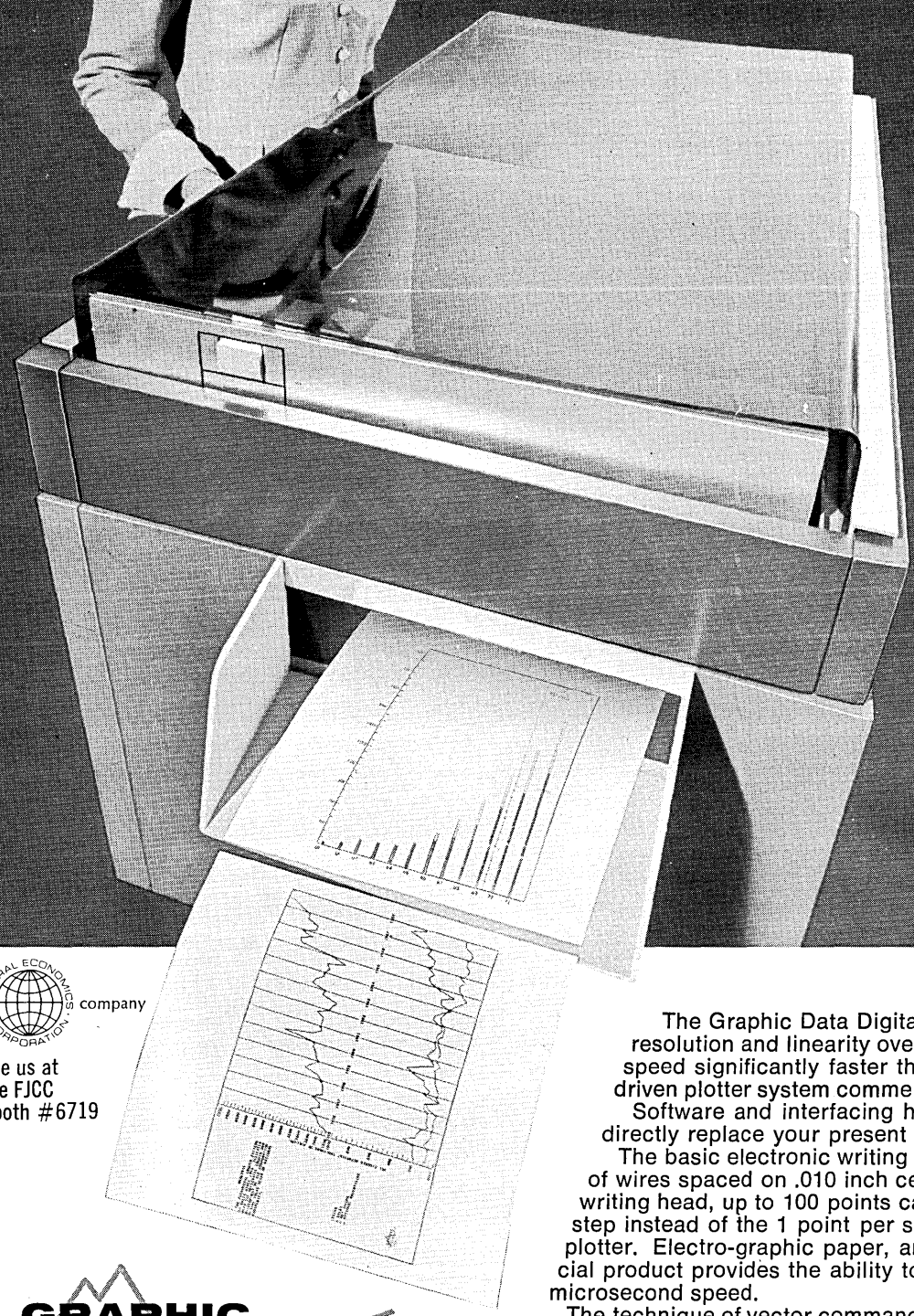
BELL COMPATIBILITY

Tel-Tech modem	Bell modem	Speed
TT-103	*103*	*0-300 bps*
TT-202	*202*	*0-1800 bps*
TT-201	*201*	*2000-2400 bps*

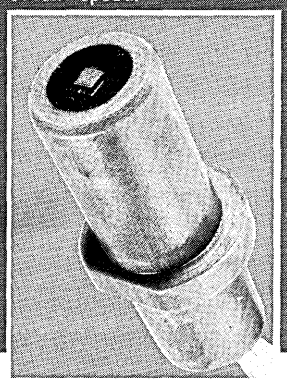
TEL-TECH CORPORATION
TELECOMMUNICATIONS TECHNOLOGY
9170 Brookville Road
Silver Spring, Maryland 20910
Phone: (301) 589-6035

Pen & Ink is Obsolete!

New, second-generation plotter plots faster... better... and at lower cost!



New electronic writing head provides character and vector segments at micro second speed.



a GENERAL ECONOMICS CORPORATION company

See us at the FJCC Booth #6719

The Graphic Data Digital Plotter gives you high resolution and linearity over large formats and at a speed significantly faster than any other computer driven plotter system commercially available.

Software and interfacing have been developed to directly replace your present plotting system.

The basic electronic writing head is a 10 x 10 matrix of wires spaced on .010 inch centers. With this unique writing head, up to 100 points can be plotted per motor step instead of the 1 point per step with a conventional plotter. Electro-graphic paper, an inexpensive commercial product provides the ability to write electronically at microsecond speed.

The technique of vector commands rather than individual point commands not only reduces computer time but simplifies the programming time and complexity.

For complete details on this new second-generation plotter, call or write:

GRAPHIC DATA, INC.

169 Bedford Street, Burlington, Mass. 01893
Tel. (617) 272-4445

CIRCLE 66 ON READER CARD

* Space contributed as a public service by this magazine.

She's being punished... She has to go out and play

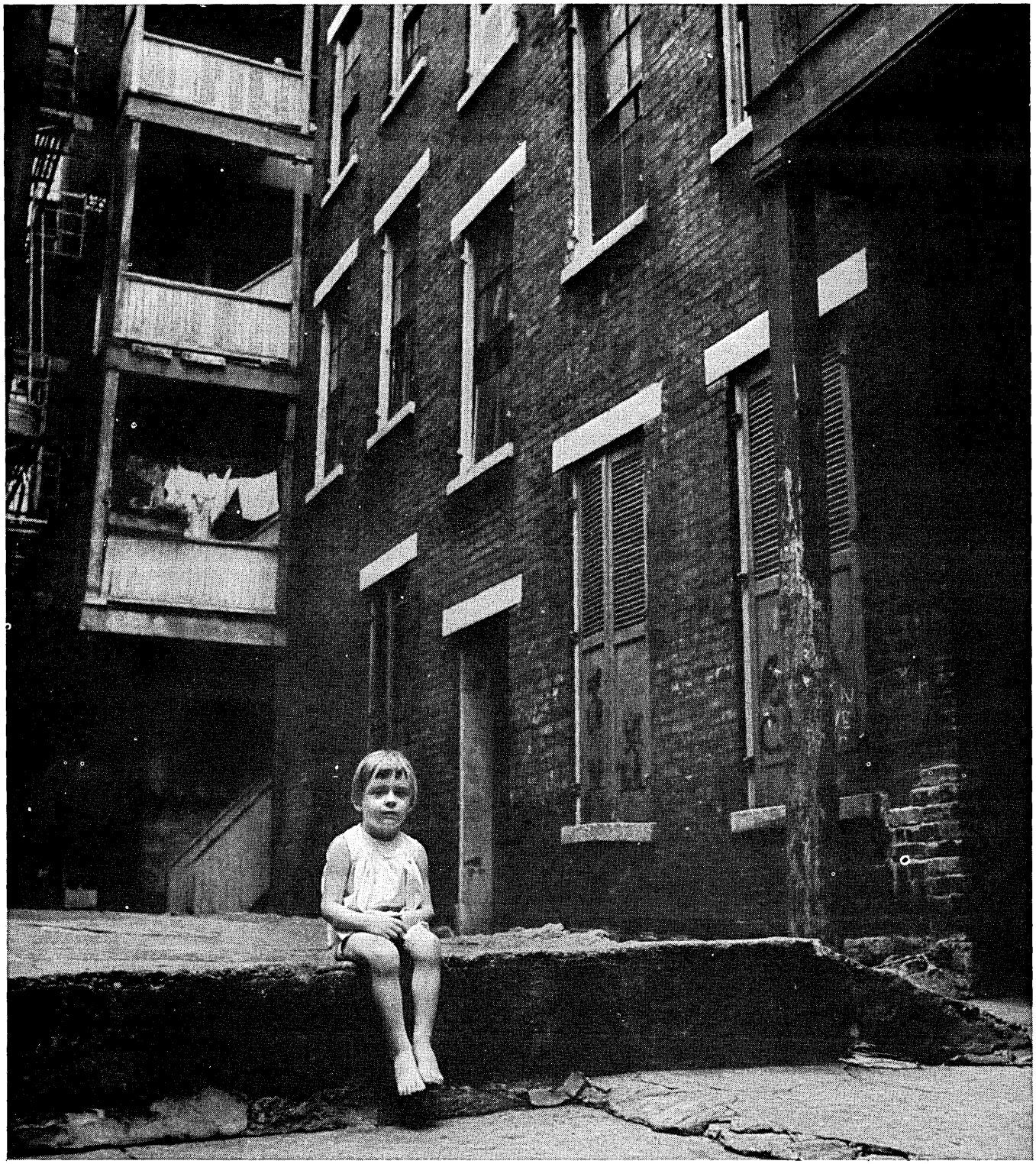


Photo contributed by Daniel Ransohoff

Many children in our cities' slums have nowhere to play but filthy alleys and littered streets. Your United Way gift helps support organizations that provide recreation and guidance for thousands of deprived children. Please help make play time fun for them, not punishment. **Your fair share gift works many wonders ✓ THE UNITED WAY**

28.4 million families benefit from child care, family service, youth guidance, health programs, disaster relief and services for the Armed Forces through 31,500 United Way agencies.

SANGAMODEMS
FOR USE WITH DATA ACCESS ARRANGEMENT

WHAT'S A SANGAMODEM ?

That's a modem made by Sangamo—a major supplier of modems to the telephone industry. Sangamodems are compatible in all respects with their Bell counterparts.

Because of a recent FCC ruling, data users can now attach their own modems to the DDD (direct distance dial) telephone network via a data access arrangement. Now there is a new family of Sangamodems for use through the data access arrangement . . . manual or automatic answer.

Using a Sangamodem through a data access arrangement lets your business machine talk to the tens of thousands of like telephone company modems already installed, therefore permitting an orderly transition from lease to purchase.

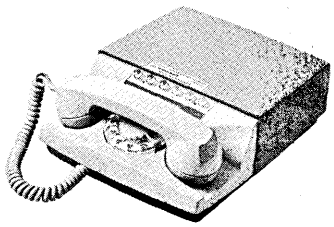
If you have a phone-company provided 201, 202 or 103 and are considering purchasing vs. leasing, call Sangamo, the people who make both, to insure a compatible operational system.

Service contracts available. Application assistance as near as your phone. Need more data? Let's communicate.

Communication Systems
SANGAMO
Electric Company
Springfield, Illinois 62708
217 544-6411

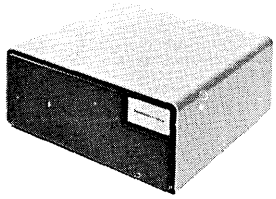
T69-15

MANUAL OPERATION

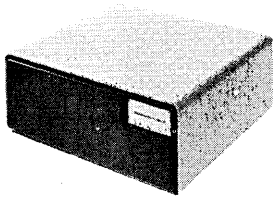


AUTOMATIC ANSWER

UP TO 300 BPS FULL DUPLEX 2-WIRE



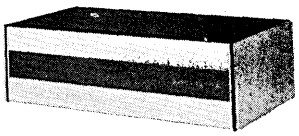
T103FS



T103G2SA

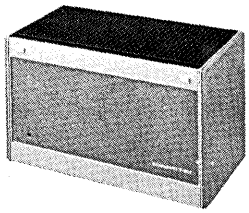
UP TO 1200 BPS HALF DUPLEX

T202DS

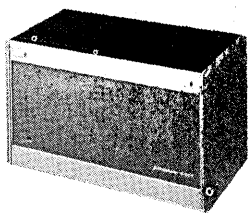


T202CSA

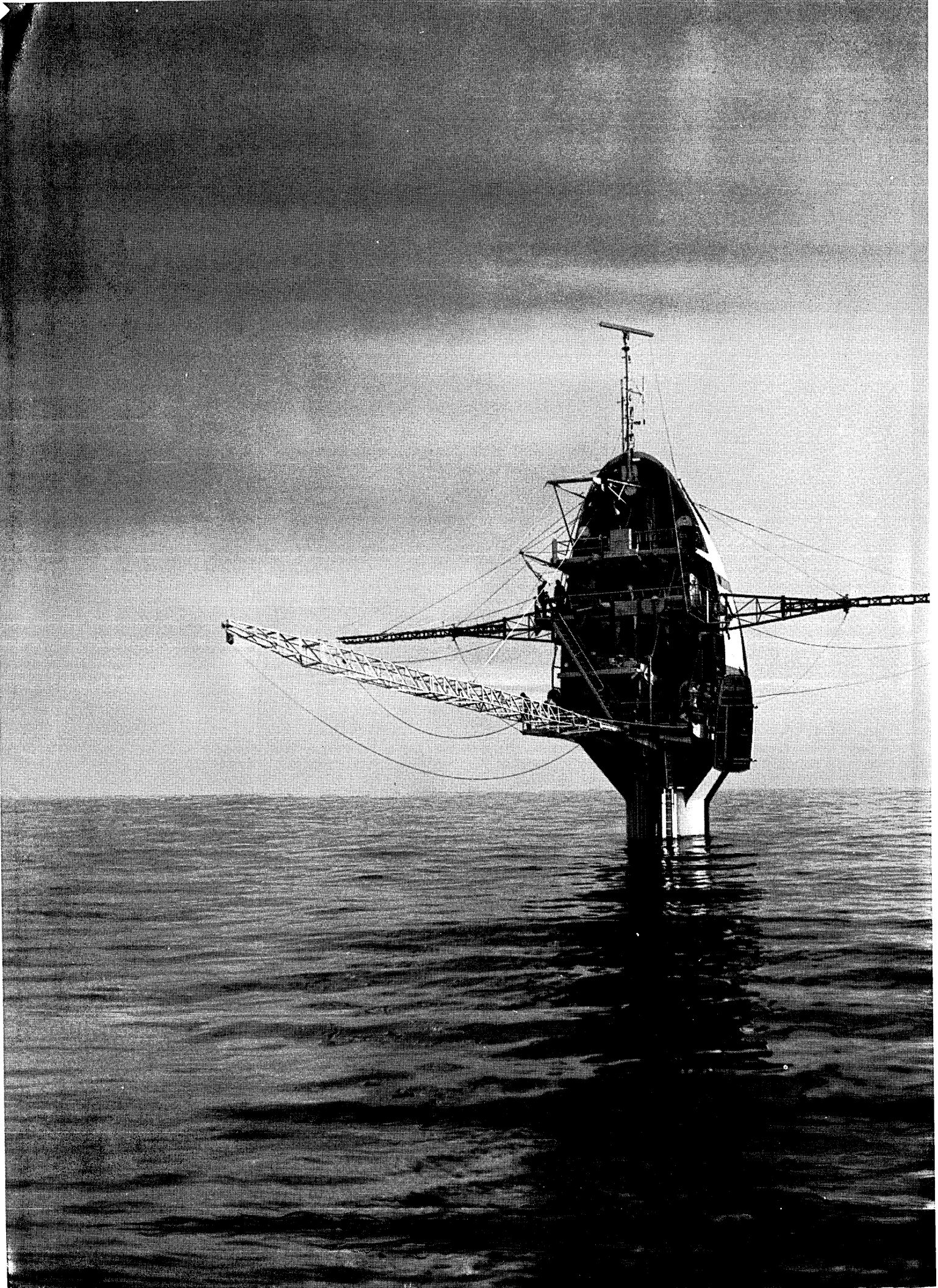
2,000 BPS HALF DUPLEX

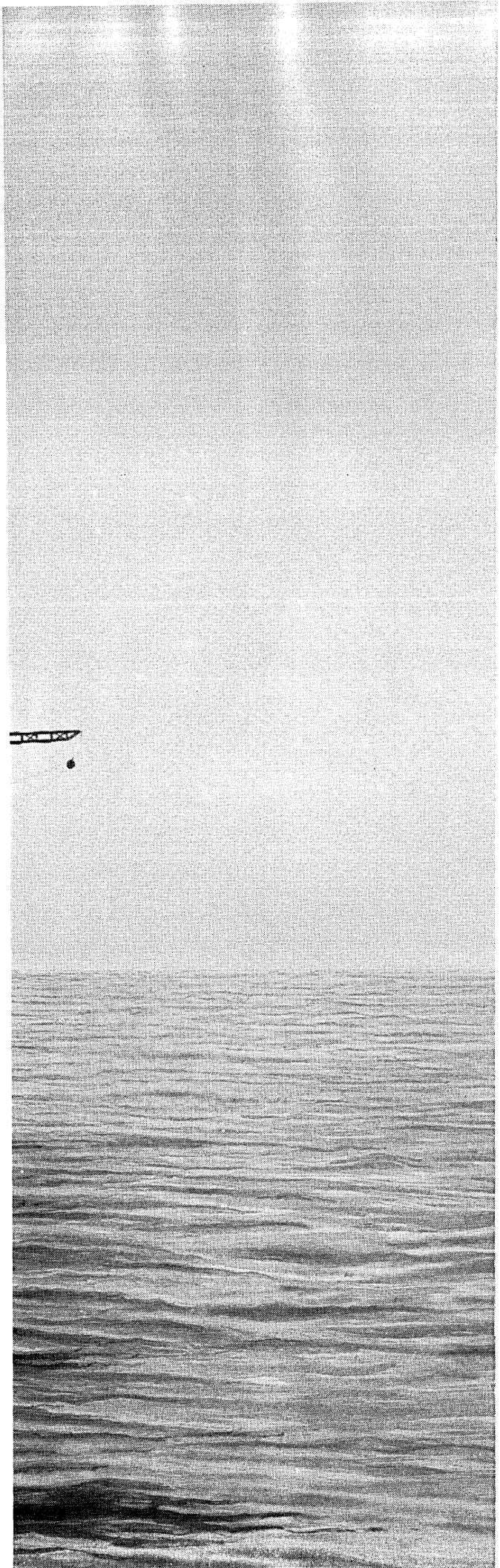


T201A1/2S



T201A1/2SA





This is no place to have problems with a real-time system.

That's why Scripps chose ours.

This strange sea monster is the FLIP ship, developed and operated by the Marine Physical Laboratory, Scripps Institution of Oceanography. She is towed to a chosen spot at sea, fills her ballast tanks and tips on end. There she remains, steady as a fencepost. Even in raging storms.

When Scripps needed a real-time computer system to help with their underwater acoustical research, they looked at suppliers with a wary eye. After all, they demanded a system that would give top-notch performance for all their real-time measurements. And one rugged enough to take the punishment of storm, humidity, heat and cold. Right side up or upended.

So Scripps chose our HP 2005A Real-Time Executive.

Its performance is well worth seeing, even on dry land. Multiprogramming capability, with simultaneous I/O, lets our real-time executive control any number of different operations. And you can use up to 99 priority levels, so your most important programs get the attention they deserve.

And because the HP 2005A handles background as well as foreground processing, you will save big money. When your computer isn't running real-time operations, you can use it to handle everyday chores. Like development of new programs, editing and process analysis.

Meanwhile, your foreground operations are guarded from "crashing" errors by our computer's dynamic memory protection. And you have direct memory access, switchable to any I/O channel.

Another nice thing. We build our HP 2005A software as a modular system. So you can tailor it to your needs. Our quick delivery and complete documentation get you "on-line" fast. And our extensive service back-up keeps you there.

So any place you need real-time help, you can count on the HP 2005 A to get the job done, starting at under $75,000. Your local HP computer specialist has all the details. Give him a call. Or write to Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT hp PACKARD

DIGITAL COMPUTERS

CIRCLE 64 ON READER CARD

Before a line printer can record 60 pages of data, BCOM can put 2,300 pages on microfilm.

BCOM (Burroughs Computer-Output-to-Microfilm system) is a fast, flexible way to convert your computer records from magnetic tape to microfilm.

It records computer data up to 40 times faster than a high-speed line printer. The microfilmed results can be stored in a fraction of the space needed for paper printout. And retrieved faster and more easily.

BCOM lightens your line printer's load. Enables your branch office or distribution center to locate and reproduce stored records.

It's available in two BCOM models with a choice of viewers offering three indexing methods plus microfiche and an optional dry page printer.

For full details of the only complete COM system made by a computer manufacturer, write to Burroughs Corporation, 6071 Second Avenue, Detroit, Mich. 48232.

Ask for our free BCOM booklet.

Burroughs

CIRCLE 9 ON READER CARD

rated number one!

To be No. 1 takes speed, price, reliability and delivery. ASAP's Model P-300 Paper Tape Punch is rated Number One because it is designed to meet the following specifications:
No. 1 Speed: 310 characters per second—paper or mylar tape
NO. 1 Price: $3,500, complete with electronics, logic level input, power supply, and tape supply handling controls.
NO. 1 Reliability: One year warranty
NO. 1 Delivery: 60 days

Designed for outstanding performance, the Model P-300 operates at a speed of 310 characters per second using either paper or mylar tape. This automatically synchronized punch features a 1,000 ft. horizontal reel within a 3½" x 19" hinged panel tape supply. Other features include slides for rack mounting (standard), single and multiple feeds for easy reloading of tape, tape alarms for low, slack or tight tape conditions.

Optional features for the Model P-300 include: advanced feed hole, long-life punch blocks and verification punch blocks. P-300 punch head and tape supply available for $1,500. ASAP's Model 240 is available for operations that do not require over 240 characters per second punching speed.

Specify the NO. 1 Punch . . . ASAP's Model P-300

For complete information contact:
Morris Bowles
Advanced Space Age Products, Inc.
4308 Wheeler Avenue,
Alexandria, Virginia 22304
Tel.: (703) 751-3320
A subsidiary of Telegraph Equipment Corp.

ADVANCED SPACE AGE PRODUCTS

look ahead

MINOR SUIT COULD HAVE MAJOR CONSEQUENCES

A small programming house in Northridge, Calif., Data Techniques Corp., has filed a suit against mighty Honeywell that has unbundling implications; it could conceivably lead to all manufacturers pricing programs separately.

Data Techniques filed the complaint in Cook County, Ill., Circuit Court (they have a small branch office in Chicago). The complaint says that DTC had an oral contract with Federated Distributors to supply a subsidiary with application programs on a time and material basis. For this they would get $100 a day from the subsidiary, Capitol-Husting. The job was estimated to take 60 days.

Honeywell, the complaint alleges, knew that Capitol-Husting planned to acquire a computer "from a rival firm" and also knew that Data Techniques had the programming agreement. It is further alleged that Honeywell then offered to supply one of their computers and offer the program needed free of charge. Thus, it is alleged, Data Techniques was cut off with only three days' work and $300 worth of billing. So DTC is praying for the other $5700, plus $4300 in compensatory and punitive damages.

The amount is pretty small. But suppose they win the suit. Where would this put a fully bundled manufacturer making a proposal to a company to replace a machine from an unbundled manufacturer, when the potential customer was buying his programming outside?

IBM CE AGREEMENT UNDER FIRE

Mollified on IBM software license contract rights, users are now taking a close look at the customer engineer agreement--in particular software maintenance. The hubbub revolves around two points, altered code (who is to determine whether it is or not, and who is to say whether the change brought on the software trouble) . . . and retroactive billing. The first point is too open to personal interpretation for users to leave the decision in the hands of a field engineer or branch manager. Users want some firm guidelines from IBM. Such guidelines should clear up the concern over billing . . . or at least some end of the month surprises.

HERE'S LOOKING AT YOU

A small Los Angeles firm is putting out a data set replacement that looks and operates like a two-eyed mail box. Called Optran, the device uses infrared light for data transmissions and is good up to 250 kilobits/sec. Limited to line-of-sight uses under one mile, applications are expected to be found in firms with many near-by computer-using groups, and one LA airline is already using one to drive its remote crt terminals.

Optran is one way to beat high line charges--since

(Continued on page 85)

there are no phone lines involved--and will pay for itself in one year figuring just data set rentals (a 40.8 kilobit 301B data set for A2 lines runs $3180 per year plus $475 installation while the Optran sells for $2950). The sets can operate even in light fog and have such a narrow field of vision that the sun and other infrared sources will not interfere with transmissions.

In another development of optical data transmission, the University of Colorado has a laser data link connecting the computer to a terminal one kilometer away. And it's both reliable and cheap. Example: the most expensive elements are condensing lenses of $40 each. (An article on the system will appear in Datamation next month.)

ASCII AND FED DP USERS MIGHT RECEIVE SYSTEM/3

Federal dp users may shortly be directed not to acquire IBM's system/3--ostensibly because it doesn't have any communications capability. Actually, there is such a capability but IBM hasn't unveiled it yet. The feds hope the proposed ban will advance IBM's release date, and persuade IBM to build ASCII compatibility into the communications module. Strengthening the government's case is the fact that /3's produced in Japan use an 8-character code, big enough to handle ASCII.

RED INK CAUSES CUTBACKS FOR GE T-S

A big organizational shakeup is underway within GE's Information Services Division, amid rumors that the operation is currently in the red, with cutbacks in the sales force. Rumors that ISD is for sale are evidently not true. VP Art Peltasalo, who has been head of the International Information Systems Division, has been named head of GE's Bethesda-headquartered Information Services Division "for a limited period." Paul Sage, who had been top man in Bethesda, is now Peltasalo's deputy. Meanwhile, two ISD departments--dedicated to overseas and domestic information services--have been consolidated under Paul Leadley. Previously, he was manager of international services. Bill Eaton, domestic information services manager, "is on special assignment" to Peltasalo.

ARMER BLOCKED BY ARMS AT FJCC, MIKE KILLED

Fireworks erupted at the opening of the evening social implications session when panelist and ex-AFIPS President Paul Armer couldn't get past a guard who claimed his pocket conference badge wasn't legit.

Armer found a show official to pass him, then took the mike to decry the presence of pistol- and club-armed guards. He had already asked session chairman Don LeBell to get rid of the armed forces or he and other panelists would walk out . . so the fuzz withdrew from sight. But when Armer, a bearded, unusually calm, dignified man, took to the air to have at the polizei, his mike went dead. That really turned him off. Calm and reason were restored, but the wounds will probably not heal right away.

A double force of security guards--some in plainclothes--had been ordered, and the sound technician ordered to cut off any speaker who threatened to become disruptive. Remembering Boston, conference chairman Jerry Koory said, "We couldn't afford to take any chances."

In a related development, we understand that a handful of ACMers are setting up a committee to hold a "counter conference" in Boulder, Colo., while the establishment ACM is holding its conference in riot city. The reason: to protest the actions of the Chicago police.

(Continued on page 264)

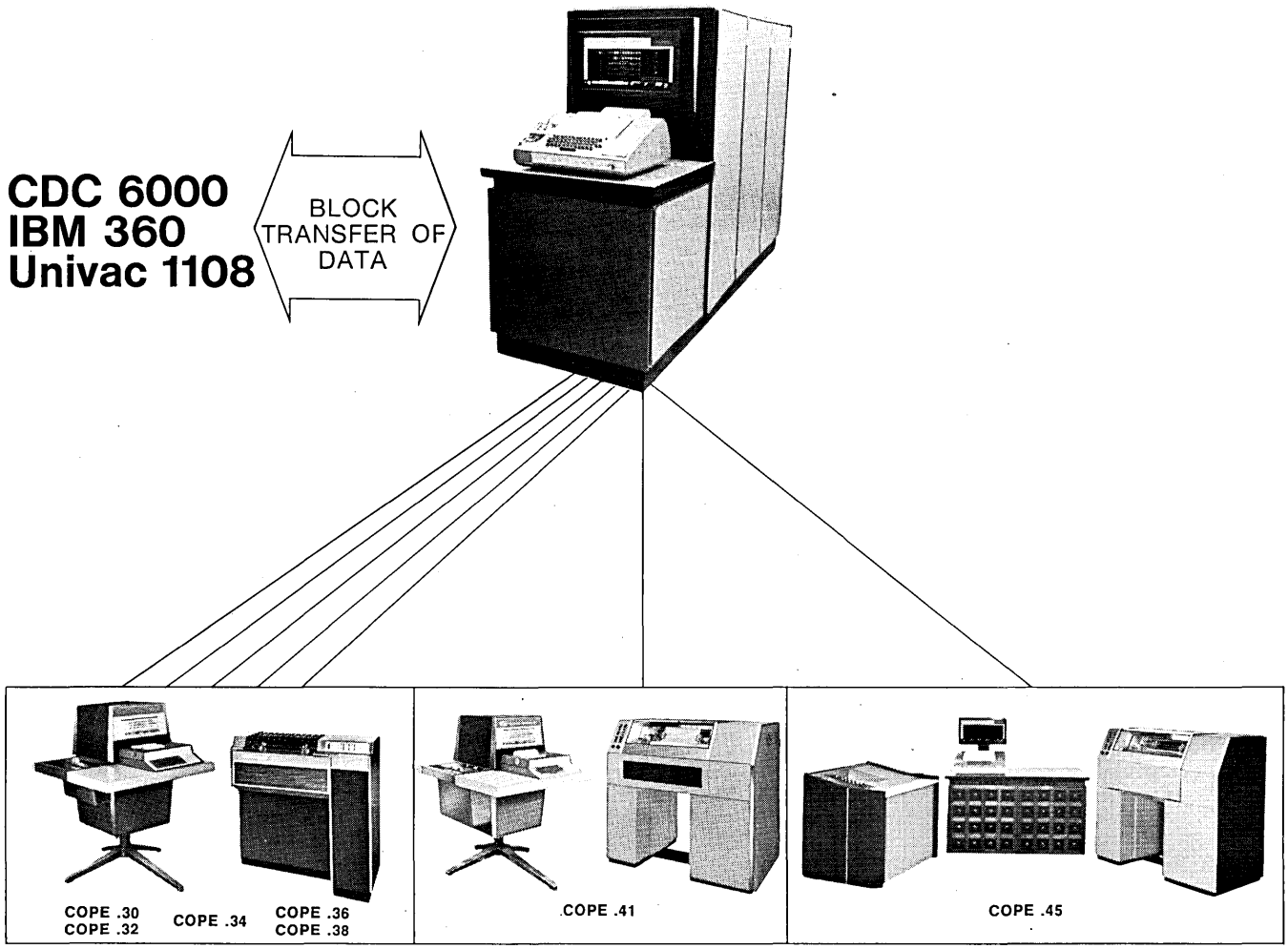
Need High-speed remote I/O to a CDC 6000, IBM 360, or Univac 1108?

Go COPE!

Now you big system users can get the work you need done at your *remote* locations . . . by going COPE. We're specialists in high speed data communications . . . and we've got industry's broadest line of systems to suit your exact requirements. Check the advantages that only COPE can give you:

Total system approach. When you rent or buy a COPE terminal system you've got just that — not a scattering of black boxes. You get a complete, fully integrated remote data communication system, including a software-compatible controller that now interfaces to such large-scale computers as the CDC 6000 and Univac 1108.

Growth capability. You can grow with COPE as your data communication requirements grow! Five members of the COPE family — the .30, .32, .34, .36 and .38 — can be field upgraded all the way to our new COPE .41 system (1250 LPM, 600 CPM). And the top performer in our line, the COPE .45, is software compatible with all other members of the COPE family.



Full-duplex, powerful high-speed through-put. If speed is your bag, try to top the 1500 CPM and 1250 LPM provided by our proven COPE .45. And all seven of our COPEs, except for our most inexpensive dial-up terminal, the .30, operate in the COPE full-duplex mode at 4800 bps. Compare COPE specifications and you'll find our terminals give you industry's lowest through-put/cost ratios.

Dial-up flexibility. Four of our COPE terminal systems can access a variety of computers in the low-cost, yet versatile dial-up mode. This flexibility allows your programs or data to be sent to the computer of your choice... anywhere. In addition, these COPE terminals can operate in both COPE full duplex and dial-up mode. COPE .30 dial up software packages simulate most popular terminal systems, including the Univac 1004 and 9300, the IBM 2780 and the Control Data user terminal.

Your money's on the line, so ride with a winner. Select your remote terminal from industry's broadest line... developed and manufactured by University Computing Company. UCC offers a total range of computer services — including a multi-national computer utility network and the new "beyond time sharing" service called FASBAC. Write or call: Marketing Coordinator, Data Communication Systems Division, 2659 Nova Drive, Dallas, Texas 75229, (214) 241-3501.

Terminal Type	Communications Mode		Input/Output Device Speeds (Maximum)	
	Half Duplex	Full Duplex COPE	Reader C.P.M.	Printer L.P.M.
C.30	ATT 201A/B	No	200	240
C.32	No	Yes	200	360
C.34	Option	Yes	300	360
C.36	Option	Yes	300	480
C.38	Option	Yes	600	480
C.41	Option	Yes	600	1,250
C.45	No	Yes	1,500	1,250

UCC

UNIVERSITY COMPUTING COMPANY

DATA COMMUNICATION SYSTEMS DIVISION

2659 Nova Drive / Dallas, Texas 75229

CIRCLE 82 ON READER CARD








the computer industry's first

key-to-disc

data input system

accepts the output from 60 or more key stations simultaneously

Time-shared input cuts data preparation costs 50%.

Now you can cut your computer input costs in half. This new innovation in data preparation techniques gives you two money-saving advantages over conventional keypunch or one-keyboard/one-magnetic-tape-per-operator systems: (1) the LC-720 employs a computer time-shared input; (2) it is the only system available that provides data output directly on IBM/360-compatible magnetic disc.

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.

LC-720 KeyDisc System

Bring your own data for a demonstration

Logic Corporation invites you to see an operating demonstration of the LC-720 KeyDisc System at the company's premises. Bring your own original data and Logic will provide a reel of magnetic tape of the output of your data from the LC-720 for later printout at your own computer facility.

To arrange for a demonstration, contact Gary Tischler, Director of Marketing (201) 334-3713

LOGIC CORPORATION

15 E. Euclid Ave., Haddonfield, N.J. 08033 (609) 428-4626

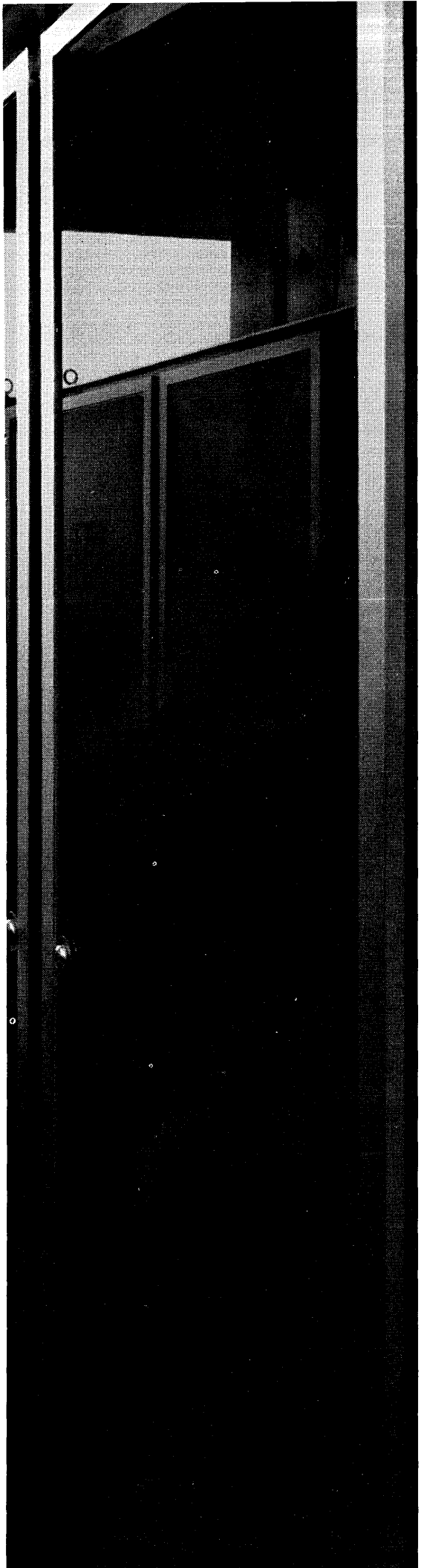
Total Compatibility with OS 360

REMCOM'S
Remote Batch Terminal gives you:

- 400 and 600 LPM Printer (field expandable)
- 300 CPM Card Reader, data compression for transmitting and receiving, plus many standard features that are optional on other RB Terminals.
- Basic terminal rental under $700.

REMCOM
Remcom Systems, Inc.
2705 National Drive/Garland, Texas 75040/214-328-9991

CIRCLE 192 ON READER CARD



Here's another good reason our time-share system is the most popular around:

90-day delivery!

You don't have to play the waiting game when you order our HP 2000A Time-Share System. It's ready for you almost as soon as you're ready for it. In most cases, you can take delivery 90 days after we get your order.

But getting customers on the air fast is just one reason for our system's success. There are plenty of others.

Like price. Our system costs only $90,500. Yet it handles 16 remote terminals simultaneously. This alone gives it one of the lowest costs per terminal-hour in the industry. And the modest initial investment is matched by the 2000A's remarkably low operating cost. Overall, it's the most economical time-sharing system going.

Simplicity is another reason for our system's popularity. HP BASIC is the easiest computer language around. That's why it's a favorite with scientists, engineers, educators, businessmen and other non-programmers. They can learn it in just a couple of hours, because it's almost like talking to the computer in English. Yet because the HP 2000A is so powerful, these users can put it to work on such sophisticated operations as matrixes, strings, and files.

The HP 2000A comes ready for your immediate use. All required software, control terminal and interfaces are included. And this system keeps on working and working and working. In fact, our customers have already logged over four million terminal-hours of successful, trouble-free operation.

With this kind of money-saving reliability, it's no wonder our time-sharing system is the most popular one around.

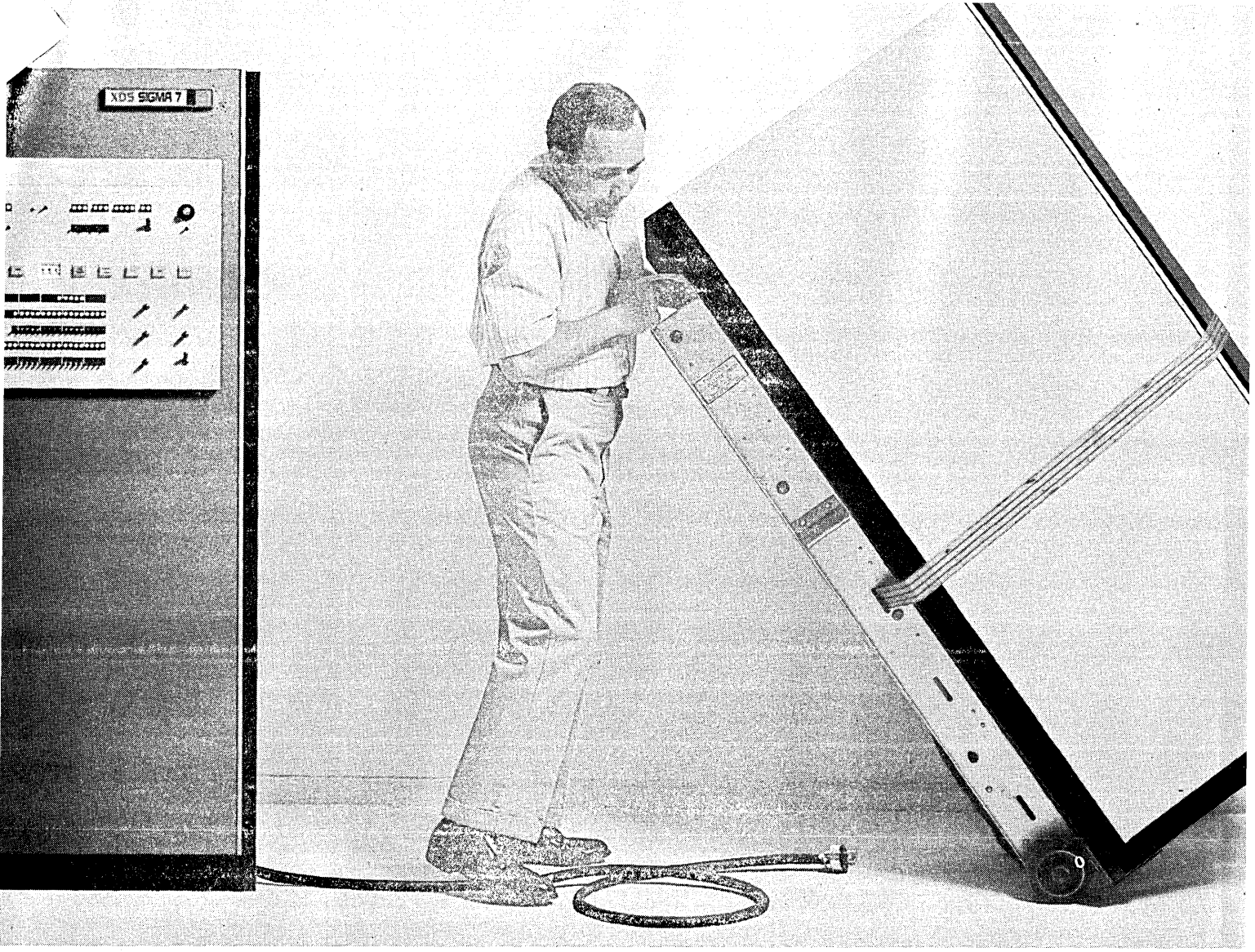
Need further proof? Call your local HP computer specialist. Or write to Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT hp PACKARD

DIGITAL COMPUTERS

CIRCLE 138 ON READER CARD

22934



Now we'll sell you a RAD™ with no strings attached.

Up to now you could get our Rapid Access Data (RAD) disk files only one way: attached to a Sigma computer.

Sigmas had dibs on all our production because we designed our RAD system especially for them. It's a head-per-track disk file, with up to 512 tracks per RAD. Since Sigmas handle problems of various sizes we make 5 different size RADs, with 6.42, 12.84, 25.68, 38.53 or 51.37 megabit capacity. So a user doesn't have to squeeze into a file that's too small, or pay for empty space in one too large. And because a good many Sigmas spend their lives in a real-time environment we make our RADs fast (3 megabit/sec. transfer rate, 17 ms. avg. access) and very reliable.

But now that we've been making RADs for years we have enough to go around. So we cut the umbilical cord. Which means you can put our RADs in your systems, no matter whose computers you use.

Of course, if you really want a complete Sigma system you could twist our arm.

But we promise not to twist yours.

XDS
Xerox Data Systems
El Segundo, California

editor's readout

LOOK WHO'S STARTING TO GROW UP

It's been a long time coming, but finally the moment is ripe for Computer Output Microfilmers. They have been around—one was operating as early as 1955—but haven't made much headway. DatagraphiX, neé Stromberg Carlson, built the industry's ice-breaker, the Model 4020. But after 10 years of peddling, less than 50 of these have been sold.

Why the massive inertia? Several reasons, we think. One was price. The sub-8000 lpm 4020 sells for about $150K, not including film viewers, duplicators, etc. More important, perhaps, is the reluctance on the part of the dp user to give up his security blanket, the printed form.

But COM's are supposed to be ready to take off now. The National Microfilm Association's recent poll led to predictions that 1,000 COM's would be in use by the end of 1970—four times the number installed at the start of 1969. Good reasons can be given for the change. First, now that many users are impossibly deluged with paper, the strangeness of film might begin to bother them less. Second, prices are becoming more reasonable. At least three announced line printer replacements in the 10,000-13,000 lpm range sell for under $50K—one third of the old price structure. Finally, the vendors are splitting up their product lines so that no machine need be sold as being all things to all men. There are at least three discernible categories to choose from: the line printer replacements at $50,000, graphic arts quality plotters and typesetters at over $200,000, and a sort of hybrid fast printer with minimal graphics capabilities at about $125,000.

If the market reacts as expected, the cheaper units will find many homes very fast, paving the way for installations of the more flexible hybrids in service bureaus and with more sophisticated users. The graphics devices will be left to find a home for themselves—at much lower rates of sale—but should also benefit from the low end expansion.

Ah, but here's the rub. The things are dangerous. When accounting departments became overloaded with hand calculations and paperwork, they accepted the computer as their Messiah. But what did they do with it? Use it to streamline their procedures and come up with more useful information more quickly? You know they didn't. They converted their hand procedures to the machine. As they got overloaded again they got faster and bigger machines.

The same thing can happen with COM's. If you have too much printout you can now go to film at ten times the speed and get rid of the bulk, too. Be more selective about reporting? Print less, but more pertinent data? Why bother, they say, if you can print it all in just a few minutes? One reason: It takes just as long to read a 500-page report on film.

So use appropriate caution in deciding how to choose and use a microfilmer. With this issue we tried to help you to understand more about the devices, and we ran into some problems you may yet have to face. For instance, there is no "COM" language to use in discussing the devices. To understand an answer to a simple question like "How many lines per minute does it run?" you may need courses in optics, electronics, photography, and mechanics—providing you already have a good background in dp. And when you get the answer, if you do, you'd better remember that the COM industry has few standards, and everyone you talk to may define and measure terms like intensity, reproduceability, and resolution differently.

It's a "growing up" industry that's going to be very big very fast all right, but it's not all grown up yet and it would be a mistake to treat it as if it were.

—R. A. McLAUGHLIN

MICROFILM — A NEW DIMENSION FOR COMPUTERS

a promising marriage

by Charles P. Yerkes

Microfilm is a memory. It is an analog mass memory that will store numbers, words, drawings and graphics in human-readable form at normal packing densities greater than 20 times that of 800 bpi magnetic tape. It is an addressable memory that can be indexed and coded to retrieve and display an 8000-character page in less than five seconds. It is a reproducible memory that can be duplicated for dissemination to multiple decentralized locations, displayed on low cost terminals, enlarged and reproduced on hard copy or offset plates. It is an inexpensive read-only memory, one capable of storing information at costs approaching $0.0000001 per character. It is becoming a powerful permanent reference medium for information storage and retrieval systems to supplement the computer. One reason is COM; an acronym for computer output microfilm, or computer output microfilmer, or computer output microfilming.

COM capabilities vary with models and manufacturers but basically a computer output microfilmer accepts digital output from the computer, converts it to analog signals and prints it on microfilm at rates from 25,000 to 100,000 characters per second. Depending on the model it may print alphanumerics, graphics, or both; operate on line or off line; superimpose business forms; vary character size and style; utilize 7-track BCD, 9-track ASCII or EBCDIC reading formats and others; print binary retrieval coding; produce animated movies; or act as a straight high speed non-impact printer. It is a third-generation output device that overcomes numerous problems created by the impact printer. It eliminates handling and costs of paper forms, prints 10 to 40 times faster than the impact printer, and reduces computer time substantially.

COM is an interface: an output device for a computer system and an input device for microfilm information storage and retrieval systems. It links the two with each receiving real benefits and advantages. As an input device for a microfilm ISR system, a COM creates at high speeds an organized, structured, coded, retrievable microfilm storage medium. In effect, it is a microfilm camera. But, backed by

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the computer's unique capability for file organization and information manipulation, this camera eliminates many restrictions imposed on standard microfilm information systems which are forced to record document sheets originally generated for other purposes.

A microfilm memory does not necessarily compete with its versatile magnetic brother. However, in business, science, and elsewhere there are large, relatively stable data collections and data banks in continuous use that require infrequent manipulation and updating. Some have referred to these as slow-time data or applications. Within certain broad application parameters a decentralized microfilm ISR system, using COM-generated film, can extend and enhance the usefulness of the computer, generally at some remarkable cost savings.

history and hardware

It seems strange to talk in terms of history when the total elapsed time since the commercial development of COM is not much over 10 years. The earliest units, those produced in the late 50's, were mostly printer-plotters used for scientific purposes. They reduced digital output from computers to graphs, charts, curves, and similar plots that were annotated with alphanumeric printing. Almost all this was done on 35mm film. Scientific plotting was the chief use of computer output microfilmers until scientific users and management began to dsicover the COM's capability for printing alphanumeric listings. This led to the development of recorders designed specifically for high-speed, high-volume printing of computer output. Currently, a large portion of alphanumeric business-related output is recorded on 16mm film.

Stromberg DatagraphiX and California Computer Products were among the first to produce commercially available computer output microfilmers. Historically, CalComp concentrated on develping printer/plotters. Stromberg continued to work on printer/plotters, but through the Charactron(R) tube approach began to produce straight alphanumeric printers as well. During this period other companies also kept pace with developmental work in the field, although they may not have produced products immediately. An example of this is one of the early experimental COM's the DACOM, a developmental effort of Kodak's during the 1950's.

The years 1968 and 1969 began the era of recognition and growth for computer output microfilmers. Prior to 1968 Stromberg, CalComp and Computer Industries were among the most active manufacturers in the field. They have now been joined by Kodak, 3M, Burroughs, Beta Instruments, RCA, Information International, Singer-Link and others. At the end of 1969 there appear to be more than 25 manufacturers with units in various stages of development and marketing—a remarkable growth.

At this time three types of COM's are being marketed. These are:

1. Alphanumeric, nonimpact printer for business purposes.
2. Alphanumeric printer and plotter for business and scientific purposes.
3. Special quality alphanumeric printer and plotter for graphic arts.

Depending on the application, COM-produced microfilm can take many forms. Some of these are 16mm film in rolls

or cartridges, 35mm film, microfiche (a sheet of film with images in rows and columns), or aperture cards (tab cards with microfilm windows). Several types of film records can be addressed through binary coding reproduced on the film by the COM, and by other special indexing techniques which can be preprogrammed. In certain cases alphanumeric business and engineering lists are sequential and are easily accessed without special indexing or coding.

The hardware and basic retrieval systems for microfilm have been hammered out over long years of development by the microfilm industry. Microfilm systems are available in varying degrees of sophistication for each microform type. Some off-line systems are simple viewers, others have capabilities extending to hard copy printout through the use of reader/printers, and some are sophisticated information storage and retrieval systems with logic and automation. The degree of sophistication is a matter of system requirements and cost.

There are many manufacturers of such hardware and systems. These include some of the old-line microfilm system companies such as Kodak, 3M, Bell and Howell, Atlantic, Dietzgen, Itek, NCR, HF Image Systems and some of the COM manufacturers who have started to produce their own microfilm systems, such as Stromberg and Burroughs. There are also a host of smaller manufacturers and suppliers marketing system components.

applications

As with any innovation or new technology the total range of applications does not become truly apparent until it has reached a certain degree of maturity; COM has not yet reached this stage. Nevertheless, some basic applications can be pin-pointed. Among these are:

1. Business listings requiring low to high frequency reference, infrequent updating (less than one per day), use at single or multiple terminals. This application includes parts catalogs, customer lists, travel schedules, rates, accounts receivable, finished inventory, employee lists, bank statements, policy records, etc.
2. Management information and reports requiring alphanumerics and graphics. This category includes sales forecasts, production schedules, profit analysis, and cost studies —both current and historical.
3. Engineering documentation—plots, graphs, charts, drawings, circuit design.
4. Animated movies and scientific sequencing.
5. The creation of film (alphanumerics and graphics) as an intermediate for hard copy or the generation of offset plates.
6. Micropublishing for the multiple copy distribution on microfilm of computer-generated data bases and information collections such as catalogs, abstracts, listings, directories, engineering information, and financial information.

One COM user, Pan American, started with a service bureau in 1968. The first reports included their bill of materials program, parts locator reports and master stock lists. The number of internal applications, passenger revenue, cargo revenues, passenger reservation records, grew so rapidly that Pan Am now has its own COM unit.

The federal government, being the largest computer user, is also the largest COM supporter. One of the earliest and continuing COM users is the Social Security Administration office located on the outskirts of Baltimore. The installation has several COM units backed up by several hundred microfilm readers in constant use, checking social security records. There are now well over 40 government agencies using one or more computer output microfilmers. The applications are diverse—supply catalogs, accounting records, personnel locators, scientific data, intelligence documents, savings bond records, census, and numerous others.

Current comments about COM equipment and output capabilities lay heavy emphasis on comparisons with line printers and their output. The reason is the upward trend in COM use for business applications. Line printers of the early 50's were close to matching first-generation computers in throughput speed. The relationship soon changed. Although current third-generation computers are capable of receiving, processing, and transferring information at rates of 25,000 to beyond 100,000 characters per second, the electromechanical line printer is a foot dragger at maximum printing rates approximating 2500 characters per second. When business requirements call for printout from the computer, and it is accomplished on line, the cpu becomes output bound operating at a fraction of its throughput capability. The COM, as a printer, closes the gap. Some units are capable of eliminating the gap entirely, recording information on film at computer speeds. In comparative terms, one COM unit is the equivalent of as many as 30 impact printers operating simultaneously. Additionally a film record eliminates the cost of forms, decollating, bursting, and other handling associated with paper.

The preoccupation with COM output speed compared to line printers is a logical first area of concentration for the edp manager, who has an output problem. However, as the field grows it seems predictable that continued effort in the development of microfilm ISR systems may affect time-sharing systems, remote video terminals, and other aspects of computer systems. The true importance of microfilm to computers is its usefulness and adaptability as an information tool, not as a high speed reproduction medium.

For example, current microfilm ISR systems can prove to be far more economical than time-sharing computer systems, when there is a need for decentralized information and when the data base is relatively static—such as parts lists, inventory lists, credit information, airline schedules, engineering specifications, etc. The time to display an 8000-character page on a microfilm viewer ranges from 3 seconds to 20 seconds, depending on the system. Video computer display terminals take from 0.2 seconds to several seconds to display the same information. A Teletype requires several minutes. To this must be added the transmission time, which can significantly increase the total elapsed time on low-bandwidth lines.

Thus, on a response time basis, under these circumstances, microfilm systems compare favorably with time-sharing systems. When comparing costs, the microfilm system usually wins hands down. Microfilm display terminal costs are normally significantly less than computer video terminals, storage costs on film per character are a fraction of magnetic storage, and there are no continuous data transmission costs with microfilm.

As a matter of application, time-sharing data processing systems are beginning to be combined with microfilm. In some systems involving the use of large or complex microfilm data banks, produced by COM or other methods, either the microfilm index is not sufficient for an in-depth search and address, or a transaction is required. A system which uses the computer for retrieval of dynamic information in conjunction with locally placed microfilm ISR systems is often a least-cost total system. The Eastern Airlines reservation system is an example of this, where each agent's basic reference library, stored in a microfiche ISR device, is located next to his computer terminal, which is used for reservation transactions.

COM is not for everyone and COM will certainly not replace the impact printer. However, within the next few

years nearly every edp manager will probably at least have a cursory look at the potential use of COM in his installation. The systems analysis required for this decision is not much different from that leading to other edp systems decisions made previously.

In evaluating COM for the first time the edp decision maker may immediately find the capacity is too large for proper cost justification and hardware utilization. This may be particularly true for small installations or if the applications are kept specifically to a 1 to 1 microfilm to paper replacement. There are also many applications for which COM-generated microfilm is not suitable because of constant updating requirements, the need for continuous data manipulation, specific hard copy requirements and others. The edp manager may not wish to make an immediate capital investment in COM and the attendent film processors, duplicators, and viewing equipment that become part of a complete installation. However, in a total analysis there are some very large potential benefits which must be considered. Some rule-of-thumb factors which may be included in a COM analysis and evaluation:

time

1. Print time—a COM printer is 10 to 40 times faster than an impact printer.
2. Computer time—an on-line COM vs. an on-line impact printer may reduce cpu time as much as 70% to 90%.
3. Terminal response time may be nearly equal for microfilm image display and time-shared systems with video display terminals.

economics

1. Supply costs—film supplies vs. manifold forms costs; per-page ratios run ½ to ⅛.
2. The purchase price of one COM, film processor, duplicating equipment and tape drive is the equivalent of 2 to 3 impact printers and tape drives.
3. Labor costs—reduced by savings in cpu time, print time of original and duplicate copies, elimination of decollation, forms bursting and binding.
4. Records storage, space and shipping costs—reduced by 90% over hard copy.
5. Where capital expenditures are being kept to a minimum, a service bureau may be the way to get started. COM service bureaus are springing up on a daily basis. The economics will depend on the problem and the competitive services and prices offered by service bureaus.

output versatility

Many COM's are capable of producing graphics. If this is a systems requirement, a COM may be the logical answer.

microfilm information systems

The edp manager should explore in depth the potential systems benefits that may be derived from the use of an off-line microfilm information system vs. the way computer output is handled presently.

the future

What of computers, microfilm and tomorrow? The question is not invalid, although tomorrow is almost here. The field is moving rapidly and competition alone will spur innovations. The most obvious trend will be toward refinement of COM features.

It seems certain more than one COM will find its way to the market featuring low cost—sans bells, sans whistles. These units will probably be nonimpact printers, directly replacing paper with microfilm. The technical approach may be different, utilizing circuitry and recording techniques that will reduce machine costs.

We most certainly should see more prepackaged software. All COM manufacturers have certain standard programs available plus systems and programming backup as necessary. These services should increase, as they have in the past, with competition, customer demands, and identification of common applications.

Although COM graphics will become more and more useful in business and scientific applications, a plotting capability in a COM often limits alphanumeric character throughput speed. There should be increased demands for versatile COM devices with high resolution graphics and high character output rates.

Forms flash (superimposing forms over data on film) and document merging techniques are included with several current computer output microfilmers. But for many applications their limited capacity may prove to be insufficient. Some future COM's may have the capacity to store large numbers of forms, drawings, photographs, and similar information on film and merge them with computer-generated data on a programmed basis.

Laser recording COM's are a distinct possibility in the future. One of the advantages would be potentially higher resolution. At present, higher costs appear to be a temporary bottleneck.

COM is only the beginning of a permanent computer-microfilm relationship. For example, several systems are now in operation where large microfilm mass memories are being used on line with computers. In these systems the computer supplies the logic and address for attribute search and retrieval of several classification characteristics and directly commands the automated film file to display a given film image at any one of a number of remote terminals. These units are coming into use for such applications as bank signature verification, insurance records, police files and many others. Such systems are currently marketed by Mosler and Sanders Associates.

Another totally new computer-microfilm area is reverse COM, the microfilm-to-computer input scanner and the programmable reader. Although this is a new field, hardware has been announced by a few companies. Some applications and hardware announced to date have been: a high speed microfilm-to-computer OCR system by Compuscan that is described as the first universal optical character recognition system; programmable readers by Information International used for reading, extracting, interpreting, and modifying film records of charts, drawings, logs, and X rays; and the AMACUS of Singer-Link which takes a microfilmed drawing as input, digitizes and displays it, provides the operator with an opportunity to review and revise the drawing on the display, and returns a microfilm copy as output.

In computer-related microfilm further out, development work is being done in holography, promising potential error-free storage and parallel-search capabilities; in erasable films, which may be capable of recycling images and digital information as required for reliable read and write storage; and in high resolution photographic mass storage to ultimately take advantage of potential packing densities of 10^8 bits per square inch.

The future seems destined to tie computers and microfilm closer and closer together, each complementing the other by performing the function it does best. COM is more than a computer peripheral. It is a catalytic link between two major information technologies. The effect will not be additive. COM is a multiplier. It will be interesting to watch it grow. ■

WHAT CAN COM DO FOR US?

plenty

by J. R. Antal

At General Telephone Co. of California, a subsidiary of General Telephone & Electronics Corp., we have been researching the Computer Output Microfilm (COM) field. From what we have read, and our several contacts with COM manufacturers, it is probable that significant savings with COM production of selected current and potential reports are inherent with our output volume. (In data processing our current budget for paper alone exceeds $300,000 per year.)

The articles that have appeared in the various trade journals, although quite illuminating, have been, in general, more concerned with reporting the general advantages of a single COM unit than with giving the potential buyer "real insight" about the range of features available with the various units. Although all COM printers produce output on microfilm, each unit may have unique features that can have special attraction to a potential user.

To share our research with others who may find themselves in need of an over-all view of the COM printer field, the following discussion is offered. Hopefully, the reader may gain a better understanding of the range of COM unit features, and techniques used in achieving computer output of reports, listings, etc., on microfilm.

When a reader is able to recognize a feature or technique that has specific application to his requirements, he is in a better position to conduct his own research to successfully locate the COM unit that meets his needs.

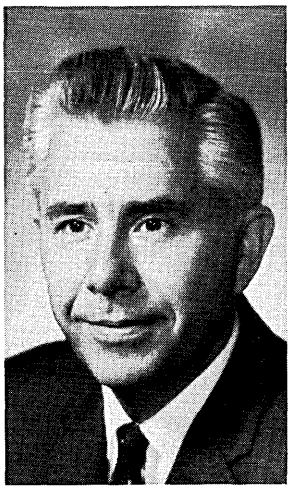
Several of the COM units will operate on-line with a computer; however, it is generally accepted that the COM unit should use computer tape as input for its operation, thus completely freeing the computer from any unnecessary slowdown in the production of microfilmed output. This article is written assuming off-line operation in all cases, and includes features in service or announced for showing during 1969.

It should be noted that there are two major divisions in the COM field: plotters and printers, with some of the plotters having complete printer capabilities. In keeping with our data processing needs to increase the speed of printing alphanumeric reports and reduce costs, our research has primarily dealt with the COM printers. Accordingly, the questions we had and the answers we evolved did not pertain to the specific features attributable to the COM plotters.

how does the com printer operate?

A tape drive, controlled by the COM printer, handles the intended input tape. As the tape is read, the logic section of the COM device translates the incoming signals as data handling commands, and directs the data display unit to present the data in the programmed format to the microfilm where it is recorded. The exposed microfilm is processed and prepared for use at viewing stations.

In the above simplified version of the action of all COM printers, many operations occur in differing ways in the various COM machines. The following sections elaborate on



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the basic operations performed and the various ways data is handled.

tape drives and computer tape

Most COM machines handle or will soon be able to handle the full range of tape densities up to 1600 bpi, and at tape speeds up to 75 ips. Standard ½", 7- or 9-track magnetic tape is currently handled in most all cases on tape drives supplied by the COM manufacturer. Further development in the software and machine hardware may permit the user to provide any tape drive with any COM unit. Competitive pressure will dictate the speed of this transition.

logic section

The function of the logic section is to coordinate and direct the action of all system elements to achieve the end product of exposed microfilm.

As the "brain" of the system, the logic section serves as the interface between the tape drive and the display and photographic units. It determines, from the tape input, what is to be recorded (data records), and in what size and position on the "page" it is to be located, with what "form overlay" (if any) it is to be recorded, and when the film is to be advanced to the next frame (the latter being "action records"). It also controls the handling of coding (if any), tape read error conditions, and reread, and it controls frame marking to indicate unreadable characters.

display section

The display section of a COM unit is that portion of the unit on which, or through which, the characters are positioned for recording on microfilm. There are basically two methods used to present the data to the microfilm.

In most units data is displayed one character at a time on the face of a cathode ray tube (crt). The character is positioned on the face of the crt in its proper location relative to its eventual location on the output microfilm page (frame), and blanked after about 1/100,000th of a second. Each character of the page to be recorded is thus displayed on the face of the crt, with the open-shutter microfilm camera recording the page image. When the particular page display is completed, the film is advanced to the next frame, and the next page is processed in a similar manner.

Three basic methods are used to generate a character image on the face of the crt. Characters are generated by:

1. Directing (and "extruding") an electron beam through individual characters cut in a thin metal disc located in the crt, and deflecting the extruded beam to the desired character location on the face of the crt.
2. Electron beam scanning of a stencil of the chosen character in a special monoscope tube. The pattern of electrons passing through the stencil to the face of the monoscope is amplified and paralleled in the display crt to form the chosen character at the desired location on the face of the crt.
3. Translating the incoming digital data to a predetermined analog signal pattern, by software or character-generating circuits in the logic section, to deflect the electron beam to form the character on the face of the crt in the desired location.

The other method of presenting data to microfilm eliminates the use of a crt and camera, as such. The microfilm frame is located in a near vacuum, in front of an electron beam gun. In this method, digital output of the magnetic tape activates character-generating circuits in the logic section. These generate analog signals that deflect an electron beam in the recorder to form the images, directly, one at a time, on the microfilm.

cameras and microfilm

COM units accommodate microfilm in one or more of the standard 16mm, 35mm, and 105mm (microfiche) sizes. Some accommodate or will accommodate all three. All use roll film and some can handle roll lengths ranging up to 1000 feet.

Cameras employed, although different in each unit, are of one of two types: stationary lens, or "step and repeat."

1. The 16mm and 35mm cameras generally use a stationary shutterless lens. The only camera movement involves advancing the microfilm, upon program command, to the next frame.
2. The 105mm (microfiche) camera, in addition to advancing film (generally when rows and columns of pages on the fiche are recorded), also has a movable, shutterless lens that steps in increments across the 105mm film to record each page of data, and repeats its action for succeeding rows of image locations in accordance with the fiche format being used. Another 105mm camera under development contains a stationary lens with a platen that moves the film to any programmed location to read the data in rows or columns.

film processing

All COM units considered, except one, use conventional silver microfilm that requires "chemical bath" processing to develop the latent images. Although this off-line processing requires additional work, several film processors are available to develop the film in what might be considered a very convenient, fast, and relatively inexpensive manner. The additional cost, for chemicals, amounts to about 35¢ per 100 feet of 16mm film.

The one exception noted above uses a "dry silver" microfilm that is developed by heat in a film processor unit that can be operated on-line with the COM unit. As a result of the on-line developing of film the user is able to monitor the finished output after about 10 feet of film has passed through the display and record unit.

Duplicate copies of microfilm can be made on any of several available units, some of which can operate at output speeds in excess of 75 feet per minute, with the material cost of a copy as low as one-third that of the original microfilm.

will we have to reprogram to use com?

The answer depends on several factors. The following may help to explain. COM units offer, for the most part, two modes of operation, "simulation" and "specific" (each manufacturer has other names for the two modes).

Simulation mode. Generally, this mode of operation requires little or no special efforts by computer programming personnel to produce output on microfilm, if channel and spacing commands used are standard. Basically, two versions of this mode exist:

1. *Hardware* is available for different computer languages whereby that language's channel and spacing commands are translated to a format acceptable to the COM unit.
2. *Software,* in the form of a utility program, translates (reformats) tapes originally made for off-line impact printers into a format suitable for use as input to the microfilm printers.

Specific mode. The specific mode, achieved by special programming, permits the programmer to take advantage of not only the highest speed of throughput but also of features that accommodate varying character size, intensity, and location (horizontal, or vertical writing—intermixed if

desired—on a page), font, "eyeball" characters, and indexing. Not all machines offer all the features noted above, and described more fully below, but all operate faster in this mode.

1. *Character size.* Features include programmable character size ranging from 264 characters per line with 128 lines per page to 66 characters per line with 32 lines per page.
2. *Character intensity.* By program command, characters can be recorded on film in normal or bold (darker) intensities.
3. *Character location.* Lines can be single, double and triple spaced, and channel skipping can be accomplished. Also, data may be written horizontally and/or vertically on the same page. Through program procedures, data can be written on a "page" in a tabular fashion so that one column after another may be recorded progressively or selectively. This feature, commonly called "tabbing," is handled in two different ways:

One method employs a patchboard on the COM unit used to "peg" tab location and channels, and codes to be received by the unit through programming, to indicate the tab or channel locations or the direction of recording mode to be used.

The second method accomplishes the same results with a punched card that is inserted in the COM unit. The prepunched card has the advantage of job set-up being directly controlled by the programmer rather than the machine operator.

4. *Character set and font.* All COM units feature a certain flexibility of font. Units normally come equipped with about 64 to 128 characters or symbols and with an optional package of additional characters and special symbols. The characters or symbols can be of virtually any style desired by the user provided he is willing to pay for this optional extra.
5. *Indexing and eyeball characters.* Programming provides the user the ability to print, in characters large enough to be read without magnification, a title or description name to identify the roll of film or a specific microfiche. The programmer also has facilities to prepare an index page to be recorded on a fiche or roll of film to aid the user with quick access to the data for which he is searching.

what happens with read errors?

Although each COM unit handles error conditions somewhat differently, most are quite similar.

In the event the tape drive detects an error while reading tape or reads a bit pattern for a character not included in its character set, the COM unit is conditioned to stop recording and reread. Depending on the machine used, the reread is made from 3 to 10 times.

In general, if the error condition persists, the logic section directs the printing of a blank or special symbol in place of the unreadable character or symbol, and the unit proceeds to record the remaining data for that page. After the frame containing the error has been recorded it is marked in one of a few ways. A diagonal line across the frame or the word "VOID" printed on the frame are common ways used to mark frames that contain errors.

The logic section can then suspend machine operation and signal for operator intervention. The operator can abort the job, or direct the unit to proceed.

A proposed method of error handling includes the facility to display a page of data containing an error on a monitor crt prior to recording the data on film.

All COM units have the capability of recording data on microfilm selectively in one of the two image formats: "cine" and "comic."

Comic mode refers to a format with pages of data appearing side-by-side on the film (data recorded laterally).

Cine mode recording places one page following another in a vertical plane (such as movie film).

how about including preprinted forms?

The ability to display, and record at program command, a "form overlay," along with alphanumeric data, is a highly desirable feature included on COM units.

This merging of alphanumeric data and noncomputer-generated graphics has the potential of providing substantial savings to the user. Form design can be changed conveniently without regard for unused quantities of preprinted higher cost special stock that would be a problem with impact printer output.

Three types of forms-merging devices exist with COM units.

Single form. With the use of a forms "flasher," a single glass or plastic slide, or film chip is projected and recorded on the microfilm (under program command).

Random form selection. This feature is an extension of the single form slide projection feature. It provides for several form overlays, on a loop of film or carousel to be included in the COM unit. At program command any of the forms can be selected, projected, and recorded on the microfilm along with the computer-generated data.

Sequential. A special unit is available or will soon be available on some units that permits large-volume graphics merging between frames of alphanumeric data. With this device, prefilmed graphics are fed, one at a time, in sequence, through the unit and merged with the computer-generated data.

In addition to merging computer-generated data with noncomputer graphics as noted above, forms can be included on the output microfilm in one other way. With the use of special straight line vertical and horizontal characters available with COM, the programmer can generate simple straight line forms in his output program by including horizontal and/or vertical lines as a part of his output records. This method, however, might use character spaces that could otherwise be used for data. Forms overlay registration varies between COM units, with manufacturers specifying accuracy of line positioning from ±1 character position to an accuracy which provides "splitting" character positions.

increased search speed

Several microfilm retrieval systems are marketed at present, all of which have been designed to speed the search of film and locate a desired document in as short a time as possible.

Representative of these systems are "Codeline," "Image Control," "Miracode®," "SRM," and "Kodamatic®."

Current ability of COM units to record the necessary coding required by these systems varies.

Throughput speed refers to the time required to process data through a COM unit to produce the exposed microfilm. The speed is usually expressed as pages per second or pages per minute.

Time required for tape mounting and rewind, film loading and unloading, error condition handling, film processing (developing), and other incidentals relative to setup are not included in throughput rating because of their variability.

In the "simulation" mode, throughput is lower than in the "specific" mode, and will range from negligible to many

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times slower. For the purpose of the following, we assume that any organization making significant use of COM equipment will consider speed of throughput essential to over-all cost reduction. As such, programs would be prepared to run in the most economical mode!

The following explains, to some extent, the items involved in calculating throughput speed, assuming the COM unit is operating in the specific (fastest) mode.

Throughput speed is dependent on several items.

Character transfer rate. Character transfer rate refers to the reading speed of the COM unit. This rate is usually expressed simply as the number of characters per second that can be read, or implied by stating that the machine is capable of handling tapes of X bpi (bits per inch) density, at Y ips (inches per second): bpi times ips = character transfer rate.

Data per page. Total data per page consists of the number of characters on the page, including specified blanks, plus control characters or blanks required by the COM unit for each record. Control characters normally vary from three to eight per record. In addition, on most machines at least one "action" record, of from three to eight bytes, is required per page to accomplish page eject (film advance). Other action records are required for forms merging, retrieval coding, and other system features.

Number of interblock gaps. An interblock gap on the input tape should be placed after each action command. This is the only requirement for IBG's. (In programming, generally, care would be exercised to keep IBG's to a minimum, as additional IBG's add to the over-all time required by the COM unit to process the data and thus reduce throughput speed.)

Forms overlay merging. Under normal conditions where only one form overlay is included in the COM unit, no additional time need be calculated for the use of the form "flasher," since the amount of time required to perform the function is relatively negligible. However, in units that are equipped with mechanically selected random or large sequential form units, the time required for the functioning of the forms merging units must be calculated for the specific job and machine.

Retrieval coding. Some units provide the ability to handle retrieval coding on microfilm. Time required to perform the recording of the code must be calculated and will vary with the job and unit being used.

Film advance. The time required to advance film after each page is recorded (including film settling time) is a very significant item involved in throughput rate. Film advance time (for 16mm film with an approximate 25X reduction ratio) varies among the several COM printers from over 100msec to as little as 20msec (on one COM printer under development).

In calculating throughput speed (frames per second) the following general formula may be used for approximating results. (This general formula would not apply to a COM unit using buffered input techniques or a unit that "skips over" blanks at high speed.)

$$F/S = \frac{1000}{(C \times TR) + (NIBG \times TIBG) + FA + RFO}$$

Where:

F/S = Frames (or pages) per second = throughput rate.

C = Total characters (or average) per page to be recorded.

TR = Transfer rate (milliseconds per character).
= 1000 ÷ [tape density (bpi) times tape speed (ips)].

NIBG = The number of interblock gaps included per page (other than the one IBG required to follow the frame advance command).

TIBG = The milliseconds of time required to read an IBG = (IBG length in inches ÷ tape reading speed in IPS) × 1000.

FA = Film advance time (including film settling) in milliseconds. (This general formula does not apply to COM units using 105mm film in the microfiche format.)

RFO = Time in milliseconds to locate random form overlay. When retrieval coding or sequential form display is to be included on the microfilm, the additional time to display the coding or form plus film advance time would act to reduce the throughput rate. The above general formula would have to be modified to accurately reflect the additional requirement.

what will com cost?

Cost of purchase or lease, maintenance, and supplies must, in this discourse, be treated very generally. Price changes by the various manufacturers, the number of optional features required by the user, and the extent to which any user would use the equipment, makes specific price quotations difficult.

In general, however, cost can be divided into two main categories: equipment and supplies:

Equipment costs relate to the purchase or lease and maintenance of the COM unit, including film developing and duplicating devices, and other peripheral equipment.

In treating the subject very approximately, one COM unit and its peripheral equipment would cost the user about the same as what he is now paying for between 2 and 3 impact printers, including the cpu time and tape drives necessary for their operation.

Supplies relate primarily to film and chemicals for developing film (when chemicals are required).

Using 16mm film as an example, 100 feet of film costs about $3. With a cost for chemicals of about $ .35, the total material cost for the processed film is about $3.35. Depending on the reduction ratio, 100 feet of 16mm film could contain from about 2000 to 8000 pages of data. Accordingly, the material cost per page would range from $ .0017 to less than $ .0005.

Single copy stock paper used for computer impact printing, on the other hand, costs about $ .0040 per page.

Supplies for duplicate copies of roll film would cost somewhat less than the original, whereas the cost of paper for a duplicate copy as output of an impact printer would be significantly higher than the original.

In view of the greater speed of COM equipment and its inherent greater use of investment capital it might generally be concluded that, provided sufficient work volume exists, nonpayroll costs for COM-produced data can be as little as ⅛th the cost of producing data on impact printers.

The greater throughput speed of COM units, ranging up to 20 or 30 times as fast as impact printing, would also certainly indicate a potential in payroll cost economies.

Balanced, to some degree, against the inherent reduced time and cost of producing and distributing data on microfilm is the cost of providing microfilm viewers which the user will require if he is to read and use the output.

Recognizing that several manufacturers supply viewers varying in cost and features over a wide spectrum, any particular user application would have to be priced individually and equated with the savings of producing and using the data on microfilm. ■

SELECTING THE RIGHT COM UNIT

after you know your needs

by George H. Harmon

Seventeen companies, offer 30 COM devices. Within six months it may be 27 companies offering 40 different units.

The advertised characteristics are confusing to the prospective buyer. There are two reasons for the confusion. First, the buyer is usually not conversant with the varied languages of data processing, electronics, optics, and microfilm. Second, there are no standards for defining the input or output requirements, the quality levels or the output speeds. But a comparative listing of some of the characteristics of existing computer output microfilm equipment should help a potential buyer in making a selection.

If one is selecting a COM device, it must first be assumed that there is a need for such a device; the system of handling information should have been completely investigated. If a new method utilizing a particular form of microfilm results, a comparison of units must be made to choose the unit which provides the proper output on the required medium at the needed quality level in the fastest time.

There are two basic types of COM units. One is called "alphanumeric" and produces characters only, usually runs very fast, and is considered as a direct replacement for an impact printer. The other type is called a "graphics" unit and is capable of drawing lines, plotting graphs, and creating complex images, as well as producing the alphanumeric characters. If graphics capability is required, alphanumeric units can be eliminated from consideration. However, if alphanumeric output is required, all units producing characters should be examined.

Since a COM device should be considered an integral part of an information handling system, one must establish the relationship of input and output of the COM unit to the other parts of the system. The specific characteristics shown in the accompanying table can help in assuring a proper match. (The figures were supplied by the manufacturers.)

The defined basic types of alphanumeric and graphic refer to the output of the devices. There are also two classes of input which must be considered, on-line or off-line, with the interface to the COM device being most important. The transmission code must be accommodated as well as the system of blocking and the transfer rate must be compatible. Off-line devices require a magnetic tape unit which must match the computer output for number of tracks and bits per inch per track. Many COM devices handle various tapes.

COM devices sometimes include their own controller with a great variety of capabilities. Cycle times vary from 800 nsec to 2 usec. Various memory capacities are indicated in

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the table. A reading of 4K-32K indicates a basic 4K memory expandable to 32K. Inputs to this controller can be paper tape, magnetic tape, keyboard, plugboard or punched card.

Monitors are provided on many COM devices. They are sometimes a part of the internal computer. There are cathode ray tube (crt) monitors, projected images or Polaroid cameras. Many different monitor image sizes are provided.

output must match microfilm system

Interfacing the output of a COM device may not be as obvious but is equally as important. Unless the film created meets the needs of the microfilm system it may be totally unusable. If the only microfilm used in an information handling system is from the COM device, the major problem will be matching the readers, duplicators, and enlarger printers. If an existing standard microfilm system must be accommodated, the output from the COM device must match the characteristics of the system. There are varied microfilm systems such as roll, cartridge, aperture card, and microfiche. There are film widths of 16mm, 35mm, 70mm or 105mm. The images might be positive or negative. The system may require duplicates and duplicates from the duplicates. Each of these characteristics places a specific requirement on the microfilm that is generated by the COM device.

Microfilm output from a COM device is in roll form of up to 1000 feet. Existing microfilm systems which use roll film usually use 100-foot rolls of either 16mm or 35mm film. The primary requirement of the COM device is to accommodate the proper size film. If the existing microfilm system uses a magazine, cartridge, or cassette, the prime consideration is still the width of film. The roll film output can be inserted in the cartridges. Aperture card systems require 35mm film and a special pull-down feature on the camera to allow mounting of consecutive images in different cards. The normal requirement is a two-inch pull-down. Microfiche systems vary and can be accommodated in varying ways by a COM device. One method is to use 105mm film and record the images by step and repeat or other techniques until the proper number of images are exposed in the proper image area. Another method is to expose individual images on 16mm film and then mount the strips of 16mm film on a carrier which holds the proper number of images.

Microfilm from a COM device must match the type of image, positive or negative, in any existing system. A positive image on film is black lines on a clear background, whereas a negative image has clear lines on a black background. Photographing standard paper printed images will give a negative image. The normal output from a COM device is a positive image, since the camera is photographing light lines on a dark background of the crt. Two common methods of reversing the COM output image are by developing a reversed image or making a film copy of the positive image output.

The microfilm systems which require several generations of duplication place the most stringent requirements on the COM device output. All reproduction processes introduce degradation of the image. Unless the original image is very high quality, the third or fourth generation copy will be unreadable. The National Microfilm Association is recommending quality standards to assure readability. Some COM units can now meet the total end requirements of photographic microfilm systems.

To be sure the requirements of the microfilm system are accommodated, one should check the cameras available, forms overlay, retrieval codes and over-all expected quality of film. Cameras are sprocketed (perforated) or nonsprocketed (unperforated) for films that are 16mm, 35mm or 105mm wide. Some cameras accommodate more than one size film.

Two basic methods of forms overlay are optical forms flash and programmed forms merging. The programmed form which can, on some units, include lines, characters, and special logos, can be stored in the memory of the COM device for merging, can be on a second input file, or can be included with the data to be recorded. The advantages of programmed forms merging are ability to provide absolute registration and consistent density level and ease in modifying the form format. Problems include the need for qualified programmers and the requirement for storing the form as data. Very complicated forms also require more exposure time than slide flashing.

Forms flashing involves placing the required form on film or on a glass slide for re-exposure on the COM output. Some COM devices provide ability to select more than one form for merging either on a random choice or sequential basis. One of the advantages of this method of forms merging is that very complex forms, including multigray level images, can be rapidly merged. If many forms are needed, it is much easier to store them in a microfilm form than in the data form on magnetic tape.

Retrieval codes can be applied by many machines; this allows utilization of the microfilm in automatic storage and retrieval systems. Some of those provided are Miracode, image count, bar code and code line. Most units can also make void marks, which are used to void frames when an error is detected by the system.

The most difficult item to determine from a specification sheet is quality. First, there is quality as it relates to the images on the film. As noted above, the level of quality needed is determined by the use of the microfilm. The best method of determining whether the quality is adequate is to see a series of images from the COM device. This is practically the only way to check alphanumeric units. For graphic units, various figures of merit have been devised and such factors as resolution, line edge gradient, density, relative density, modulation transfer function, spread function, and raster elements are quoted. Studies indicate that standard font style characters can be read and understood if made up of 6 pairs of lines and that a certain minimum line width is required for drawing high quality graphics. On the basis of such studies, one can rate quality based on the number of addressable points (the number of locations where a spot can be placed) and the number of resolvable elements (the number of points which can be placed on film completely separated from one another).

The most severe quality requirements are in systems which require matching existing microfilm qualities and making multiple generations of duplication. Here one must determine whether the COM device can expose on the same type of film, whether the film can be developed to give a similar background density, whether a reversed image can be obtained, and whether it will still meet a suitable resolution characteristic over the entire image area.

The other characteristic of quality which should be investigated is the quality of the machine itself—the ability to create microfilm of a stated quality over a long period of time without downtime. Some companies have experience with units in operation for an extended time. Most companies have estimated reliability of their units and reflected their own faith in maintenance contract prices. It is only logical to assume that a low-cost maintenance contract indicates relatively low expected service and minimum

(Text continues on page 106; Table I next two pages)

MANUFACTURER/ MODEL NUMBER	ADAGE AGT Models 5M, 10M, 30M, 50M	AMETEK/STRAZA 1201	AMETEK/STRAZA 1311	BETA INSTRUMENT COM 600	BURROUGHS BCOM B 9260	BURROUGHS BCOM B 9262	CALCOMP 835	CALCOMP 840	CALCOMP 890/895	CALCOMP 1670	CANON J-COM 101	COMPUTER INDUSTRIES 120 ①	COMPUTER INDUSTRIES 180 ①	COMPUTER INDUSTRIES 300-1	COMPUTER INDUSTRIES 300-2	COMPUTER INDUSTRIES 300-3
ON-LINE																
Transmission Codes	binary, BCD	no	binary, BCD	any	no	no	binary	no	no	binary	any	no	no	no	no	no
Max. Transfer Rate	120KC - over 1MC ①	no	62.5KC	50KC - 600KC	no	no	100KC	no	no	500KC	500KC	no	no	no	no	no
OFF-LINE																
Transmission Codes	binary, BCD	binary, BCD	no	binary, BCD, EBCDIC	BCL/BCD, EBCDIC, ASCII	BCL/BCD, EBCDIC, ASCII	binary, BCD	binary, BCD	binary, BCD	binary	any	BCD	BCD, EBCDIC	BCD, EBCDIC	BCD, EBCDIC	BCD, EBCDIC
Transfer Rate	27.8KC - 96KC (except model 5M)	62KC	no	36KC - 120KC	50KC	96KC	16.5KC/33KC	30KC	30KC	30KC	20KC-60KC	18KC	18KC	18KC	36KC	36KC
CONSOLE																
CRT Monitor	12" x 12"	no	12" x 12"	no	no	no	8" x 10" OPT.	8" x 10" OPT.	8" x 10" OPT.	8½" x 10"	12" (diag.)	no	no	no	no	no
Projected Image	no	yes	no	no	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Punched Card	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Plugboard	no	yes	no	no	no	no	no	no	no	no	no	no	no	yes	yes	yes
Keyboard	ASR 33	no	no	ASR 33	no	no	no	ASR 33	ASR 33	no	no	no	no	no	no	no
Paper Tape	yes	no	no	yes	no	no	no	yes	yes	no	no	no	no	no	no	no
Other	no		no	no	no	Polaroid	no	no	no	tape cartridge	no	no	no	no	no	no
CONTROLLER																
Manufacturer	Adage	no	no	DEC PDP-8/L	no	no	Calcomp	Honeywell DDP-516	Honeywell DDP-516	Calcomp 904	no	no	no	no	no	no
Memory Size	4K-32K	no	no	4K-8K	no	no	2K	8K-32K	8K-32K	16K-32K	no	no	no	no	no	no
Bits/Word	30	no	no	12	no	no	6	16	16	9	no	no	no	no	no	no
CPU Memory Cycle	2 usec	no	no	1.6 usec	no	no	2.5 usec	960 nsec	960 nsec	2 usec	no	no	no	no	no	no
CAMERAS AVAILABLE																
Manufacturer	Vought	Vought	Vought	Vought	Phil-Air Transport	Phil-Air Transport	Automax/Vought	Automax/Vought	Vought/Kodak	Vought	Canon 501	Vought	Vought	Terminal Data/Vought	Terminal Data/Vought	Terminal Data/Vought
16MM	no	no	perf/unperf	perf/unperf	unperforated	unperforated	perf/unperf	perf/unperf	perf/unperf	unperforated	unperforated	perf/unperf	perf/unperf	perf/unperf	perf/unperf	perf/unperf
35MM	no	no	perf/unperf	perf/unperf	no	no	perf/unperf	perf/unperf	perf/unperf	no	no	perf/unperf	perf/unperf	perf/unperf	perf/unperf	perf/unperf
16MM/35MM	perf/unperf	perf/unperf	no	no	no	no	perforated	perforated	no	perforated	no	no	no	no	no	no
105MM (fiche)	yes	no	no	no	yes	yes	no	no	no	yes	no	no	no	no	no	no
16MM/35MM/105MM	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	yes	yes
Frame Advance	100 msec	65 msec	65 msec	85-100 msec	80 msec	80 msec	200 msec	208 msec	100 msec	50-100 msec	75 msec	20 msec	20 msec	20 msec	20 msec	20 msec
RETRIEVAL CODES																
Image Count	yes OPT.	no	no	yes	no	yes	no	no	no	no	yes	yes	yes	yes	yes	yes
Bar Code	yes OPT.	no	no	no	no	yes	no	no	no	no	no	yes	yes	yes	yes	yes
Miracode	yes OPT.	no	no	no	no	no	no	no	no	yes	no	yes	yes	yes	yes	yes
Codeline	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Other	no	no	no	no	no	random access.	no	no	no	no	no	no	no	Kodamatic	Kodamatic	Kodamatic
ALPHANUMERICS																
Characters/Sec	67KC	62KC	62.5KC	40KC	50KC	96KC	2.6KC	2.7KC	4.4KC	10KC/30KC ①	20KC	12KC	18KC	18KC	36KC	36KC
132-Character Lines/Min	18,000	28,182	28,409	14,400	22,680	43,620	1200	1600	3300	4,500/10,000 ①	8,400	4,500	6,000	6,000	12,000	12,000
Characters/Font	96	78	78	128	64	64-96	∞	∞	∞	∞	192	62	62	62	62	62-124
Standard Fonts	2	1	1	no	1	1	∞	∞	∞	1	1	1	1	1	1	1
Maximum Fonts	2	1	1	∞	1	1	∞	∞	∞	∞	∞	1	1	1	1	1
Character Sizes	3	1	1	2	1	3	∞	∞	∞	∞	1	1	1	1	1	1
Intensity Levels	∞	2	2	4	1	1	no	no	no	1	no	1	1	1	1	1
Minimum Pages/Min.	265	298	300	202	241	357	17	18	30	66/181 ①	122	85	122	122	235	235
Average Pages/Min.	414	530	530	375	428	540	44	46	77	172/400 ①	266	222	338	338	580	580
GRAPHICS																
Resolvable Elements	16 x 10^6	1.32K x 1.36K	1.32K x 1.36K	1200 x 1200	no	no	1500	1500	1500	3500	no	1K x 1K	no	no	no	1K x 1K
Addressable Spot Positions	10^9	1.32K x 1.36K	1.32K x 1.36K	4K x 4K	no	no	4K x 4K	4K x 4K	4K x 4K	16K	no	1K x 1K	no	no	no	1K x 1K
Points/Sec.	200KC	60KC	60KC	50KC	no	no	100KC	140KC	300KC	500KC	no	8.4KC	no	no	no	16.8KC
Point Sizes	1	1	1	1	no	no	32	32	32	32	no	1	no	no	no	1
Full Width Vector	39 usec	220 msec	220 msec	28-54 usec	no	no	3.5 msec	1-2.5 msec	150 usec - 1.2 msec	4 msec	no	84 usec	no	no	no	168 usec
Line Widths	1	1	1	1	no	no	32	32	32	32	no	1	no	no	no	1
Intensity Levels	∞	2	2	4	no	no	32	32	32	1	no	1	no	no	no	1
MAGNETIC TAPE																
Number of Tracks	7 or 9 track	7 track	no	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track	7 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track
Packing Densities	200, 556, 800	200, 556, 800	no	556, 800/1600 OPT.	200, 556, 800	200, 556, 800	200, 556, 800	556, 800	556, 800	556, 800	556, 800	556, 800	556, 800	556, 800/1600 OPT.	556, 800/1600 OPT.	556, 800/1600 OPT.
Optional Cost	$20,000/$49,500	standard	no	standard	$27,000	$31,200	$35,000	standard	standard	$16,500-$19,500	standard	standard	standard	standard	standard	standard
FORMS OVERLAYS																
Projected	no	yes OPT.	yes OPT.	yes	yes	yes	no	no	no	yes OPT.	yes	yes	yes	yes	yes	yes
Number On-Line	no	no	no	1	1	1	no	no	no	16	no	1	1	1	1	1
Stored Program	yes	no	no	no	no	no	no	yes	yes	no	no	no	no	no	no	no
SPECIAL ON-LINE FEATURES																
Film Processing	no	no	no	yes	no	no	no	no	no	no	yes OPT.	no	no	no	no	no
Hard Copy Output	yes	yes	no	no	8½" x 11" OPT.	8½" x 11" OPT.	no	no	no	no	no	yes	no	yes	yes	yes
Active Graphics	tablet and joystick light pen, switches photoelectric keyboard	no	no	no	no	no	no	no	no	no	no	yes	no	no	no	yes
Other	card reader, disc pack, communications	aperture card output, image rotation	image rotation	128K	no	no	no	disc, mtu's	disc, mtu's	no	disc, mtu's	no	no	no	no	no
PRICES																
Purchase	$60,000 ② (5M)	$78,000	$74,000	$125,000	$85,000	$125,000	$50,000	$140,000	$200,000	$117,000 (est.)	approx. $100,000	$118,960	$97,120	≈$85,000	≈$12,000	$139,000
Lease (1 yr.) with Maint.	$ 2,700 ② (5M)	$ 6,667	$ 5,834	$ 3,600	$ 2,100	$ 3,290	$ 1,500	$ 4,200	$ 6,000	$ 3,500 (est.)	none	$ 3,900	$ 3,000	≈ $ 2,600	≈$ 3,200	$ 4,559

② $ 80,000/$3,600 (10M)
$145,000/$6,525 (30M)
$195,000/$8,775 (50M)

① with 30-bit data

① optional hardware character generator

① no longer manufactured; only rebuilt units sold

① no longer manufactured; only rebuilt units sold

	COMPUTER MICRO-IMAGE SYSTEMS 7000	EASTMAN KODAK KOM-90	INFORMATION INTERNATIONAL FR-80	MEMOREX 1603	3M Series "F" EBR	PERIPHERAL TECHNOLOGY 1300	RCA VIDEOCOMP 800	SCAN GRAPHICS GraphiCOM	SEACO COMPUTER-DISPLAY 401[1]	SINGER-GENERAL PRECISION APD-5000	STROMBERG DATAGRAPHIX 4020[1]	4060	4360	4400[1]	4440
ON-LINE															
Transmission Codes	any	no	binary, BCD	EBCDIC	BCD, EBCDIC	no	no	any	no	binary	no	BCD, EBCDIC, BCDIC, ASCII	no	no	EBCDIC
Max. Transfer Rate	300KC	no	60KC	500KC	41.7KC/60KC	no	no	100KC	no	100KC	no	256KC	no	no	120KC
OFF-LINE															
Transmission Codes	any	BCD, EBCDIC	binary, BCD	no	BCD, EBCDIC	EBCDIC/BCD OPT. ASCII OPT.	EBCDIC, binary	any	EBCDIC, ASCII	binary	binary, BCD	BCD, BCDIC, EBCDIC, ASCII	BCD, EBCDIC, BCDIC	BCD	BCD, EBCDIC, BCDIC
Transfer Rate	120KC-240KC	7.5KC-90KC	36KC/60KC	no	41.7KC/60KC	30KC	30KC	96KC	45KC	30KC	90KC	120KC	30KC/41.7KC	62.5KC	120KC
CONSOLE															
CRT Monitor	no	no	8" x 10"	no	no	no	no	no	no	8" x 10" usable OPT.	no	no	no	no	no
Projected Image	11" (diag.)	yes[1]	no	no	10" x 10"	no	no	8 cm x 10 cm	no	no	no	11½" x 14"	no	no	no
Punched Card	yes	yes	no	no	yes	yes[1]	no	no	no	no	no	no	no	no	no
Plugboard	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no
Keyboard	no	no	ASR 33	no	no	no	ASR-35	ASR-33	no	no	no	no	no	no	no
Paper Tape	no	no	yes	no	no	no	yes	yes	yes	no	no	no	no	no	no
Other	no	no	no	no	no	no	no	no	no	no	no	no	no	no	Polaroid
CONTROLLER															
Manufacturer	Computer Micro Image	no	DEC PDP-9/L/PDP-15	no	3M/CDC/LOCKHEED	no	RCA 1600	DEC PDP-15	no	no	no	Honeywell 516	no	no	no
Memory Size	4K-32K	no	4K-32K	no	4K-32K	no	32K-65K bytes	4K-32K	no	no	no	8K	no	no	no
Bits/Word	16	no	18	no	16	no	16	18	no	no	no	16	no	no	no
CPU/Memory Cycle	1 usec	no	800 nsec	no	1 usec	no	1.6 usec	800 nsec	no	no	no	960	no	no	no
CAMERAS AVAILABLE															
Manufacturer	Computer Micro Image	Computer Equip. Corp.	cust. choice	no camera	no camera	no	RCA	Vought	no	Vought	Vought/Nayhart	Vought/SD	Vought/SD	Vought	Vought/SD
16MM	perforated	unperforated	unperforated	unperforated	perforated	unperforated	no	no	unperforated	perf/unperf	perf/unperf	unperforated	unperforated	unperforated	unperforated
35MM	unperforated	no	unperforated[1]	no	no	no	perforated OPT.	no	no	perf/unperf	perforated	perforated	no	no	unperforated
16MM/35MM	perforated	no	perforated	no	no	no	no	perf/unperf	no	no	no	perforated	no	no	no
105MM (fiche)	yes	no	yes[1]	no	no	no	no	yes	no	no	no	no	yes	no	yes
16MM/35MM/105MM	no	no	no	no	no	no	35/70/150/250/310MM	no	no	no	no	no	no	no	no
Frame Advance	20 msec	50-100 msec	80-185 msec	42 msec	25-60 msec	80 msec	190 msec	100 msec	≤75 msec	100 msec	100 msec	110 msec	400 msec	100 msec	100 msec
RETRIEVAL CODES															
Image Count	yes	yes	yes	no	yes	no	no	yes	no	no	no	yes	no	yes	yes
Bar Code	no	no	yes	no	no	yes	no	no	no	no	no	no	no	no	no
Miracode	yes	yes	yes	no	no	yes	no	no	no	yes	no	yes	no	yes	yes
Codeline	yes	yes	no	no	no	yes	no	no	no	no	no	yes	no	yes	yes
Other	spec. orders	no	no	no	page search OPT.	no	no	no	no	no	sequential retrieval	sequential retrieval	sequential retrieval	no	sequential retrieval
ALPHANUMERICS															
Characters/Sec	120KC	90KC	80KC/40KC[2]	22KC	60KC	30KC	6KC	40KC	45KC	to 2KC/17KC[1]	17KC	40KC	60KC	60KC	120KC
132-Character Lines/Min	50,000	20,000	3600/18,000[2]	10,000	20,000	13,000	660	18,000	20,450	900/7700[1]	7000	7000	7000	15,000	22,500
Characters/Font	64-128	121	128+	64	64-128	64-120	up to 207	128	64	60/64[1]	64	64	64	64	64
Standard Fonts	2	2	no	1	∞	1	20-30	1	∞	∞/1[1]	1	1	1	1	1
Maximum Fonts	2	2	∞	1	∞	1	∞	∞	∞	no	1	1	1	1	1
Character Sizes	48	2	64	1	3	1	34	4-64	∞	∞	2 OPT.	4	1	1	1
Intensity Levels	2	2	8	1	2	1	1	8	no	8	16 OPT.	4	1	1	1
Minimum Pages/Min.	664	418	53/205[2]	141	362	166	38	159	228	14/100[1]	100	187	111	249	342
Average Pages/Min.	1330	720	132/387[2]	156	800	333	87	342	425	38/217[1]	216	324	133	400	440
GRAPHICS															
Resolvable Elements	no	no	4K x 4K	no	2K x 2K	no	900 x 1400	4K x 4K	no	4K x 3K	1K x 1K	4K x 3K			
Addressable Spot Positions	no	no	16K x 16K	no	2K x 2K	no	3100 x 4800	16K x 16K	no	16K x 12K	1K x 1K	4K x 3K	no	no	no
Points/Sec.	no	no	90KC	no	40KC	no	2.7 MC	500KC	no	100KC	17.8KC	60KC	no	no	no
Point Sizes	no	no	8	no	2	no	no	8	no	8	1	4	no	no	no
Full Width Vector	no	no	6 msec	no	85 usec	no	no	4 msec	no	5-40 msec	5 msec	1 msec - 4 msec	no	no	no
Line Widths	no	no	8 (4:1)	no	2	no	∞	2	no	8	1	4	no	no	no
Intensity Levels	no	no	8	no	∞ (2:1)	no	1	8	no	8	16 OPT.	4	no	no	no
MAGNETIC TAPE															
Number of Tracks	7 or 9 track	7 or 9 track	7 or 9 track	no	7 or 9 track	9 track	9 track	7 or 9 track	7 or 9 track	7 track	7 track	7 or 9 track	7 or 9 track	7 or 9 track	7 or 9 track
Packing Densities	200,556,800/1600 OPT.	200, 556, 800	200, 556, 800/1600[3]	no	200, 556, 800, 1600	800	800	556, 800	556, 800	556	200, 556, 800	556, 800	556, 800	556, 800	556, 800
Optional Cost	$28,000/$32,800 OPT.	$21,000	standard	no	$11,000 - $19,000	standard	standard	standard	standard	$20,000	$15,800	$31,000	$15,800	$31,000	$31,000
FORMS OVERLAYS															
Projected	yes	yes	no	yes	yes OPT.	yes	no	yes	yes	yes OPT.	yes	yes	yes	yes	yes
Number On-Line	8	1	no	1	1/30[1]	1	255	1	1	1	1	1	1	1	1
Stored Program	no	no	yes	no	yes	no	yes	yes	no	yes	no	no	no	no	no
SPECIAL ON-LINE FEATURES															
Film Processing	no	no	no	no	no	no	no	no	no	no	no	yes	no	no	no
Hard Copy Output	no	no	no	no	yes	no	standard	no	no	no	yes	yes	no	no	no
Active Graphics	no	no	light pen	no	no	no	no	no	no	no	no	no	no	no	no
Other	no	no	color	no	no	"dump" mode	no	no	no	no	no	no	no	no	no
PRICES															
Purchase	$125,000	$117,000	$225,000	$44,250	$86,600	$49,750	$310,000	$212,500	$35,000-$45,000	$99,750	$154,960	$275,000	$78,000	$83,200	$102,500
Lease (1 yr.) with Maint.	$ 4,000	$ 3,650	$ 7,500	$ 895	$ 3,085-$2,140	$ 2,400	$ 8,000	none	none	≤ $ 4,500	$ 5,575	$ 8,210	$ 1,925	$ 3,120	$ 3,120

[1] two monitors included: one, full image, 3½" x 4½" and one, for registration, at 40X magnification.

[1] 35MM/105MM camera
[2] optional hardware character generator in development

[1] optional: 30 forms on-line random access; 1600 forms on-line serial access.

[1] in development

[1] first deliveries scheduled for mid-1970

[1] optional hardware character generator

[1] no longer manufactured; only rebuilt units sold.

[1] no longer manufactured; only rebuilt units sold.

downtime. Service exceptions in maintenance contracts might indicate sources of difficulty and expense, as well as loss of time for the user.

check actual speed of operation

The most misrepresented characteristic of a COM device is its speed of operation. Any unit is many times faster than an impact printer or a plotter. However, the actual speed is only partially stated. The throughput is the most useful given value, but is seldom defined. In order to give a value closer to actual throughput for alphanumeric printout recording the average lines per minute, computations were made to include character expose rate and film advance rate (time to move film from one image area to the next and allow complete settling for exposing equal quality characters throughout a frame). The numbers in the table are based on estimated average lines of 60 characters and pages of 50 lines. Seconds per page is determined by dividing 3000 by the number of characters per second and then adding the frame advance rate. Dividing 60 by the seconds per page gives a value for average pages per minute. (Similarly, the "minimum pages/minute" figures were arrived at using 132-character lines and 64 lines per page.) The actual desired value is the total number of frames of film which can be exposed in a one-day operation. This requires analyzing the times for handling the film set-up of the machine and introducing the data as well as recording the images. The nonproductive times, such as error handling and monitoring, must also be considered. Sometimes it's necessary to run the same materials on different machines to really compare throughput speeds.

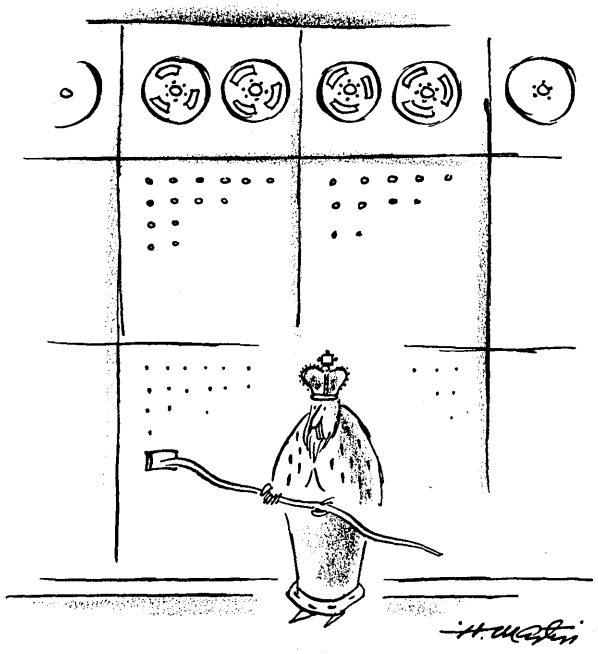
special system requirements

In the choice of a COM device for a particular information system the deciding factor is usually a specialty requirement. Many devices have the versatility to provide for these special situations.

Characters can be provided in varied fonts, varied sizes and in varying degrees of darkness. The chart indicates the number of intensity levels which can be applied automatically by input control. This then relates to the different levels of density on the film output. Multiple levels allow emphasis by other than size or font. Some units can also automatically italicize as well as make characters bold.

Points can be provided in various sizes and lines in various widths. Either can be recorded with different intensity levels. This is very important when producing stored program forms overlays.

Other capabilities that are often important include: on-line film processing, which provides immediate microfilm or on-line hard copy output; the ability to expand memory capacity, including addition of a disc pack; or the ability to combine an interactive graphics unit with the COM device. Color recording also adds value to any system.



"Monarchy is dying. Long live machines."

cost evaluation

After determining which units can produce adequately the microfilm required, it is necessary to economically justify a unit. Three choices are offered. The microfilm might be made by a service company which has a unit. (It is recommended that this be done initially in all cases to assure that the customer's procedures for using a microfilm system will work.) A COM device may also be bought or leased. Purchase and lease prices must be checked closely. All prices are subject to change at any time. Advertised prices do not always provide a total working system. An off-line operation requires a magnetic tape drive, yet eight companies listed in the table charge an additional amount. Other features which one might expect to be standard are considered extra-charge options. When the choice of unit is made, advise the manufacturer of your use of the device, and receive assurance that the entire job will be done to your specifications.

summary

Choosing a COM device can be a perplexing problem. Using this table and the following 10 steps should assure the proper selection.

1. Check the system use of the output microfilm to determine the need of a COM device.
2. Determine if only alphanumeric is required.
3. Check if an on-line or off-line operation is required.
4. Match the input to the system.
5. Match the output form to the system.
6. Check for needs of forms overlay and retrieval code marking.
7. Determine the expected quality.
8. Check the speed requirements.
9. Check the need or utilization of special features such as on-line processing or color recording.
10. Check the economics of using various units, including cost to operate as well as original cost.

Prior to the final choice, a total study of its use should be made. If the device can be utilized over 50% of the time, it is probably adequate for the job. If it is being used substantially less than 50%, a device should be investigated which can handle more functions than originally considered. Some COM devices, as shown in the table, can replace impact printers, plotters, and automatic drafting systems at the same time.

In the final analysis, it should be the cost of the service provided with all factors considered that determines the unit chosen. ■

Larry Martin of
NCI New York tells how to

"Make duck soup of documentation"

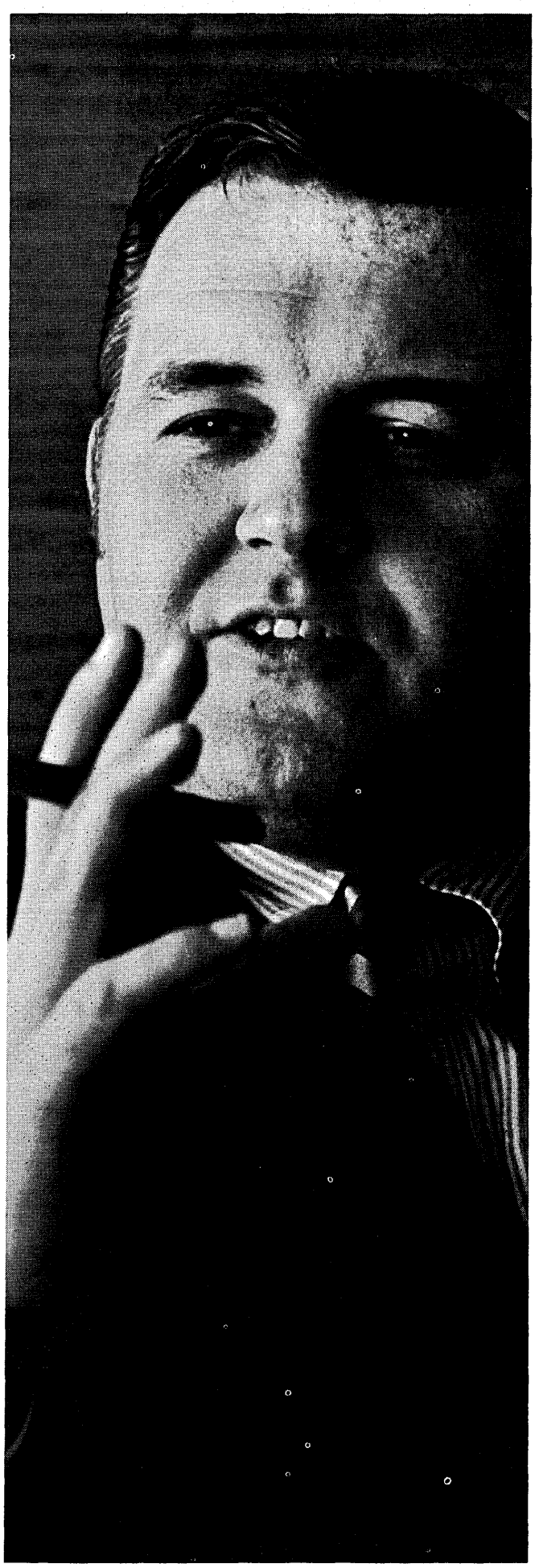
"When a programmer uses the new language, WORK TEN, he gets his documentation done for him. Automatically. Complete, accurate, narrative and up-to-date documentation. And it is available immediately from the first compilation onward.

"It shows definitions of the files used and detailed descriptions of each record type. Field name, picture, edit words, and relative character positions. And a cross-reference listing of where each field is used, changed or printed.

"WORK TEN documentation includes a narrative description of each logical operation, separated according to the time at which each occurs. And print lines are shown in expanded edited format.

"Any programmer can come back to WORK TEN programs at any time in the future and be able to tell precisely what is happening at every stage in every program. The documentation never gets 'cold', even though the original programmer may be long gone.

"Documentation is duck soup with WORK TEN. If you have a taste for duck soup, drop us a note. We will send you information by return mail."



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COM AT THE MANNED SPACECRAFT CENTER

fly me to the simulated moon

by Thomas A. Fuller

Computer output microfilm made its debut as an on-site operating peripheral at Houston's Manned Spacecraft Center in 1963. It was two years after the U.S. had declared as a national objective its intention to place a man on the moon before the end of the decade. How MSC's COM system evolved in support of that challenge places this story in a dramatic background.

The principal aim of my report, however, will be to highlight one of the earliest and largest COM applications within the technical community. Much has already been written about COM vs. the impact printer. The emphasis here will be on microfilm graphics and the impact of COM on an engineering-oriented computer center.

The first investigation into possible COM feasibility was initiated at MSC by the Computation and Analysis Division (C&AD). It should be noted that C&AD is not part of the real-time computer complex used in Mission Control.

The C&AD, headquartered in a two-story building, is comprised of some 900 government and support-contractor personnel. Although C&AD receives data in real time, the output is mostly used for postflight analysis, evaluation and planning.

But if the real-time computer complex is widely publicized as the "nerve center" of mission control, perhaps C&AD might be considered as the "memory, reflective reason, and judgment" at work between missions.

More broadly, the role of C&AD is threefold: (1) to provide data reduction from manned space flight and on-site testing; (2) to provide computer support for scientific R&D; and (3) to offer edp services for MSC administration and management.

This responsibility entails an enormous data base just for engineering data reduction, retention and retrieval alone. Also required is rapid reporting of high volumes of data in a form that can be easily communicated to many different specialists in different locations.

In common with most scientific computer centers, MSC relies heavily on plotting to communicate the message embedded in page after page of numerical data. Prior to COM, this was done largely by pen-on-paper, electro-mechanical devices.

Well over half the plotting at MSC, perhaps as much as 90%, is for the presentation of time-history data; i.e., visualized instrument measurements from space flight as a function of time. During each mission, hundreds of readings per second must be sampled for a wide range of instrumented systems on the spacecraft. Later the analog data recording is converted to digital data, checked for validity, and processed by computer. The computer program translates the data into engineering units and references them back to ground elapsed time. The time reference allows correlation of measured effects with their apparent causes.

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For example, it enables mission analysts to study the change in heartbeat due to physical exertion; or the rise of mechanical vibration during take-off; or the effects of heat upon reentry.

For scientific analysis or management reporting, plotting is simply an efficient means of telescoping voluminous data into "quick look" trends. C&AD has accordingly employed nearly ever variety of plotting device toward this end: flatbeds and drums; precision drafting systems; even a 3-D wire output unit. The wire plotter, made by Spatial Data Systems, creates three-dimensional representations upon a base matrix comprised of many receptacles. Any one of the receptacles can be addressed as the designated location for a given wire according to programmed X and Y coordinates. After locating a receptacle on the base matrix, the wire is moved up to an appropriate height and cut to its designated position along the Z axis. Upon completion, many wires of varied height create the illusion of topology just as the eye connects closely spaced points on a flat surface.

In data reduction, the wire plotter has been used extensively for simulating the topology of lunar surfaces. In R&D, the unit has also been used in heat shield design. For this application, various plots were converted into a scaled shield structure, then coated with plastic to provide surface texture. Alternative configurations could then be compared and contrasted for desirable performance characteristics.

Plotting via crt is obviously many times faster than incremental mechanical movement of a pen. COM plotting would consequently offer considerable improvement in throughput for MSC. But C&AD management emphatically state that COM was never contemplated as a substitute for incremental plotters. Each of the pen-on-paper plotters—and the 3-D device—continues to have its own inherent advantages and justification.

Another key factor in the decision-making process was the growing problem of data transport. Manned space flight depends upon the cooperative efforts of hundreds of engineers located throughout the nation. With only paper printout, some of the massive reports from C&AD were being delayed for up to a week due to crating and freight handling required. With microfilm, the same information could be mailed across the country in one day.

These were some of the considerations which led to the original installation of a DatagraphiX 4020, a 60,000-character-per-second recorder which generates alphanumeric and graphic output from computer data.

Later, along with the 4020, C&AD took on another output unit which could be used as an on-line display and an off-line microfilm recorder. The two COM systems provided some very tangible benefits, but in no way represented an ideal solution.

The weakest link in the total COM circuit in those days was the user interface. Viewing equipment was unsophisticated and lacked compatibility. Image reproduction and duplication often left much to be desired.

The early use of COM at MSC proved to be a mixed blessing. The lesson drawn by C&AD management was that output speed alone is not a panacea; and that there can be no substitute for high quality output, dependable equipment operation, and uniformly predictable results on a day-to-day basis.

Fortunately, the weak links were strengthened over the next several years as the COM industry became more systems oriented. At the same time, higher output speed became more important in the increasingly sophisticated space program. It is interesting to note, for example, that by the mid-sixties space engine thrust and computing speed had both improved by two orders of magnitude while line printer speed had changed little.

By the late sixties, growing output demands were pressing hard upon the capabilities of the dual microfilmers. Management began another investigation into a new microfilmer which could combine increased output speed, reliable operation and high quality recording.

choosing a new com unit

In 1968, at the conclusion of comprehensive evaluations, C&AD decided to install a DatagraphiX 4060 recorder. The reasons for this choice were several. The character-shaping matrix had proven to be a reliable system of generating data. And the manufacturer could supply a 4020 simulator, meaning that no additional programming would be required for the immediate future.

Fig. 1 (p. 110) shows information flow through the over-all system at the Computation and Analysis Center. After computer processing much of the data is graphically output via various off-line digital plotters. The largest volume of data from the three user groups goes to the 4060 for microfilm output tabulation and/or plotting.

At this juncture in the system flow, it may be useful to describe the COM unit and its role (Fig. 2, p. 110). The 4060 is comprised of a mag tape transport, internal computer with stored program, a crt, and film camera for recording. The microfilm recorder's stored program interprets FORTRAN carriage controls and record marks to position all data from the computer on the face of the crt in prescribed page formats. Light on the face of the tube exposes the film, usually in less than a second. When end-of-page condition is sensed by the stored program, a command is generated to advance the frame.

Operating speed of the microfilmer is 90,000 characters per second. Alphabetic characters, numbers and special symbols are formed by a character-shaping matrix, through which light is extruded onto the face of the crt. For tabular listing without plotting, a single control card in front of the source data is inserted prior to the computer run.

To get vector drawings and other engineering graphics, the programmer incorporates FORTRAN instructions as part of his over-all program read into one of the shop's g-p computers, usually a Univac 1108. These instructions determine how the data will be handled, mainly by combining previously written modules from storage for locating coordinates, scaling, annotation, etc. A variety of graphics software is available from the MSC systems library, a legacy from the early days of the 4020. A library of routines in the cpu is used to generate instructions for tape input to the 4060.

At this point, mag tape input for the 4060 includes computer-processed data and instructions for generating images on the microfilmer's crt. At MSC, the 4060's internal 16-bit, 8K computer is used as a controller to decode a variety of mag tape formats. The 4060, for example, can produce microfilmed output from a standard 1401 or 360 print tape, Uniprint, or other standard and nonstandard formats.

Line drawing and plotting are produced electronically on a raster of 12½ million addressable points. Program options enable a choice of four line thicknesses, a variety of dot widths, and annotation along the X and/or Y axis. Special mathematical symbols, along with standard alphanumerics, can be formed via the character-shaping matrix.

Recording is done on 16mm silver halide film. On a standard 400-foot reel, this provides about 8000 frames, or

roughly twice the number yielded previously on 35mm film. On any given day, two, three, or four rolls may be exposed. Whenever the last film on the roll is used—or sooner in the event of an urgent requirement—the film is taken to the processor (a DatagraphiX 89) for developing. This takes about 20 minutes to process the master, which is retained for archives and to make copies.

C&AD management believes strongly in reversal processing; i.e., white data showing through a black background.

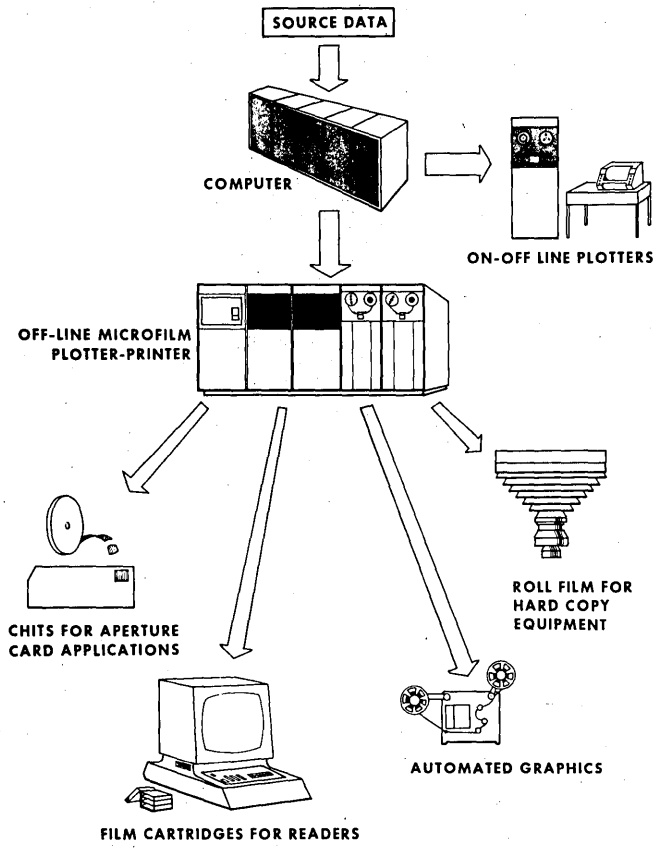


Fig. 1 Schematic of an MSC computer-plotter system.

Copies are made on diazo, negative to negative. Copying is effected by a Columbia Broadcasting System (Model 303) duplicator. High volume hard copy is produced by Xerox Copyflo equipment at 20 feet per minute.

A fully exposed magazine usually contains more than one job. Under supervision of the computer operations department at C&AD, the microfilm from one shooting may be handled in various ways. Depending upon the end user's need, the film output may be packaged in the form of a spool or a cartridge similar to a stereo cassette. With appropriate graphics generated in continuity, the frames can be cut, spliced and edited into an animated motion picture. Individual microfilm frames can also be cut and inserted into an opening of a standard punched card. Called "chits," these microfilm frames within punched cards have long been used for storage and retrieval of engineering drawings in aerospace manufacturing.

C&AD's largest demand continues to be for microfilm cartridges and roll film used in a variety of viewers interspersed throughout the MSC campus-like complex. Viewer equipment includes the DatagraphiX 1700, 3M's Model 100's and 400's, Eastman Kodak's Recordak, and an IBM unit.

Some of the viewers, such as the DatagraphiX 1700/3500 (Fig. 3), are equipped with demand printers so that paper copies can be made on demand from a remote location. After locating data of interest in space mission planning, for example, an engineer may want to print out selected frames of the film as part of his report.

C&AD's COM system can be viewed as an amalgam of many different equipments, supplies, procedures, and people. User satisfaction is not always a simple matter of machine characteristics. Orderly response to varied priorities, responsive turnaround time for routine reporting, dependable operations and procedures have an important bearing on end-user satisfaction.

During space missions, Univac 1108 computers and the 4060 microfilmer are pre-empted to assure quality control and provide controlled response to established priorities. Other applications are also handled in the background as workload permits.

For data reduction of spacecraft instrumentation, three basic priorities have been established to regulate response time: (1) as soon as possible; (2) to meet evaluation report deadlines (two weeks or less); and (3) at earliest convenience according to workload. In the case of an "exception" situation, an automatic override of routine priorities allows an optimum turnaround time within a few hours. In the case of the visual landing maneuvers of Apollo 11's Lunar Module, for example, the real-time data was processed, converted, displayed and reported back to mission evaluation while the astronauts were still on the moon.

One of the obvious advantages of microfilm is a data base compression factor on the order of 1 to 500. It is interesting to note that MSC has been able to store all the data pro-

Fig. 2 DatagraphiX 4060 recorder, consisting of magnetic tape transport, internal computer, crt, and film camera.

cessed from the Apollo and Gemini flights without going into the warehousing business. Paper output from the recording is destroyed after six or eight months; archival records are on microfilm.

Even with microfilm, it is always necessary to explore methods of containing the information explosion. One method used at MSC is a programming filter called a "Zero-Order Polynomial Predictor with Variable Aperture." Simply stated, this means that if the value remains unchanged during a sampling period, then output is suppressed. For every second of space flight, 1, 10, 50, 100, or 200 sampling readings are taken. When a particular subsystem is un-

affected for many seconds, this simple programming step saves processing time, print time, and film materials. More importantly, it facilitates analysis by the engineer.

r & d applications

Next to data reduction, the second largest demand for COM recording comes from research and development scientists at MSC. This runs the gamut from structural design to simulation of a future space mission. Long before the Apollo 11 lifted off the ground, U.S. astronauts had experienced the views that would be seen from the Command Module and Lunar Module. In addition to use prior to flight, such simulations are valuable on board the spacecraft for visual navigation or for possible modification of flight plans.

Fig. 3 DatagraphiX 1700 viewer, mounted on enclosed 3500 demand printer.

For example, a computer program has been written which numerically simulates the position and attitude of a spacecraft as a function of time. Detailed out-the-window views are also depicted for critical maneuvers executed by the Command Service Module and Lunar Module. An interesting feature of COM simulation is that it can be used to filter out the visual field as it will appear at any point in time. Included in the computer program are mathematical models of the earth, moon, sun, and a catalog of over a thousand bright stars. Some of the visible objects will appear as merely position points; others will show topology and shadow lines. But given the position of a spacecraft relative to the simulated objects and attitude positioned on a known coordinate system, the microfilmer can be used to prerecord a field of vision for every second of a space odyssey. By using short time intervals between frames and splicing, a visual continuity is produced which offers a fascinating space flight without ever leaving the ground. In a very real sense, COM at MSC has helped guide men to the moon and back.

The third application area for computer microfilming concerns the generation of reports for MSC managers and administrators. In many scientific computer centers, there is often a reluctance to use the full potential of microfilm as a data base for management decision making. This appears to have begun in the early days when viewers were harder to use. Today manufacturers offer a wide variety of viewing devices which allow automatic retrieval, indexing, annotation and other features for convenient access.

As an example of a typical MSC management application, 13 individual reports consisting of 3,000 frames or report pages have been combined into a single microfilm cartridge. The cartridge can be inserted easily and any of thousands of pages can be retrieved on the viewer screen within less than a minute. And at the push of a button a paper copy can be made.

The first three frames on the cartridge serve as the index. Each frame has a retrieval number. Once the user determines the desired frame number from the index, he taps out the appropriate keys and retrieval is automatic. The larger reports are toward the end to save time in accessing the more numerous smaller reports. Indexing, cross-indexing, and bidirectional automatic search can save a good 50% of the time wasted in looking for data buried in 3000 equivalent pages of hard copy.

One of the easily perceived benefits of COM for management is the "forms-merging" capability which can combine computer output with official record formats, invoices or letterhead stationery. This can save thousands of dollars per year in preprinted forms. It is accomplished by projecting a graphics image along with the dynamic data for film exposure. As a case in point, personnel administration at MSC is preparing to use the 4060's forms flash projector to create documents used in record keeping.

Many arguments can be made for extending microfilm facilities of an engineering computer center to management reporting. For example, the American Management Association estimates cost of filing and distribution at $1 per page for every copy of a generated report. And a variety of COM graphics can facilitate communication of management information.

What, then, is the over-all performance rating given to COM by hundreds of engineers, R&D scientists and administrators at MSC? Perhaps the most meaningful index of satisfaction is usage. Last year, C&AD provided microfilm output for about half of all data computed. The percentage —and total volume—is even higher this year.

It is always dangerous to wring sweeping generalizations from limited samples. But certain conclusions seem to be indicated as consensus judgment of C&AD management.

COM has undoubtedly quickened distribution of data inside and outside of MSC. More than five copies of a report once meant repeated passes through an impact printer. Now many more copies can be made from the microfilm master for less expense.

COM has also eliminated the need for warehousing vast amounts of paper printout. Archival records are stored on microfilm more efficiently, securely and economically.

COM did *not* replace the impact printer or electromechanical plotter at MSC. But it did significantly magnify printing and plotting throughput, introduced some new information aids, and enabled multiple economies in a period of rising workloads. Somewhere along the way, COM also helped guide men to the moon and back. ■

quick and clean

APPLYING COM TO A JOB BANK

by William V. Fogler and George D. Benjamin

On an average day, the Missouri Division of Employment Security lists more than 7000 job openings in the St. Louis area. Now, for the first time, every one of our job interviewers in the city, surrounding St. Louis County, and adjacent St. Charles County has at his fingertips, via a new computer film, a complete list of these jobs, current as of 8 a.m. So do interviewers at cooperating nonprofit agencies such as the Urban League.

Computer-produced and filmed by a new, high-speed electron beam recorder, this "job bank" information insures maximum exposure for both jobs and job applicants. Faster placements result, reducing the number of unemployed at any one time. And these are better placements. With more jobs to choose from, the job applicant is more likely to be placed at his optimum level. With applicants referred from the entire metropolitan area, the employer is more likely to get better qualified employees.

The new system has only been in operation since June, 1969, too brief a time to produce meaningful statistical results. However, we can already see faster reaction to job orders, improved placements, favorable reaction from employers, applicants, and our own staff, and greater mobility of labor resources in this metropolitan area.

Moreover, the centralization of data, necessary for a job bank, produces several benefits, not the least of which is tighter control. Our goal is that now only one solicitor from our agency, or any of the cooperating agencies, calls upon an employer to "sell" our free services to him. When an employer phones in a job order, he need make only one call to disseminate it to all the offices. And despite this broad exposure of his job order, we refer to him only the exact

Mr. Fogler is manager of the St. Louis office of the Missouri Division of Employment Security. He joined the division as a junior interviewer in 1938, has held several positions there since, and assumed his present duties in 1962.

number of job applicants he wishes to see.

Reporting too is greatly eased and improved. Computer-prepared data is now available daily, weekly, monthly, and quarterly on referrals, placements, aged analyses of job orders and the like. This provides a great deal of management information not formerly obtainable. We expect to refine and expand reporting further as we explore its potential.

towards a national system

Job banks such as ours represent phase one of President Nixon's goal of a nationwide, computerized, job-matching system. The first related job bank was established in Baltimore last summer (1968). Others are newly launched or set to go in Portland, Ore.; Hartford, Conn.; Washington, D.C.; Atlanta, Ga.; Chicago, Ill.; Newark, N.J., and other cities designated by the U.S. Department of Labor. These banks, like our own, store only data on job openings at present, not on the applicants. Applicant information is still kept manually, on cards. However, experiments in computerized matching of applicants with job orders are under way in Utah, Wisconsin, New York, California, Michigan, and Florida.

Phase two of the Missouri program will include establishment of job banks in other cities in the state—in Kansas City next February, for example. Phase three will expand these banks into regional operation and, ultimately, a statewide Missouri job bank, probably centered in the division of employment security computer in Jefferson City, the state capital. Presently, data for the St. Louis job bank is processed at McDonnell Automation Co. here. Phase four will be computer storage of data on jobs and applicants, with computerized matching, ultimately on a nationwide basis.

In the meantime, our present job bank solves perhaps the biggest problem of any large employment service: the broadest possible dissemination of information on job orders. It has been described by several members of our staff of more than 300 as the most important technological development in the employment field since job descriptions were codified into the "Dictionary of Occupational Titles" some 25 to 30 years ago.

In theory, every job interviewer in a large employment service has access to all its job orders. In the past, however, communications were a problem and interviewers focused their attention primarily on job orders in their own card files. Now we have 85 microfilm readers, throughout our various offices, shared by two job interviewers. Updated film, listing complete information on all job orders, is delivered to each reader via courier by the opening of business every weekday morning.

Mr. Benjamin is job bank coordinator for the Missouri Division of Employment Security, which he joined four years ago as an occupational analyst. He previously had 15 years of experience in personnel administration. He has a degree in business administration from Eastern Michigan University.

first com for job bank

While our job bank is generally modeled after the first one in Baltimore, it does differ in our use of film and in other respects. In fact, so far as we know at this writing, none of the other job banks uses computer-produced microfilm yet, although several are looking at our system with interest.

Initially, we planned to duplicate computer printouts of the job openings and disseminate them. However, a typical

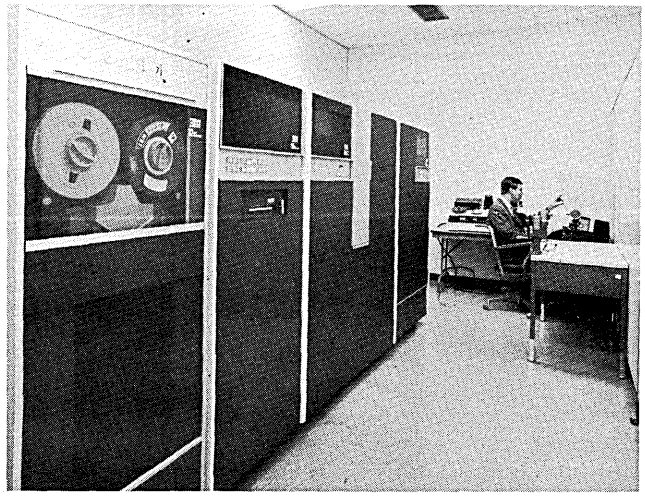


Fig. 1 This 3M Electron Beam Recorder converts output data from magnetic tape directly to 16mm positive microfilm at a speed of 20,000 lines a minute.

day's printout, listing the more than 7000 job openings in the form of some 2800 job orders from employers, requires 473 pages of 11x14-inch printout. Hard copy duplication of this much paper is relatively slow, paper costs are high, transportation becomes a problem, and so does "recapture" and destruction—the information in these job orders is considered confidential and at the end of each day must be returned to our premises and destroyed. In addition, thumbing through big computer pages, each with six job orders, is rather slow for interviewers.

However, a 3M Electron Beam Recorder (Fig. 1) makes high-speed filming feasible, even in a high-volume operation, and enables us to avoid the problems inherent in hard-copy output. Instead of bulky paper, we supply one small roll of microfilm to each reader location. Legibility is excellent. The readers enable our interviewers to get to the data on the film much faster than they could by thumbing through the computer printout. Transportation problems are virtually eliminated, and daily recapture and destruction (shredding) are greatly eased. In addition, the microfilm is produced much faster and at lower cost. The EBR converts output data from magnetic tape directly to 16mm positive film at a speed of 20,000 lines a minute. This is about 20 times faster than line printing; the output costs only about ⅕ as much; weighs only about 1/50 as much; and reduces data storage space by 96%.

Over-all, McDonnell supplies our job bank system with: keypunching of job order data, computer processing, EBR operation, and duplication of the EBR film into the negative

copies we distribute. McDonnell is also using the equipment to provide microfilming services to its commercial clients in addition to other divisions of the McDonnell Douglas Corp.

Our job bank application runs each night on a System/360 Model 30 at McDonnell, which has a total of 51 computer systems valued at $45 million. However, the programmers and analysts in our Jefferson City headquarters handled all systems design and programming for the job bank, working under the direction of Victor E. Viets, chief of data processing. This required one analyst and two programmers full time for four months, then one analyst and one programmer full time for two months. The system was tested and debugged on our System/360.

A total of 31 programs, in COBOL, are involved daily. These take an average 100 minutes and run at over 90% efficiency in clock time vs. meter time. We use multiprogramming to produce the control book—the full printout of all job orders in an original and five copies—while sorting other outputs.

Incidentally, the people at McDonnell Automation Co. said that this was one of the first times a system of such magnitude, programmed elsewhere, ran smoothly from the start. On the Sunday morning our people brought the programs to McDonnell, management there had called in a staff of nearly a dozen people and reserved the computer for the entire day. Our personnel arrived at 8 a.m. and departed with the completed job before 10:30 a.m.

In preparation for the new system, we redesigned all printed forms involved to ease keypunching. At noon and 4:30 p.m. daily, a courier picks up new job orders, changes, notifications of job orders filled, notifications of referrals made, and other data at our main St. Louis office. These are taken to McDonnell, keypunched, and selected fields are verified.

The application is generally ready to go on the computer by 9 or 10 p.m. and is off before midnight. The output tape then goes to the EBR, which is located on the first level of McDonnell along with other I/O-oriented systems linked to printers, plotters, optical scanners, and the like.

com equipment

Components of the EBR include a 3M-112-Magnetic Tape Transport, 210-EBR Controller, 310-Electron Beam Recorder and 410-EBR Image Processor.

Essentially, the transport's tape heads read the digital data on the magnetic tape, and the controller converts the digital signals to analog signals to activate an electron beam produced by a filament in a vacuum in the EBR gun. This beam passes through an aperture and is focused by varying the current in a series of coils. The beam, as directed by the analog signal, "writes" the output data on 3M "Dry-Silver" Computer Film. The latent image is developed by heat and comes off the processor as a finished positive. This film has 19 frames to the foot, and each frame contains the same data in the same format as a full computer printout page. The operator can monitor the film constantly and make adjustments to control quality when necessary—unlike conventional photographic developing where corrections must be made "after the fact," which sometimes necessitates rerunning.

Our Jefferson City people also wrote the four programs necessary to format the magnetic tape for the EBR. This tape has nine tracks and a density of 800 bits per inch. The EBR can handle seven-track tape, too, and densities of 200 and 556 bits per inch.

When processing has been completed, a courier delivers the films and the five copies of the master control book to our main office by 6 a.m. A bank courier service then distributes the films to outlying offices by 8 a.m.

Several microfilm readers (Fig. 2) are located in each of the three placement divisions; two in counseling; one in special placement for Job Corps returnees; four in space set aside for the use of cooperating agencies supplying non-

Fig. 2 Most microfilm readers are shared by two job interviewers. Information on job applicants is still kept manually on cards.

profit employment services; and several are used by management. We also have 24 readers at five outlying offices in St. Louis County and one reader in our St. Charles County office; six readers distributed among four CEP (Concentrated Employment Program) offices in the inner city; a reader at each of eight CMP (Comprehensive Manpower Program) stations operated by the Human Development Corp. where employment service is one of several services offered; two readers at the WIN (Work Incentive Project) office which works to make welfare recipients self-supporting; and one reader on loan to the Urban League, a cooperating agency which supplies nonprofit employment services from its own offices. The job bank data is particularly valuable in the small outlying offices with just one or two interviewers who, in the past, had limited referral outlets—usually only those they had developed in their own areas.

Essentially, we have superimposed the advantages of the job bank system on our existing operation. For example,

each of the three placement divisions— (1) clerical, professional, and sales; (2) manufacturing; (3) nonmanufacturing, domestic, and service—is divided into 11 units based on occupational-industrial specialization. Each unit is responsible for contact to, and placement in, its area of specialization, and we channel each job applicant to the proper unit. This is a traditional approach in a large public employment office. But now the increase in quality and quantity of the job data complements the experience, expertise, and specialized knowledge of each interviewer.

finding the jobs

To illustrate the job bank in operation: If a job applicant who is a qualified arc welder comes in, the interviewer prepares a card, or pulls his card if he has been in before. The interviewer then presses a button on the microfilm reader and locates—literally in seconds—all orders for arc welders listed on the current day's microfilm. Job orders are arranged on the film in code number order as specified by the Dictionary of Occupational Titles (DOT). Every interviewer knows his code numbers, so accessing the data is quite fast. Typically, all orders for arc welders are grouped under #810.884; all orders for electrical engineers are grouped under #003.081, etc.

As scon as the interviewer gets the job orders for welders on the reader screen, he discusses these with the applicant and, if one looks good, the interviewer phones our control center. This is operated by three clerks who use one computer-printed control book. The interviewer uses a standard terminology to ask permission to refer an applicant to an employer, saying: "Page XX, line YY." The control clerk responds with the order number to insure that they are both talking about the same job order. Then, if referral openings remain, the clerk gives the interviewer permission to send out the applicant. The clerk then tallies in the control book one referral and the station number of the interviewer.

To systematize this, each job order printed in the control book and listed on the microfilm includes the DOT number, job order number, and the letter "R" followed by a numeral indicating the number of referrals requested by the employer. The order also lists, of course, the name of the employer, address, and a wide variety of other information such as qualifications, wages, etc.

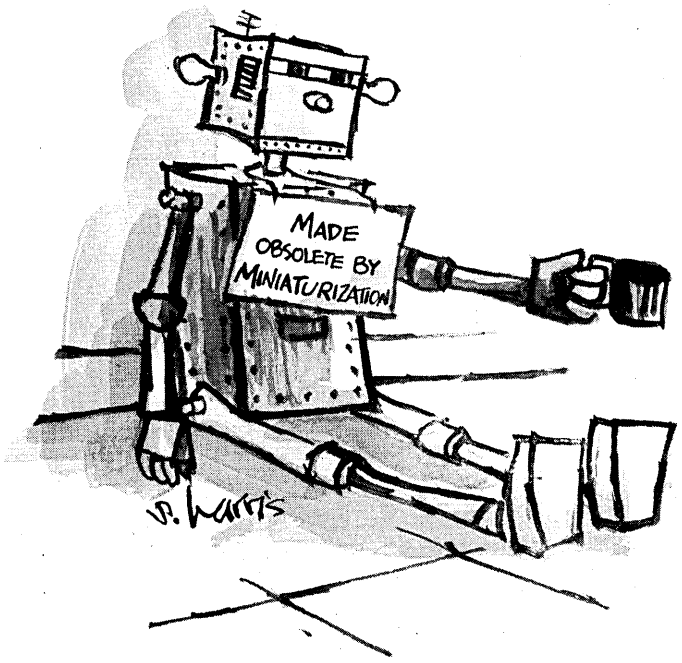
After the number of referrals requested has been made on a job order, the control clerk jots the order number on a piece of paper and sends it to the change desk. A clerk there waits a couple of hours, to give the job applicants time to get to the firm placing the order and be interviewed, then the clerk phones the employer and asks if he wants more referrals. If so, the change clerk notifies the control clerk who alters the control book in pencil or pen and sends through a change order so the book and films will be updated by the computer that night. However, if the employer doesn't want additional referrals, the order is dropped from the books and films by the computer, although it remains in a "referred and hold" control book until final disposition is determined and the order is closed.

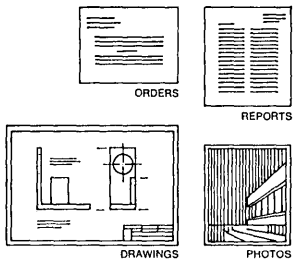
From data accumulated as a by-product of this daily processing, the System/360 at McDonnell issues the reports mentioned earlier. Daily reports include: data on results of referrals by applicant, listing name, social security number, hired or not hired, and other information; indexes, listing all job orders by occupation and by industry; closed orders; referrals to be verified, set up by occupation; and referrals the previous day, set up by applicant. Weekly reports, set up by occupation, include an aged order list showing orders which have been in the system for 15 days without activity; weekly totals on referrals, with certain analytical data; and an inventory of job openings, including the number received, the number on hand, the number filled, the number closed, and number of referrals. Monthly reports are generally recaps of the weekly documents, but we also get a closed job activity list of all applicants referred on orders and the results. Each quarter we get a recap of orders in the system for 30 days or more, set up in DOT order.

Reporting is not yet fully automatic because our system does not encompass job applicant data, as mentioned. Some manual compilation is still required. However, even the degree of automation we have achieved has upgraded reporting in all respects—speed, comprehensiveness, and analytical value. For example, the listings of jobs that have been in the system without activity show us a variety of factors which may need investigation and/or correction.

The job bank is supported by federal funds. In planning our first year's operation, we budgeted $279,000 to cover nonpersonnel costs, including supplies, communications, equipment, services, travel, etc. However, this was based on four hours of computer time each night. As indicated, we require a great deal less. So we now estimate that nonpersonnel costs for the first year will be about $200,000.

While our present job bank system is the first step down the road to nationwide automated job matching, it is a major step in terms of what it accomplishes. It not only solves the biggest problem facing large employment services—that of fast communication of key data on jobs to all interviewers and job technicians—but it also gears our operation and the thinking of our employees toward centralization and automation. The recognition of its success by our employees, and their enthusiasm for it, will help make each additional step easier and more effective. ■





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THE COM SERVICE BUREAU

by Gerald R. Marks

It seems that the word is getting out that COM can be a practical, economical approach to controlling one of the most important aspects of the information explosion—computer output. Many of COM's benefits are readily apparent: vast reductions in storage requirements, ease of retrieval, flexibility in systems design, and greatly reduced operating costs. However, we must realize that COM is still in its infancy and, like any technical innovation, does require an appreciation of its limitations in order to be utilized efficiently.

Once edp management is sold on the COM concept, the question arises, "how should we convert our existing hard copy printout system to COM?" The experienced edp manager is quite familiar with many disasters in edp systems conversion projects. Conversion problems can result from any number of sources. Hardware, software, inexperienced personnel, and—more commonly—inadequate testing.

The COM service bureau can help the edp manager to make the transition to COM with a minimum number of conversion problems. A thorough evaluation of COM's effectiveness can be done through a "test drive" on a COM service bureau's system. Cost data and operational efficiency can be compared, reviewed, and projected through such a test.

A cautious, well-planned conversion is extremely important, since once the edp manager decides to switch to COM he enters a whole new ball game—film and graphics technology.

Film creation, film processing, film duplication and film packaging are processes that are quite foreign to most data processing people. The wide variety of microforms and microform conversion media, and the appropriate selection and application of this media, could prove to be a perplexing problem to the uninitiated.

For the vast numbers of small and medium-size edp installations, the service bureau is the best means of using COM. A typical small or medium-size edp installation whose prime computer output is essentially a listing operation usually makes the easiest transition to COM. The cost and operational time reductions in such conversions can be phenomenal. A good example of such a conversion is our experience with a client, the American Institute of Aeronautics and Astronautics, headquartered in New York City. The AIAA is a professional society of scientists and engineers in the aerospace and hydronautical fields.

The institute's edp system was developed to service its subscription fulfillment requirements for six professional journals, to monitor and update its membership files, and to control the flow of periodical mailings to the various categories of members. Since there are different categories of membership and corresponding dues, an accurate master file must be maintained at all times. Also, the highly mobile nature of professionals in the aerospace industry necessitates a fast responding information system. The basic function of the subscription system is to update, on a monthly basis, the master file of AIAA's 45,000 subscribers. Inasmuch as the processing of 45,000 unit records did not justify the acquisition of a computer system, the work was contracted out to an edp service bureau, where it is done on an IBM 360/40 system.

Once a month the AIAA received a hard copy printout of the membership master file. Each printout consisted of an original and three carbon copies which were subsequently bursted, decollated, and bound into huge books, each weighing an average of 20 pounds. As time went on, several problems began to emerge.

The ever-increasing storage requirements of the massive books containing the master file printouts began to reach epic proportions. The storage capacity of the AIAA's New York office limited the period covered by the file data to two

Mr. Marks is executive vice president of General Computing Corp. He was previously at General Dynamics and was a member of the Department of Defense/Industry Assets Management Systems Advisory Committee. He has also worked for American Air Lines. He has a BS in industrial engineering from Carnegie Technical Institute.

months. It would not have been sensible to extend the period by turning the institute's expensive New York office into a warehouse. Also, employee morale began to sag in the edp department when "the carbon-covered girls started to develop muscles in the wrong places" from juggling the 20-pound books containing the master file copies. While reviewing the over-all edp operation, AIAA's edp program manager Nelson W. Friedman came across an item in a trade journal describing the advantages of COM. The recognition that some major cost reductions might be achieved through COM resulted in a thorough investigation of this new medium by the institute's management.

Representatives from COM equipment vendors and local COM service bureaus were requested to make a system recommendation.

A joint study was done by General Computing's New York service bureau and AIAA's edp manager. The study indicated that a 50% reduction in operating costs could be realized by switching to COM. (See Table A.) The greatest single cost reduction would be achieved by reducing the amount of IBM 360/40 time required for processing printouts from 7.5 hours to 25 minutes. The turnaround time would be cut from approximately one week to about four to

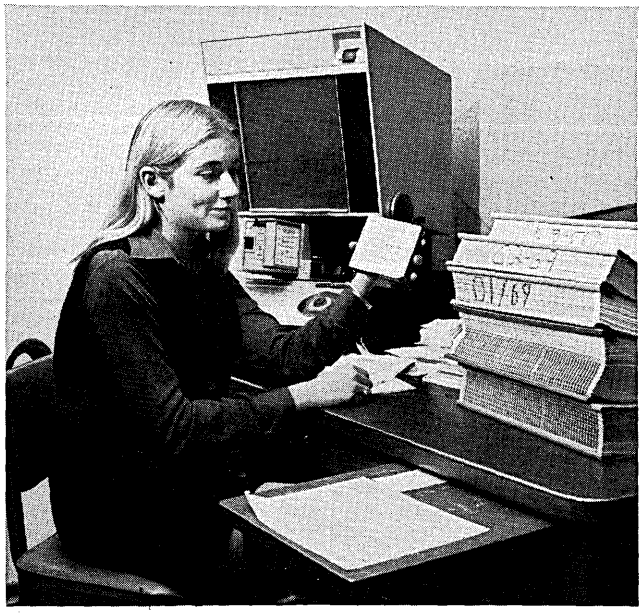

Fig. 1. American Institute of Aeronautics and Astronautics edp microfilm equipment operator compares COM cartridge with computer hard copy printout ledgers.

five hours for a completely updated copy of the master file on microfilm. And the 4x4" microfilm cartridges would only take 2% of the storage space required for the hard copy printouts (Fig. 1).

test runs

A side-by-side, on-line comparison "test drive" of COM conversion was made by running the AIAA master file program on GCC's COM system and the original hard copy system. In addition, during this period in May of 1968, COM readers, and reader-printers from different vendors, were tested on the system.

All of the initial study estimates were on target. After the COM readers and reader-printers were thoroughly field tested, a detailed cost analysis was done. Four 3M Model 400 C Readers and one 3M Model 400C Reader-Printer were purchased. The reader-printer would be used to develop a full-size hard copy of any of the 45,000 records in the master file on microfilm.

The AIAA COM system was fully operational on June 1, 1968. No problems were encountered during any phase of the transition to COM or since then.

The basic AIAA COM system is quite simple. Once a month the edp service bureau sends the updated master file tape to GCC for conversion to microfilm; approximately four to five hours later AIAA receives a total of six microfilm copies of the master file in 4x4" film cartridges. Under the old hard copy system only four copies of the master file were received by the AIAA. There were no additional programming expenses required since the output formatting remained essentially the same and only a very minor modification in the computer program was made.

Numerous benefits have accrued from the switch to COM. An approximate 50% reduction in annual operating expenses was achieved, storage requirements were reduced approximately 98%, and turnaround time was cut to hours instead of days. Employee morale is high. The messy, laborious task of bursting, decollating, and binding the carbons of the master file was completely eliminated. The girls now feel that they are part of a truly modern system, since they now use easy-to-operate readers to access the file data. When a hard copy of a record is needed, the operator simply inserts the selected film cartridge in the reader-printer. Additional benefits include improved office cleanliness and superior readability of all copies of the master file. Under the new system, the historical data covers a year-and-a-half period instead of two months as under the old system. The increased capacity for historical data makes it easier to unravel inquiry problems concerned with dues payments, changes in membership status, and address changes.

A new application of COM projected by the AIAA is the use of portable viewers at conferences and conventions to determine whether a person wishing to attend is a member in good standing. This could be done by mailing a microfilm copy of the AIAA master file to an institute official equipped with a portable reader at the conference site. The use of the COM master file at branch offices is also under consideration.

computer films and graphics

A service bureau can also provide consulting services in computer graphics and film techniques. General Computing Corp. recently extended its graphics capabilities into computer-generated films, acquiring the services of a well-known scientific cinematographer. Although the field of computer-generated film creation is still in its infancy, such films are being used to teach complex mathematical and physical concepts difficult for students to visualize. They are also being used to give a three-dimensional representation of meteorological data.

The effective use of this new medium in edp and computer-related applications will change data presentation and interpretation in many areas. Mathematical model construction and simulations of complex phenomena seem to be likely areas for its application.

The COM service bureau is probably the best place to develop a complete COM graphics system. For example, let's assume that the AIAA decided to distribute a quarterly printed edition of its membership file by region, for use by researchers in the aerospace industry. GCC would design the system so that the master file microfilm could be converted to plate form for use in offset printing. Another approach would be to interface the institute's COM output with a micropublishing system. The versatile new medium might also be interfaced with a computerized phototypesetting

system.

The "odd-ball" graphics project requiring an innovative use of the new computer-related graphics techniques can also be handled by a service bureau. Management reports that are easier to understand can now be produced through the use of new graphics techniques.

Overload or back-up is another service provided by the COM service bureau. A good example of back-up for a company's in-house COM facility is our relationship with American Telephone & Telegraph's shareowners communications department. The department's responsibilities include answering customer inquiries about dividends—overpayments, underpayments and missing checks—government tax questions, and inquiries by brokerage houses and stock exchanges for transfer investigations. This is a tough assignment since there are some 20,000 inquiries per month from AT&T's over 3,100,000 shareowners.

Under the old system the preparation of printouts was tedious and costly. It took an average of 60 hours to print out the reports at an hourly rate of $50 on AT&T's IBM 360/30 system or a total of $3,000 for printouts alone. This cost covered two operations, dividened register lookup and dividend reconciliation. The added costs of paper, ribbons, bursting, decollating and binding brought the over-all cost up to approximately $5,000 for each quarter. The total annual cost for the actual printouts was averaging $20,000.

The new COM system has provided several benefits to the shareowners communications department. The data that was contained in 1112 binders (812 for stock record listings and 300 for dividend listings) is now housed in 332 film cartridges (300 for stock records and 32 for the dividend listings). Each cartridge is 4x4" and holds 100' of film on which are recorded 2000 64-line pages of information. All 32 dividend-listing cartridges—the most frequently referenced—fit into a single drawer. They are kept for ready reference for six years.

As in the case of the AIAA, impressive cost savings were realized and employee morale improved by eliminating the drudgery of picking up heavy binders and getting smudged with carbon. A girl now goes to the file drawer, withdraws the appropriate cartridge, puts it on a Recordak Lodestar Reader and locates the account number related to the inquiry and the exact digit line number of the account. Next, she goes back to a separate drawer file that houses 16 cartridges which contain films on the actual dividend checks. She finds the cartridge she needs and places it in a Lodestar Reader-Printer with image control (count) indexing, punches in the digit numbers that enable the unit to locate the exact check on the film, and views it. If she needs a copy, she makes it while at the machine. Under the old system, a researcher had to go outside the shareowners communications department to make copies of checks, a process that could take up to four hours.

The current AT&T Shareowners Communications COM system works as follows:

The filming and processing of the check cartridge file is done on the premises at 195 Broadway in New York City. The dividend register file is handled by General Computing's COM service bureau, which provides a 24-hour turnaround service. This is essential since dividend checks are mailed out at the same time that record tapes are being created and it is imperative that these tapes be back in the hands of AT&T before shareholders receive their checks. GCC works directly with the AT&T computer department to facilitate pickup of tapes for filming, cartridge loading, packaging and delivery to shareowner communications.

The COM service bureau has a vital role in the new post-Gutenberg era of data processing. The scope of services provided includes preconversion testing; systems design and equipment evaluation; COM conversion; training of personnel; back-up service for peak workload periods, and the design and development of advanced computer graphics. And most importantly, these services are provided on the most economical basis. ■

PRODUCTION OF MASTER COMPUTER FILES FOR REFERENCE AT AIAA

Annual Expense

	Present	Proposed
Computer runs	$ 8,400	$ 600
Paper, cont. form	2,400	—
Decollating	300	—
Original microfilm, 5,600 pages	—	3,360
Duplicate microfilm, 5 copies	—	1,860
Maintenance, 4 readers	—	600
Maintenance, reader-printer	—	200
Photocopy supplies	—	300 (est.)
Total annual cost:	$11,100	$6,920

NET ANNUAL SAVINGS: $4,180

Capital Expense

4 3M Company Mod. 400C Readers @ $1,250	$ 5,000
1 3M Company Mod. 400C Reader-Printer	1,750
	$ 6,750

Alternate: Leasing Arrangement

4 3M Company Mod. 400C Readers w/maintenance	$ 7,713.60
1 3M Company Mod. 400C Reader-Printer w/maintenance	2,678.88
Total 24 month leasing cost:	$10,392.48
Same equipment purchased, plus 24 mos. maintenance	$ 9,097.00

Table A

The second revolution in computer time sharing continues.

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▲ The AL/COM interactive time sharing network will electrify every sophisticated computer user in the United States.

AL/COM now gives you more interactive computing power with faster response time, than any other time-sharing system . . . 32,000 36-bit words per user. Cycle time one microsecond. Your access to this increased computer power is instantaneous and direct. Through your telephone. Privately. It's a "tough-job" system and it has the best price/performance ratio there is.

▲ AL/COM has a policy about insoluble time sharing problems. We solve them.

We're after the tough jobs, the big ones. We're talking about price/performance ...good response time...and freedoms that time-sharing hasn't granted you before. Things like:

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On-Line Storage – AL/COM has a billion characters of disc storage.

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CIRCLE 6 ON READER CARD

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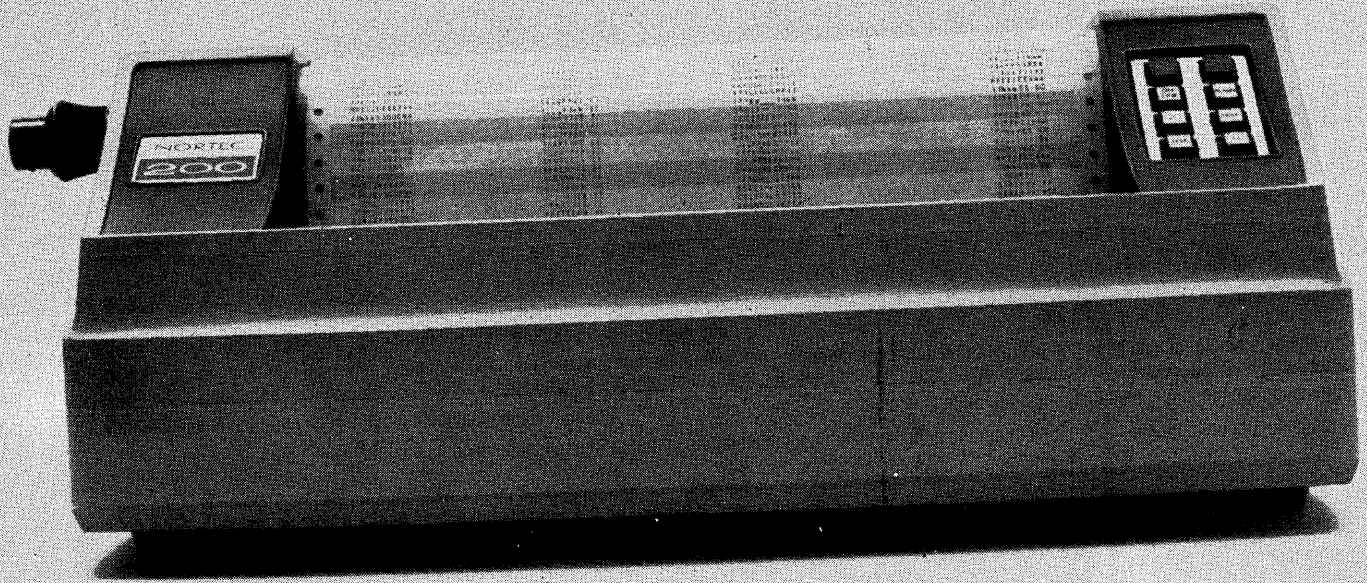

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CIRCLE 85 ON READER CARD

PALINDROMIC PROGRAMMING

By

William A. Bernstein

This report is intended to introduce a new concept to programming which may ultimately provide the software-hardware vehicle for computer evolution: palindromic programming.

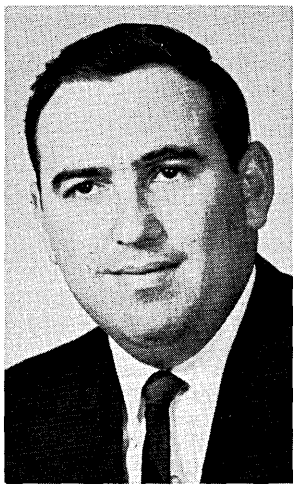
The primary principle involved in the art of palindromic programming is analogous to that in the creation of a palindrome. A word or phrase is defined as a palindrome if it reads the same backward or forward (e.g., radar, rotor). A program may be defined as a series of instructions which transforms machine state A to machine state B through a series of intermediate states (first to last instruction execution). A palindromic attribute applied to this program would by definition allow it to be executed in reverse order (last to first instruction), thereby transforming machine state B back to machine state A.

This concept is somewhat difficult to grasp; however, a basic example should help point out the overwhelming advantages inherent in this technique. Most mathematical subroutine packages normally contain a routine designed to extract an *n*th root. The application of the palindromic attribute to this very routine would automatically eliminate the need for a separate routine to raise a parameter to the *n*th power. The application of this technique opens avenues of research which until now have been considered to be far beyond the scope of current software technology.

investigations under way

The implementation of "first-step" palindromic techniques is evident in the design of today's system architecture. The introduction of a read-backward capability on magnetic tapes and header-trailer label compatibility in many operating systems are prime examples of the preliminary investigations currently under way in the area of palindromic programming. The established last in-first out queueing discipline presents an ideal tool to aid in palindromic research efforts. The parallel characteristics of even the most basic machine operations (backspace-forward space, multiply-divide, etc.) clearly lend themselves to applications of palindromic techniques. The justification of a concentrated, advanced technology effort in palindromic programming can be illustrated by considering the effect of such an effort in the fields of programming systems, marketing, and engineering.

The spirit of palindromic programming can be most appreciated in the programming systems community. An attempt will be made here to enumerate certain immediate consequences of palindromic implementation. These applications are by no means exhaustive since the author has not been exposed to numerous areas of programming technology. There is no doubt, however, that the reader (be he



Mr. Bernstein is an advisory programmer at IBM Corp.'s Systems Development Div. where he is responsible for the design of future programs, including control programs for Operating System/360. He has a BS in math from Brooklyn College.

programmer, analyst, or engineer) can add many more applications germane to his area of interest.

conversion

One of the basic problems currently faced by conversion technology is that of translating compiled object code to original compiler statements. Certain tailored programs have been produced which, in varying degrees of efficiency, "decompile" object code. With the knowledge of the cost and complexity involved in determining feasibility, let alone economy, of decompilation, it is obvious that future compilers must be palindromic. The addition of an attribute restriction to compilers has already proven feasible, as exhibited by the "read only" and "re-entrant" attributes necessary for time-sharing or multiprocessor operations.

The newly produced product would be categorized as a compiler when operating in normal mode (N-mode), and by palindromic definition as a decompiler when operating in palindromic mode (P-mode).

It is, of course, too late to apply this technique to current system compilers; however, serious consideration must be given in the definition of architecture and requirements of future systems to P-mode operation.

system reliability

The systems programmer has increasingly been made aware of the importance of ensuring total system reliability of his product. Computer manufacturers have recently embarked upon a necessary campaign to intensify the emphasis to be placed upon error recovery. The wide range of I/O devices supported by programming systems has made it necessary to clearly define the steps to be taken in the event of an error, depending upon device type and error condition.

Although the procedural steps to error recovery are well defined, exceptional conditions arise which must be handled on an individual basis. This results in additional programming steps for each exception.

The implementation of palindromic programs would of course eliminate this costly and sometimes burdensome task. The discovery of an error condition would now merely initiate a switch to P-mode for a predetermined interval (dependent upon hardware requirements and system philosophy) to accomplish "recovery." Upon successful recovery, N-mode is once again entered. It is important to note that this procedure transcends both hardware and software lines. The intuitive reader will also realize that the necessity to provide checkpoint capability is now eliminated.

maintainability

The advantages to be gained by the implementation of palindromic techniques are not limited to hardware/software suppliers internally. The maintenance of a program library by the user has been of prime concern both to the user and supplier. The user is currently faced with maintaining a vast tape library of his programs and supplied systems. This fact is clearly illustrated in the many documents distributed concerning the data and program conversion problems faced by the user. The size of tape libraries may reach several thousand reels, depending upon system installation.

The user must currently preserve a number of levels of system tapes, and the update tape necessary to produce the newer level. An update program must be run merging an original system tape (e.g., version 1 level 0) with an update tape to produce a new system (e.g., version 1 level 1). The "old" system tape is not destroyed since the user has become sophisticated enough to realize that the "new" system may not necessarily be a better system for his purposes. The update tape is also maintained in order to generate additional new systems.

Once again, palindromic programming may be used to solve this problem. A palindromic update program allows the user to destroy the old system and the update tape once a new system has been generated. By definition, the user could always recover a copy of the old system and the update tape by operating the update program upon the new system in the P-mode.

The sophisticated user may effectively cut down the size of his library to the point where economical hand conversion of his library is feasible, thus eliminating simulator, translator, and emulator efforts.

conclusions

The author is aware of the fact that a close liaison is necessary with engineering to successfully introduce P-mode operation into future hardware design. There are many problems which engineering and programming must now consider to support the palindromic technique.

Manufacturers must, for example, modify the interval-timer circuitry to provide edp managers with a means of preventing the unscrupulous user from running 12 hours of production work in normal mode and subsequently switching to P-mode for 12 hours to escape machine time charges.

The programming community is on the verge of a phenomenal technological breakthrough which very well may advance software and hardware capabilities. We are confident that engineering and programming technology can and will meet this challenge. ■

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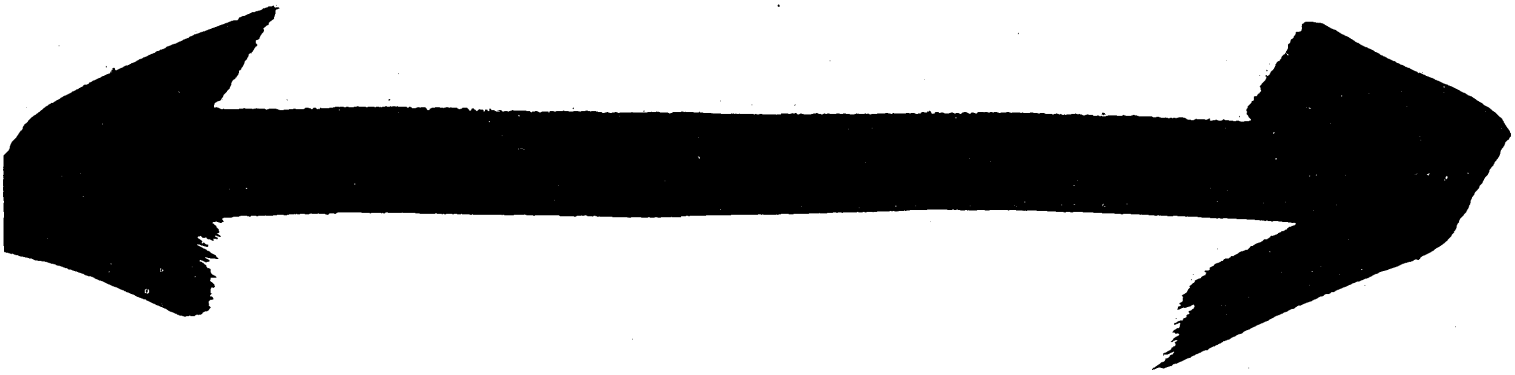

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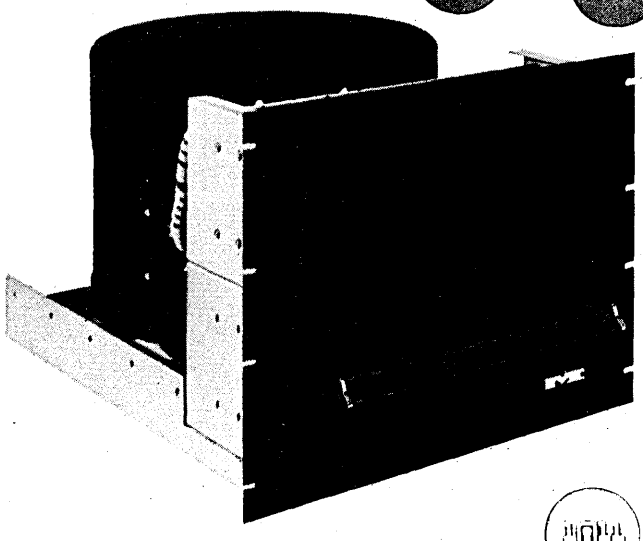

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A SURVEY OF COMMUNICATION TARIFF DEVELOPMENTS

by John E. Buckley

Communication tariffs are the regulations under which licensed communication common carriers are permitted to provide communication services and facilities to the general public. These tariffs have remained essentially unchanged over the many decades since their original adoption. While new communication services and facilities have created modifications and addendums to these regulations, their basic structure with respect to what is permitted and what is not permitted has remained virtually immutable.

Within the past two years, this basic tariff structure has undergone a major re-examination and has been and is being significantly modified. Organizations which utilize or plan on utilizing communications as a major part of their business structure are no longer presented with absolute tariff provisions, but are now faced with the need for communication implementation in an environment of constantly changing tariffs. While the decisions and recommendations of the various regulatory bodies are properly publicized, it is extremely difficult for an organization to interpret these conclusions in light of their own requirements and objectives.

Even though the final tariff provisions cannot be accurately predicted at this time, a presentation of the nature of the communication tariffs and the major issues pending before the applicable regulatory agencies has been long overdue. It is with this need in view that the following has been prepared. The reader is cautioned, however, to be aware of the fact that some areas of tariff provisions are under consideration at this time and may be ruled upon by the time this is printed. The historical and background value of this analysis, however, warrants its presentation without further delay.

Before an examination of the tariff issues is attempted, an understanding of the tariff jurisdictions must be firmly established. It is also necessary to appreciate the interrelationships of the various communication common carriers.

communication common carriers

In the United States there are a number of communication common carriers licensed to provide communication services and facilities to the general public.

Generally, communication common carriers are subdivided into three categories.

1. The Bell System
2. The Western Union Telegraph Co.
3. Independent telephone companies

Bell System. The Bell System comprises 23 operating companies. While each of these companies utilizes Bell System equipment and adheres to the general policies of the Bell System, the actual services and equipment may vary among the different companies. The American Telephone and Telegraph Co. is the headquarters or holding organization of the Bell System. The primary structure of AT&T consists of three separate organizational entities.

Bell Telephone Laboratories is the research and development organization of the Bell System. New products and equipment used by the Bell System are designed and developed by Bell Laboratories.

Western Electric Co. is the manufacturing company for the Bell System. Products and equipment are purchased from Western Electric by the associated operating companies.

AT&T Long Lines is the function which generally provides and operates communication circuits that involve more than a single associated operating company.

The Western Union Telegraph Co. Western Union is a nationwide communication common carrier which presently provides communication services and facilities in competition with the Bell System. This area of competition, however, is primarily in the area of leased or private communication circuits. Originally Western Union was envisioned as providing written or record communications such as telegraph, while the Bell System was envisioned as providing voice communication. Over the years, this unofficial distinction has become invalid as the growth of both organizations and the associated technologies accelerated.

A major distinguishing characteristic is their organizational structures. While the Bell System is primarily an

Mr. Buckley is director of communication services for Computer Group, Inc., King of Prussia, Pa. His previous experience was with Western Union and Univac. He had several technical management positions at Univac, including direction of Univac's part of the AUTODIN program, and in 1965 became product manager of communications systems there. He was also a member of the management group that formed the Univac Information Services Div.

association of separate companies, Western Union is a single company providing communication services and facilities over the entire country.

Independent telephone companies. While Western Union can provide communication services in any area in the United States, the associated Bell companies are limited to specific geographic areas. For example, the Bell Telephone Co. of Pennsylvania operates in the Commonwealth of Pennsylvania. There are many areas within Pennsylvania, however, which are not serviced by the Bell Telephone Co. of Pennsylvania. This is true of every other state. These non-Bell areas are provided communication services by independent telephone companies. Within the United States, there are approximately 2000 independent telephone companies. The largest of these "independents" is General Telephone and United Utilities.

The services and facilities of these independents vary widely. A potential communication user must exercise care in planning communication services and equipment when an independent telephone company's territory is involved. This need for care is not because of any implied inferiority of services and equipment but is prompted by the possible differences in the type of services and facilities available as compared to the Bell System.

Common carrier interconnection. While the above descriptions may create the concept of a competitive environment expected with industrial enterprises, the various communication common carriers cooperate with each other in many ways.

In order to avoid unnecessary redundancy of circuits, many communication common carriers make circuits available to their competitors. The Bell System, in some cases, utilizes Western Union-owned circuits in order to provide services to their customers. Conversely, Western Union will use circuits owned by the Bell System companies. All communication common carriers will interconnect their circuits whenever required. For this reason, a dial telephone connection which may originate in the territory of a Bell System company can terminate in an independent telephone company territory.

This cooperation and interconnection did not automatically occur. It was initiated and is maintained by the existence of government regulations. These regulations are the communication tariffs. The purpose of the communication tariffs is primarily to protect the general public. They are also intended to establish a reasonable degree of uniformity of service and rates and to avoid unwarranted duplication of equipment and facilities.

communication tariffs

The two government levels which have jurisdiction in the area of communications are the state and federal governments. In some states, however, there are such things as city communication tariffs similar to local building codes. These are not considered here since they generally conform to the state communication tariffs.

Each state has a public utility commission or equivalent agency which defines and administers the state communication tariffs. The federal government agency for this function is the Federal Communications Commission. The Common Carrier Bureau of the FCC administers the federal communication common carrier tariffs.

The question of jurisdiction between federal and state communication tariffs is primarily a function of the geographical deployment of the communication service. When a communication service and associated equipment originate and terminate solely within the boundries of a state, the state tariffs apply. When a communication service and associated equipment originate and terminate in different states, or are capable of originating and terminating in different states, the federal tariffs apply. As with any general definitions, exceptions can and do occur. The major exception to the above definitions is that for switched communication services, such as direct distance dialing (DDD), the terminal equipment is not considered part of the service.

With these general definitions and their stated exceptions, the jurisdiction of the tariffs are presented in Table 1.

While the state tariffs are too numerous to list in the space allotted for this article, the major federal tariffs for AT&T are as follows:

FCC Tariff 259—Wide Area Telecommunication Service (WATS)

FCC Tariff 260—Private Line Service

FCC Tariff 263—Long Distance Telecommunications Service (DDD)

The general practice of tariff evolution has resulted in the state tariffs adopting the provisions of the federal tariffs with the exception of the rates provided in the federal tariffs. The rates for similar services and equipment will vary among the state tariffs. Depending on the tariff juris-

	COMMUNICATION SERVICE	TARIFF JURISDICTION
Circuits		
1.	Leased or private circuit between points in the same state	State tariff
2.	Leased or private circuit between points in different states	Federal tariff
3.	Switched circuit service[1] (Direct Distance Dial)	Federal tariff
	Customer Equipment	
a.	Telephones and Datasets on circuit in #1 above	State tariff
b.	Telephones and Datasets on circuit in #2 above	Federal tariff
c.	Telephones and Datasets on circuit service in #3 above	State tariff

Note 1: The basic rate and region for dial network access service, residential and business, and the message unit charges are under state tariffs.

Table 1 Tariff jurisdictions

diction for a particular service, a customer may have at the same location two pieces of the same equipment, installed and maintained by the same communication common carrier personnel, and be paying two different rates.

For example, two datasets, one connected to an intrastate private circuit and the other connected to an interstate private circuit, will be charged at two different rates which the customer will pay to the same communication common carrier. This example is the result of two governmental entities and associated evolved communication tariffs having overlapping areas of interest and responsibility.

As mentioned above, these state and federal tariffs have evolved over decades. This evolution has occurred at a predictable rate until the past few years. During the past few years, the traditional tariff provisions on both the state and federal levels have been challenged by the exploding technological advancements of data communications. We are now witnessing many events whose outcome will decide the course of communication systems for years to come. It is imperative that every user or potential user of communications, especially in conjunction with data processing, be aware of these situations and make sure that their needs are considered in any resulting decisions.

This complex environment of competitive yet cooperating communication common carriers with separate yet coincident tariff jurisdictions must be understood prior to any presentation of the major tariff considerations presently pending before the FCC and state regulatory agencies.

present tariff considerations

At the present time, the FCC and a number of state public utility commissions have received and are acting upon major tariff modifications and associated petitions. The decisions handed down in a number of these cases will have a major influence on the future application of communication technology.

The major activities which are being conducted at this time are as follows:

1. Interconnection Tariffs—FCC Docket 16942
2. CATV—Section 214—U.S. Supreme Court
3. Computer-Communications Inquiry—FCC Docket 16979
4. Telpak Sharing—FCC Docket 17457
5. Microwave Communications, Inc.

While this list is not intended to be all-inclusive, it is certainly representative of the more significant areas of inquiry.

Each of the following sections will briefly discuss the history of the action, the issue in question and the current status of the associated proceeding. In this manner, the reader will have a better understanding of the subject and hence be better able to interpret any future developments.

Interconnection Tariffs—FCC Docket 16942. For years, the communication common carriers have prohibited, through tariff provisions, any equipment from being connected to their lines or circuits unless that equipment was owned and maintained by the communication common carrier. When the use of computers and data communications began to develop during the late 1950's and early 1960's, this restriction was relaxed for private or leased lines. The prohibition, however, was maintained for the dial network. Devices such as telephone sets and modems provided by the customer were strictly forbidden from being connected to the common carrier dial network. Privately owned communication systems, such as a private microwave link, were not allowed to be interconnected to the common carrier systems of leased lines or dial circuits.

During the 1960's a small company, Carterfone, formed to provide private mobile radio service, was contesting this interconnection prohibition in the form of a legal suit against the Southern Bell Telephone and Telegraph Co. and AT&T. Ultimately the courts referred the question to the FCC to review since the basis for the litigation was if the common carrier had acted properly in their enforcement of the tariff provisions prohibiting interconnection of non-common carrier devices and systems.

On June 27, 1968, the FCC in a 6-0 decision, responded to the Carterfone case by ordering all the prohibitions against interconnection and foreign attachments stricken as of July 29, 1968. Appeals by AT&T were accepted by the FCC and the effective date for this landmark policy decision was postponed until AT&T had an opportunity to file new tariffs.

During the summer of 1968, AT&T issued new tariffs. As the result of numerous petitions from manufacturers and users, these new tariffs were replaced by newer tariffs during the fall of 1968. Even though the petitions for greater interconnection and attachment capability continued to be submitted, the FCC on Dec. 24, 1968, issued the following decision. "We will permit the tariff revisions to become effective as scheduled with the understanding that in doing so we are not giving specific approval to the revised tariffs." The FCC also announced its intention to conduct informal technical hearings or conferences in the near future to determine the final tariff provisions.

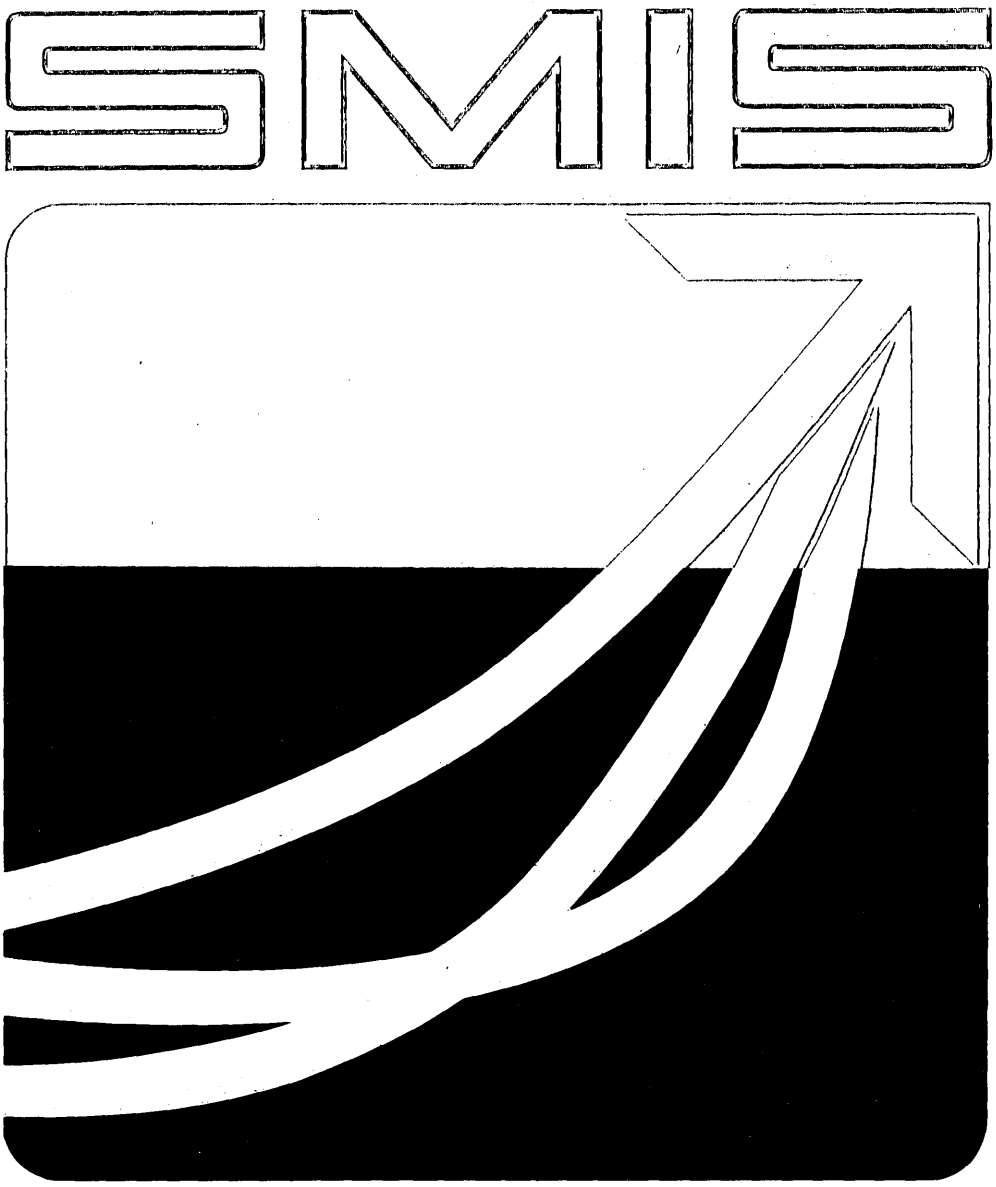
Throughout the spring of 1969, the revised tariffs were further clarified and revised. At the present time, the interconnection and foreign attachment provisions permit direct electrical connection of all non-common carrier devices and systems if the connection is made via a common carrier connecting and protective device. This access arrangement device isolates any direct current and imposes an energy limitation on the customer provided equipment. The common carrier also insists that, with dial network access, only common carrier provided devices may perform the function of network control signaling, such as generating the actual dial pulses.

On Sept. 25, 1969, the long awaited informal hearings and conferences will have begun. The major delay was the formation of a panel of experts under the auspices of the National Academy of Science. This panel will advise the FCC on the technical matters to be discussed at these conferences.

CATV Section 214—U.S. Supreme Court. On June 26, 1968, the FCC decreed that channel service as provided by telephone companies to community antenna television systems is an interstate service. As such, this service requires construction authorization from the FCC as provided for in Section 214 of the Communications Act. The telephone companies were to stop all CATV construction unless they had filed section 214 applications with the FCC. The Bell System during July, 1968, requested a stay of effectiveness before the U.S. Circuit Court of Appeals for Washington, D.C.

On April 30, 1969, this circuit court upheld the FCC's authority to regulate local CATV construction. Over the protest of telephone companies and the National Association of Regulatory Utility Commissioners, the three-judge tribunal, which included Judge Warren E. Burger, stated that the FCC had acted within the scope of the Communications Act. In August, 1969, the National Association of Regulatory Utility Commissioners asked that the U.S. Supreme Court review the FCC order and the decision of the U.S. Circuit Court of Appeals which upheld that order.

The basic question in this proceeding is primarily a question of jurisdiction. The National Association of Regulatory Utility Commissioners stated that they were acting



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"in an effort to protect state jurisdiction over activities of telephone companies which are primarily of local concern and subject to adequate state and local regulation." The outcome of these proceedings will significantly influence future questions concerning intrastate and interstate communication jurisdiction.

Computer-Communication Inquiry—FCC Docket 16979. On Nov. 9, 1966, the FCC initiated an inquiry into the relationships which were developing between computer technology and communication technology. While for many years these two technological developments had been clearly distinct, a rapid merging of the two was now clearly visible. The computer technology, relatively young, had rapidly matured in an environment of open competition. The communication technology, considerably older, had developed in a regulated environment. The FCC was now attempting to distinguish these two disciplines while they were still separate. Some of the regulated communication common carriers were offering computer services in conjunction with their regulated communication services. It was logical to also expect that computer companies would shortly be attempting to provide communication services in conjunction with the computer services.

All interested parties, particularly the computer manufacturers and large users, were requested to submit their positions concerning the future regulatory relationship of the computer and communication industries. In March, 1968, nearly 70 companies submitted detailed positional and technical responses to the FCC.

On June 28, 1968, the FCC authorized Stanford Research Institute (SRI) to prepare a report on the responses. The final SRI report was expected to present recommendations as to the manner by which questions and issues may be resolved. The final SRI report was released to interested parties on May 9, 1969. This significant report was received with mixed reactions. While there were no clearly stated conclusions, the report did present a thorough analysis of the responses submitted and examined the issues in question (see DATAMATION, October, 1969, p. 71).

The industries were then asked to review and submit comments on the SRI report by July 24, 1969. The comments received by the FCC generally expressed previously stated positions and the fact that the SRI report did not change the complexity of the problem. The controversy basically remained between non-Bell system communication common carriers planning to provide computer services and computer service companies.

After review of the SRI report comments, the FCC is expected to initiate an "appropriate proceeding as a basis for definitive decisions as to what requirements shall be imposed upon carriers with respect to data services; and whether computer services which involve data communications should be subject to regulation whether engaged in by carriers or others, and the specific form of any such regulation." At the middle of September, 1969, the FCC had not yet issued its next statement in this most important consideration.

Telpak Sharing—FCC Docket 17457. The Telpak services provided by the common carriers allow communication users to realize significant private or leased circuit savings. Telpak essentially permits a user to order a wide spectrum of bandwidth and have the carrier subdivide this spectrum into individual voicegrade circuits.

A Telpak C (Type 5700) can be divided into 60 voicegrade circuits. The user will realize an economic advantage over separately ordered voice-grade circuits if approximately 20% of the Telpak C capacity is actually used. This percentage is dependent on the actual mileage of the Telpak service. If the other 80% of this Telpak C could be used by others, the original customer would realize a greater cost savings.

The Telpak tariffs, however, have been quite explicit in their prohibition against sharing Telpak—with one exception. The applicable tariffs permit regulated entities to share a common Telpak. A trucking company, for example, is regulated by the ICC and therefore competitive trucking concerns can jointly order and use a common Telpak service. Other regulated organizations, such as airlines, railroads, utilities, etc., were all permitted to share Telpak. The nonregulated organizations, however, were expressly forbidden from any joint utilization of this means of economical long distance private line service.

On April 25, 1969, the FCC ruled that the existing Telpak-sharing regulations were discriminatory and AT&T was ordered to file new Telpak tariff revisions. The FCC did not indicate what the revisions should contain; AT&T could either prohibit all sharing or permit sharing to be performed among any organizations.

A number of petitions were filed by regulated organizations who were previously permitted to share Telpak service. These petitions asked the FCC to reconsider its decision of April 25, 1969, or to merge the matter into the docket for the private line rate inquiry. The Common Carrier Bureau accepted petitions on the Telpak-sharing subject through July, 1969. By mid-September, 1969, the FCC had not yet announced the next step in this vitally important matter.

If sharing is permitted for all organizations and companies, the economic savings to nonregulated companies for private or leased circuits could prove most significant. It may be possible to implement long distance voice-grade circuits at 30% of the present individual circuit cost. The other advantage is that this would permit these savings to be realized even if the customer only required a few long distance private line voice-grade circuits. All that would be required would be to share a Telpak service with other companies and organizations who also desired circuits between the same general locations.

Microwave Communications, Inc. A truly major decision was handed down by the FCC during August, 1969. In that 4-3 decision, the FCC granted the application of Microwave Communications, Inc., to function as a communication common carrier for special communication services.

MCI had petitioned the FCC to provide 2kHz channels between St. Louis, Mo., and Chicago, Ill. The 2kHz channels are not offered by the existing carriers which provide 4kHz channels (voice-grade circuits). The FCC majority noted that some customers may achieve a saving in their communication costs by utilizing MCI's special services. This decision came at the end of a long inquiry and investigation. Actively opposed by the existing communication common carriers, MCI can expect further regulatory and legal procedures to be initiated in opposition to this FCC decision.

Shortly after this decision, however, MCI announced the formation of a new organization, Microwave Communications of America (MCA). This new company is intended to organize existing microwave companies throughout the United States into an association similar to the structure of the Bell System. As with the Bell System, these associated companies would file their own tariff requests but would utilize MCA for technical and administrative support and standardization. All these separate microwave companies would interconnect with each other and, as the activities with respect to FCC Docket 16942 indicate, will also be able to interconnect to the existing communication common carriers.

We are, therefore, perhaps witnessing the embryonic

beginnings of a new nationwide communication common carrier association. Further developments in this area may have significant effect upon the future communication services available to the general public.

The five major FCC actions presented above, while representative, are certainly not all the subjects under consideration before the FCC. It would not be possible to present in detail all applicable tariff activities within the space allotted. These five decisions, however, can be regarded as the more significant and most likely to have an immediate effect on the data communication user or potential user. Other pending activities which should also be monitored are as follows:

1. CATV Inquiry—FCC Docket 18397
2. Private Line Rate Inquiry—FCC Docket 18128
3. Domestic Satellite Issue—FCC Docket 16495
4. TWX Acquisition

An ancillary activity on the federal level is the forthcoming hearings of the Senate Judiciary Subcommittee. This subcommittee will be inquiring into the administrative practices and policies of federal agencies, including the FCC. The actual hearings were scheduled to begin Sept. 12, 1969, and offer a unique opportunity to gain a better understanding of the internal operation of the FCC.

As mentioned above, a complete survey and presentation of similar tariff activities at the state level is beyond the scope of this article. Since these state tariffs normally reflect the policies of the federal tariffs, a detailed presentation might tend to be redundant. There is, however, one major development occurring on the state level which has not yet been reflected to the federal level. This development is of major importance to any organization which has a computer connected to the dial network (DDD).

At the present time, three Bell operating companies have filed—in some of their associated states—a special assembly charge and a significantly higher monthly charge for the normal business dial network access service (IMB Service) when that service is used by a computer. These operating Bell companies support these higher charges for computer dial network access because of their interpretation that the computer usage results in (1) more frequent calls than a normal business telephone service and/or (2) a longer holding time (duration) of calls originated by a computer. This article will not attempt to resolve this question since it is under debate in many of the applicable state public utility commissions. It is the responsibility of this article, however, to report this trend for higher charges for computer dial access presently developing on the state tariff level.

The Bell operating companies having filed these state tariffs for this increased cost are as follows:

1. Mountain States Telephone & Telegraph Co. (except Arizona)
2. Ohio Bell Telephone Co.
3. Southwestern Bell Telephone Co. (except Oklahoma)

In conclusion, the tariff explosions and the relationship of the communication common carriers should be understood and monitored by all actual and potential users of communication services. This article is not intended to develop instant experts but has been prepared to document the basic background and primary developments of this vitally important technology. As a result, it is hoped that a better understanding has been achieved so that a more knowledgeable and effective utilization of communications can be realized by present and future communication users. ■

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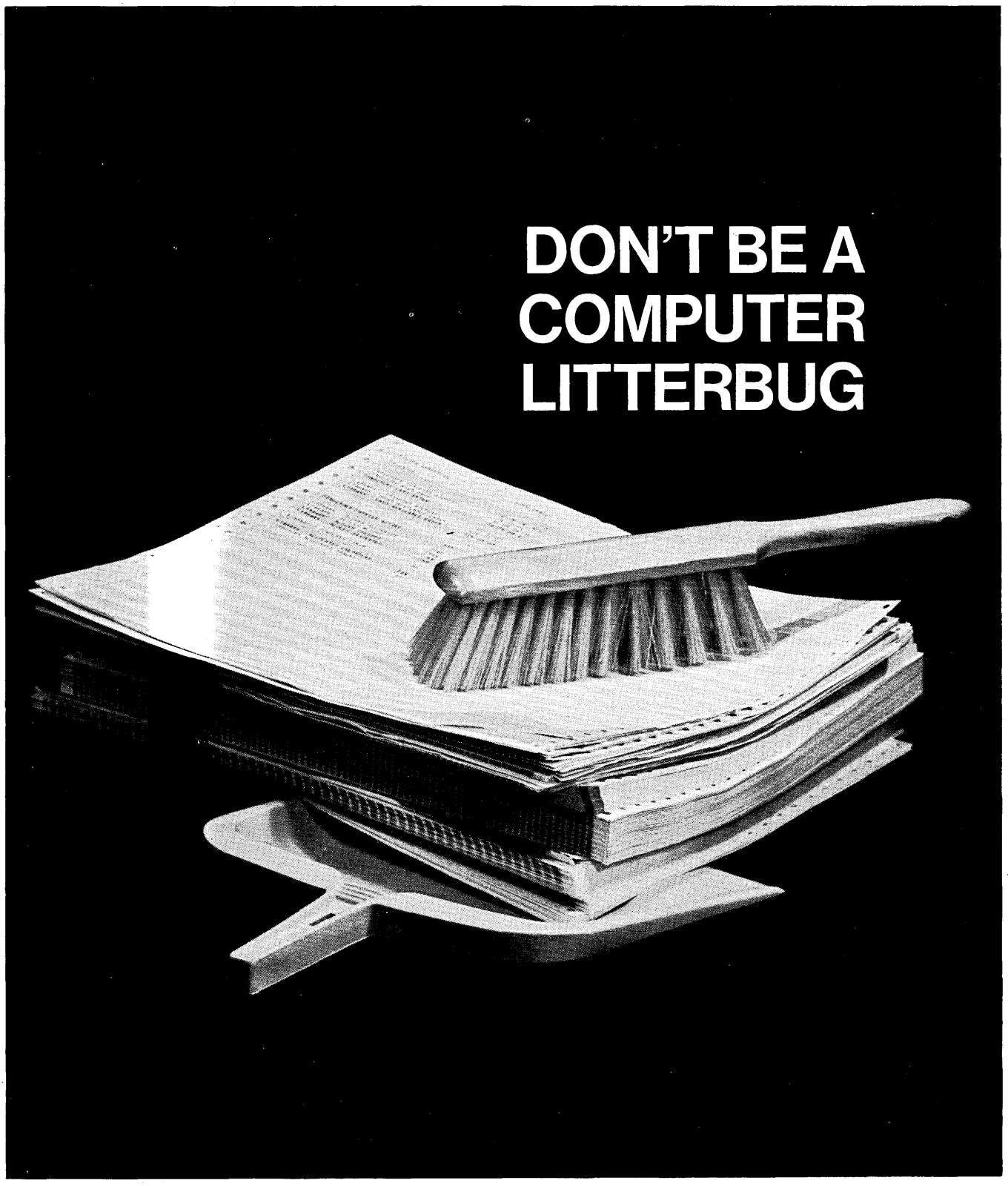

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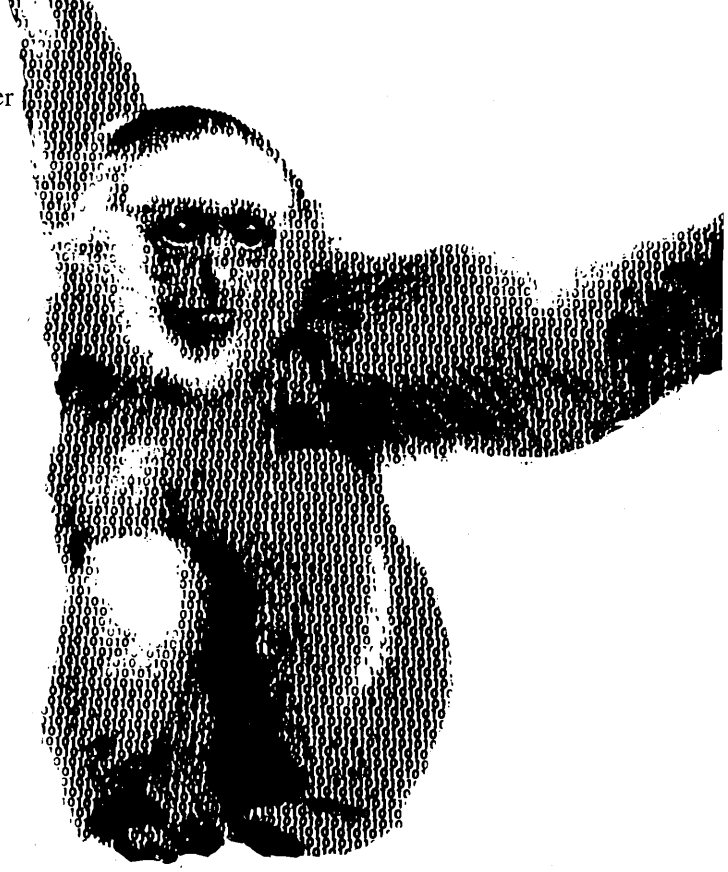

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AN INTRODUCTION TO PROCESS COMPUTER SYSTEMS

by Robert J. Matherne

A process computer is the workhorse of modern industrial technology. It combines thermocouples, pressure transmitters, gas analyzers, control valves, and analog controllers to provide the eyes, ears, nervous system, and muscle of many industrial processes. Process computers are being used to regulate and record the outputs of such diverse operations as paper mills, steel mills, power generating plants, and chemical plants.

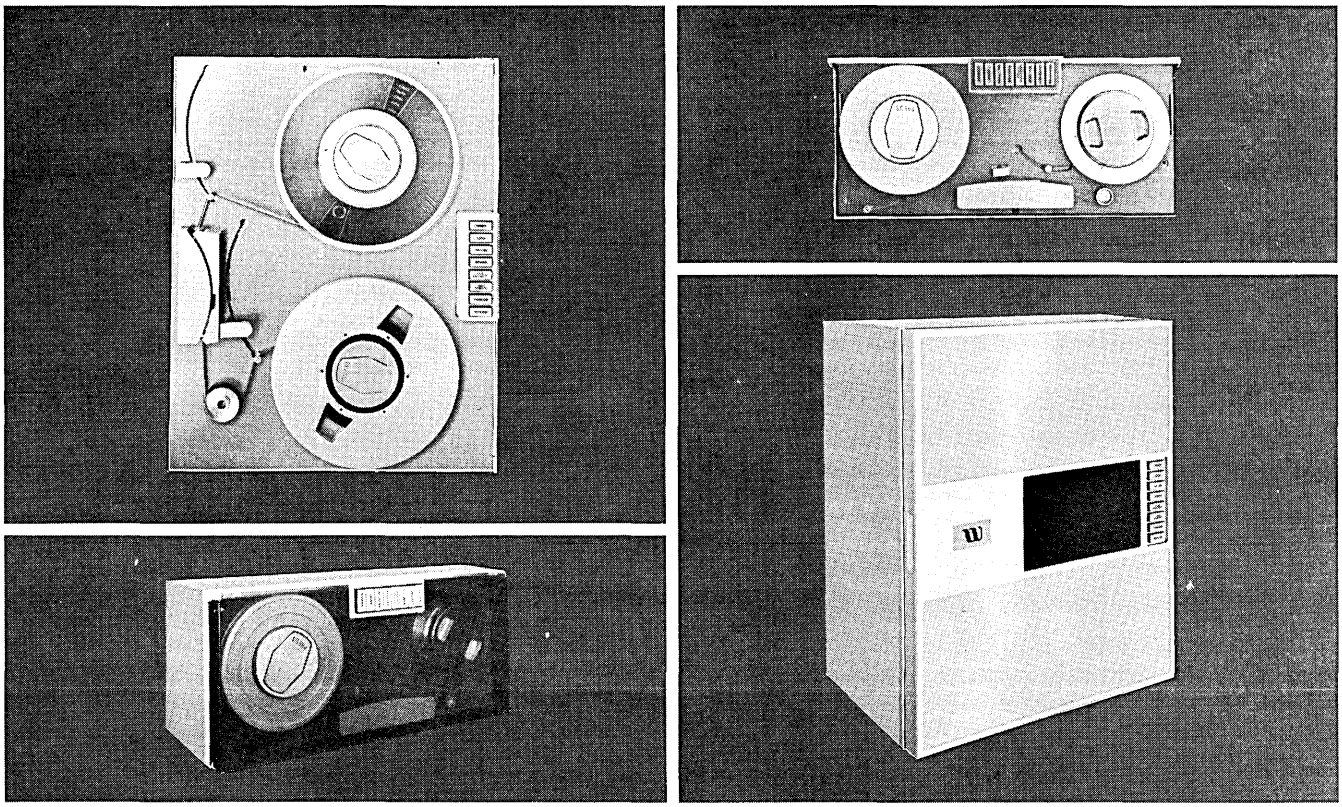
Process computers comprise a small portion of the computing industry and command little attention outside of instrumentation and process control circles. Many of the real-time computer techniques currently in vogue in the edp industry have been in use for six to eight years in the process computer field. Techniques such as priority interrupts, multiprogramming, dynamic core relocation, and cycle-stealing input/output are indispensable for using computers for economical control of large, complex processes. The intent of this article is to introduce process computer systems to the general edp community.

what does a process computer do?

The basic function of a process computer is collection of input data from the processes it is to monitor and control. The input may be digital or analog information. The analog information is a voltage which is functionally related to a physical quantity such as pressure, temperature, flow rate, or percent composition of a gas or liquid mixture. The analog data is converted into digital data for storage in the computer's memory. Digital input information is defined as the position of a switch or relay which is read directly into the computer's memory as the status of a bit (e.g., 0=open, 1=closed).

The earliest use of a process computer was for logging; that is, recording the vast amount of pertinent information produced by large industrial processes. These records or logs provided raw material usages, production outputs, and a means for detecting operating deficiencies. When log data is available quickly, it is possible to monitor the process to detect undesirable changes in operating conditions and to bring these to the immediate attention of the operating personnel. This function is called the alarm-scan monitor. The alarms may be a typewriter message, a horn, a flashing light, or a combination of these. *(Continued on p. 137)*

Mr. Matherne is senior programmer in standard software development for the MAC 16 computer with the Data Products Div. of Lockheed Electronics Co. Previous to this he was with Union Carbide Corp., where he was responsible for systems programming, training, and operation of a multicomputer process control system. He has a BS in physics from Louisiana State University.



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In the case of alarming, the correction of the process' breach is incumbent on the human operator. In many cases, however, the computer is programmed to take the corrective action itself. Such a self-correcting scheme is called control, and the smallest unit of control is a control loop. Other more specialized functions such as startup and shutdown routines, on-line analyzer programs, and open/close contacts round out the usual control capabilities.

One aspect of the process computer which distinguishes it from a logging computer is its man-machine interaction. One or more operator consoles provide this capability. An operator console is a piece of equipment which usually contains lights, buttons and digital displays. With an operator console, it is possible for a human operator to communicate with the process computer. The console hardware-software combination provides the medium through which a non-programmer can use the computer with a minimum of training.

historical development

The first process computers were primarily loggers. The logs were printed on various types of printing devices, from strip printers to electric typewriters. Special forms containing the description of each log variable were used in log typewriters, and each hour the computer typed the data in the proper column. To type the data this way required little core memory, and most of the early process computers were all-drum computers. The drum-resident programs were read into the instruction register one word at a time, and the instruction contained the drum address of the next instruction. The computers had a primitive interrupt system, the programs ran to completion every time, and the real-time response was necessarily slow.

As process computer systems became more complex, the core sizes increased and the drum memory became an auxiliary memory for program and data storage. The larger, faster core gave the process computer time to do other jobs besides logging, but before it could do these jobs there had to be a method of establishing priorities. Some process control functions had to be serviced before others. If an hourly log on one typewriter had just started typing when an alarm message was needed, the message had to be typed before the log was completed. This requirement necessitated the use of priority interrupts and cycle-stealing. With interrupts, if program A was running and a higher priority program B was needed, the computer could switch over to B, then return to A after the alarm condition was typed. Cycle-stealing was an absolute necessity in process control, because with cycle-stealing it was possible for program A to be doing its I/O while program B was busy doing calculations. With larger cores, larger drums, priority interrupts, cycle-stealing, and new computer-process interface equipment, many new functions were implemented such as digital scan, direct digital control (DDC), process startup-shutdown, and operator consoles. This brings us to the present with its larger all-core, drum-core, disc-core, and multi-computer systems.

advantages

The operating advantages of a process computer over other methods of data acquisition, logging, and control are twofold; it is faster and more economical. The economic advantages of using a process computer are not obvious. Depending on the application, the justification of a process computer usually includes one or more of the following: process optimization, equipment regulation, automated production records, operating guides, and alarm action capability.

The alarming function can be done quite well without a computer, but the computer provides flexibility plus a hard-copy record of alarm conditions. With the data logging, a permanent record is made of the process variables, which can be used for records of production, operating efficiencies, etc. The alarm action function is an extension of the alarming function. When the alarm monitor detects an out-of-limits condition, a program can be executed to take corrective action. The alarm action program might, for example, change the set points of several control loops or it might accomplish an orderly emergency shutdown.

Two new areas which are opened up by process computers are on-line material analysis and unit optimization. In the case of chemical plants, if the material to be analyzed is a gas, the analyzer might be a chromatograph controlled directly by a process computer program. Unit optimization is made possible by a computer program which calculates the set points for several control loops to provide a product mix with a maximum dollar value in the current market place.

problems

The disadvantages of process computers are intimately interconnected with their advantages. The replacing of a group of analog controllers with one large digital controller is seldom done because of the net loss in reliability of control. When one part of the computer fails, the entire group of controllers are lost. When an analog controller fails, however, a new one can be quickly plugged in. A process computer system can approach the total system availability of an equivalent analog system but cannot match it without costly improvisations such as a back-up computer system.

Another dilemma lies in the flexibility of a process computer. The software can be changed over in a matter of seconds to hours, depending on the particular computer. The function of a program can be reversed in a matter of seconds through the programmers' console. On the other side of the coin is the costliness of an error in changing the process computer software. Bugs in real-time programs may not be repeatable, as they are a function of the jobs in progress at the time.

One miscalculation in changing the logic of a routine and the process computer may bomb out two days later in the middle of a critical process control run. Therefore, when new software is added to the process computer the final debug phase requires off-line computer time. This time reduces the total system availability just as an outright hardware failure would. This situation fosters a healthy respect for program changes by the programmers and analysts. The benefits of a software change must always be weighed against the risk involved in effecting the change.

A third problem is the addition of analog inputs, control loops, and other connections from the process computer to the controlled processes. With the computer's flexibility, any desired input, output, or analyzer can be handled. On early process computers, however, the implementation of inputs, loops, etc., required experienced real-time programmers who were familiar with the system. To begin scanning an analog input, the programmer would decode arithmetic coefficients into machine code and enter this into the computer off-line via the programmers' console.

The fourth problem, especially in early process computers, was that the entire computer was needed for its basic functions. There was little computer time available for such desirable features as on-line symbolic language assemblers, process optimization programs, or elaborate production records systems. With the advent of larger and faster main-

frames, process computers were developed which overcame these shortcomings.

single-computer approach

The increase in core/drum capacities and the advent of inexpensive disc storage has made possible increased sophistication in process computer systems. The common approach today is to use a single process computer, which has update capability, optimization programs, on-line language processing, and can provide production and management reports.

The update capability is a set of programs to translate the process data from forms filled out by process engineers into the machine code required by the system. This is a powerful tool for a process computer system because it relieves the programmer of the time-consuming task of hand-entering coefficients and parameters for the inputs and loops of the control system. At the same time it puts the computer into the process engineer's hands. The computer becomes a tool which the engineer uses to reach his goal of better product through better control. Each function has its update program. To produce a log, for example, the process engineer decides which variables and descriptors he wants on a log. Then he writes this information on a form. The cards are keypunched and read into the log-update program which generates the requested log.

Background processing was introduced in process computer software simultaneously with real-time business systems software. The name implies the status of the on-line assembly work, that is, it occupies the lowest priority function of the process computer. When the computer has completed servicing all demands from the process, it works on the language processing. An essential feature of process computer language processing is the on-line debugging capability with memory protect. This permits testing new programs without the danger of interfering with the primary control functions. Some systems include dynamic program relocation on bulk storage by means of library-maintenance software.

Production and management reports are generally coded by the user, and little vendor software is currently available in this area. The capability of on-line compiling and testing in a high level language such as FORTRAN eases the task of adding special purpose programs to the system.

drawbacks

The single computer systems suffer a common drawback. The large, complicated update, optimization, and language-processing packages are stuffed into the same computer with the process control functions. Any problem with the nonprocess-control software causes deterioration of the computer's main function, which is controlling the process. On drum-core machines, the drum space taken by this extra software also restricts the number of analog inputs, control loops, and analyzers which can be handled by the process control functions. The usual number of analog inputs in a drum-core machine is about 300. The large memory capacity of a disc-core system can handle many more analog inputs, but the number is usually limited by the long disc access time to about 600.

types of single computer systems

Current process computer systems are generally tailor-made to suit the application, but the single computer systems can be broken into four main types: (1) all-core, (2) drum-core, (3) disc-core, (4) drum/disc-core. The all-core systems provide excellent response to process changes but have limited application because of the cost of today's core memories. The drum-core system is the most widely used configuration. It provides rapid response to process demands because of the fast drum access time. The cost of drum storage on these systems usually precludes such extras as the update capability, a user-oriented optimization system, and a background language-processing system.

The disc-core systems provide inexpensive bulk storage at the expense of a longer bulk access time, lower reliability due to moving disc heads, and larger core requirements to minimize disc accesses. (The disc-core systems are next in popularity to the drum-core systems.) The drum/disc-core systems are appealing because they provide the speed for handling a large amount of inputs and the large bulk storage for handling a large software system. Few drum-disc-core systems have been installed. The main objection is the cost.

the central computer approach

For large processes involving thousands of analog input points and hundreds of control loops, another type of system becomes attractive. This system utilizes several process control computers communicating with one master or central computer. In such a system the functions to be performed are divided between the process and central computer. The aim is to put each function into that machine which is best equipped to handle it. In general, fast cycle-time and process control functions go into the drum-core process computer. Slow cycle-time and supervisory control functions go into the disc-core central computer. With a central computer system, the fast drum-core computer can be loaded with about 2000 analog inputs and a large number of auxiliary functions. The central computer, with its on-line compiling, optimization, and process computer update software, can survive with the somewhat lower reliability because it is not directly controlling the processes.

advantages

On systems with a large number of analog inputs (greater than 1000), the logging of these variables is a problem. If the log data cannot be saved on bulk storage somewhere, it must be typed on a log typer. With large systems the typing of hourly logs becomes a time-space consuming task. The central computer system solves the log problem by the use of summary logs. A summary log is simply the accumulation of the past 24 hours of data. It resides on the central computer disc. Upon demand the data can be retrieved by the process computer and printed quickly on a line printer. This design releases considerable computer capacity for more fundamental work such as scanning a large number of inputs, etc.

The central computer approach has a built-in reliability that is difficult to achieve in an equivalent single computer system. This added reliability is due to the basic simplicity of the process computer system. Once implemented, the functions need not change even though the processes being controlled change drastically. Only the functional tables in the process computer change through central computer updates. This lack of software changes results in improved reliability.

Another advantage is the capability for providing summaries of plantwide functions at each of the process computers. This is accomplished by programs in the central computer system which can access data in each of the satellite process computers.

(A second article by Mr. Matherne, "The Central Computer Approach to a Large-Scale Process Computer System," will be published in a future issue.) ■

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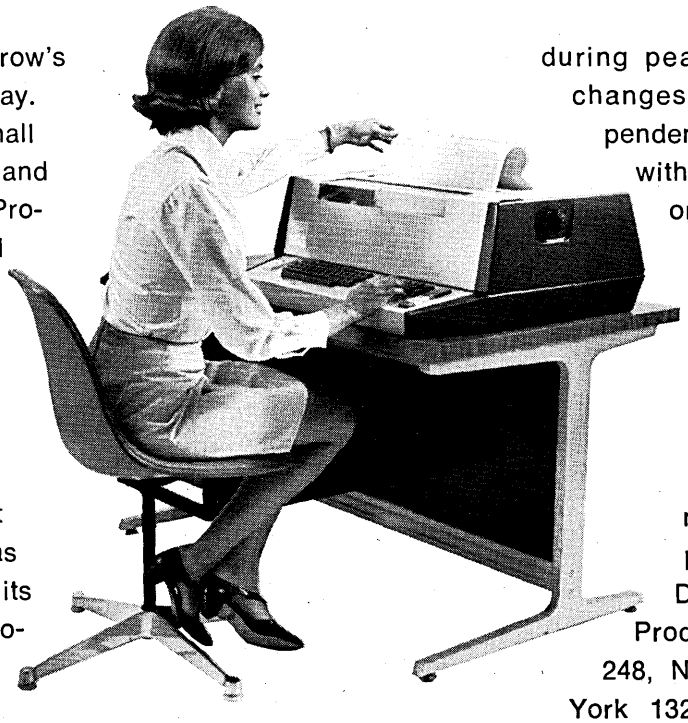

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CIRCLE 40 ON READER CARD

IMPLEMENTING THE VERY LARGE APPLICATIONS-SOFTWARE PACKAGE

prepare management for the worst

by Donald J. Minini

Much has been written recently of the growth of the packaged software industry. This paper intends to indicate some of the unique aspects of installing a very large applications package. The package described is the IBM Programmed Airlines Reservations System (PARS). This package is the third-generation version of earlier airline reservation systems and includes similar capabilities such as passenger name record storage and retrieval, automatic Teletype processing, current seat inventories, schedule change processing, etc. In addition to the normal reservation functions, this package provides an internal message switching capability.

The PARS package represents an IBM investment of approximately 400 man-years, not counting manpower invested in the development of earlier airline reservations systems. The package has been implemented by nine domestic and three foreign air carriers and approximately 12 others are planning to implement PARS. Some versions are heavily modified and others are virtually unmodified. Hardware configurations vary mainly in the number of peripherals (disc, tape, reader/printers) and the number of remotes (crt and hard copy terminals). Also some users have interfaced non-IBM remote equipment with the IBM central processing unit. The IBM cpu being used in all but two installations is the 360 Model 65. Two installations are using 360 Model 50's. The main storage unit used is the IBM 2314 disc drive, which has the capacity to store 225 million characters. The number of 2314 disc drives in an installation is a function of the total passenger business of the airline.

The implementation of such a large applications software package presents problems for the user which are not normally encountered in working with smaller software packages—be they hardware-vendor supplied or acquired by purchase from software firms or other users. These problems fit into the following categories: (1) management attitudes and (2) manpower.

management attitudes

Management generally regards such packages as "turnkey" operations with basic support for installation devolving upon the vendor programming support group and requiring little or no maintenance after implementation. The question often asked is "What are you going to do with all those (in-house) programmers after cutover?" Data processing in general and real-time systems in particular are a mystery to most corporate management and an insufficient appreciation for the effort involved in successful implementation is widespread. Nor do they comprehend the manpower requirement for postinstallation maintenance. This turns out to be a major and continuing user of programmer

Mr. Minini is director of data applications for Mohawk Airlines, Inc., with responsibility for all data processing, including DART — Mohawk's version of the IBM PARS system. Previously he was manager of applications programming for the SABRE project at American Airlines. He has a BA in economics from Cornell University and is working on an MBA at Syracuse University.

time, as will be discussed later in this article. Finally, it is wise to prepare management for the worst in terms of cutover problems and simultaneously strive for the best.

The second area in which management attitude plays a significant part is the degree of support given to the cross-departmental project organization or the working committee concept. Since the installation of this package affected the operations of data processing, communications, reservations, airport operations, facilities and flight dispatch, multidepartmental co-operation and compliance is required. Strong management backing for a project leader is mandatory for a successful implementation. The project leader must have the authority to enforce compliance with agreed-upon objectives since voluntary methods will result in delays and breakdowns due to insufficient knowledge, interest or lack of urgency on the part of some of the involved departments. In our case the project leader selected had a diverse background in communications, engineering and facilities planning and management—a generalist accustomed to solving problems. Weekly committee meetings were held at which representatives of affected departments were present. Weekly targets were reviewed. The need for coordination was especially great since in addition to introducing a new reservations/message switching computer system we were building a new system reservations/computer center and installing a new systemwide telephone system for reservations. The need for crossing organizational lines may be greater or less in the planning and installation of other large software packages, but it is nearly always there.

The third area in which management influences system planning and implementation is their willingness to adapt procedures and organization to the system rather than substantially modify the system to accommodate existing methods. Extensive modifications require much programming and consequently are expensive. On the other hand, little or no modification effort will prevent programmers who will maintain the system from gaining extremely valuable insight into the fundamental design of the system. Ideally, modifications should be limited to those with a large payoff that afford programmers an opportunity to gain experience in vital system areas. This type of modification is generally a revision to an existing real-time program or the addition of a new real-time function. Justification is functional improvement or system reliability enhancement plus programmer training. I emphasize real-time programming modifications because these are the kind which provide fundamental system education for programmers. Naturally management will want to take advantage of the information accumulated in the data base to provide management reports for marketing, scheduling, etc, but these essentially off-line programs can be written at leisure after implementation.

manpower requirements

Manpower requrements for the large applications software package usually exceed anyone's estimate and fall into three categories:

1. Installation
2. Postinstallation maintenance
3. Modifications

1. Installation requires a small but extremely knowledgeable group of programmers. The core of this group must be vendor personnel who participated in the programming and testing of the original package supported by customer personnel who have had training and some programming experience (modifications) in the application. If it is not possible for customer personnel to gain actual programming experience prior to installation, then it is highly desirable that there be programmers in the group who have been selected from within the company who have practical, operational experience with the functional area of the application in the customer programming group.

The quality and knowledge of the vendor installation team is a significant factor in determining installation success. The team should be comprised of some programmers who participated in the programming and testing of the original package and ideally represent a cross section of major subsystem knowledge. Technical knowledge alone, however, is not sufficient. Personal dedication and concern for success of the project are also important. The project leader or head of the technical group can enhance the value of the contribution of the vendor group by avoiding unnecessary separation of vendor and purchaser personnel—organizationally or technically—and by keeping vendor and management informed of all plans and developments relating to the project. With proper encouragement and direction, vendor personnel will fill knowledge gaps on the purchaser project staff and impart their knowledge to purchaser personnel. Just as it is vitally important to concentrate on developing an in-house staff technically competent to maintain and develop the installed system, it is also important to permit a flexible intercompany approach to the pre-installation situation.

If the purchaser is not satisfied with the caliber of vendor support and the time frame is too short to negotiate improvement, it would be wise to consider employing the services of an experienced consultant since it is unrealistic to expect the in-house staff to master all of the intricacies of such a large program in the time span normally allowed.

Installation activity is planned in three stages:

Data base generation consists of the allocation of main storage, large core storage and disc. These storage media are used for programs, working storage, constants and fixed file records. Input to the decision-making process involved in selecting the optimum allocation within and between various storage media, is derived from two sources:

1. In the first place the vendor supplied a fixed portion of core reserved for hardware-oriented uses and for the control program. The vendor also supplied a recommended list of core-resident programs based on his own experience with system testing. Naturally, an allocation of programs between core, LCS (large core storage) and disc based on such limited experience cannot be optimal. System measurement studies after implementation using the data collection and analysis programs provided would enable a more finely tuned allocation. The remainder of core was set aside for system constants and dynamic indicators used for interprogram communication and a pool of dynamically allocated working core storage. The trade-offs between the use of core for programs versus working storage is again subject to change after actual operating experience.

Large core storage is a low speed (8 microsecond) large volume (million bytes) storage medium. It is normally allocated between programs and heavily accessed data records—particularly agent assembly areas (working storage uniquely associated with a terminal). Some PARS customers (including us) do not have this device.

Disc is allocated between fixed duplicated storage (programs, some data records) and pool records of various sizes. An attempt was made to keep potentially heavily accessed records near the center of the disc.

2. Over-all storage requirements plus the system parameters required for initialization were derived by a study of existing airline booking patterns and by a projection of passenger boardings to 1975 (predicted system life). This

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information was converted into a requirement for passenger name records (disc storage). An analysis of booking patterns also indicated number of days from today in which the vast majority of bookings were made. This was used to determine the level of detailing in the seat inventory record group.

Other information derived from this functional analysis were in-house communications lines required, interline communications lines, number of terminals, location and type of terminals, interline availability agreements, etc.

The team that was responsible for data base generation was comprised of a vendor system engineer with software system knowledge and a functional analyst from our staff who understood the airline's characteristics and learned a great deal about the ultimate system in this exercise.

Volume testing. This comprises testing of the program in a nearly operational environment. It has the effect of testing the validity of the data base also.

Testing was accomplished by simulating agent and incoming Teletype entries. These were coded, keypunched, sorted and edited and finally loaded to tape. Each tape simulated a day's operation and contained approximately 500 transactions. PARS time was stepped so that a simulated day passed in a much shorter time than a real day. Five daily tapes using the dates Dec. 28 through Jan. 1 were created. The input simulator used during the test was a package called System Test Vehicle which was designed to be operated from a computer room agent set. It is called and controlled via messages entered into the system. System Test Vehicle positions the input message tape and starts entering the messages into the system. Live messages may also be entered while this is running. This permits a testing environment which is very close to an operational environment. All functions were run and rerun until all five simulated days could be processed without error. Schedule changes, file maintenance, file capture and other support functions were run against this background.

Training. Some 500 reservations and ticket counter personnel had to be trained in the use of the system. This was accomplished by bringing up the live system four months prior to cutover. Each agent was given 40 hours of instruction, including several hours of hands-on experience. Training guides were developed from operators' manuals which were part of the document library. Live training also was, in effect, live system testing and provided an opportunity for programmers to gain some on-line debugging experience. Console operator training was also a by-product of this. The relatively smooth operation of the training system was a credit to the essential cleanness of the software package.

postinstallation maintenance

Programming support required consists of two types.

At least in the first few weeks after installation, a 24-hour day, 7-day-week programmer coverage is warranted in order to minimize response time to problem occurrences. As system reliability improves—and operational and control procedures evolve—resident programmer coverage can be reduced. The coverage programmer performs a number of functions. He fixes data records which have been partially or wholly destroyed due to program bugs. Some of these bugs are very obscure and may remain undetected in the system years after implementation. Also, as modifications are made new bugs tend to get introduced. The coverage programmer will also help operations with problems they may run into in processing special functions such as file maintenance or system capture. He will attempt to debug and fix software problems using dump analysis, documentation, assembly listings and his own knowledge of the system as debugging aids or if unable to solve the problem will call for help from technically competent staff. Since the operation of the company is vitally dependent on the health of the system, programmer coverage should probably never be totally eliminated because it serves to keep some programmers current with system idiosyncrasies and prepares them for coping with the rare, but potentially costly, catastrophic problem.

The support group is concerned with keeping the main system (operational program library) and all test and fallback systems current with respect to program fixes and synchronous with respect to model. The nature of vendor support of customers who have installed or are planning to install this package needs to be explained here. Naturally, with use of the system by various customers comes the occurrence of problems and the solutions to problems. Problems and fixes encountered in the field were documented and sent to the vendor, who then redistributed them in the form of patches to all users. From time to time a major reassembly of programs incorporating symbolic versions of fixes previously distributed as patches would be issued as a release. In the process of testing the release additional patches would be generated. It was not advisable to attempt major reassemblies of programs locally since one's libraries would no longer match the base from which vendor headquarters was working. It was necessary to carry a large number of patches in the system which, of course, was fraught with peril. Very tight controls needed to be established over patch decks and system changes in general since the impact of error on a real-time system can be catastrophic.

Keeping current with patches and major releases distributed by the vendor along with those fixes internally generated is a major workload for the support group. All these programming changes must be tested since our environment might not be exactly identical to the vendors. This was a workload and a manpower requirement not anticipated by management.

modifications

The number of modifications to be programmed is a cost/value decision of management. By modifications I mean those changes to existing programs to provide improved or revised functional facilities and also the addition of new programs to accomplish new functions not part of the original package. Beyond those modifications which are considered mandatory for acceptance of the package (discussed earlier in this paper), modifications should not be considered a part of the initial cost of the package. Therefore, evaluation of postimplementation modifications is not any different than the normal management process of balancing costs and objectives of programming projects. A recent development has been agreement by some users of this package to the *free* exchange of modifications. This could upgrade these systems functionally and enhance reliability at a greatly reduced cost.

In summary then, the purchaser of a large applications software package must be prepared to select, train and develop a sufficient number of his own programming personnel to achieve freedom from dependence on the vendor as soon as possible after implementation. The problem, of course, is compounded if the package is a complex real-time system as the PARS package is. Even if response time to problems is not so critical as in a real-time system, the advantages of increased control, enhanced security, greater flexibility and employee morale outweigh the manpower costs of building his own staff. ■

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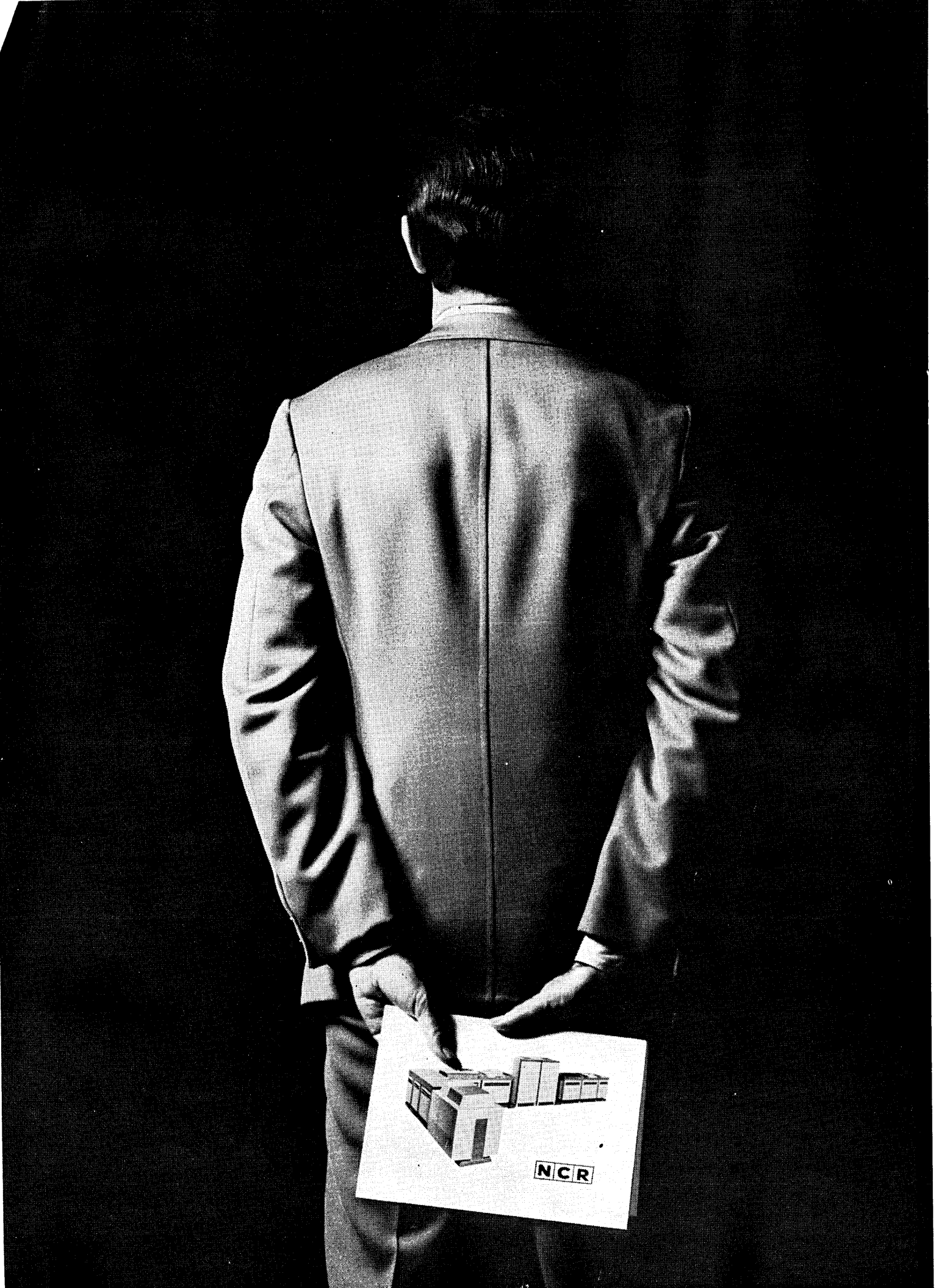
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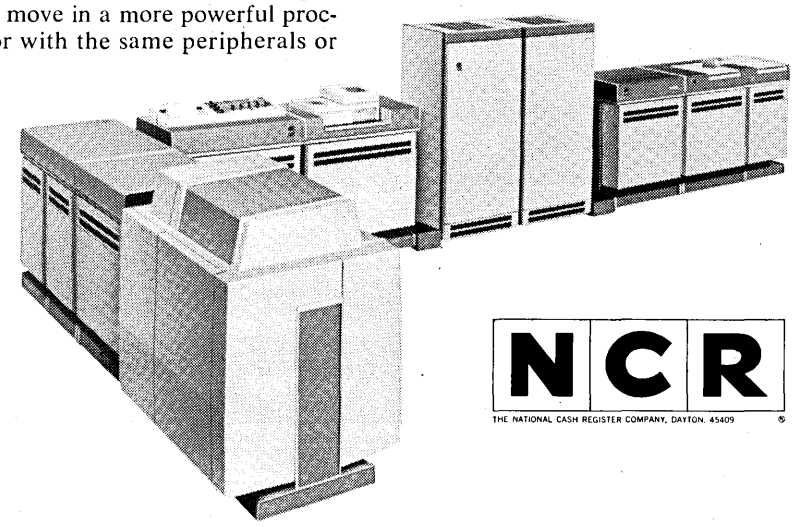

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CIRCLE 80 ON READER CARD

A COMMUNICATION FACILITY FOR COBOL

by Harry T. Hicks, Jr.

On May 6, 1969, CODASYL's Programming Language Committee approved a proposal developed by its Communications Task Group that specifies "COBOL Extensions to Handle Communications Processing." This proposal adds to the official COBOL specifications a set of language elements for acquiring, processing and dispatching messages in a communications environment. While this feature will probably not be available in COBOL compilers until mid-1970 or later, COBOL users who are planning teleprocessing applications should be aware of how this new facility operates.

This article describes the communications environment in which the COBOL Communications Facility (CCF) will operate, then discusses the language features available for dealing with this environment, and finally uses an example to indicate how the language works.

the communications environment

The environment in which the CCF will operate consists of a communications network and a sophisticated software control system. Because few, if any, real environments will ever be identical, a hypothetical environment having most of the essential characteristics will be described.

At the physical level, a communication environment consists of one or more message sources and destinations. Each source or destination has one or more terminals—devices such as badge readers, display stations or teletypewriters that physically initiate and receive messages.

Sources and destinations are connected to the computer via a communication network. The connections may be permanent (leased line) or may be made via the usual exchange equipment for the duration of a particular transmission (dial-up).

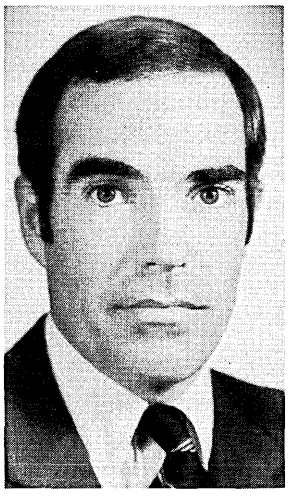
The CCF requires a Message Control System (MCS) to be implemented. This MCS handles all the physical activities essential to operating the communication network. Although the CCF relies heavily on the availability of several MCS features, it does not specify the details of how MCS functions. Therefore, each implementor is free to create an MCS that fits the requirements of his particular cpu, control units and terminals, provided that the resulting system supports the CCF defined features. Let us follow a message from its inception in order to understand in greater detail how a hypothetical MCS functions.

The sender prepares a message and enters it into a sending terminal such as a card reader. Each message will usually consist of text, preceded by a header which indicates among other things the source code, a message type code, and a source sequence number. The MCS may become aware of the existence of the message in one of several ways. If the source is connected to the computer by leased line, the MCS may be continuously polling all operating terminals in a user-specified sequence. If the connection is made by exchange equipment, the terminal may automatically dial the computer or the computer may dial it at a specified time. Or, a human at the terminal or computer may simply dial the other party and manually switch to data mode for transmitting the message.

The MCS assigns a core-storage buffer to the incoming message. If any errors occur during transmission, the MCS will attempt correction or request retransmission. When the end of the message is detected by the MCS, it may then perform one or more housekeeping operations.

1. The message may require translation from terminal code to the cpu code (e.g., from Baudot to EBCDIC).
2. The message may be time/date stamped and given an internal sequence number for scheduling purposes.
3. The message header may be scanned for a priority code or to determine the processing program to be called.

If there are previous messages not yet processed, the MCS



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 University of California at Berkeley.

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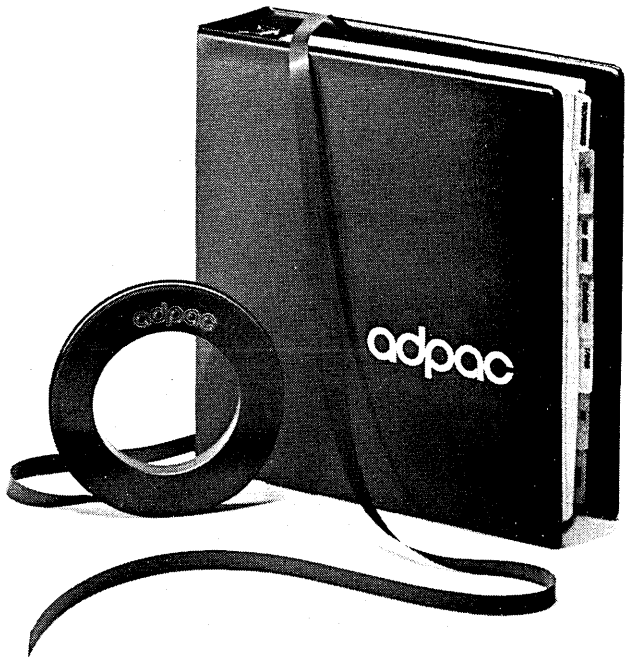

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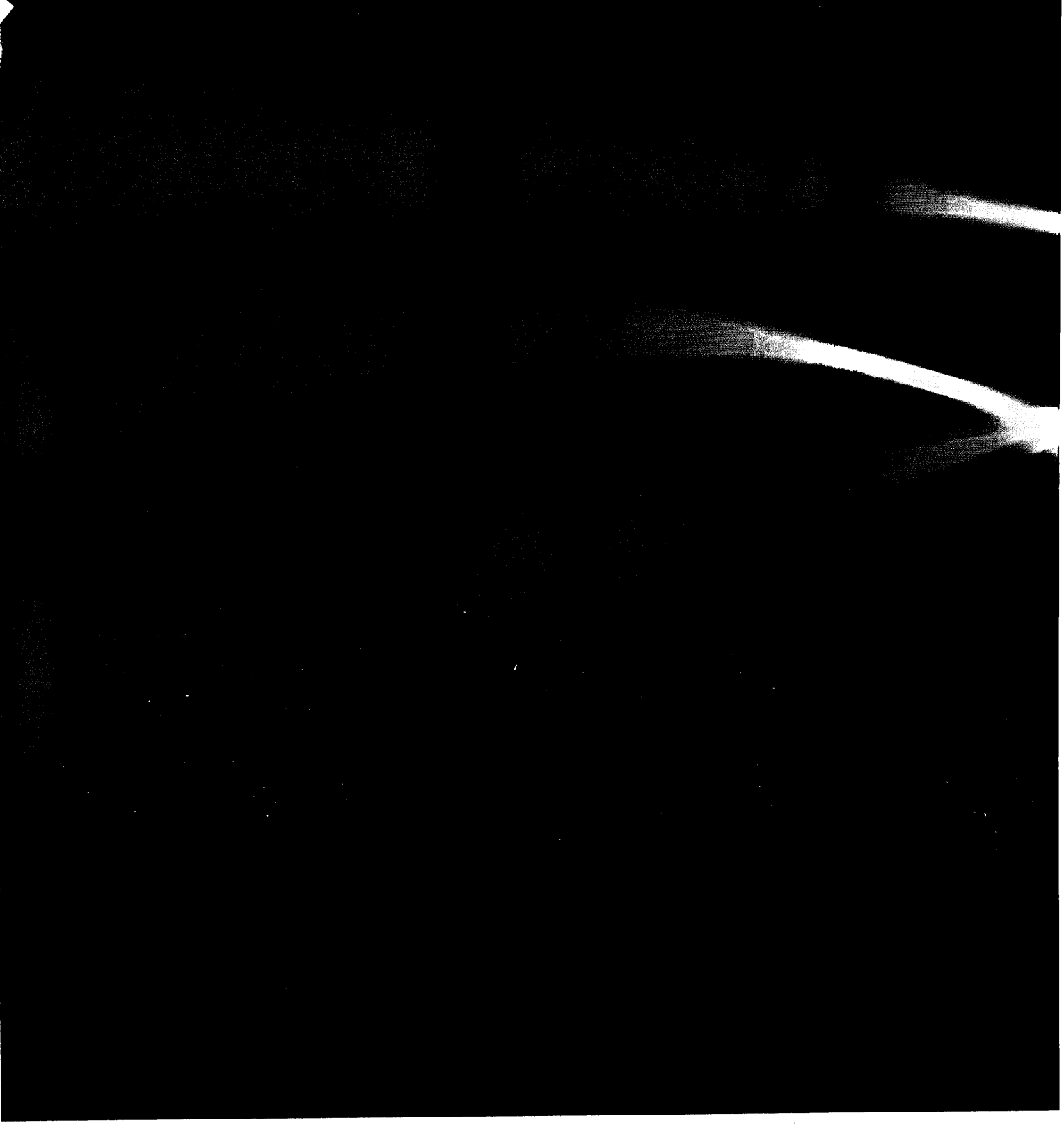

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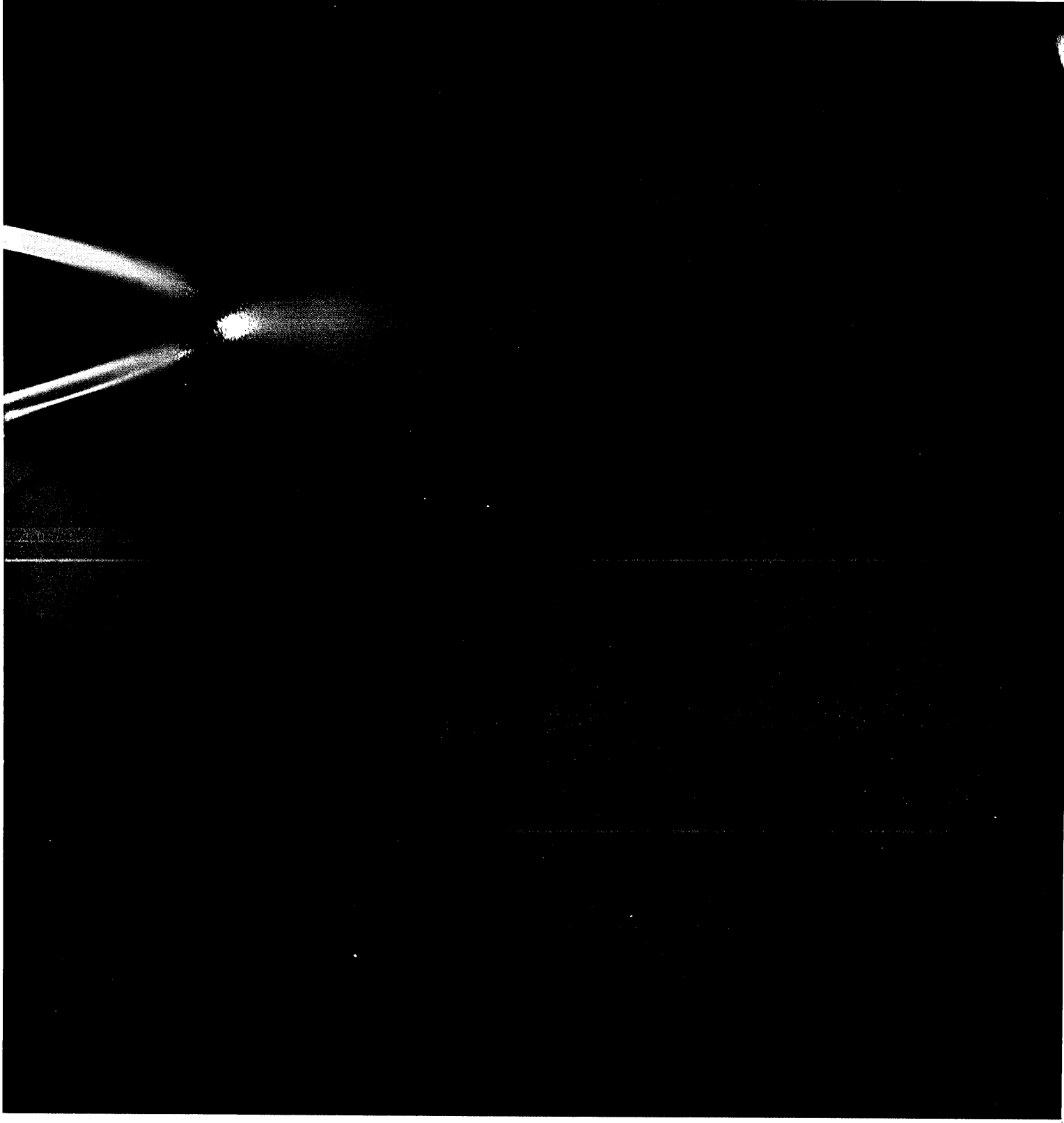

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places this message in a queue located on external storage, and assigns it a priority according to a user-specified algorithm based on a message heading code, arrival time or some other condition.

At the proper time, the MCS dequeues the message, calls the processing program if necessary, and places the message in the core-storage location specified by the program.

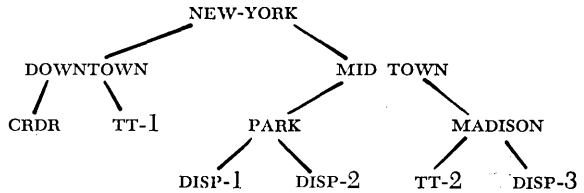
This process is essentially reversed by the MCS when it accepts messages from the user's processing program for transmission to a destination.

The COBOL user must specify to the MCS a great deal of information outside of the COBOL source program. This specification may occur at MCS generation time, at the time the COBOL program is compiled, at run time, or all three.

Among the information the MCS requires is the following:

1. The symbolic name of each source and destination, the number and type of terminals located there, the type of connection to the computer, and data concerning how the connection is handled (e.g., dialing information, polling sequence, terminal address).
2. The structure and symbolic name of all queues.
3. The relationship between each sending terminal and the queue structure.
4. If the COBOL object program is to be invoked by the MCS, the relationship between messages and processing programs.
5. The algorithm that determines the sequence in which messages are presented to the COBOL program.
6. Housekeeping requests, such as data/time stamping, code translation, etc.

The queue structure should be discussed further, since it is important to the operation of the CCF. Queues of incoming messages can be assigned a hierarchical structure. For example, the following structure could be defined:



The names shown are the symbolic names used by MCS and the COBOL object program to describe the queues. For each branch of this structure (e.g., NEW-YORK/DOWNTOWN/CRDR), the user specifies to MCS the symbolic name of the source(s) and terminal(s) whose messages are to be stored in this queue. The structure shown above identifies six logical queues. The physical arrangements necessary to accommodate these six queues is left to the discretion of the MCS.

cobol elements

In contrast to the complexity of the communication network and the MCS, the COBOL elements are few and relatively simple. A Communication Description entry (CD) is added to the extant FD, SD, and RD. Its two operations, INPUT and OUTPUT, are used to define areas for information interchange between the COBOL object program and the MCS. The RECEIVE and SEND verbs are the CCF's message handling commands, while the ENABLE and DISABLE verbs permit the user to add or delete terminals during a run. The MESSAGE condition provides a way of determining the presence of messages in a specified queue. Two additional verbs, STRING and UNSTRING, provide a means of constructing and separating messages. Although included in the CCF proposal, these verbs are not a necessary part of the communications facility and, therefore, they will not be discussed in this article.

The CD Entry. The Communication Description entry appears in the Communication Section of the COBOL program. This section is located between the Linkage Section and the Report Section in the Data Division. The CD is unique to COBOL in that it defines a communication area in which information is passed between the COBOL object program and the MCS. Because this exchange takes place only during the running of the program, the area defined by the CD is essentially empty during compilation. Furthermore, there is no defined connection between a CD and a message source, destination, terminal or queue hierarchy. Such connections are made during a particular run and are in existence only during the run time increment required to queue or dequeue a given message.

The communication areas defined for an INPUT CD differs in structure and content from that of an OUTPUT CD, but in both cases the structure and content are predefined. The CD entry serves only to:

1. Assign a cd-name to the communication area.
2. Assign data-names to some or all of the predefined fields within the area.
3. Identify whether or not an INPUT CD is used to accept INITIAL input (this option must appear in a COBOL object program that is to be invoked by the MCS).

The INPUT CD defines a contiguous set of 11 elementary items. The format of the entry is:

```
CD cd-name FOR [INITIAL] INPUT
    [SYMBOLIC QUEUE IS data-name-1]
    [SYMBOLIC SUB-QUEUE-1 IS data-name-2]
    [SYMBOLIC SUB-QUEUE-2 IS data-name-3]
    [SYMBOLIC SUB-QUEUE-3 IS data-name-4]
    [MESSAGE DATE IS data-name-5]
    [MESSAGE TIME IS data-name-6]
    [SYMBOLIC SOURCE IS data-name-7]
    [TEXT LENGTH IS data-name-8]
    [END KEY IS data-name-9]
    [STATUS KEY IS data-name-10]
    [QUEUE DEPTH IS data-name-11].
```

As the format indicates, the programmer does not have to assign a data-name to each of the 11 items. For instance, if he knows that none of the queue hierarchies that he will use in conjunction with this CD is over two levels, he can omit the key words SUB-QUEUE-2 and SUB-QUEUE-3 together with data-name-3 and data-name-4.

If one has an aversion to writing and is willing to assign all 11 data-names, the CD can be written in this alternative form:

```
CD cd-name [INITIAL] INPUT
    data-name-1 . . . data-name-11.
```

Either format can be optionally followed by one or more level 01 entries that redefine the 11-item communication area. Furthermore, the programmer can write the phrase "CD cd-name [INITIAL INPUT]" followed immediately by an 01 entry, omitting entirely the list of key names/data-names or data-names only.

The CCF associates data-names 1 through 11 with the implicit data description shown below. Regardless of how the programmer codes the CD entry, the MCS utilizes this definition.

```
01 data-name-0.
   02 data-name-1  PICTURE X(12).  (Queue)
   02 data-name-2  PICTURE X(12).  (Sub-Queue-1)
   02 data-name-3  PICTURE X(12).  (Sub-Queue-2)
   02 data-name-4  PICTURE X(12).  (Sub-Queue-3)
   02 data-name-5  PICTURE 9(6).   (Date)
```

```
02 data-name-6  PICTURE 9(8).    (Time)
02 data-name-7  PICTURE X(12).   (Source)
02 data-name-8  PICTURE 9(4).    (Text Length)
02 data-name-9  PICTURE X.       (End Key)
02 data-name-10 PICTURE XX.      (Status Key)
02 data-name-11 PICTURE 9(6).    (Queue Depth)
```

The first four items of 12 characters each are used to exchange the symbolic names assigned by the programmer to queue hierarchies. The item defined by data-name-7 is used to exchange the symbolic-name of the source terminal associated with this particular queue in the programmer's specification to MCS. The content and meaning of the other items will be discussed under RECEIVE.

The area defined by the OUTPUT CD contains fewer items, hence the format is shorter:

```
CD cd-name FOR OUTPUT
    [DESTINATION COUNT IS data-name-1]
    [TEXT LENGTH      IS data-name-2]
    [STATUS KEY       IS data-name-3]
    [[DESTINATION TABLE OCCURS integer TIMES
      [INDEXED BY index-name-1 . . .]]
    [ERROR KEY IS data-name-4]
    [SYMBOLIC DESTINATION IS data-name-5]
```

The programmer is offered fewer options in coding the output CD, since he must write the defining clause for data-name-1. As in the case of the INPUT CD, a level 01 may follow this entry to implicitly redefine the output communication area (if only the required entry is coded, then an 01 must follow the CD).

The CCF associates data-names 1 through 5 with the following implicit data description:

```
01 data-name-0.
  02 data-name-1 PICTURE 9(4).(number of destinations)
  02 data-name-2 PICTURE 9(4).(text length)
  02 data-name-3 PICTURE XX.  (status key)
  02 data-name   OCCURS integer TIMES.
    03 data-name-4 PICTURE X.       (error key)
    03 data-name-5 PICTURE X(12). (destination).
```

The item defined by data-name-1 contains the number of destinations to which a particular message is going. The individual symbolic names of the destinations are in the destination table in data-name-5. The remaining items will be discussed under SEND.

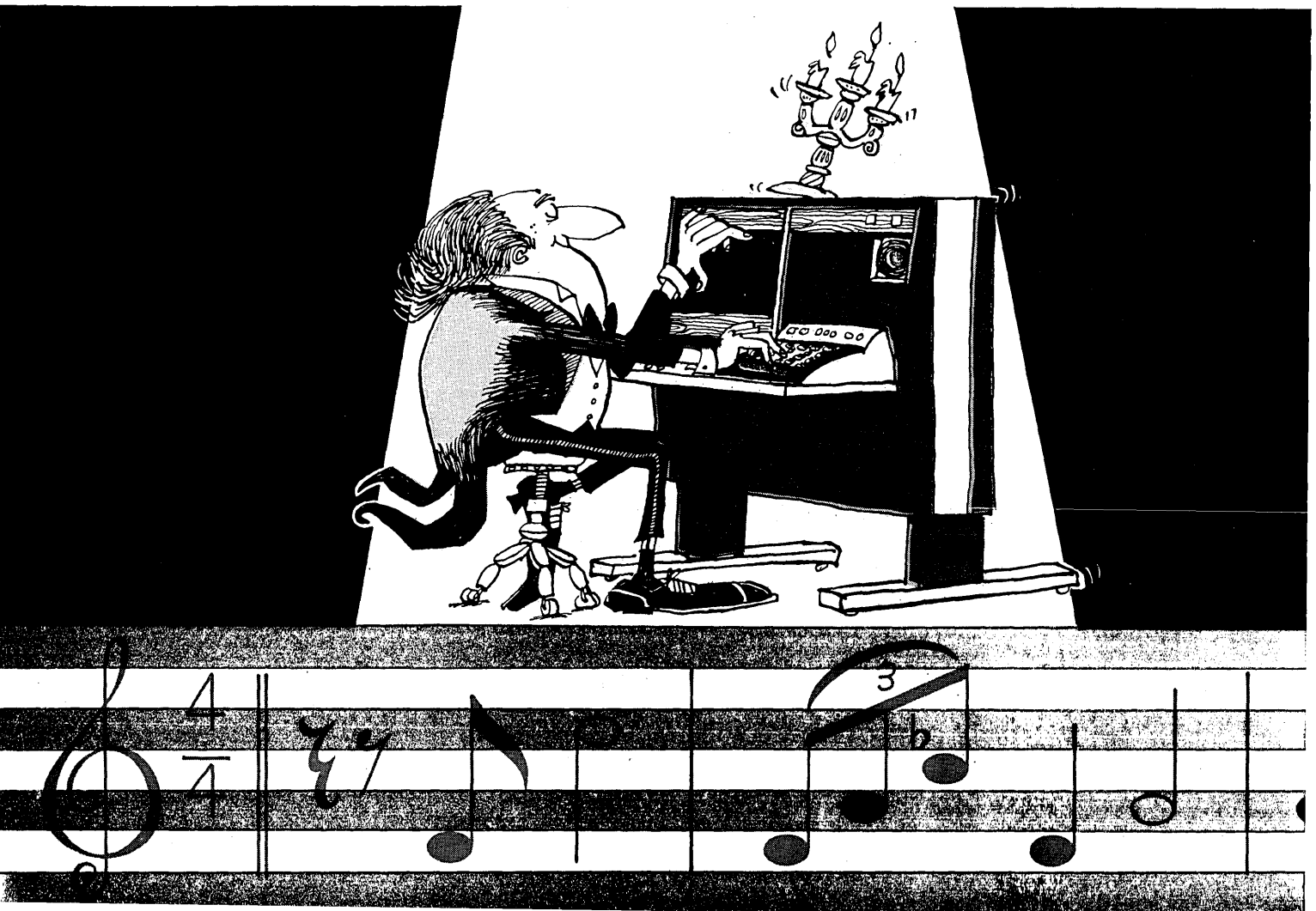
The ENABLE and DISABLE statements. These statements permit the object program to add or delete terminals during a run, an ability that can be used in conjunction with an internal clock to handle time-zone differences, for example.

The format of the verbs is:

```
{ENABLE }{INPUT  [TERMINAL]}
{DISABLE}{OUTPUT           } cd-name WITH KEY {identifier}
                                              {literal   }
```

These statements permit (ENABLE) or inhibit (DISABLE) data transfer between sources (INPUT) or destinations (OUTPUT) and the MCS. They do not affect the ability of the COBOL object program to acquire messages already queued, or store messages for transmission later in the run.

If the optional word TERMINAL is specified for an INPUT CD, MCS activates or deactivates the path between all previously enabled queues and the terminal whose symbolic name is in the SOURCE field of the CD at the time the statement is executed. Otherwise the path between the queue hierarchy whose symbolic names are found in the CD



at execution time and all associated sources is activated or deactivated.

For OUTPUT, the logical paths between all destinations whose names are found in the CD and all associated queues are activated or deactivated.

The KEY clause provides a password of up to 10 characters that MCS must match against its system password to validate the command before it can execute it.

The RECEIVE statement. The RECEIVE statement is used to acquire a message, part of a message, or a single segment of a message from a particular queue. It is written as follows:

RECEIVE cd-name { MESSAGE / SEGMENT } INTO identifier

[NO DATA imperative-statement]

The queue from which the message is to be taken is indicated by the symbolic names MCS finds in the CD when the command is executed. If a hierarchical queue structure has been specified, not all of the symbolic names of a particular branch need be named. Using our sample queue structure again, the CD could contain NEW-YORK only (the sub-queue items being filled by spaces), or NEW-YORK/MIDTOWN or NEW-YORK/MIDTOWN/PARK, etc. In the event that the set of symbolic queue names in the CD is incomplete, the MCS will logically pool all the queues that are referred to by the names that are present and take from the pool the message that is next according to its user-specified selection algorithm.

The message or segment is placed in the area named by identifier. No space fill is added if the message is shorter than the area. If the message or segment is longer than the area, the remainder can be recovered by a subsequent RECEIVE referring to the CD, provided that the queue names are not modified by the programmer between the execution of the first RECEIVE and the second.

After the message has been transferred, the MCS updates the CD with the following information:

1. The symbolic names representing the entire branch of the structure whose queue yielded the message.
2. The data and time of message receipt.
3. The symbolic name of the source terminal from which the message was sent.
4. The length of the message or segment.
5. The field identified by data-name-9 (END KEY), indicating whether end of transmission, end of message or end of segment was detected, or no indication was detected during the transfer.
6. Indication of any unusual conditions or logical errors (STATUS KEY).

If there is no message in the designated queue, the statement following NO DATA is executed if this phrase is specified. If there is no message and NO DATA has not been written, the object program is suspended until a message arrives. At that time, the RECEIVE is executed.

The SEND statement. The SEND statement is used to release a message, a portion of the message, or a message segment to MCS for transmission to one or more sources.

When a SEND is executed, the CD must contain the number of destinations (data-name-1), the symbolic names of each (in the occurrences of data-name-5), and the

number of characters to be transferred (data-name-2). Two formats are available:

```
SEND cd-name FROM identifier-1
                or
SEND cd-name [FROM identifier-1] [WITH { identifier-2 | ESI | EMI | ETI }]
     [ BEFORE | AFTER ADVANCING . . . ]
```

If the first format is written, another SEND using the second format must be executed before MCS will dispose of the message. The second format may be written without the FROM option but with the WITH option to transmit one of the three status indications to the MCS. Identifier-2 names a one-character field that contains a code specifying no indication, or one of the three indicators designated by the key words ESI (end of segment), EMI (end of message) or ETI (end of transmission).

The SEND statement causes the designated number of characters from identifier-1 to be logically enqueued for transmission to each of the destinations indicated in the CD. When the WITH option is used, the indicator is used by MCS to supply the appropriate control character and/or take other necessary controlling action. The ADVANCING option is used to control devices that permit vertical positioning.

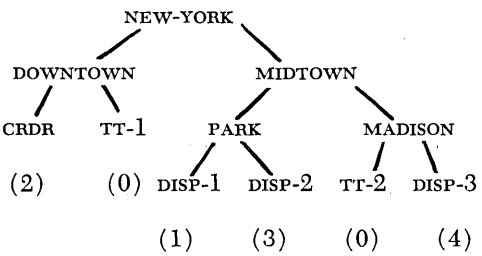
The MCS updates the STATUS KEY (data-name-3) and the ERROR KEY of each destination (data-name-4) as a result of execution. The STATUS KEY indicates the occurrence of any unusual conditions or logical errors concerned with the transmission, while the individual error keys are set if the associated destination has not been defined to the MCS.

The MESSAGE Condition. The MESSAGE condition determines the presence or absence of queued input messages, and is written in an IF statement as:

```
IF MESSAGE FOR cd-name . . .
```

The CD contains the symbolic names designating the queue to be interrogated. As in the case of the RECEIVE statement, a complete queue hierarchy need not be specified. The number of messages in the queue is stored by MCS in the QUEUE DEPTH field of the CD (data-name-11) as a result of the test.

For example, suppose a queue structure contained the following number of messages:



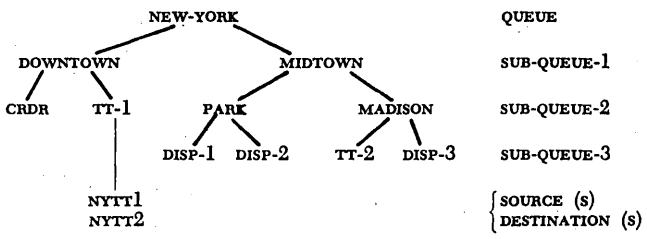
If the CD contained NEW-YORK/MIDTOWN only, the IF MESSAGE statement would return a value of 8 in QUEUE DEPTH. If the CD contained NEW-YORK/MIDTOWN/MADISON, the QUEUE DEPTH would be set to 4 by IF MESSAGE.

example

This example uses the previously illustrated queue hierarchy. One of its branches is augmented by the symbolic names of two terminals that are specified to the MCS as both sources and destinations. This is all the extra-COBOL information needed for this example, but if one were writing a

real COBOL program to operate in this environment, the MCS would need a great deal more hardware-oriented data, some of which was mentioned earlier.

The communication network looks like this:



The MCS allocates one or more input queues for each branch of this hierarchy. The size of the individual areas within the input and output queues is not specified, because the MCS (in this example, and probably most real MCS's) allocates queue space dynamically during the run.

The following input and output CD's are defined:

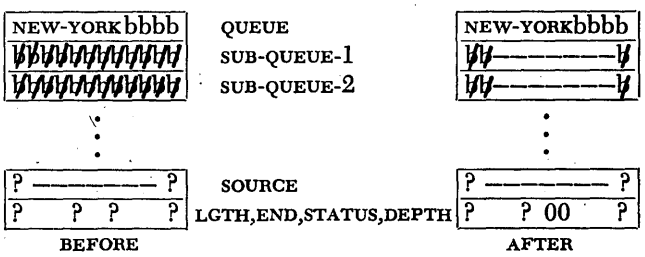
```
COMMUNICATION SECTION.
CD in-message FOR INPUT
    QUEUE            q-in
    SUB-QUEUE-1      sub-q-1-in
    SUB-QUEUE-2      sub-q-2-in
    SUB-QUEUE-3      sub-q-3-in
    SOURCE           source-in
    TEXT LENGTH      length-in
    END KEY          end-key-in
    STATUS KEY       status-in
    QUEUE DEPTH      q-depth-in

CD out-message FOR OUTPUT
    DESTINATION COUNT   no-dest-out
    TEXT LENGTH         length-out
    STATUS KEY          status-out
    DESTINATION TABLE OCCURS 2 TIMES
    ERROR KEY           error-out
    DESTINATION         destination-out
```

Assuming that our program was not invoked by the MCS, we must first attach the terminals using the ENABLE statement. To attach all sources we would write:

```
MOVE 'NEW-YORK' TO q-in.
MOVE SPACES TO sub-q-1-in sub-q-2-in sub-q-3-in.
ENABLE INPUT in-message KEY 'valid'.
```

The input CD would contain the following (space for SUB-QUEUE-3, date and time, has been omitted for brevity):



The MCS returns a '00' in the status code to indicate successful completion of the operation.

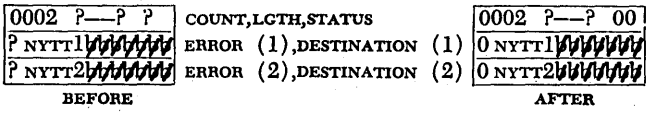
Alternatively, to attach only the sources on the particular branch we are working with we would write:

```
MOVE 'NEW-YORK' TO q-in.
MOVE 'DOWNTOWN' TO sub-q-1-in.
MOVE 'TT-1' TO sub-q-2-in.
ENABLE INPUT in-message KEY 'valid'.
```

With a single ENABLE statement, we can attach as many destinations as we have entries in the CD's DESTINATION TABLE. To attach the two destinations we will be using, we write:

```
MOVE 2 TO no-dest-out.
MOVE 'NYTT1' TO destination-out (1).
MOVE 'NYTT2' TO destination-out (2).
ENABLE OUTPUT out-message KEY 'valid'.
```

The output CD contains the information shown below. The zero in the error field of each destination table entry indicates the MCS recognizes the destination. A '1' would indicate that the destination had not been defined to the MCS.



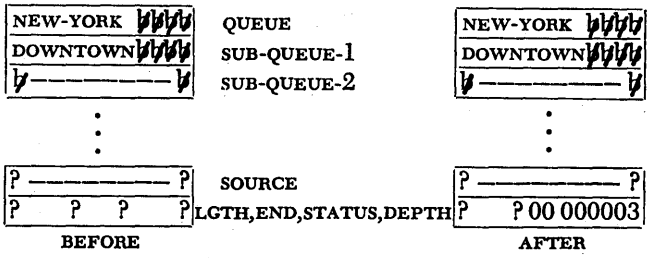
To check for correct operation of the last ENABLE, we write:

```
IF status-out NOT EQUAL TO '00' GO TO enable-error.
```

To test for the presence of messages in the input queues for NEW-YORK/DOWNTOWN we would write:

```
MOVE 'NEW-YORK' TO q-in.
MOVE 'DOWNTOWN' TO sub-q-1-in.
MOVE SPACES TO sub-q-2-in sub-q-3-in.
IF MESSAGE in-message GO TO process-downtown.
```

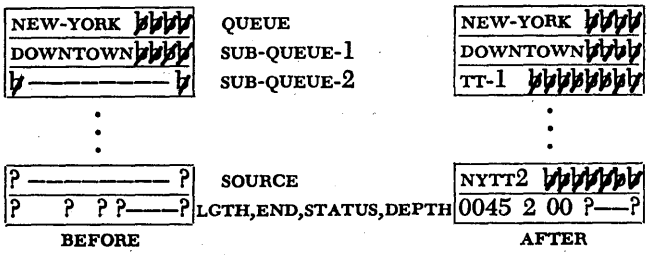
The MCS returns the number of waiting messages (in this case, 3) in the QUEUE DEPTH, together with the status code.



To retrieve the first message, write:

```
RECEIVE in-message MESSAGE INTO in-area
```

The MCS returns the complete set of queue names that define the queue containing the message (TT-1 added), the symbolic name of the source (NYTT2), the message length (45 characters), the end indication (2 means end of message detected), and the status.



The program must find which queue the message is from in order to determine the proper processing routine.

```
IF sub-q-2-in EQUAL TO 'CRDR' GO TO PROCESS-order.
```

Alternatively, the program could have requested only the

first segment of the message:

```
RECEIVE in-message SEGMENT INTO in-area
```

After testing the queue, the remainder of the message (if any) would be retrieved by:

```
IF end-key-in LESS THAN '2'
   RECEIVE in-message SEGMENT INTO in-area.
```

When processing of the message has been completed, the return message is sent by writing:

```
MOVE 1 TO no-dest-out.
MOVE 55 TO length-out.
MOVE source-in TO destination-out (1).
SEND out-message FROM out-area WITH EMI.
```

0001 0055 ?	COUNT,LGTH,STATUS	0001 0055 00
? NYTT2	ERROR (1),DESTINATION (1)	0 NYTT2
? ?————	ERROR (2),DESTINATION (2)	0 ?————
BEFORE		AFTER

Messages consisting of two or more segments, each to appear on a separate line at the destination, can be sent by the following code (note that this message goes to both terminals at the destination).

```
MOVE 2 TO no-dest-out.
MOVE length-msg-1 TO length-out.
MOVE 'NYTT1' TO destination-out (1).
MOVE 'NYTT2' TO destination-out (2).
SEND out-message FROM out-area-1 WITH ESI.
MOVE legth-msg-2 TO length-out.
SEND out-message FROM out-area-2 WITH ESI.
                    .
                    .
                    .
SEND out-message WITH EMI.
```

The last SEND transmits no characters; only an end of message indicator.

After each SEND, the correct execution of the operation should be validated by writing:

```
IF status-out NOT EQUAL TO '00' GO TO send-error.
```

summary

As the preceding example shows, the CCF is a flexible and easily used facility for writing message handling programs in COBOL. Its primary commands RECEIVE and SEND messages, and ENABLE and DISABLE terminals. To use these commands, the programmer follows a three-step procedure:

1. He places in the CD the parameters required by the command he is going to issue.
2. He issues the command.
3. He interrogates information stored in the CD by the MCS as a result of executing command.

Additional commands are available to test for the presence of input messages (MESSAGE condition) and to manipulate the text of messages (STRING and UNSTRING).

In addition to learning how to use these commands, the programmer must know how his MCS operates and what specific information he must provide to it. This latter task appears the more difficult at this point in time.

In closing, let us look briefly at the future. As indicated earlier, the CCF should begin to appear in COBOL compilers around mid-1970. The early implementations will provide feedback to the Programming Language Committee which may clarify or revise the CCF accordingly. Standardization activity will begin after the initial "shakedown" is over, leading to eventual incorporation of the CCF in USA Standard COBOL. ■

THE SONG OF I/O-WHAT-THE

Should you ask me whence these programs
Whence these listings and these records
With the ring of truth (the right ring)
With the bits and bytes of data
With the flippancy of flip-flops
With the crushing reams of printouts
With their frequent iterations
And their input, output, throughput
Not to mention downput, upput
I should answer, I should tell you.

From the wells of honey (Waltham)
From the IB empty spaces
From the land of Univacuums
From the land of controlled data
From the burrows of Paoli
Where the coder, called programmer
Feeds among the reeds (and write-outs)
I repeat them as I heard them
Memories from Glitchee-Kludgee
Father of all new computers
Also grand and great-grandfather
(Depending on their generations)
Should you ask where Glitchee-Kludgee
Found this output wild and wayward
I should answer, I should tell you.

In the little town of Kingstown
In the little town of Bluebell
Near the highway called one two eight
In the bedlam of Bethesda

Should you ask me what the point is
Thus assuming that there is one
I should tell you that there is none
I should answer, I should tell you
END: computus interruptus
Let us finish, let us finish
Stay and read this rude inscription
Read this song of I/O-what-the

In a room with air, conditioned
On a false floor (one below it)
Stands (or sits) our Glitchee-Kludgee
All around him are peripherals
Not to mention stray programmers
Mention also operators
(Having done that, let's forget them)
One more mention—keypunch ladies
Taking up with stray programmers
Here amidst this grand confusion
Sits (or stands) our Glitchee-Kludgee
Sits (or stands) and thinks—or does he?
Thoughts programmed by stray programmers
Maybe thinking random thoughts by
Random-punching keypunch ladies
Sits and thinks (or stands) and wonders
Who will tell them of his story
Who will tell of his beginning
Tubes of vacuum—cards with round holes
How he looped and how he halted
How he shifted, stored and added
How he did and called and went to

That the tribes of men might prosper
(Not to mention stray programmers)

Will he someday find his Boswell
Will someday a fellow (long one)
Write his story—Tom Tom fashion
Beating out on drums this legend
Using disks for more mass stories
Tape-recording software sagas
Holy punched cards! Hollerith-ms!
Maybe someday we should answer
Maybe one day (Never'n someday)

Glitchee-Kludgee, not realizing
That his thoughts are being printed
In the subroutine of someone
(Probably a sub-programmer)
Said programmer can't debug them
Sends them in to Datamation

Thus deports our I/O-what-the
Not to mention Glitchee-Kludgee
In the back of Datamation
Back among the tempting want ads
With the agencies employing
With the agencies imploring
Back with advertisers' index
And the bore-um of the Forum.

Ask me once more what the point is
Ask me once more if you care to
Even if you couldn't care less
I should tell you: I should tell you.

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CIRCLE 180 ON READER CARD

A SHORT GUIDE TO THE WONDERFUL WORLD OF COBOL

by Howard Edelman

In the olden days (which really weren't so long ago outside a COBOL time-frame), some of us felt secure leafing through our authentic COBOL-*Edition 1965* manual with "Department of Defense" emblazoned on its drab, green cover. The DOD seemed to lend an aura of stability and prestige to this gospel which we knew was really being produced by a mystical outfit called CODASYL.

But that was in the olden days and the world has progressed. In recent months new "authentic type" COBOL manuals have been blossoming like summer flowers. Two of these are of particular interest. One is covered in pristine white and the other in a jazzy green and white cloak. Both appear to carry the stamp of approval of highest COBOL authorities—seemingly uncorrupted by implementors' jaded interpretations. But a scan of these two documents by even a modestly astute COBOLer will quickly point up some interesting differences.

1. Two different organizations issued these manuals. The white-covered version, entitled *CODASYL COBOL Journal of Development, 1968* (the DOD association crutch apparently no longer needed), is the product of the Programming Language Committee (PLC) of CODASYL. The color-covered book, entitled *USA Standard COBOL,* is a copyrighted product of U.S.A. Standards Institute (USASI).
2. The *Standard* is, from the point of view of variety of language, more limited than the *Journal.*
3. Not all of USASI's specifications agree with CODASYL's—although USASI indicates it's a subset of CODASYL.
4. Organization of the two manuals is different—but not entirely. USASI is organized by COBOL functions into "Modules," while CODASYL is basically organized by COBOL "divisions." They do agree within the elements, where both describe function, general format, syntax rules and general rules.

As noted, COBOL is the baby of an independent, voluntary group known as CODASYL (Conference on Data Systems Languages). Directly responsible for all COBOL language development and maintenance within the CODASYL hierarchy is PLC (Programming Language Committee, formerly known as the COBOL Language Subcommittee). This committee is composed of representatives of COBOL users and manufacturers. The computing community has by tradition accepted the COBOL specifications issued by PLC (after approval of the CODASYL Executive Committee) as the only "official" definition of COBOL. The first COBOL manual published by CODASYL (under DOD auspices) was *COBOL-60* with *COBOL-61* next; followed by *COBOL-61 Extended* and *COBOL-Edition 1965.*

The most recently published, *Journal of Development, 1968,* is planned as the first of a continuing series of documents which, together with subsequent updates, will represent the current state of the official COBOL language. It is projected that the first update of the JOD will be in late 1969 or early 1970. Plans call for it to include all additions, corrections, modifications, and deletions approved by PLC since issuance of the *Journal of Development, 1968.* The current edition of *JOD* is available from either the Canadian federal government (Canadian Government Specification Board, Department of Defence Production, Ottawa, Canada; Document #110-GP-1, at a cost of $1.75) or from the U.S. Printing Office (Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Document NBS Handbook #106, at a cost of $2.75).

To disseminate *JOD* changes as quickly as possible (prior to publication of a completely revised *JOD*), both sources plan to make available all updated *JOD* pages as and when released periodically by PLC. Page changes to *JOD* will also be published in the *COBOL Information Bulletin* at the direction of USASI X3.4.4.

Although CODASYL has been specifying the full COBOL specs since 1960, no one has (or would—if sanity prevails) implemented all of its provisions. PLC considers its work developmental. In some cases functions were specified by PLC as attempts to anticipate future needs. For various reasons, such as changes in hardware development or changes in users' requirements, some of these COBOL specifications have been very seldom used. Other elements of COBOL are redundant, but have been included to simplify programming. The computing industry recognized that the COBOL objective of compatibility could not be readily achieved if implementors continued to randomly select features for inclusion in COBOL compilers using a method akin to plucking from a CODASYL smorgasbord. The users not only failed to have cross-compiler compatibility, but also were handicapped in not being sure what was included in vendors' compilers without going through them element by element.

The United States of America Standards Institute is a

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privately supported organization that acts as a coordinating agency and national clearing house for voluntary standards in the U.S. It is the U.S. member of the International Organization for Standardization. The USA Standards Committee on Computers and Information Processing, X3, was established in 1960 under the sponsorship of the Business and Equipment Manufacturers Association.

In 1961 at an ISO meeting held in Geneva, the U.S. representative accepted the secretariat of a working group which was directed to develop "standardization and specification of common programming languages of broad utility . . ." As a result X3.4 was established to provide the U.S. input to this international standardization activity. In 1962, X3.4, having decided that COBOL had reached puberty, established working group X3.4.4, with the title "Processor Specification and COBOL Standards" to pursue a United States COBOL standard. This committee consisted of COBOL specialists from the ranks of government and industrial users, computer manufacturers, and software consultants. They worked for some five years to analyze and organize a reasonable and acceptable standard. It was determined, right at the beginning of X3.4.4's effort, that USASI did not want to develop a new COBOL language. For this reason it was decided that the USASI Standard COBOL would be a subset of the CODASYL COBOL specifications.

By evaluating the COBOL language for usefulness and function, elements were chosen for inclusion in the standard. If a selected element was deemed a basic requirement for all COBOL compilers, it was allocated to a specification module called "Nucleus"; otherwise, it was assigned to one of seven functional processing modules: table handling, sequential access, random access, report writer, sort, library, or segmentation. Each of these modules were, in turn, subdivided into levels of elements which were grouped to provide decreasing functional and/or programming sophistication capabilities. Each lower level, within a module, is a proper subset of the elements included in the higher level of the same module. Therefore, a COBOL compiler having some stated levels of nucleus and various functional modules is communicating the COBOL facilities which a user programmer can expect to have available from this compiler. In order to preserve the integrity of the COBOL language used in the standard, no changes to the original CODASYL specifications were permitted, other than minor grammatical ones necessitated by the subsetting reorganization.

keeping up-to-date

Then why the differences between the *Journal of Development* and the USASI *Standard* in spite of USASI's commitment to specifying the standard as a subset of CODASYL COBOL? An understanding of the dynamics of the two documents' development is necessary to appreciate the reasons for these differences.

COBOL, being a live language, is a moving target. Although the last two full language specification documents CODASYL's PLC officially released were *COBOL-Edition 1965* (published November, 1965) and *COBOL Journal of Development* (published June, 1969), there also exists a continuing flow of updates and changes to the language, authorized by proposals approved by PLC between these two publication dates. USASI had to live within this environment of a constantly changing base language. For the

purpose of standardization, X3.4.4 made a decision that Jan. 1, 1967, would be used as a cut-off date for any new changes that PLC might make to the *Edition 1965* document. ("New" is a key word, in that any change that PLC made subsequent to the Jan. 1, 1967, date, as a result of action initiated prior to this date, would be considered for inclusion in the final standard.) The proposed standard was published in *COBOL Information Bulletin #9* (April, 1967) and based on the original *Edition 1965* specs. Subsequently *CIB #10* (June, 1967) provided all updates to *COBOL-Edition 1965* approved by PLC up to Jan. 1, 1967. As a result of comments received from the computing community—especially the extensive contribution made by both the European Computer Manufacturers Association and the Japanese standards group in its close liaison during the development of the proposed standard—certain corrections and modifications were made to the proposed standard (all of them consistent with the CODASYL specs). In August, 1968, the voting members of USASI approved the final version of the *Standard (USASI X3.23-1968 USA Standard COBOL).*

The programming language committee had its own working environment (and its own cut-off date) when it published its updated language specs. Therefore, the *Journal of Development* includes language elements that were not even considered by USASI for the standard, plus updates to elements approved by PLC between the USASI cut-off date (Jan. 1, 1967) and the CODASYL cut-off date (the end of 1968).

And so the iterations go on, with USASI now looking into the future for their reconsideration of the existing standard (with an update possible within the next couple of years) and CODASYL's PLC continuing its refinement and enhancement of the basic language specs. When the responsibilities for development and standardization exist in two separate organizations, this problem of coordination must be recognized and understood. The argument as to whether one organization should possibly take over both functions has been considered within each organization—and by many interested outsiders. Certainly both benefits and shortcomings can be found on each side, but the balance, for the present at least, seems to favor the separate approach.

subjects for future exploration

Many new and wonderful extensions are being considered by PLC for possible inclusion into COBOL. Just added was a large communications specification (see Hicks' article in this issue), with other task groups developing language for asynchronous processing, data base, I/O editing, and revised report writer. At the CODASYL 10th anniversary meeting held May 27 and 28, 1969, in Washington, which was attended by most of the individuals who were responsible for COBOL coming into being and its present day development, strong support was expressed for further enhancements to the COBOL language. To achieve this will require the assistance of many people with varied backgrounds.

Speakers at this meeting asked those people interested in affecting the future course of COBOL development to join one of the task groups working in an area in which they are particularly interested and knowledgeable. Expertise in COBOL is not a requirement for membership on a task group Some of the subjects being considered for further explora-

tion are:

Debugging tools. This task group hopes to provide at the source language level functions that will facilitate COBOL object program debugging.

Executive interaction. This will provide the ability to communicate an operating system. In particular, to: (1) effect a multiprogramming environment; (2) perform and reestablish a rerun; (3) communicate with any "monitor system"; (4) write real-time control systems which incorporate the manufacturer's operating system; (5) recognize and act on interrupts; (6) manage memory at object-time; and (7) change dynamically the sequence of run units in a job.

I/O editing-data representation. This task will involve the development of extensions to the language which will provide automatic editing of information. This should include the ability to: (1) specify the external medium and external format of data; (2) specify the internal configuration and format of a data item; (3) translate the data from the external medium to the internal format and vice versa; (4) replace selected characters within a string of characters on a straight substitution basis; (5) validate fields for CLASS and contents (check digit); (6) pack and unpack a data item; and (7) de-edit a data item.

Library maintenance. This task involves the development of specifications for the format of a COBOL library, and specifications for a source language that allows for the maintenance of this COBOL library. This activity should also include a review of the existing COPY specifications.

Extended segmentation: data and procedure. This task involves development of an extension to the language to provide the capability for the segmentation of data as well as procedures. The segmentation of procedures should include the DECLARATIVES section procedures as well. This effort should also include a review of the PERFORM, ALTER, and GO specifications insofar as they interact with the segmentation rules.

Mathematical functions. This task involves the preparations of proposals that will incorporate in the Procedure Division of COBOL the capabilities which now exist in scientific programming languages, especially FORTRAN. This task would involve the investigation of the possibility of allowing within the COBOL Procedure Division: (1) standard FORTRAN as a set of language particularly allowable within the COBOL ENTER statement; and/or (2) trigonometric functions, square root, log, exponentiation, minimum, maximum, etc.

Floating point. This task aims to allow, within the COBOL language, the ability to define a floating-point number. This should include a discussion of representation, size, etc.

Default options. This task involves the development of proposals that would define the assumed option for every case in which a selection of several options is allowed and the programmer has not specified any.

Free (reference) form COBOL. This task involves the development of proposals to remove the restrictions on the COBOL format.

Mass storage extensions. This task involves the development of extensions to the existing mass storage specification in order to include the facilities of lock-out, delete, insert, index sequential file formats, etc.

Shorthand COBOL—abbreviations. This task involves the development of a method for including a set of abbreviations for words (key words, data names, etc.) in the COBOL language which can be used as substitutes.

Realignment. This task involves the development of proposals which will relocate those features which are currently in one division but logically belong in another. For example, the environmental parts of the FD description.

COBOL metalanguage. This task involves the development of new metalanguage constructs that would permit the allowable syntax to be expressed without cumbersome general formats and/or lengthy syntax rules.

Generalized subscriptions. This task involves the development of proposals that will extend the existing subscripting capability so that: (1) there will be no limit to the number of levels of subscripting; (2) formulas may be contained within subscripts; and (3) indexing and subscripting will be replaced in favor of one comprehensive facility as described above.

List processing (data base). This task involves the development of specifications that will allow data to be ordered in well-defined interrelated structures, i.e., trees, rings, strings. This would include an ability to insert, delete, and update records within these structures.

Closed subroutines. This task involves the development of proposals that would allow a well-defined set of procedure to be executed as a closed subroutine.

Collating sequence. This task involves the development of specifications that would provide a method whereby different collating sequences can be considered.

Global common (COMPOOL). This task involves the development of COBOL features that will allow the passing of data from one run unit to the next executed run unit in a job.

Punctuation characters. This involves the development of proposals that would remove the requirement that a period must end clauses and statements.

Communications facility. This task involves the further enhancement of the COBOL language to provide additional facility to process messages from and to terminals via queues.

Variable length data items. This task involves the investigation of providing in COBOL the ability to define a variable length data item. This effort should take into account the OCCURS . . . DEPENDING ON feature now in COBOL.

ELSE in implied conditional statements. This task involves the development of proposals that would allow the ELSE construction to be used in all implied conditional statements, i.e., AT END, INVALID KEY, etc.

Index for COBOL Journal of Development. This task involves the development of an index for the *COBOL Journal of Development.*

Review of COBOL glossary. This task involves reviewing the COBOL glossary, in conjunction with other ADP glossaries, with a view toward making the COBOL glossary more consistent with the others whenever possible.

For those interested in assisting in any of these efforts, a letter to the chairman, Programming Language Committee, Box 124, Monroeville, Pa. 15146, will get you the necessary information.

There are two official COBOL documents: (1) The CODASYL PLC *Journal of Development,* which contains the current state-of-the-art COBOL specifications; and (2) the USASI *Standard COBOL,* which specifies a modularized subset of the CODASYL specs (as of a specified cut-off date) and which is basically intended as the criterion for adherence of COBOL compilers to a standard.

Hopefully, the USASI Standard will continue to reflect the progress being made by CODASYL and the differences between the two documents will remain minimal in those areas common to both. It is also hoped that the soon to be voted on ISO COBOL Standard will reflect 100% alignment with USASI's COBOL Standard so as not to introduce still another "official COBOL manual." (Note: see News Briefs in this issue for a position statement from the Conference on Data Systems Languages.) ■

VOICE RECOGNITION AND RESPONSE SYSTEMS

hel-lo

by Cay Weitzman

This article is concerned with two types of audio equipment: computer input devices capable of recognizing human speech, and computer output devices capable of generating a voice output. A computer system that can identify words in continuous speech of an unknown speaker is beyond the current state of the art in speech recognition. However, limited speech recognition systems have been developed on an experimental basis. Problems associated with speech recognition are briefly discussed and several voice recognition devices are described in some detail.

The problems involved in the design of voice response systems are less formidable than those encountered in the development of voice recognition systems. Several types of voice response systems are discussed and an analysis is made of the commercially available voice answer-back units.

Since audio devices generally are an integral part of a computer-communications system, communications connection requirements are surveyed in terms of capabilities and limitations.

voice recognition systems

The relatively slow progress being made in the development of sophisticated voice recognition equipment can be attributed to the enormity of the problem. Voice recognition devices must be designed to handle variations in speech intensity levels, detect the onset time of each word through

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proper segmentation of words in a sentence, adjust to the variations in total duration of the individual word as well as the sentence when spoken, differentiate between the voice of a speaker and background noise, and recognize the voice message independent of who the speaker is. Only partial solutions have been found to all these problems.

Several attempts have been made to design voice recognition devices where, instead of the device being capable of recognizing a large number of voices, the speakers have been trained to adapt their voices to the range of the device. The success of this method has been limited, due to the fact that differences in vocal tracts makes it difficult for any two speakers to produce similar spectra for a given word. Furthermore, it has been determined that the same speaker very seldom is capable of repeating sounds exactly.

Two basic approaches to voice recognition system design have been used: direct sampling of voice input; and sampling of preprocessed voice input.

Experimental systems based on direct sampling of the audio input (as reflected by the changes in voltage generated by the microphone) provide the user with a flexible means of analysis of the voice input. One such system, developed at Stanford University in 1968, samples the speech signal at a rate of 20,000 samples per second using 9-bit digitization of the analog input signal. Hence, each second of voice input requires the storage and processing of 180,000 bits.

The amount of computer processing and storage required by the direct sampling scheme can generally be reduced by hardware preprocessing of the voice input.

The preprocessing is done by a spectrum analyzer which consists of a bank of 20 to 30 narrow band-pass filters, spaced within the voice band. The purpose of these filters is to "decompose" the voice input into 20 to 30 analog signals. The analog filter signals are sampled at rates ranging from 2400 bps to 48,000 bps, multiplexed and converted into digital data before being fed into the computer for further data reduction and final message identification.

The basic function of the preprocessor is therefore to reduce the amount of redundancy inherent in the voice input signal by several orders of magnitude, and consequently simplify the message recognition task for the central processor.

An example of a system based on the sampling of a preprocessed voice input is the experimental voice recognition device designed by Bolt, Beranek and Newman in 1968. This device can recognize a set of 100 messages consisting of single words or short phrases. A 100-word recognition vocabulary requires approximately two million bits of core storage. This system, which must be adjusted to each individual speaker, uses an SDS 940 computer for the information processing.

Another type of device, also based on the preprocessing technique, was delivered to the Rome Air Development Center by Litton Industries in 1968. This voice response system operates with a vocabulary of 30 words and can identify up to 30 different speakers. The voice "pattern" of each speaker must, of course, be on file in the computer used for the processing of the audio input.

voice response systems

The most commonly used voice response systems are based on analog recording of voice or digitally controlled synthesis of speech. Each method will be discussed in terms of performance and complexity.

The least complex voice response systems rely on voice recording of a limited number of words or phrases. The

audio signal from a male or female speaker is usually prerecorded on a magnetic or photographic film drum. The voice tracks on a magnetic drum are accessed by one or more read heads or, in the case of an optical cylinder, by sensing one of the modulated light beams passing through each track. The optical recording technique will eliminate some of the problems associated with wear of a magnetic surface.

Except for the IBM 7772 Audio Response Unit, all presently available devices use an analog drum.

Two major types of computer-controlled voice synthesizers have been developed. The first and earlier type, which is still in its experimental stage, consists of an electronic analog of the human speech organ or vocal tract. This system, also called the articulatory analog, consists of a series of inductor-capacitor sections simulating the nasal and vocal tracts, terminated in nose and mouth radiation impedances.

The second type of voice synthesizer or "vocoder" (voice coder) simulates the sounds of human speech, but not the vocal tract which produces them. The most commonly used voice synthesizer, and the only commercially available system (IBM 7772), is the channel vocoder which consists of more than 15 digitally controlled narrow band-pass filters covering the total telephone voice band. The audio signals from these filters (or synthesizer channels) are combined, amplified and applied to the receiver of a listener's telephone set.

A channel vocoder, in reducing the quantity of information required for the speech signal representation, takes advantage of the large amount of redundant information in human speech.

It has been estimated by J. McCarthy, L. D. Ernest, D. R. Reddy, and P. J. Vicens in a research project supported by the Advanced Research Projects Agency (ARPA)[1] that one second of human speech carries information equivalent to 180,000 bps. However, only 2400 bps is required to actuate the above-mentioned set of band-pass filters to produce voice acceptable quality. The same bit rates also apply to voice recognition. Vocoders operating at lower bit rates than 2400 bps are said to be operating in a "degraded" mode.

The Voice Excited Vocoder (VEV) is an improved version of the Channel Vocoder. The VEV is insensitive to noise conditions and tends to have a superior output quality in comparison with the conventional Channel Vocoder. The VEV operates at bit rates ranging from 4800 bps to 9600 bps.

The main differences between a voice response system based on prerecording of voice and a system based on synthesis of voice are in the size of the vocabulary, the number of access channels, and cost.

A prerecorded voice drum permits the parallel access of as many lines as the number of available tracks, since parallel access is generally provided to each track. However, the size of the vocabulary is limited to the size of the drum. The maximum number of words recorded on a drum is presently 255 (Technitrend VM-1400). A vocabulary change generally requires a change of voice drum.

A system based on voice synthesis requires extensive hardware duplication for each input line. The vocabulary of such a system is limited to the amount of memory space available. Since approximately 2400 bits (300 bytes) is required for each second of voice output, a disc track containing 3625 bytes per track can store approximately

[1] J. McCarthy, et al. "A Computer with Hands, Eyes and Ears," Proceedings, 1968 Fall Joint Computer Conference, pp. 329-338.

twenty 0.50-second words. Hence, about 240 short words can be stored on one "cylinder" of an IBM 2311 disc storage drive. The vocabulary, made available in the form of digitally coded punched cards, can easily be loaded into the storage unit using a card reader. The vocabulary can therefore also be modified, exchanged or expanded using conventional means of computer data input.

Since all presently available voice response systems require keyed input inquiries, parallel data sets are used that are capable of automatic answering and of transmitting audio back to the calling party. Voice answer-back systems require the use of Touch-Tone telephones or equivalent, since information to the computer must be transmitted in the form of specific frequencies. (An example of a device permitting the use of a dial-up telephone is the Audio Response Terminal manufactured by Metroprocessing Corp. of America, White Plains, New York. This unit, selling for $160, can be attached to an ordinary telephone in seconds.) The 403A data set is commonly used in most voice answer-back systems. The transmission mode is half-duplex and the transmission method is serial by character, parallel by 8 or 14 bits.

available audio units

Fig. 1 is a summary of the characteristics of several commercially available audio response units. These units are discussed in the following sections. (Prices given are those quoted several months ago.)

Cognitronics. The Cognitronics Speechmaker series of audio response units use a voice-recorded drum with vocabularies varying in size between 10 and 189 words. The voice recording is made on photographic film and is therefore less sensitive to wear than the IBM 7770, which uses magnetic recording techniques.

The basic cost of a 31-word unit with one input line is $6000 (Model 672). A line expansion unit, which permits the addition of up to 10 lines, costs $3000. In addition to the cost of the line expansion unit, the cost of every two lines added to the system is $350. The total cost of a Model 672 with a 31-word vocabulary and four input lines is therefore approximately $10,000.

The cost of an IBM 7770 (Fig. 1) with the same number of input lines and the same size vocabulary is $57,600. However, in contrast to the Speechmaker audio response units, the price of the IBM 7770 includes software and IBM 360 interface.

The Cognitronics Speechmaker units have been interfaced to several computers (other than the IBM 360) and are sold by RCA under the designation 70/510 (Fig. 1). The Speechmaker units are also included in computer systems manufactured by Burroughs, CDC, GE, NCR, Honeywell and VRS.

In summary, the Cognitronics audio response units are less costly than comparable units manufactured by IBM, but lack both software and "off-the-shelf" hardware to interface with the 360. Cognitronics cannot provide the required software but will supply the 360 hardware interface at additional cost. The Cognitronics audio response units can be accessed by a virtually unlimited number of input lines.

IBM. The cost of the IBM 7770 Model 3 Audio Response Unit is $57,600, and the monthly rental including maintenance is $1238.50. This price includes provisions for four lines and a 32-word vocabulary prerecorded on a magnetic

drum. The prerecorded cylinder can be exchanged by the user, but changes or additions to the vocabulary recorded on the cylinder can only be made at the factory. The maximum number of words that can be recorded on the cylinder is 128. The 7770 can be interfaced to the 360 multiplexor channel; no adapter is required. The maximum number of input lines is limited to 48.

The cost of the 7772 Audio Response Unit, including control for two communications lines, is $30,000, and the monthly rental including maintenance is $652. The 7772 requires a random access storage unit to store the digital information which is used to activate a system generating the audio output. The 7772 can use either 2311 disc storage drive or some other type of random access storage.

The monthly rental including maintenance of a 2311 Model 1 is $596. The 2311 is interfaced to a 360 selector channel using a 2841 Model 1 storage control unit which leases for $645 per month including maintenance. Consequently, the total monthly cost of the 7772, assuming no previous storage space for the vocabulary is available, amounts to $1893 and the total purchase price is $91,940. This compares with $57,600 for the 7770.

This comparison is, however, unfair since most computer systems generally include some type of random access storage. The 360 interface of the 7772 is similar to that of the 7770.

The 7772 is presently the only available voice response unit with virtually an unlimited vocabulary. The main constraint of the 7772 lies in the fact that the maximum number of input lines is limited to eight.

RCA. The RCA 70/510-11 Voice Response Unit, leasing for $530 per month, consists of a Cognitronics Speechmaker Model 672 with provisions to handle a maximum of 10 lines and a vocabulary of 31 words or phrases. The 70/510-11 includes hardware to interface with the RCA Spectra 70 through a 70/668 communication controller-multichannel. The 70/510 is presently not supported by standard software. All RCA systems employing the voice response unit will have to be programmed by the user. The RCA 70/510-21 and 70/510-26 correspond to the Cognitronics Models 674 and 678 respectively.

Technitrend. The VM-1400 Voice Response Multiplex System consists of a remote frequency division multiplexor and a voice response unit based on the Cognitronics Speechmaker series accessed over the direct dial telephone network using 401 or 403 series data sets. The remote multiplexor terminal is connected to a central computer facility over a single voice-grade leased line which can handle up to 14 channels simultaneously. A system block diagram is shown in Fig. 2.

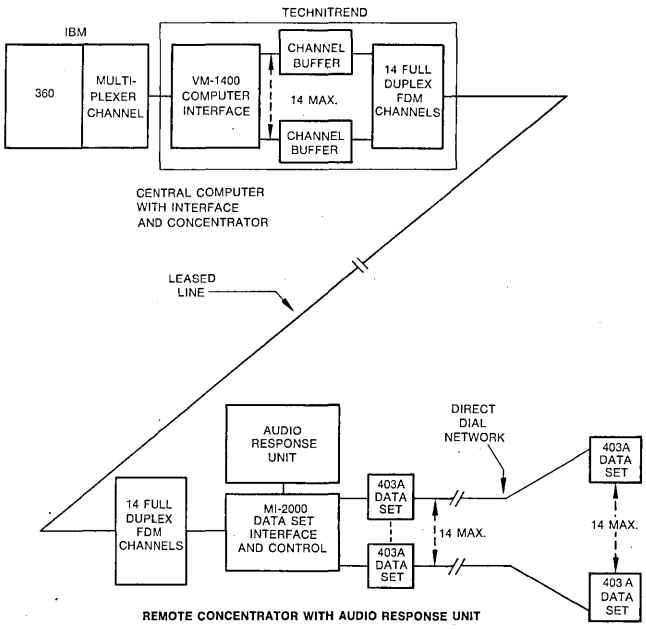

Fig. 2 Major assemblies of Technitrend VM-1400.

The cost of a "local" 31-word, 4-line VM-1400 voice response unit is $29,549, plus factory recording at $5.50 per

Fig. 1 Audio response units.

Manufacturer	Model	Number of Words	Number of Input Lines	COST ($) Purchase	COST ($) Lease; Monthly, Incl. Maint.	Max. Number of Words	Max. Number of Input Lines	Interface to S/360	Software Included	Word Length in Seconds	Data Set	Type of Memory	INPUT Binary Select.	INPUT Switched Lines	Delivery (Months)
Cognitronics (Speechmaker Series)	630	10	1	975	—	10	1	No(1)	No	0.60	403A	Photographic Film Drum		√	2-3
	631	31	1	1,600	—	31	1	No(1)	No	0.60	403A	"		√	2-3
	632	31	1	1,700	—	31	1	No(1)	No	0.60	403A	"	√		2-3
	672	31	1	6,000	—	31	Unlimited	No(1)	No	1.60	403A	"	√		2-3
	674	63	1	7,500	—	63	Unlimited	No(1)	No	1.60	403A	"	√		2-3
	676	93	1	10,400	—	93	Unlimited	No(1)	No	1.60	403A	"	√		3
	678	189	1	15,600	—	189	Unlimited	No(1)	No	1.60	403A	"	√		3
IBM	7770/3	32	4	57,600	1,239	128	48	Yes	Yes	0.50	403A 401J3	Analog Magnetic Drum	√		3-12
	7772/3	1,000	2	30,000	652	Unlimited	8	Yes	Yes	—	403A 401J3	Digital Core, Disc or Drum	√		3-12
RCA	70/510-11	31	10	26,500	530	31	50	No(2)	No	0.50	403A	Photographic Film Drum	√		6-12
	70/510-21	63	10	31,800	n.a.	63	50	No(2)	No	0.50	403A	"	√		6-12
	70/510-26	189	10	n.a.	n.a.	189	50	No(2)	No	0.50	403A	"	√		6-12
Technitrend	VM-1400	31	4	29,548	—	255	14	Yes	Yes	0.60	403A 401J3	Photographic Film Drum	√		3-4

NOTE: 1. Speechmaker series of audio response units can be interfaced with computers made by Burroughs, CDC, NCR and RCA.
2. Interface only with RCA Spectra 70 series of computers.

track. This system is based on the Cognitronics Speechmaker Model 672 and includes 360 multiplexor channel hardware interface. The VM-1400 is compatible with BTAM software.

Although half the price of a comparable IBM unit, the VM-1400 is approximately three times as expensive as the Cognitronics Speechmaker Model 672. However, the cost of the latter device does not include 360 software or hardware interface.

areas of application

The audio response unit is most applicable where immediate usable replies to telephone inquiries are needed, such as systems using telephone or radio communications for immediate access to data stored in a central file.

An example of such a system, for a city or county government police force, is a voice answer-back system replacing the "hot sheet" in prowl cars. The audio response system would also provide the patrolling officer with information on burglaries, accident locations, hold ups, etc.

A voice answer-back system can efficiently handle telephone requests to a bank regarding information on various items such as personal loans, mortgages, trusts, checking accounts, hold orders, stop payments, etc. A similar type of system can also be used by a brokerage house to provide stock market quotations as well as customer account information useful to brokers and account executives.

A system based on the use of an audio response unit could provide the insurance agent at a remote location information regarding insurance policies, premiums, expiration dates, etc.

Another example of an application can be found in the retail business, providing information for inventory or credit checks, or a manufacturing facility with up-to-date information on parts, materials and assemblies. A wholesale distributor could also have immediate access to order, shipping and parts inventory status as well as dealer sales reports.

Hotel chains or travel agents could offer their customers audio response information regarding availability of rooms, types of rooms, charges, etc. Aircraft control based on voice response to pilot inquiries on facilities, weather, etc., is another possible application. Any organization whose functions are decentralized but which desires centralized information may have a potential use for an audio response system.

conclusions

The use of an audio response unit is more suitable than the use of a crt display, a Teletype or some other type of printer in areas where short and simple replies to remote inquiries are required and where no need exists for computer interaction or hard-copy output. The use of voice answer-back for information retrieval is obviously more practical than the use of a crt display or a Teletype on a police motorcycle, in a patrol car, or on board a plane. The selection of a particular type of audio device must be based on the area of application, depending on whether the requirement is for a large vocabulary and a limited number of input lines or vice versa. An equally important factor is the type of central processor to be used. ■

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STANDARDS FOR EVALUATING DATA PROCESSING MANAGEMENT

by Milton C. Spett

Many companies today are disillusioned with data processing. New projects begin with high hopes, but take twice as long as originally estimated, and then deliver only half of what was expected. Data processing costs increase rapidly while the quality of systems remains poor. Turnover of systems analysts and programmers reaches 40% a year. There are repeated failures to meet time, cost and performance criteria.

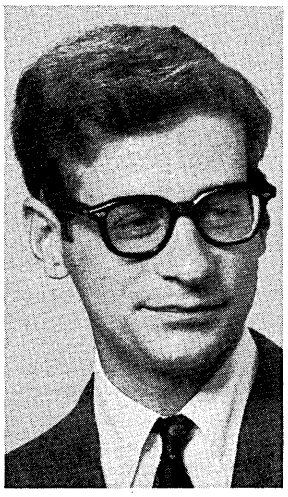
Often data processing management is replaced, and a ray of hope flickers as the new management repeats the promises of the old. But the ray of hope is slowly extinguished as the performance of the new management also duplicates that of the old.

In its effort to improve the data processing function, management introduces the traditionally sound management practices. A complex project control system is implemented utilizing work plans, project reports, and perhaps even PERT charts. Salaries of data processing people are increased. Training programs are instituted. The latest computing equipment is installed. But the failures continue, as if management had done nothing for its data processing people.

In many companies top management grows weary of trying to manage data processing and turns its attention to other matters. This is understandable since every manager and every management technique seem to have failed.

But the basic problem behind all of these failures is that today's management grew up and formed their organizational concepts in the pre-computer age. They therefore limit the range of possible management techniques to those practices which evolved and were successful in the pre-computer age.

But third-generation data processing departments require people of uniformly high intelligence, imagination and technical knowledge. In the past such people typically entered the business world through the engineering department. And while engineers can do their work in relative isolation, systems analysts and programmers must enter into the mainstream of organizational life if they are to be effective. This has become more and more true as each



Mr. Spett is manager of data processing for the Industrial Gas Div. of the Air Reduction Co. He was previously with The Columbia Broadcasting System and the Equitable Life Insurance Co., where he did both programming and systems work. He is a graduate of the Wharton School at the University of Pennsylvania.

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generation of computer hardware sharply increases the potential and the challenge of data processing. The first generation of programmers worked on accounting applications; the second hopefully developed management information systems; and the third generation should be working in the basic operating decision areas of the company.

In order to meet the challenge of third-generation computers, third-generation systems analysts and programmers must have the intellectual qualifications of engineers *and* the diplomacy and pragmatism of modern business executives. Because people with these somewhat contradictory capabilities did not exist in the business organizations of the past, the management techniques of the past consistently fail when they are applied to third-generation data processing. To compound the problem, those techniques which are successful in modern data processing management are often the antithesis of the sound management practices of the past. For this reason they are offensive to executives who learned their trade in the business organizations of the past.

And so top management continues to evaluate data processing management in terms of the techniques of the past. This not only encourages each data processing executive to repeat the mistakes of his predecessors, but also prevents the potentially successful data processing manager from ever achieving that position.

The remainder of this article will examine the successful practices of the past and propose the successful practices of the future.

turnover and productivity

Most executives judge the data processing manager as highly productive if he can meet the following three criteria:

1. Quick execution of requests for changes to existing systems. The changes can be anything from an additional report to a new heading on an old report. Although they may be simple to implement, these projects make an excellent impression on management.

2. The completion of conversion projects. This can be the mechanization of a manual system, the programming of an eam system or the reprogramming of a second-generation system for third-generation equipment. In each case, however, an existing procedure is transferred to a new piece of equipment with little change in the method of processing.

3. The completion of all systems projects within the time allotted in the work plan.

If a systems manager pushes his people hard to satisfy these three criteria he will have a high turnover rate. This will be attributed to the demands he makes upon them and the high turnover will be accepted as a necessary concommitant of high productivity.

As the years go by, top management begins to notice that data processing costs are rising sharply while the quality of systems remains poor. The dp manager is judged a failure. What has happened? *The three criteria that the data processing manager tried so hard to meet were actually criteria for low productivity rather than high productivity.*

Let us take a closer look at those three criteria:

1. Most requests for programming maintenance are poorly thought out and of dubious value. For example, a manager would like to see some additional information and so he makes a request for an additional report. He may look at the first report but he soon becomes too busy to read it or he is transferred and his successor has no interest in it. The report is nevertheless prepared every month.

Meanwhile, there were many highly important projects which were overlooked because no one requested them or because the programmers were tied up with so-called "improvements" to existing systems.

The solution to this problem is careful analysis of all requests to determine their worth before they are undertaken. The dp manager must resist the temptation to make a quick impression by executing all maintenance requests. After a few years, the data processing systems will be basically unimproved.

2. Each conversion project puts an existing system on a more expensive piece of equipment. Since the systems are basically unchanged, each conversion project produces a new system that is more expensive to run but produces nothing additional.

It is said that more sophisticated equipment is more expensive, but its additional capabilities make it cheaper per unit of throughput. This is true, but if a third-generation computer is being used as if it were a second-generation machine, its additional capabilities are not being used, and less sophisticated equipment would be cheaper per unit of throughput.

3. When there is a rush to meet target dates, short cuts are taken to complete the system on time, while making it a much less efficient system. In many cases, additional computer programs are added on to existing systems, an expedient that is always quicker than designing a completely new system. Thus the systems grow and grow until they are patchwork monsters that are expensive to run and of little value.

But if productivity is actually low, what about the assumption that high turnover is the result of high productivity? The fact is that high turnover is the result not of high productivity but rather of low productivity.

Today's best systems analysts and programmers seek accomplishment as their primary goal. They have neither the desire nor the need to remain at a company where they are not allowed to produce. Strict adherence to the three rules for low productivity will therefore lead directly to high turnover.

evaluation by majority vote

In evaluating dp management, top management will often seek or be influenced by the opinions of executives who come in contact with the data processing department. The reasoning is that if most managers are unhappy with data processing the dp manager must be incompetent.

This is not necessarily true because most executives judge data processing by the three rules for low productivity. The successful dp manager must ignore these three rules and thus alienate some important executives in the short run. It may be several years before it is apparent that excellent work has been produced and, without the support of top management, the successful dp manager may be fired or downgraded before his efforts have a chance to bear fruit.

For these reasons, the excellent dp manager will lose any majority vote on his effectiveness. His only hope lies with a top management that is more knowledgeable than the average executive.

tranquillity at any price

Data processing managers who cannot attract or keep outstanding people sometimes resort to hiring people who are of average intelligence and will follow orders without objection.

The reasoning is that these people will be highly motivated, loyal to the company and satisfied with doing whatever they are told to do. The hiring of highly intelligent

college graduates, on the other hand, is just asking for wise guys, personnel problems and high turnover.

These points are true, except that they ignore the fact that staffing data processing departments with mediocre people assures mediocre work. And the data processing field is so complex and difficult that mediocrity means failure. But if a company intends to observe the three rules for low productivity, it is best that they hire mediocre personnel and muddle through. Too many companies hire fine systems and programming people and then apply the three rules for low productivity. The result is high turnover and chaos. Mediocrity is more desirable than this.

But as data processing becomes more and more central to the success of a business, the companies that emerge as leaders in their fields will be the ones with superior data processing staffs.

Top management must take care to differentiate between the effective data processing department and the tranquil data processing department. Both will have the same external appearance and it may be years before the tranquil, mediocre department is found out.

politics and productivity

In every large business organization, everyone is constantly forming and re-forming opinions of everyone else. These opinions are determined in part by the actual productivity of the person being evaluated, and in part by factors that are totally irrelevant to the individual's contributions to the organization. This area of evaluation divorced from productivity may be referred to as politics.

Now, it is necessary for all programmers and analysts, and particularly for the data processing manager, to be well thought of so that others will have confidence in them. In order to enlist the confidence of management, therefore, the data processing manager may sometimes present an image of his department that differs from the actual data processing operation. Once he thus enlists the confidence of management he will be able to accomplish real goals and will be successful.

In this example, politics is used as a tool in order to increase productivity. For some data processing people, however, politics is the real goal and productivity is considered worthless except as a political tool. People can be divided into those whose primary goal is to accomplish and those whose primary goal is to be well thought of.

The systems analyst or manager whose primary goal is to be well thought of will never be able to make a real contribution because he will not be aggressive and creative at the same time. His aggressiveness will be directed toward meeting target dates; his creativity will be expressed gingerly and with the primary goal of determining the listener's reaction to his ideas. For fear of making enemies, he will never aggressively push for implementation of his creative ideas. The main function of the systems analyst—innovation—is thus rendered impossible.

While the productive systems analysts and programmers will always make a few enemies, the political ones will devote most of their effort to making no enemies at all.

The crucial question for the data processing department is: Which type of systems analyst is hired and promoted? If the political analysts are being promoted and the productive analysts are leaving, the department may be making a good impression but it is not producing and will eventually be found out.

If top management evaluates its data processing operation quickly and superficially, it is asking for a politically oriented department. Only when a careful, in-depth analy-

sis is made will top management be able to distinguish between politics and productivity in data processing.

Job "enlargement" (and get ready for job "enrichment") is very big this year. In data processing this is used as a justification for combining systems analysis and computer programming into one job, sometimes called the "programmer-analyst." A related issue is the "promotion" of the best senior programmers into systems. The result of this move is often losing a good programmer and gaining a bad analyst.

The fact is that programming is so difficult and so complex today (especially on the 360) that it is a full-time job. Similarly, the systems analyst must devote a tremendous amount of time to learning the business of his company and developing relationships with operating personnel. This is also a full-time job. Combining programming and systems analysis into one job creates a monster that is too much for one person.

Furthermore, the qualities needed for the two jobs rarely occur in the same person. The analyst must observe the social amenities, cultivate the right friendships and withstand the many frustrations of organizational life. Most fine programmers prize their independence and technical ability too much to be interested in or qualified for the work of systems analysis.

The successful data processing organizations are usually the ones that separate the systems and programming functions. In these organizations the programmers will be the technical specialists and the systems analysts will go to them with their technical problems. In more primitive organizations the systems analysts will really be senior programmers and the programmers will go to the analysts for solutions to their technical problems. This distinction is a good simple test to determine if a company's systems analysts have become experts in the mainstream of company business or are merely computer technicians.

the service bureau fallacy

In most companies the systems department is looked upon as a service department. Projects are requested by other departments and systems requirements are determined by other departments. This is an untenable situation which must be corrected by giving equal responsibility to the systems department:

1. *Project selection.* Most departments are so concerned with their day-to-day problems that they are not able to take the long, careful look that is necessary to determine the underlying causes of these problems. Most departments will therefore request systems that solve short-range and superficial problems.

With few day-to-day pressures, the systems department can direct most of its energy toward the basic, significant problems of the organization.

2. *Determining systems requirements.* Because most departments are primarily concerned with their day-to-day operations, they will state their requirements for a new system without thinking them through carefully. Each time they give a little more thought to the system being developed they will change their "requirements." In this manner a system under development can change direction several times, with each change delaying the project and destroying the enthusiasm of the data processing people.

The systems department, however, has as its only concern the installation of a superior system. If they are given this responsibility they will carefully evaluate all details so that the right decisions are made the first time. In this manner the time-consuming changes in direction will be minimized.

This does not mean that projects will be undertaken and systems requirements will be determined without the approval of the using department. It does mean that no system will be undertaken and no requirements will be determined without the approval of the systems department.

But in order to properly execute this responsibility, the systems analysts must be brought into the mainstream of company business. They must be treated not as computer technicians, but rather as experts in finance, marketing, distribution, and production.

Thus they will become the members of the company who are knowledgeable in both business and systems technology. They will understand both the value of systems changes and the costs of implementing them. Since project selection and determining systems requirements are the two most important areas in data processing, it is imperative that the systems analysts be trained to identify and execute those projects that will produce the greatest benefit for the least investment.

If the data processing department is treated as a service bureau, the analysts and programmers will mechanically execute their projects. In order to fill the void that is thereby created they will become interested in problems that are technically interesting but provide little benefit to the company. This is why software has become such a romantic field while applications, which put money in the corporate pocket, are second-class citizens.

Surprisingly, systems analysts and programmers will experience far greater satisfaction from producing work that is of real benefit to the company than they will from useless displays of technical virtuosity. If they are allowed to accomplish real work they will develop the loyalty that everyone claims is nonexistent in data processing people. Again, both they and the company will benefit.

Top management must not allow the dp manager to set himself up as a service bureau and shift the responsibility for systems decisions to the other departments which are less qualified to effect systems innovation. Instead, top management must hold the dp manager accountable for all systems work. With this responsibility clearly defined, the systems department can aggressively develop those new systems which will produce the greatest benefit for the company.

decentralization of decision-making

In data processing, as in more and more fields, so many skills are needed, so much knowledge is essential and so much complex analysis is necessary that no one man can hope to be the brains of a department with his subordinates as arms and legs. The head man cannot make all the major decisions himself; he must consult with a variety of technical and business specialists.

John F. Kennedy understood this. When he called a meeting to discuss an important decision he would cut across organizational lines to invite anyone who might contribute an interesting idea, especially if that idea was likely to differ from the majority opinion. If such a man was at the same meeting as his superior and expressed different views, that was exactly what Kennedy was looking for. And Kennedy rarely expressed his own views. He felt that this would stifle opposing opinions which might have merit.

By the same method, the dp manager must encourage all ideas to flow freely up to him if he is to meet the difficult and diverse needs of his department.

But decentralization of decision-making serves an additional purpose. Any creative, aggressive systems analyst or programmer wants to be involved in the major decisions being made in his department.

If he is involved, he will become an integral part of the department and, even if his ideas do not prevail, he will be satisfied that he has had a fair hearing. Both he and the department will benefit. If, on the other hand, he is out of the mainstream of departmental decision-making, he will have the "I just work here" attitude and he will take the first good offer that comes along.

Top management must beware of the dp manager who constantly refers to his department as "I". The manager who firmly states, "I will do this" and "I will take care of that" often projects a superficial image of confidence and competence.

This constant use of the first person singular, however, demonstrates a dp manager's lack of regard for his analysts and programmers. Such a man will not seek the ideas of his best people and will soon lose them.

The manager who refers to his department as "we" understands his own fallibility, has enough self-confidence to admit it, and will gain the respect and co-operation of his department. And because he has access to all the ideas generated within his department, his decisions will be far superior to those of the domineering manager.

push the button

There is a tendency for some non-data-processing people to think of the computer as a marvelous machine that can do almost anything but sometimes makes stupid mistakes. The fact is that a computer can do nothing right and can do nothing wrong. It is the people who develop the marvelous systems and it is the people who create the gigantic disasters that the computer only makes possible.

But due to the incredible complexity of third-generation hardware and software, any data processing project is an enormously difficult undertaking that requires systems, programming, and managerial talent of exceptional quality. Just because an idea for a computer system sounds good, does not mean that the talent is in fact available to implement it. Similarly, just because a system is bad does not mean that it will be improved by redesigning it; the new system could be as bad or even worse. The new system will be better only if it is designed by data processing people who understand why the original system was poorly designed and have the courage to design the new system properly.

The romantic illusion that computers can do everything is revealed in the phrase "push the button." Executives who are unwilling to face and conquer the enormous difficulty of implementing third-generation systems say that if we develop this new system all we will have to do is push the button and the marvelous computer will spew out beautiful information.

When data processing management proposes any new system—sophisticated or traditional—top management must press for a complete explanation of *how* the idea will be implemented when so many data processing projects fail to meet time, cost and performance criteria. If dp management tries to confuse the issue with PERT charts, top management must cut through this deception to ask hard questions about the talent available to handle the project.

Unfortunately, many top executives are impressed by simplistic presentations which imply that a data processing project will be implemented with no trouble at all. But the dp manager who self-assuredly states that all he need do is

push the button should generate skepticism rather than confidence from top management.

horses

There is a tendency for top management to think of systems analysts and programmers as a vague mass of homogenous workers. This tendency is a dangerous oversimplification that is symbolized by the frequent reference to analysts as "horses" that will be "thrown" onto a project. Work plans show that ten analysts will work six months on phase X of project Y.

The fact is that many different skills are needed for systems analysis and programming and each individual has a unique combination of these skills. The assignment of various responsibilities to various analysts and programmers must be done very carefully. It is the quality, not the quantity, of analysts that causes a project to succeed or fail. It is thus meaningless to speak of numbers of analysts and numbers of months on projects.

the use of target dates

Many systems departments assign a target date for the completion of each project. If that target date is met, the analyst and the manager are considered successful. If the project is completed six months after the target date, people will say the project was six months late. This is fallacious reasoning; it is more likely that the target date was six months early. The only time a project can be truly said to be late is when the analysts have wasted time through lack of initiative or through poor planning.

If a new product is being introduced on a particular date, systems must be ready to handle the product, and the deadline will motivate the programmers and analysts assigned to the project. On most projects, however, no real deadline exists, and if the analysts and programmers rush to complete the project "on time" it is likely that they will produce a system that is no better than the old system.

Of course, time estimates are necessary for coordinating people and projects, but these should not be considered target dates against which performance will be measured.

The only means of controlling and evaluating the work of analysts and programmers is to continuously sit down with them and openly discuss their projects. By this means, work in the wrong direction or lack of progress will become apparent to the perceptive supervisor.

Many managers institute elaborate reporting systems because they have no faith in their own subjective judgments. Elaborate reporting systems can never control projects, however; only people can, and if a manager cannot rely on his own judgment, he certainly cannot rely on a bar graph. Top management must resist the temptation to accept charts and statistics as evidence of progress.

the crisis-of-the-month club

Each month some very important executive discovers a data processing problem and complains about it vociferously. He says: "I don't care if every other project is dropped, this problem must be corrected." The problem is usually very minor but in most cases the data processing manager will put several of his best people on the project with the promise "as soon as this is solved, we'll get back to the other projects." In the rare cases where the problem actually is solved, no benefit accrues to the company. In most cases, however, the month is up before the crisis is solved and the new crisis of the month is declared. Everyone then loses interest in the previous project and dives into the new one.

There is a tendency for management, especially top management, to pass around the crying towel and complain about the failures of "the computer people." But failure begins at the top and what little time top management devotes to data processing is usually devoted to trivialities. The second most popular triviality is "Which computer do we need?" Management is, of course, in no position to determine which type of equipment is necessary. If top management cannot trust its data processing management to choose the right equipment, it had better get new people whom it can trust. And computer hardware accounts for only a small fraction of total data processing costs.

But the number one management topic in multidivisional corporations is: "Should we have one large data processing department or many small data processing departments?" There are few questions in all data processing that are less important.

There are as many arguments for centralization as there are for decentralization, and all of them are equally extraneous. It is the quality of the people that counts, not whom they report to. Nevertheless, when data processing is in trouble, the most popular solution is to redraw the organization chart. Three years later it becomes apparent that things are just as bad as they ever were and there is a new reorganization.

The fact is that unqualified data processing management can produce failure in a centralized organization or a decentralized organization with equal facility.

In any organization there exists this human temptation to dwell upon concrete problems such as computers and organization charts while ignoring the more important concepts because they are abstract. In the field of data processing, top management should be addressing itself to the following 11 critical questions:

1. Is our data processing turnover below 20%, particularly among our best systems and programming people?
2. Are we applying modern systems techniques and computer technology to the mainstream of company business where it will do the most good?
3. Is our systems and programming work oriented toward long-range company goals or is it intended to make a quick but superficial impression on the right people?
4. Do we have many outstanding managers, technicians and analysts in our data processing department?
5. Are we giving our analysts and programmers enough time to complete their projects successfully?
6. Are our systems analysts primarily oriented toward politics or productivity?
7. Do our systems analysts understand the nature and needs of our business or are they computer technicians?
8. Does our data processing department actively and aggressively pursue better systems or does it merely implement the requests of other departments?
9. Is there upward and downward communication in our data processing department or is it a one-man show?
10. Are all possible projects carefully analyzed before determining which ones will produce the greatest benefit for the least investment?
11. Does data processing management know the strengths and weaknesses of each programmer and analyst, and carefully match people with projects or do they hide behind statistics and bar graphs?

If top management is truly concerned about data processing, and willing to devote the time and effort to ask these basic questions, they are sure to get a creative, productive data processing department. ■

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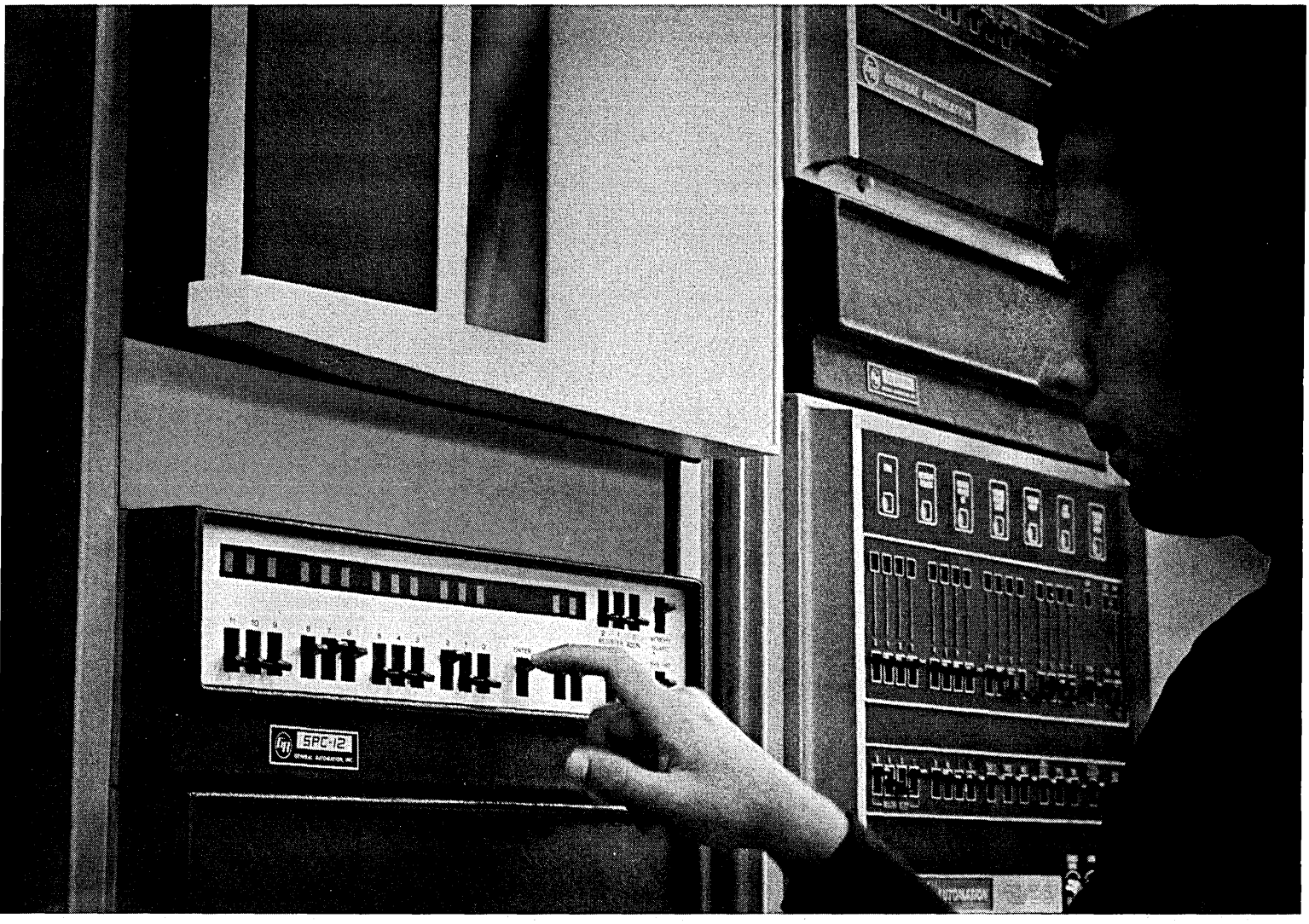

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THE ANNUAL ASIS MEETING

"Hair" was playing at the Geary Theater in San Francisco, but from the first to the fourth of October there was heavy competition at the Hilton, where bearded information scientists and mod girls congregated for the annual meeting of the American Society for Information Science. "The *thirty-second* annual meeting?" "Well, it's really only the second annual meeting of ASIS—the name was changed on January 1, 1968."

The predecessor of ASIS, of course, was the American Documentation Institute; its journal continues the name in its title, *American Documentation*. The ADI had a successful 30-year history, which began with Watson Davis, science reporter for the Washington *Times-Herald* and later editor of *Science News Letter*. As early as 1936, Davis proposed that journal publication of scientific papers be abandoned in favor of a scheme he designated as the Auxiliary Publication Service. Scientific papers would be refereed in the usual way, submitted by editors, and then be made available in either full form or by microfilm on demand. Davis may also have been the first to suggest source indexing—solicitation of the author's and editor's suggestions for subjects, names, and other terms to be used by classifiers and indexers. For the first seven years, after ADI's founding in 1938, Davis served as president. In the early fifties, Luther H. Evans, Librarian of Congress, and Ralph R. Shaw, Librarian of the Department of Agriculture Library, were prominent in ADI affairs. In cooperation with the National Academy of Sciences/National Research Council and the National Science Foundation, ADI sponsored the International Conference on Scientific Information.

Following a successful proposal for support from the NSF, the ADI meeting in 1961 featured a state-of-the-art symposium. This meeting set a precedent in format which is still being used—including tutorial sessions, specialist seminars, and author forums. For the Silver Anniversary meeting of ADI, Watson Davis returned to deliver the keynote address, "Documentation Unfinished."

The theme of this 32nd Annual Meeting was "Cooperating Information Societies," and the general session looked promising. The first half was devoted to the SATCOM (Scientific and Technical Communication) Final Report. John W. Tukey, a member of the SATCOM committee of the National Academy of Sciences and the National Academy of Engineering, merely read the final recommendations, although the printed document had been available for some weeks. A commentary, even if only to stress the most important aspects of the report, would have been invaluable. A critical examination of the report could hardly have been expected from a member of the committee, however, and perhaps this is the reason for a second session which was scheduled for later in the week. Unfortunately, Professor Tukey was unable to attend the discussion meeting.

The second part of the general session was devoted to a demonstration, with Douglas Engelbart in the meeting room beside a huge screen, and his colleagues in Menlo Park at the Stanford Research Institute. At his crt terminal, with some added controls, Dr. Engelbart described how he could interact with the various other researchers and their files of information back at SRI. By means of a large computer, several tv cameras, the crt units, and microwave relays, the audience could see (sometimes simultaneously) Dr. Engelbart, a researcher in Menlo Park, and the data they were manipulating from the computer storage. Sophisticated media techniques were used to show dramatically (in between fuse overloads) how the team in the "Augmented Human Intellect Research Center" could call up data, revise it, edit or add to it, and return it to storage. Augmenting human intellect can be taken to mean various things, but if one is looking for increased insight, imagination, or originality, it was hard to see how the demonstrated system was going to help much.

In addition to the tutorial sessions and author forums, 10 special interest groups sponsored a variety of meetings. During registration, each person received a hardbound, 532-page book containing almost all of the papers to be presented during the conference. Theoretically, one could read the papers (at poolside?) prior to attending the meetings, and be loaded with questions. Unfortunately, not all participants took advantage of this opportunity and most speakers, too, assumed that no one had read the papers in advance.

Featured at this meeting was the "On-Line Arena," where a dozen presentations were rotated during the two full days of the conference. Terminal equipment was linked to computers across the country to demonstrate various system capabilities. For this meeting, also, a special effort was made to have programs sponsored by other societies, such as ACM, EDUCOM, FID, UNESCO, National Federation of Science Abstracting and Indexing Services, and the Special Libraries Association.

The technical sessions ranged from a nuts-and-bolts paper on "Preparation of 'CODEN for Periodical Titles' for Computer Printing in Upper- and

Lower-case Letters," to a highly abstract but valuable paper by F. W. Lancaster on "Costs, Performance and Benefits of Information Systems."

A report on the intriguing FAMULUS system, developed by Theodor B. Yerke and Hilary D. Burton, excited a good deal of interest. This is a series of computer programs written to allow each researcher to do his own indexing. At the top of each document, the researcher notes the terms which will recall the information in that paper to his mind. For example, he might only be interested in the methodology of a given study, not its results. At any time, the researcher can ask for a printout of all the terms he has been using and revise or systematize them. The computer then re-indexes all his documents accordingly. In contrast with the common approach to indexing, which is necessarily designed for use by numbers of people with varying needs, the FAMULUS system "provides it user with an information transfer environment dominated by his own viewpoint. He is the favored observer of his information universe." In other words, he can't complain about his own lingo.

Another worthwhile session was devoted to the RECON (retrospective conversion) project at the Library of Congress. This is a proposal to put into MARC format about 5000 selected titles from the 85,000 books with 1968 and 1969 imprints which are not now in machine-readable form. Henriette Avram gave the report, and the two critics on the panel either went off on tangents or gave the project their blessing. It reminded one of Oscar Wilde's remark about washing one's clean linen in public.

About 1000 of the almost 1,400 registrants were on hand for the Friday night awards banquet. Hubert H. Humphrey told the group that "information is a national resource." Further, he said, "agreement should be reached so the language translation abilities, the codifying skills, and the processing capacity of the Soviet Union, Eastern Europe, and even mainland China could be drawn upon by the world scientific community in the common interest of human progress."

Those who liked the old name ADI refer to the A.S.I.S. either by "AS IS" or "ASIS." Nevertheless, it's about the only forum where leaders in the fields of datamation and librarianship can address themselves to their common problems. Symbiosis may, in time, become mutualism.

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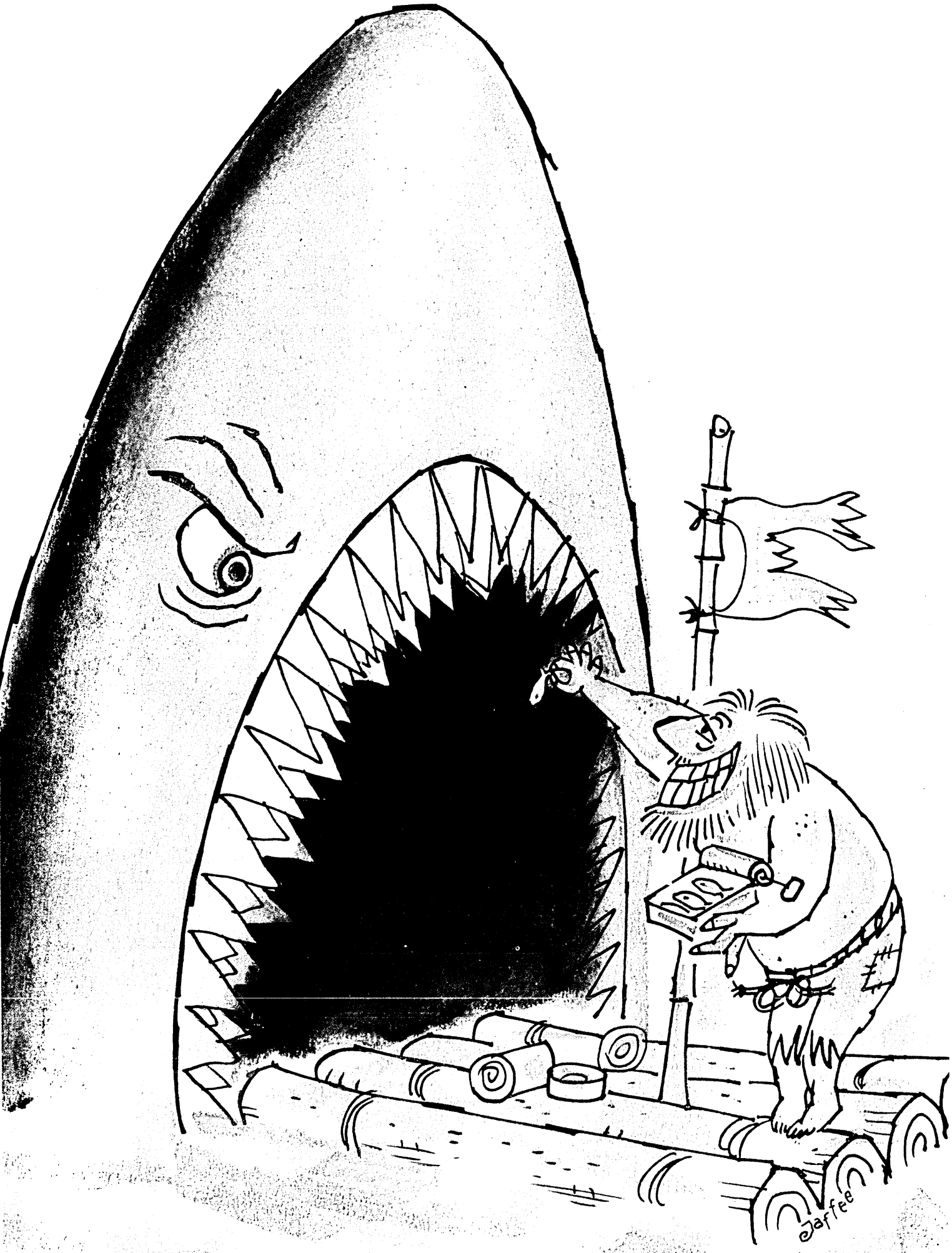
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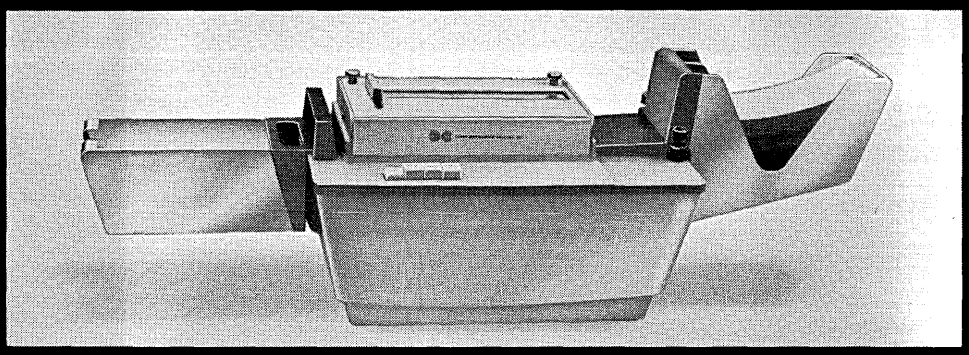

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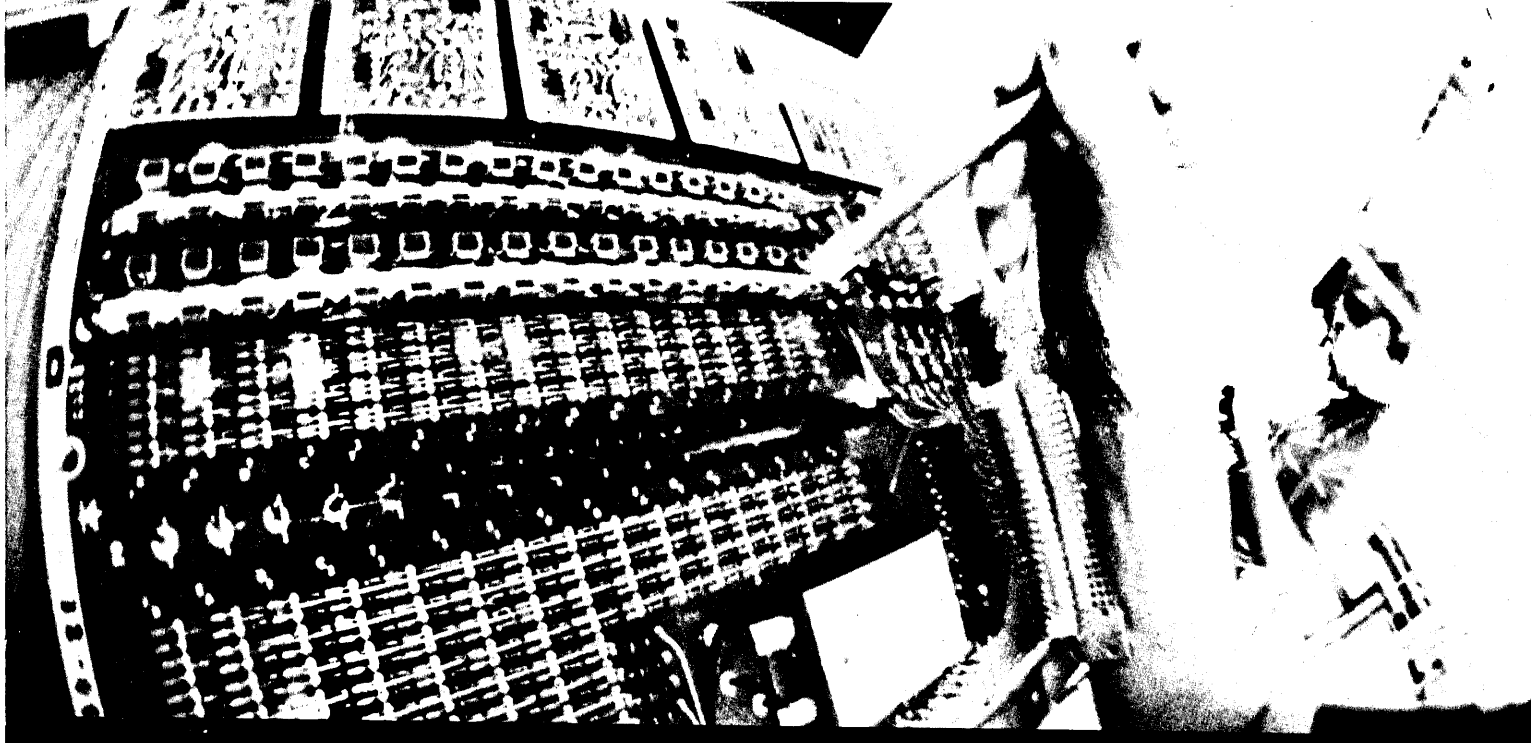

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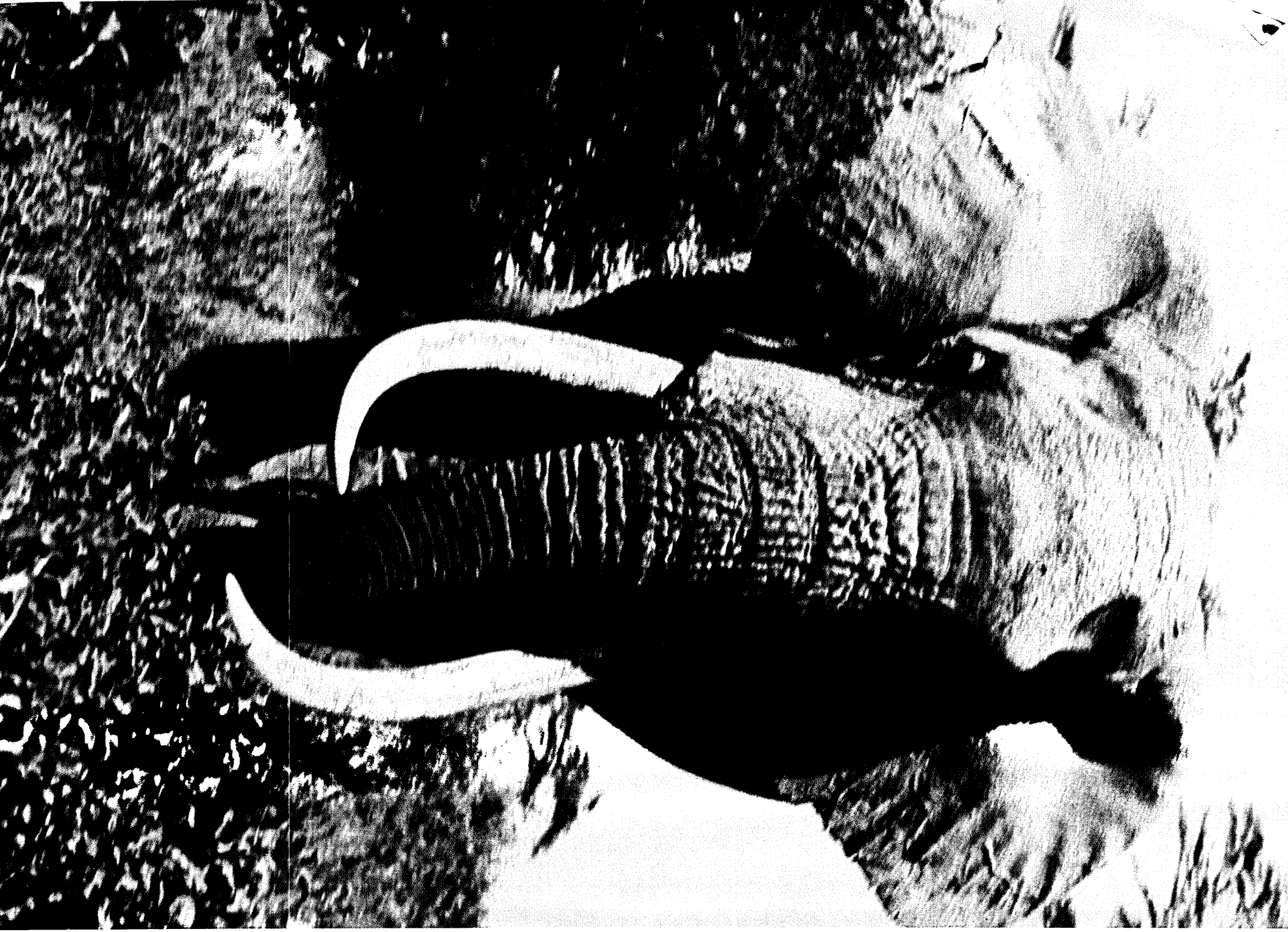

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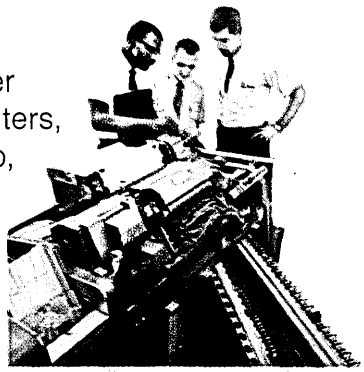
Then there are things like computer editing and back-up. Not exactly the stuff of tomorrow's headlines, but not to be ignored either. Especially when the auditors are hanging around.



In the salons of technology they twitter about the new computers, and sometimes we do, too. But all those workaday calculating tasks keep piling up, problems in search of an economical solution. That's why all those punched card machines are still around. Along with all those well trained men to care for them. You need good men in a vanishing business.

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news scene

an interpretive review of recent important developments in information processing

UCC ENTERS RING AGAINST BELL WITH NATIONWIDE DATA NETWORK PLAN

University Computing Co. unveiled its long-awaited plans for a nationwide data transmission network last month. Users were promised rates substantially below those presently charged by Ma Bell for analagous services; a number of other goodies were also offered. The net result will be a quantum jump in the cost-effectiveness of data communications — if FCC gives its blessing. That development probably will involve quite a fight between UCC and Ma Bell. However, the old lady just might surprise everyone by not fighting very hard.

On the average, rates charged for the new service will be 50% below Ma Bell's, says a spokesman for Data Transmission Company (Datran), the recently-formed UCC subsidiary that will build and operate the network. Most users of existing switched data services — e.g. TWX, Dataphone, Series 50 and broadband — would save around 200% in most cases, and in certain cases, the reductions would be considerably more. Datran's projected charges for 150 baud private line service are roughly 500% below Bell's present tariffs. For 4800 bps service, the saving is around 300%, and for Telpak it is as much as 400%, depending on channel width and distance.

Datran's rate philosophy may be even more significant, in the long run, than the specific tariffs. The company will charge primarily for line holding time and bandwidth. Users within a given radius of each other will pay a "local rate," while those outside this area will pay a "regional rate." It hasn't yet been decided whether there will be one or two regional rates, but in either case, the Datran tariff would be far simpler than Bell's lengthy list of rate/mile charges, and would produce proportionately greater savings as transmission distance increased.

It is more than likely that if the Datran network is authorized, Bell — in order to compete — will have to offer data communication services on a similar basis. Presumably, the telephone company would have to consider reducing its charges as well.

data traffic

Basically, Datran is proposing an initial system of microwave and cables serving 35 metropolitan areas throughout the country. Data would be the primary traffic, but voice messages could also be accommodated. The individual links in the system are designed to carry from 4K to 16K data channels, each 4.8 kilobits wide.

Charges will be based on a six-second minimum holding time, versus Bell's three-minute minimum. Electronic switching will complete each connection in less than three secs. Bell's switching system requires 20 secs.

Datran also promises a far greater variety of data speeds than Bell offers. Data can move over both switched and leased lines at 150, 4800, 9600, and 14.4K bps, and leased line customers could also get 40.8K bps service. Asymmetrical combinations of these speeds would be available; users could share a single channel, as well as a group of channels, and a maximum error rate of 1 in 10^6 bits would be guaranteed. Users would have extremely wide latitude in connecting foreign attachments to the system. Also, since the network would utilize a digital, rather than an analog signal, no modem equipment would be required for data terminals. All of these features represent improvements over existing Bell offerings.

The system would extend from San Francisco southward to Los Angeles, then eastward across the southern part of the country through San Antonio, Dallas, Birmingham, and Atlanta, then up the East Coast through Washington, New York, and Boston. Additional links would connect all the major cities within an area bounded roughly by Oklahoma City and Minneapolis, Memphis and Cleveland.

Ten switching centers are included in the initial system. These are comprised of Comcet computers and either Stromberg-Carlson or North Electric switchgear. Collins will supply the radio equipment. The microwave tower source hasn't been chosen yet. Up to 4K customers could be served through each switching center. The chance of encountering a busy signal would be 1 in 100.

locally looped

Possibly the most novel feature of the system is the local loop setup. This has long appeared to be a stumbling block facing any potential common carrier aiming to compete with Mother Bell. The problem, basically, is that most users are far from a potential carrier's nearest connection point, and so a way of bridging this distance is needed. The logical method is to obtain a line from AT&T (or one of the other established carriers). But the carriers have made it clear that they aren't anxious to interconnect their facilities with those of competitors. Existing AT&T switched and private line tariffs allow such interconnections, but only on the user's premises. In effect, this means that a Datran customer who wanted AT&T to supply a local line from his terminal to the nearest Datran tower would be unable to obtain connection at the latter point.

Datran plans to get around this obstacle by using an omnidirectional radio system. It will consist basically of a microwave antenna, in a central location within a metropolitan area, which communicates with one or more concentric antenna rings about 10 miles apart. Cables will cover the distance between the user and the nearest ring antenna, or a low-power, highly-directional microwave antenna will be mounted on the user's property. A miniaturized version of the latter device — consisting of an antenna "the size of a dinner plate and a circuitry module no bigger than a cigarette package" — is reportedly being

acquired by Datran from Resa Labs, Dallas.

The Datran system, as presently planned, will permit users to connect directly only with other users of the same system. Those who want to reach customers of Bell, GT&E, Western Union, or other established carriers will have to make their own arrangements for separate communications facilities with those companies. Datran officials expect this to be a more-or-less temporary expedient. "Once we're established, AT&T and the other members of the club will see the advantages of connecting their systems with ours," says an official.

it costs a bit

UCC estimated in a press release that the cost of the initial system will be $375 million. Once FCC grants a license, it will take about four years to build the network. The ultimate plan calls for service to 52 cities. There would be 52 switching centers, and the total plant would be worth $1 billion. UCC estimates that revenue from the initial system will be $178 million by 1978. Revenue projections for the ultimate system haven't been made.

The initial-system figures are based on a detailed market analysis that required the full-time services of 20 people for a year and a half, plus extensive use of an 1108 computer. Fifteen major industries were analyzed in each of the metropolitan markets Datran expects to serve. For each industry, a factor that correlated with its data volume was isolated (e.g., number of employees, annual sales, number of computers installed). By measuring this factor, the industry's data volume was estimated for each metropolitan area. Then, the individual volumes were combined and converted into a dollar total. Datran took 10% of this latter figure as its likely share of the market.

So far, UCC reportedly has poured $6 million into planning the Datran system. The bulk of the work was done by Microwave Transmission Corp., a subsidiary formed several months ago. MTC was absorbed by Datran when that company was organized.

An official was asked whether Datran would have to go public to raise capital for implementing its plans. The answer: "It isn't likely within the next year."

The bigger question, of course, is whether Datran can get a common carrier license. Among the favorable signs is FCC's recent approval of MCI's petition for a somewhat similar offering. MCI, however, will sell only leased, not switched service, and will employ analog rather than digital signals. Also, MCI is certificated at present to operate only between Chicago and St. Louis, although it has applied for authority to expand this system, and has announced plans to establish a nationwide network.

enigma variations

Another enigma is AT&T's attitude. UCC is clearly attempting to compete directly with Ma Bell for a small, but rapidly growing slice of the total communications load. On that basis, Ma Bell has a powerful incentive for putting every roadblock in the path of the Datran application.

However, AT&T is having troubles at the moment satisfying its telephone customers in a number of cities. According to some observers, Ma Bell isn't anxious to take on any more battles. This is regarded as one reason the telephone company recently stated publicly that it "believes the wisest public policy at this time would be to permit any organization or group interested in establishing a domestic satellite system to apply for a license." Conceivably, AT&T could adopt a similar posture regarding data communications.

But the telephone company certainly won't do this without raising at least some objections. The fact that Datran is a subsidiary of a company that operates dp service centers is one obvious objection. When AT&T brings it up the dp industry will be put in a somewhat ironic spot.

For years, industry spokesmen have been arguing that common carriers shouldn't be allowed to offer commercial dp service because of the probability that the former capability will give the carriers an unfair advantage in the latter market. Now, the shoe is on the other foot: a dp firm wants to offer communications services capable of cutting costs substantially for the whole data processing community. It will be interesting to see how service center operators react when common carrier spokesmen complain about unfair competition from UCC/Datran.

It is quite possible, however, that AT&T won't object to the UCC/Datran lashup provided that the service center and data communications activities are *both* regulated. That idea can't help but send every commercial service center operator to the nearest bar, for, not only would all on-line service centers then face the possibility of federal regulation, but also, AT&T, currently barred by a consent decree from engaging in such extracurricular activities, probably would be free to go into the service center business.

—PHIL HIRSCH

UNIVAC-SPONSORED CONFERENCE GIVES EDITORS THE WORD ON NEXT DECADE

Shawnee Inn, an oversized manse overlooking a golf course, a river, and scarlet/yellow-clad Delaware hills, is the house that Fred Waring built. Walking up the steps and past a sign stating "Porch closed at 10 p.m.," one can almost hear the glee club singing "Sleep, Sleep, Sleep."

Such was the site of a workshop on technology and change in the '70's conducted by Univac in October for a score of journalists from many kinds of publications.

Despite the somnolent setting, the 1½-day session was lively enough, thanks in large part to the presence of witty iconoclast Herb Grosch, who kicked off the meeting, then got in lots of other licks along the way.

He opened up with another plug for Grosch's Law and the economies of scale offered by supercomputers, which in 20-30 years might enable "several" such machines to take care of all of Manhattan's information processing needs. (For a similar kind of prediction in 1947, see Oct. '69. p. 136.)

And he threw in a private view of the privacy problem, which he thinks will fade because people don't really want privacy "all that much. Given the alternatives of privacy or easy credit, they'll opt for the latter."

On the negative side, Grosch sees continuing difficulties with applications and systems software: "We're in an awful mess, and it will continue to get worse." Why? Because the industry has hired "people who are unhappy with reality" (mathematicians, folks) who make poor interfaces between the administrative process and a million-dollar computer. They make lousy managers, too, said Dr. G. Another reason for software woes: software can't be manufactured; 99% of its cost lies in development. What's needed is a new level of human to interact with the computer. And he

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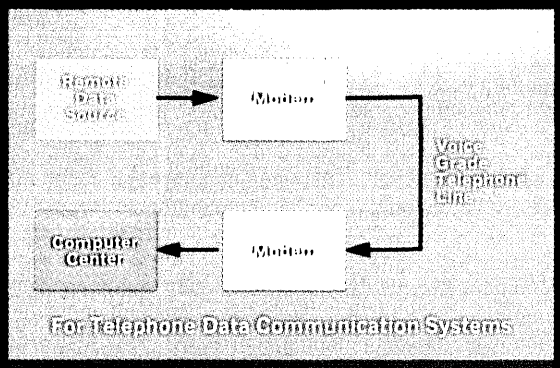

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CIRCLE 44 ON READER CARD

threw in a prediction that the computer industry will account for 30% of the GNP "a few years from now."

The solutions to our ills won't come from within the industry, and no help at all can be expected from the universities, which are "hopeless. No element of our society is as self-serving." There should be a federation of users, concluded the good doctor, but there is small probability this will happen.

manpower needs

Next on the program was John W. Merck, director of the management sciences department at RAND, talking about technical, professional and skilled manpower in the '70's. "We are moving into a more and more untenable position to provide technical manpower," Merck said. And he noted the implied limitations of training, which make it difficult to help people change jobs. We keep on creating new specialties, he claimed, while sticking to traditional (outmoded?) educational methods.

Although the labor force will increase 18% in the '70's, the demand for professional and technical workers will rise 40% by 1975, when service work will occupy 40% of the labor force. The computer industry's need for mathematicians (the ones Herb Grosch likes so much) and statisticians will double between 1970-75.

Having one of the most profound effects on our life style is the information explosion: in 1950 there were 700 scientific books published. In '60, it was 1100, and 2700 by '64. In some specialties, publications double every 8-8½ years. The consequences: people spend more time learning, or becoming more specialized.

sociological consequences

Anthony J. Weiner, chairman of the Research Management Council of the Hudson Institute, took on the ticklish topic of the sociological consequences of advancing technology. He pointed out that our (American) society is marked by what he calls manipulative rationality. We view things in terms of ends and means, view things functionally ... we intervene. A Polynesian, asked why he builds a boat, might say, "It's time for the boatbuilding ritual." An American would answer in terms of economic needs or demands, and construct the boat according to detailed studies of fish movements, markets, weather, efficiency, power requirements, etc. And he told a story of a systems analyst who began with his wife an extremely formal review of their marriage, only to have her leave the room in tears. His explanation of the failure to communicate: "I didn't conduct a preliminary feasibility study."

Perhaps the major change in our society, Weiner feels, is the increase in affluence. In the '30's, Lord Keynes predicted an annual GNP growth rate of 2-5%, leading to a solution of our economic problems in 100 years. Now, says Weiner, we're getting close to producing enough; the problem of too much is coming. Our productivity machine is starting to work itself out of a job: for the postwar period, output per man-hour per member of the labor force is up 3.8% per year, and that's expected to continue. The U.S. is the first nation with more employees in service than in manufacturing.

Keynes hoped that achievement of basic economic wants might lead society to turn away from the Puritan ethical goals of thrift, hard work, and prudence to those of the Sermon on the Mount. We might prefer the good and beautiful to the useful. Weiner thinks that this has begun to happen, and that this explains the dissent of the radical students ... products of an affluent society, they have experienced neither world war nor depression. He believes this rejection of our political and economic systems by the young will increase. Their values are those of impulse rather than conscience and reason.

Weiner ticked off some of the major social problems that will be created by technological developments. They include the checkless society (he foresees a new federal crime: to give false information ... or to fold, bend, etc. a punched card); pollution (which might affect the basic process of photosynthesis); medicine (ethical problems raised by organ transplants, and drugs that suggest the possibility of social control as described in *Brave New World*).

He feels that we have rewritten the Faust legend, made a different deal with the devil. "Our bargain rests on our promise that whatever we do, we'll take the responsibility for the consequences. The main condition is that we'll keep the bargain on all particulars. It's a long list and we have to solve them all." But, Weiner warned, the more rationally manipulative we become, the more difficulty we face in solving the huge problems we are creating. It's a kind of "Catch 2000."

economic growth

Opening up the second day was Martin R. Gainsbrugh, senior vp and chief economist of the National Industrial Conference Board. His topic: technology and economic growth in the coming decade. Noting that the "population clock has been ticking," Gainsbrugh estimates that the growth of the labor force — which has been averaging about 1.2% per year — may grow at a rate of 1.7-1.9% in the '70's. The question: will we use it efficiently, or will there be shortfalls? A clue from a recent NICB publication: a need for 110-150,000 engineers and 160-200,000 technicians beyond "normal sources."

But he pointed out that our manpower studies are lopsided: "we know about unemployment, but we don't know how many jobs go begging." More attention must be paid to manpower planning. And we need a far better meshing of our educational institutions with job requirements.

Looking at general economic growth in the '70's, Gainsbrugh adds a 1.7% labor force growth, a 2.8% increase in productivity, throws in 2-3% for inflation ... and comes up with a projected 7% growth rate for the economy. "Dividing any number into 70 tells you how often it will double," he said. "Thus the economy will double in the '70's. And since we're on the verge of a trillion-dollar economy today, that means a two-trillion-dollar economy by 1980. Unbelievable."

transportation

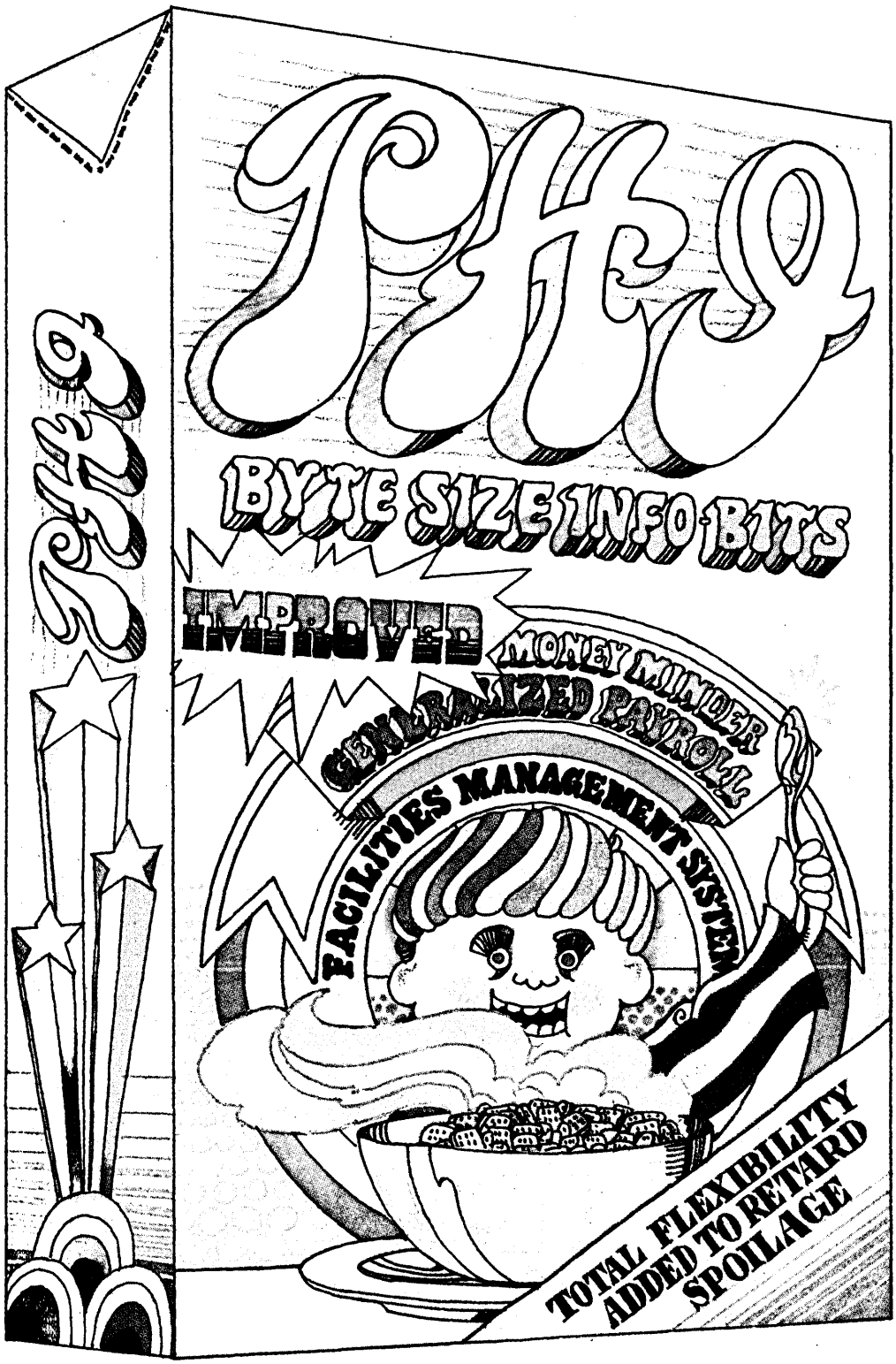
Bruce C. Netschert of National Economic Research Associates conducted an impressive, energetic tour of "Opportunities for Development and Use of Natural Resources" which has little direct bearing on computers and information processing, so we'll skip to transportation, the topic of Laurel van der Wal Roennau of RAND.

Mrs. Roennau noted the need of "massive capital development" plus interdisciplinary research and analysis to minimize the risk of research investment. She cited as the basic needs of transportation research:

1. Analytical tools, mechanisms for automated systems analysis, data collection and storage, information on the way people and things move.

2. A methodology for long-range transportation forecasts — the demand and our ability to meet it. She noted that the management of one major airport predicted 520,000 operations (takeoffs and landings) a year by 1980. For the same year there, the Air Transport Association Foresees 940,000.

3. Regulatory aspects — legal and jurisdictional problems ranging from the Dept. of Transportation to the local traffic court; home rule vs. regional planning needs. A proper division of developmental expenses (funding of



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SST represents "one small rational step." We must acknowledge the role of the labor unions ... get their cooperation early in the planning stage.

4. Modal split considerations ... understanding the factors affecting the choices of various travel modes (auto, bus, train, etc.).

5. Traffic load limitations for each mode of transportation ... at different hours and under varying conditions. Future transportation systems might dictate changes in our way of life: control of the degree of mobility allowed in urban centers (rule out cars?), the return of cottage industry (some programmers have already discovered this one); company housing (and a company store?).

The present transportation system, Mrs. Roennau concluded, is inadequate because there is not adequate incentive for it to improve; there is no way to demonstrate the advantages of new developments (needed: government research dollars); lack of education of people and industry.

communications

Harvey McMains, director of business research and management sciences for AT&T, started his talk by telling Alben Barkley's story about the dog who got so used to having the kids tie tin cans to his tail that he used to back up to them.

According to McMains, an entertaining but meandering speaker, the '70's will see the development of instrumentation centers to which people can go for physical examinations. The centers will be tied to regional computers which will analyze the data, provide on-line diagnosis. "But," warned McMains, "people must be treated like people." The machine will take over a lot of a doctor's work, freeing him from information analysis to work with people. The new doctor will have to know more about psychology than medicine.

McMains defended the present telephone system, saying that it is being used to only 15% of its capacity. (This will surprise a lot of people in New York and other large cities having troubles getting their phone calls through.) The problem, he says, is not too much information, but too much garbage (is that another mother-in-law joke?). And, he said, the feds should adopt a more flexible treatment of rate schedules, especially considering the 8-12-hour work day which poses the same problem faced by the airlines with everybody wanting to take off for home at 5 p.m.

And, he concluded, the videophone will come into its own in the '70's (but cost 4-5 times standard voice transmission ... a new way of saying how many words a picture is worth).

One nasty reporter at the meeting asked him if the '70's would see the installation of Touch-Tone phones in Los Angeles. We didn't catch his name.

—R. B. F.

WHAT COSTS LESS THAN $20 AND HAS THE COMPUTE POWER OF AN IBM 704?

On July 21, 1969, impatient with Litton Industries for not going beyond the first wafer computer his group developed, a project manager named Bill (Wm. C.) Mow started a company to do it himself. The company is called Macrodata, and is located in Chatsworth, Calif. It is primarily dedicated to the development and use of large-scale circuit integration, and secondarily dedicated to the production of a commercial version of the military wafer processor.

Of his new company Mow says, "We are the only ones who really know how to design with LSI now that Litton has cut off its work. Other people are still using third generation design techniques to make fourth generation products."

At Litton Mow's group had designed a wafer computer which included an arithmetic processor, four 8-bit registers, and two 32-bit registers built on an 80x80 mil chip. "We could have built another STRETCH* on two and a half 4x9-inch trays," Mow says. But Litton started running into problems and out of money.

founder and president

Obviously it isn't easy for a small (15-man) company to take up where a large established one left off. Mow realizes this, but as he talks his confidence is infectious.

The president's office at Macrodata is large but not luxurious. It has a flip chart easel and a blackboard on which Mow deftly sketches logic gates and explains how they are translated into single layer metallization. Mow is an intense speaker, and an intense person. The dozens of photographs studied for use in this story never caught him in a pensive or reflective mood, only conscious, aware, intent. A little laugh, punctuating his claim of "It's not impossible — I've *done* it" is the only real indication of the pleasure he gets from meeting his self-imposed challenges.

"Designing a computer isn't difficult," Bill Mow maintains, "The problem is what do you do with it when you have it."

Mow's credentials for the presidency of Macrodata included a PhD from Purdue, but did not include U.S. citizenship papers. In March of 1949, twenty years before the founding of his firm, one of the last Pan Am flights out of free Shanghai had taken him and his family away from Mao Tse-tung's Communist rebellion. Chao Wei Mow was 13 years old. Passed through his first year of schooling in the States solely on the basis of his incredible ability in math, since he knew no English, Mow received his BSE from Rensselaer Polytechnic 10 years later as a member of the elite Sigma Xi, Tau Beta Pi, and Eta Kappa honor societies.

But his stay in the U.S. was precarious. He received a note from the Immigration Service informing him that he was being deported — for he had

*IBM's big, rare 1969 computer, some three times as powerful as a 7090.

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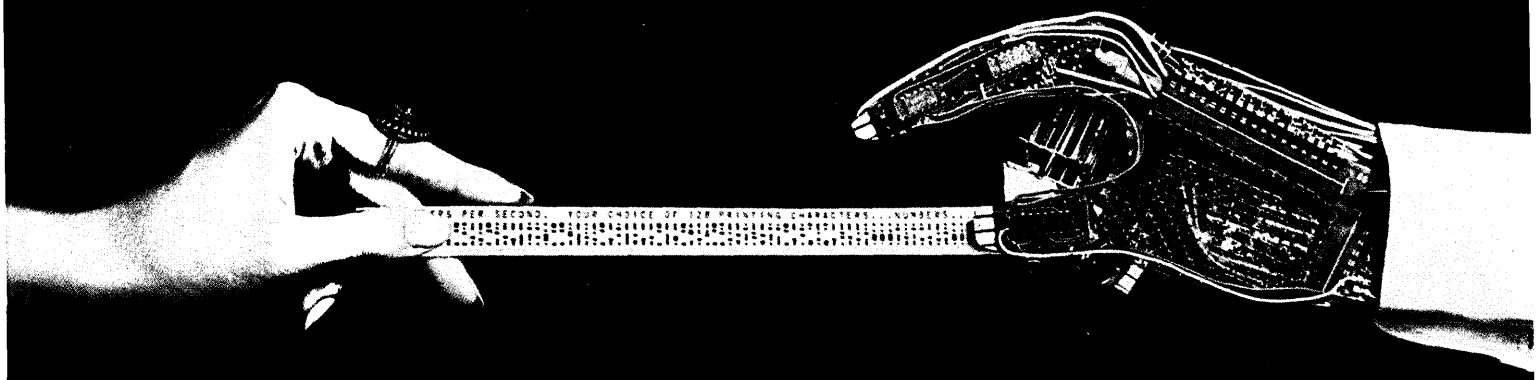

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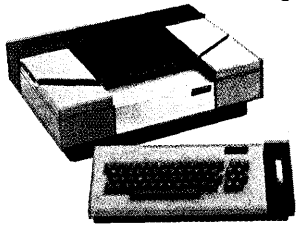


no legal status here as an alien — and that passage was already booked for him to Taiwan. Shaken, he waited, and was not deported. He was to receive the same note four times.

He worked on his MSE thesis as a Jr. Research Fellow at Brooklyn Polytechnic. On "The Detection of Partial Symmetric Functions," it again demonstrated his unique prowess in mathematics. He became a Sr. Research Assistant in the computer science center there and taught switching theory, an accelerated digital computer theory course, electronics and electromagnetics, and was in charge of the analog computer center.

firsts for honeywell

Not really fitting the academic mold, in 1963 he went to work for Honeywell. His first "sink or swim" assignment there was a 6000-wire retrofit modification to a Honeywell 1800 done for MIT's radiation labs. The machine produced was capable of running nine programs simultaneously in a time-sharing mode, and Honeywell claimed a "first" from it.

In 1964 he designed an H-300, a scientific machine with direct memory access and with core interleaving — and Honeywell claimed another "first." The machine, which didn't sell, later became the Honeywell Alert.

By the time he had outlined the design for the H-120, developed the maintenance and diagnostic procedures and software for the H-8200 and -4200, recommended read-only memory for the 4200/8200 series (again claimed "first" by Honeywell — the firm clearly enjoyed having him around), he was bored with computer design and left the company.

He then spent 18 months getting his doctorate at Purdue, but dislikes being called "Doctor." ("It embarrasses me.") He seems to measure everything, even a title, by its practical value. About his dissertation, "On Multi-threshold Threshold Logic," he says: "It *may* be of practical value to some genius 60 years after I'm dead." It did serve, however, to get him six job offers, one at Litton.

The big development at Litton was LSI technology. At Honeywell he had started with discrete bi-polar transistors and worked into fully integrated circuits as circuit technology advanced. At Litton, two years later, he was designing his own LSI chips with densities beyond any previously attempted. Litton was so far ahead at this stage that copies of circuits the firm sent out to be plated quickly found their way into the subcontractors' product lines.

chip philosophy

It will be the aim of Macrodata to continue to train others in the use of LSI just as Litton did, but to make a profit at it. "First, the idea is to minimize the area used, not the complexity," Mow says. And this is difficult for many to understand. Contrary to a layman's expectations, increased complexity means increased reliability. But by packing as many logic functions on a chip as possible two gains are realized. True, the number of external connections is minimized and reliability goes up. More important in a practical sense, denser packing means greater yields. This follows from the fact that the silicon crystals on which MOS circuits are plated are imperfect. When more functions are added to the same size chip, fewer chips are needed and the yield goes up.

"Say that you can get a cpu onto one chip instead of onto 20. Then you can plate 20 times as many cpu's on a single 1½-inch square silicon wafer. A 30% yield of chips may then produce 30 cpu's from one plating operation instead of one and a half." The result is more useable product per wafer and lower cost per item. But the thinking doesn't extend indefinitely. "The exercise becomes academic." After awhile the cpu's are cheap enough to be used once and thrown away, and there is no longer an incentive to reduce size and cost. Because of this, the days of micro-technology may be limited. When one chip equals one cpu, then the computer becomes the basic building block, and concerned minds must tackle the problem of making the computer work for some real benefit — a far greater challenge and one which has not yet been aggressively taken.

Under Bill Mow Macrodata will not be content with producing a wafer or chip processor and then stepping back to allow others to accept the second, more difficult, challenge. Perhaps that is because the company and its principals are not just technically competent. Mow is a manager as well as a technician. In addition he is surrounded with talent, including: Ron Danklefs, engineering vp, BSME Purdue, with experience at Bell Labs, Burroughs, Beckman, Tidewater, and Litton (where he was mgr. of the computer logic section); Loren Steadman, vp operations, BA from Cal State, from General Dynamics (where, as mgr. of special programs, he worked on the space program with NASA), and Colortran (where he was president and gen. mgr.); William Mandl, director of LSI systems, MSEE USC (specializing in computer and circuit design), of Autonetics, North American Aviation, RCA, and Litton (where he designed the processor on a chip working with Mow); Tony Banes, vp software systems, MS Oklahoma State, of Trinity Univ. (math dept. chairman), TRW, Bisset-Berman, and Compata; and Howard Wright, director of applications programming, BS UCLA, of North American Rockwell, SDC, and Litton (where he was an engineering specialist in the digital lab).

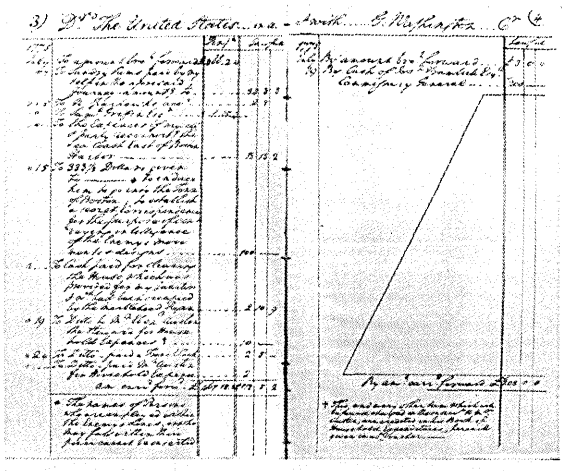
self-determination

Financing for the firm was arranged by an equally talented behind-the-scenes man, Julius Lefkowitz. Eminently successful in managing movie stars' personal funds through a group called Diacomp, this is the first firm he has helped start from the ground up. He manages aspects of money, timing, marketing, and taxation. ("An area of my complete innocence," says Mow.) Unlike many high-technology firms where the principals give away the farm to get into business only to lose inertia — and have the company falter — when they realize that they're still working for someone else, Mow and his group joint ventured with Diacomp, retaining their self-determination and more nearly insuring that the young company will be able to reach its goals.

Right now the goals are to continue developing the technology, with the help of an in-house computer aided design package, to build a tester to measure the growth of that technology, and to use both to produce the now-imaginary computer on a chip. Along the way the CAD package, software and hardware, will be marketed. So will the tester. In addition, Macrodata will pick up the second challenge. For instance, the firm is already busy designing and preparing to install capable management decision systems called COMDIS, which will give its customer meaningful computer power to help in running even a medium-size business without the sacrifice of data security and relying on, instead of substituting for, management responsibility. COMDIS, admittedly, is only one example, but then the firm is only six months old.

Tomorrow, which may be three years away but could easily be half of that — a $20 computer with processing power roughly equivalent to that of an IBM 704. Granted, anyone can make big claims. Mow, a citizen as of Oct. 1, backs his up with a simple statement: "It's not my dream. I've *done* it."

—R. McLAUGHLIN



This is from George Washington's personal accounting book, titled: "Accounts, G. Washington — with the United States Commencing June 1775 and ending June 1783, Comprehending a Space of 8 Years."

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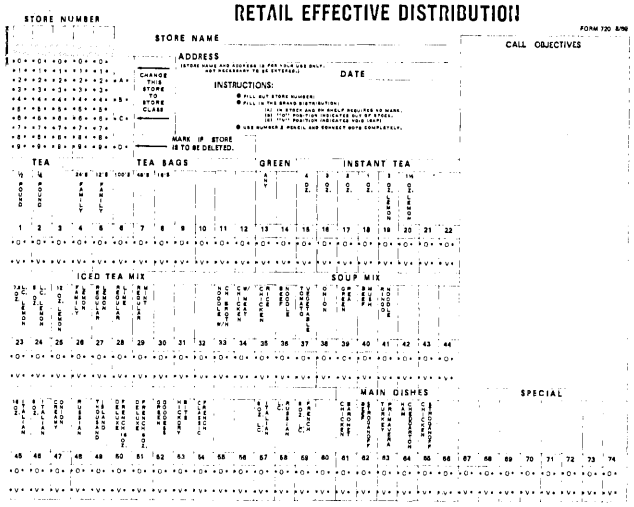
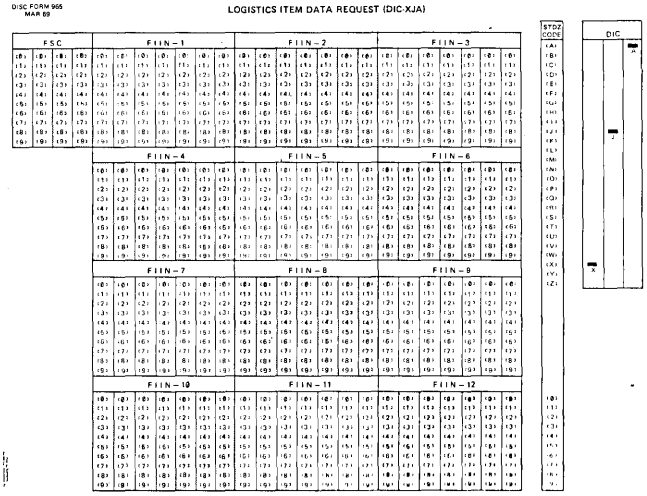


but it wasn't a great business form—



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Mr. Stone is one of many EDP professionals who are determining, on the job, (in this case with a coupled System/360 50/65 installation) that BASF Disk-Packs actually do offer substantial long-term advantages over other units. Reason? Very simply, greater care and precision in assembly and coating for better performance and surface characteristics.

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news briefs

SERVICE CENTERS GO ONE UP ON ONE-BANK HOLDING CO.'S

Dp service center operators scored a surprise victory over the banking industry last month when the House of Representatives passed legislation sharply circumscribing the commercial computer services that can be offered by bank holding companies.

The bill (HR 6778) forbids most of these companies from "engaging in the business of providing data processing services except ... as an incident to banking services such as the preparation of payrolls, or ... to the extent necessary to make economical use of equipment primarily acquired and used for the bank holding company or its bank subsidiaries."

If the legislation is enacted by the Senate, this language will be added to an existing law administered by the Federal Reserve Board.

When HR 6778 was reported out by the House banking committee last July, it covered only those bank holding companies organized after February 17th, 1969. Virtually all one-bank holding companies now in business would have been exempted. But on the House floor, the effective date was changed to May 9th 1956, eliminating the exemption.

Lobbyists for the American Bankers Association fought hard for the later date, while Adapso pushed for the earlier one. The bankers had most of the banking committee on their side, while the service center operators were supported by Chairman Wright Patman of Texas, Cong. Ben Blackburn of Georgia and C. P. Wylie of Ohio.

The bill reported by the banking committee also didn't specifically prohibit bank holding companies from offering commercial dp services. Instead, it allowed activities "functionally related to banking" that were likely to produce "benefits to the public that outweigh possibly adverse effects." Testimony before the committee indicated clearly that, under this criterion, bank holding companies could operate extensive commercial dp businesses.

Language added to HR 6778 during debate on the House Floor explicitly mentions benefits and adverse effects FRB should consider when evaluating bank holding company activities. The purpose is to further restrict the activities that are approved.

The bill passed by the House contains two other major changes: it makes bank holding companies operated as partnerships subject to FRB jurisdiction, and redefines "bank holding company" to include those that control banks indirectly, rather than through stock voting rights or representation on the bank's board of directors.

The bill's chances of getting through the Senate more-or-less in its present form are probably better than even. Final action is likely early next year.

IBM TO EMULATE IN 3.5 GENERATION

It's been almost six years since the initial announcement of IBM's System/360, and industry curiosity about the follow-on generation of computers is peaking. A serious concern, of course, is whether users will find the new machines so incompatible as to require a complete reprogramming job — or "resetting to zero." This interest does not imply that users have recouped their investment in third-generation gear; indeed, probably the last thing they want foisted onto them now is a replacement series that makes their systems obsolete. Their applications programs may be of second-generation genre, but at least they're running.

From what we've heard, they can rest... for awhile. It appears that in its next family of computers, IBM will provide program compatibility with the third generation through emulation. *(Continued on p. 204)*

BUT NONE OF OUR COMPUTERS IS MISSING!

The relationship between computers and militant activities took another turn on October 15th, when the equipment shown in the photographs was left outside the Federal Office Building in Boston, Mass. Here the emphasis was placed on the cost of the equipment, and on the lack of any direct benefit that computer-manufacturing made to the general populace.

The notice painted on the equipment said that it was a 'War Tactical Position Computer' and had cost $449,265, which was more than Boston had received under the Model Cities program. It then listed General Dynamics, Univac Remington Rand, and Mast Development as being contractors and wryly commented, "They benefitted, did you?"

U.S. Government sources declined any comment or confirmation of the price or nature of the equipment. John Lawless, of the General Supplies Administration, told DATAMATION that he had inspected the equipment before it was removed a day or so later. "It had nothing to do with us," he said. "None of our computers are missing." He said that a City of Boston truck had removed it the next day.

However, Boston officials denied that they had removed it, leaving the question of just what happened to it quite as mysterious as just where it came from in the first place.

news briefs guide . . .

According to a knowledgeable source close to IBM's front office, that company's next line of offerings will consist of six models. Internally, it is being designated the NS (New Series) line — more specifically, NS I. The new 3.5 generation systems will fetch operating system instructions out of a read-only storage (ROS) unit, we are told. The ROS will be accessible only to IBM field engineers, who will be responsible for its modification. By removing the operating systems from main memory, IBM reportedly will increase core storage available for applications programs and data by 15-25%.

As of December, 1968, it was learned, this was the distribution of core sizes among all IBM's systems users, by type of operating system, (see chart below).

As noted briefly last month in DATAMATION (see p. 125), the NS I family will have processors ranging in size between the 360/40 and the 360/195. The larger units are being announced ahead of the smaller models, we are told, because IBM wants to make a bigger pitch to scientific users, who would be the primary customers for larger cpu's. The company feels it has been losing ground in this market to Univac, CDC, and XDS.

Following the NS I onto the marketplace will be the fourth generation NS II family. Target date for announcement of the first model of this family is the first quarter of 1971. It is said that B.O. Evans, until recently head of IBM's Federal Systems Division and now in charge of systems development, is overseeing NS II. Unclear yet is whether NS II will provide any program compability.

CORE SIZE	OS	DOS	OTHER (TOS, BPS, etc.)
1024K	3.8%	0.00%	0.00%
512K	20.1	.6	.1
256K	14.9	4.5	.4
128K	7.0	8.4	.7
64K	1.1	14.0	1.0
Under 64K	0.0	15.6	7.7
TOTAL	46.9%	43.2%	9.9%

SEARS ADDS COMPUTER USAGE TO ITS CATALOG

Sears, Roebuck & Co. has agreed in principle to purchase a majority of the stock in Computer Usage Co., Greenwich, Conn., software firm that has been undergoing reorganization in personnel and structure in an effort to get into the black (Sept. '69, p. 154). Terms of the deal call for Sears to issue 0.3 share of common for each share of CUC, and Sears will not have to accept for exchange less than 65% or more than 81% of CUC's outstanding common stock. At 65%, Sears would issue around 165,000 shares with a market value of over $11.5 million. The offer to CUC stockholders will be made after a registration statement is filed with the SEC, probably in January '70, and will remain in effect for at least 20 days.

CUC will become an arm of Allstate Enterprises, Inc., a Sears subsidiary that offers auto financing and protection, and also operates a savings and loan association and a mutual fund. The acquisition is one of the few that Sears has negotiated in recent years and marks its first entry into the data processing industry.

VIATRON STARTS DELIVERIES AND SIGNS UP SUPPORT FIRMS

We have delivered units of System 21, declare Viatron and its distributors. One distributor even went so far as to say they would deliver more. However, no one said how many units had been shipped or who they went to. The reason? There are so many people interested in the devices.

Given this, the questions are: Does Viatron wish to protect initial users from the importuning of these interested parties, or does the company wish not to reveal just how many of the letters of intent it had on hand have become sales? How capable is it of meeting demand for the units? And how do the units perform in the field?

Probably this will all be revealed in due time to the followers of Viatron's advertising campaign. Viatron officials once said they were going to market the System 21 like toothpaste so perhaps we'll soon be seeing testimonials by edp managers on the benefits of System 21 with color, or telling us why they switched, or that there are no cavities in their input since they started using System 21.

In a more pratical vein, Viatron has set up a national string of distributors. They will handle sales — rental with or without purchase option, time payment, outright sale — and customer and system support. Software firms have been selected, among them Viatron's own Viatron Programming, Inc., Programming Sciences Corp. (in four locations), Boothe Resources International, Inc. (six locations), Information Systems Design (five locations), Tele-Data Systems, Inc., North American Computer Corp., Pryor Computer Industries, ComputerComm, Inc., National Information Systems, New Jersey Data-Matic, Inc. and Diversified Data Services & Sciences, Inc. *(Continued on p. 207)*

COMES WITH EVERY GE COMPUTER GRADE CAPACITOR

Extensive research and development

Research at General Electric is directed toward one basic philosophy: to give every customer the most reliable product at a reasonable price. Toward this end, our capacitor research staff in Irmo, S.C., working with their colleagues in the GE Research and Development Center and the Material Supply Operation in upstate New York, have contributed unique innovations in electronic capacitor development.

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High-capacitance units are available in nine case sizes — diameters 1 3/8" to 3" with lengths up to 8 5/8" — for operation up to 100VDC.

Choose from other standard ratings of computer grade capacitors for operation up to 450VDC (370,000uf maximum at 5VDC) . . . or let General Electric special-design a computer grade capacitor to fit your application.

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GENERAL ELECTRIC

news briefs . . .

SCC FISCAL TRAVAIL UNFOLDS

Long-brewing, long-rumored money troubles finally burst into the open at Scientific Control Corp., Dallas (June '69, p. 142), with the collapse of negotiations with Commercial Credit Company, the CDC subsidiary, for a $4.5 million loan. With higher than anticipated engineering and production costs (primarily, we heard, with two products, the DCT-132 remote terminal and the 4700 computer) and a substantial overhead, the money was really needed.

SCC, a young, ambitious computer maker eager to move into the big leagues, turned the first quarter of its present fiscal year with a loss of $1.6 million, just about as much as it lost through all of fiscal 1969. The poor fiscals likely sped, but were not the whole story behind, the departure of Patrick C. Martin, a 12% stockholder who had been chairman of the board and chief executive officer since the disability of ex-Univacer president Bill Lee in an auto accident last summer. Lee has since returned to active duty and presided over the SCC annual meeting in late October, at which time his disrupted tenure and the company's direction as a whole were subjected to sharp interrogation by attendees, including John Baird, founder and former president of the firm who had departed in an earlier management shuffle.

Lee candidly acknowledged that the overriding need, if the company is to meet production schedules, is for quick capital, about $8 million, in fact, which can be a tall order in the present bear money market. While the basic troubles were obviously not of his making, the volatile Martin, primarily a money man, had given a personalized and often erratic guidance to the company, reflected in the contradictory and sometimes recanted news releases that issued from his office. The Commercial Credit misadventure, now the subject of a pending suit, was followed by the failure to materialize of an announced merger with Graham Magnetics, of Graham, Texas, a company on whose board Mr. Martin sits. There was, in addition, reported concern on the part of principal customers who were becoming distressed over the growing fiscal chaos, with one major buyer rumored ready to pull out entirely.

However, there are some bright spots in the SCC picture, including a claimed backlog of $44 million in orders. A source close to the firm said that its officers were working diligently to effect a financial turnaround, had cut back on personnel with a layoff of 25% of its work force, around 250 people, in early November to correct the disparity between costs and sales revenues. It also received $1 million in additional credit from two Dallas banks. And there were prospects for reduction in manufacturing expenses through a new Mexican border source for circuit boards that could almost halve their present costs.

NO CEASE-FIRE YET ON THE TELECOMMUNICATIONS FRONT

Ohio's Public Utility Commission has been advised by its staff that rate increases recently levied against dp service center operators within the state may be unjustified. A public hearing is likely this month. The case has national significance because similar increases have been imposed, or are being considered, in virtually every other state.

The PUC staff said rates for Ohio Bell's new Information System Access Lines are the same as for business trunk lines; but if ISAL's are actually trunk lines hasn't been officially determined yet. Since individual line rates are far less than trunks, the distinction is important.

In a related development, BEMA negotiators reportedly have won an admission from AT&T that individual communication ports of an on-line computer are separate "stations"; in tariff parlance, this means the ports qualify for individual line rates. The concession was obtained at the second of the informal conferences the FCC is holding in Washington to resolve the foreign attachments fight. Companies opposing the rate increase in Ohio are certain to argue that, since AT&T believes computer ports comprise individual stations, there is no justification for its affiliate charging a trunk rate.

Elsewhere on the telecommunications battlefront, the FCC delayed AT&T's imposition of higher Telpak and TWX rates until next Feb. 1, and allowed the new Series 11,000 broadband private line service to become effective Nov. 1. The phone company, with FCC's approval, announced a $240 million reduction in interstate telephone charges. The justification for the Telpak, TWX and Series 11,000 offerings will be considered separately in formal hearings, the commission said.

Commissioner Nicholas Johnson sharply criticized his fellow members for accepting the broadband offering. "It is intended to forestall competition," he pointed out. Johnson didn't mention MCI specifically, but this was clearly the competition he had in mind.

Johnson also thought the reduction in message poll telephone rates was far less than it should have been. The commission majority, he said, has been persuaded that Bell is entitled to a rate of return greater than 7.5%, despite a 1967 order limiting the telephone company to that percentage.

Meanwhile, sparked by a speech from CBS President Frank Stanton, and a statement from AT&T, efforts to establish a multipurpose domestic satellite system seemed to be lurching forward.

Stanton, in an address to the Audio Engineering Society, called for the FCC to authorize, immediately, a satellite system that would be built by the three broadcast networks, and be in operation by 1972.

AT&T's statement was submitted to a White House task force studying the satellite question. The phone company said that using satellites, instead of terrestrial facilities, to carry domestic telephone calls won't be economically feasible for some time. It added that "the wisest public policy at this time would be to permit any organization or group interested in establishing domestic satellite systems to apply for a license.

The statement is considered significant because it suggests that AT&T will no longer insist that communications carriers own satellite ground stations. Also, if and when a domestic satellite network is established, more channel capacity presumably will be available for nontelephone communications.

Comsat recently began discussions with possible users of a domestic satellite system. Two synchronous-orbit satellites, each with a capacity of up to 24 color tv channels, and providing a full complement of voice, data and broadcast services, are contemplated by the satellite corporation. A ground station equipped with a 42-foot antenna will be built on either coast, and possibly near Chicago as well. Users would erect their own receive-only stations, either on a cooperative or individual basis. University Computing is among the firms reported to be taking a close look at this proposed system.

Another answer to the nation's mushrooming telecommunications needs was offered recently by the Electronic Industries Association, which called upon the FCC to encourage two types of wideband communication facilities. One would be a switched videophone service, similar to AT&T's Picturephone system, but able to provide limited keyboard access to computers, video output, and facsimile transmission at a speed of one second per page. The other facility would be based on local CATV systems and consist of a 300-mHz

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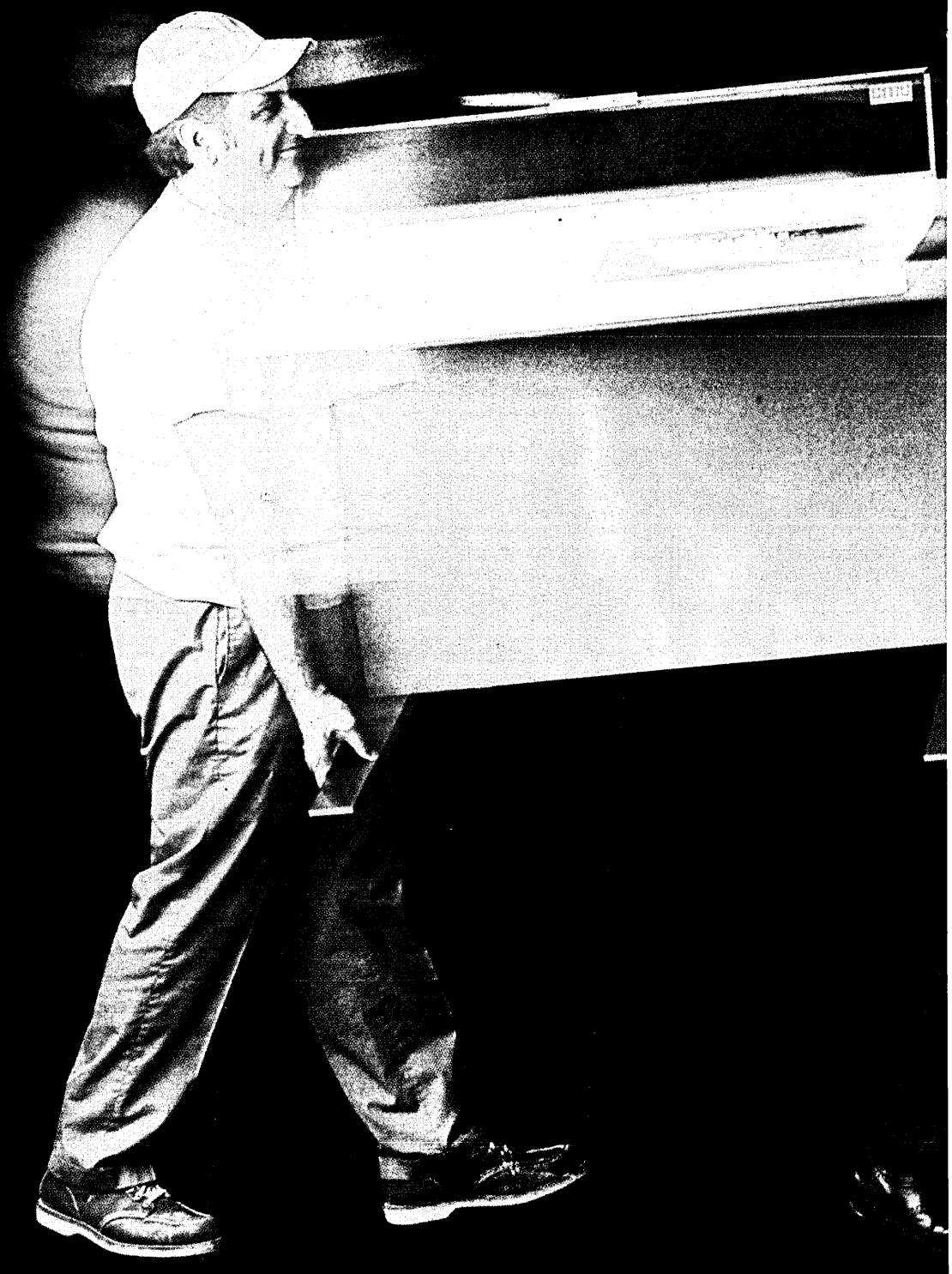
Card-handling and tape-handling are eliminated. As operators key data through their keystations, it is processed by the



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The CMC KeyProcessing System for computer-controlled keyboard input

system's computer and written on a magnetic disk.

After verification, batches of data may be transferred automatically, in any sequence, from the disk onto a single reel of magnetic tape. Done! This one tape then becomes clean input to your computer.

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EIA's proposal was one of several which the FCC has received as part of its long-term study of CATV's potential. The filings indicate clearly that another battle is shaping up between the established common carriers, on one hand, and telecommunication users and competing suppliers on the other. AT & T, for example, argues that costs must be reduced before anyone can seriously consider CATV a diversified communications medium. The phone company added, in its CATV filing, that "the public interest will ultimately be best served if common carriers are permitted to contribute fully to this developing technology and to make optimum use of existing and future local distribution networks."

ICL DUMPS BIG MACHINE AS U.S. COMPANIES PUSH ON

Fifteen months after we reported on ICL's paper tiger, the superscale system with which the UK's International Computers Ltd. was allegedly to mop up Europe, the project has been dropped. The world was informed in one of those unimaginatively brief statements that the ICL 1908A was no more because something better was round the corner. Unfortunately for ICL, the decision was timed to follow on the heels of IBM's latest push with the new 360/195 and just before CDC disclosed that a 7600 would be wheeled into London soon, where a European support center has been set up to sell the big machines into some ravenously hungry universities, research centers and industries. Ironically, the pace of expansion among some of the British prospects for big computers has been deliberately slowed down to allow for ICL getting the 1908A ready. Places like the Rutherford High Energy Laboratory are expected to be allowed to go for an IBM 195 and Imperial College, London, a CDC 7600.

Despite brave words from ICL about a mysterious big 'un being developed under the label Project 52 for delivery in 1973, most of the customers have lost confidence because they have already been delayed by two years or so. The fact that many of the manufacturers' senior software men are popping up in new jobs elsewhere does little to inspire loyalty. But many of the customers are left in the quandry that their funding comes directly or indirectly through a government with a 20% stake in the supplier and which has been seen to bend over backwards to direct purchasing accordingly.

Further pressure on the U.K. manufacturer comes from GE, which has stepped up deliveries of GE-600 systems into Europe. This follows an order for a 600 to Ford's subsidiary in Britain, thus breaking into one of the good old IBM strongholds. GE's customers for the 600 series in Europe include a French government research laboratory in the telecommunications department; Vallourec, the biggest steel fabricating shop in France; the Kugelfischer company in Germany which makes bearings, and the Swedish electrical giant ASEA.

COMPUTER AIRLINE TICKETING READY

American Airlines will begin testing an experimental automatic ticket vendor at O'Hare International Airport, Chicago, next month. The system, controlled by a 360/30, is "expected to be the first computer based self-service machine to be tested at an airport." It is designed to print and issue airline tickets in less than a minute. The project has been financed by AA and IBM, with additional support from American Express. The machines honor magnetically encoded Universal Air Travel Plan cards issued by AA and American Express, and these cards will be sent to participating credit card holders who fly frequently out of Chicago. This will also mark the first public use of the new standard magnetic-encoded cards.

The passenger operates the automatic vendor through the use of push buttons, after he has inserted his credit card. Lighted instruction panels lead him through the steps required to purchase a ticket. If he makes a mistake, the messages steer him back on the proper course. The computer confirms advance reservations, checks credit, and verifies that the card has not been reported lost or stolen. Finally, the passenger must remove his card to receive his ticket. The machine prints each flight coupon individually, binds them together, and issues a ticket book to the passenger. His name and card number are printed on the front of each coupon, along with the fare, tax, and total. Similar information is also encoded on a thin magnetic strip on the back of each coupon. The encoding is intended for use in billing systems, but the coupons will be manually processed, since the project is an experiment to determine the effectiveness of the vending machine rather than a billing system. The ticket vending machine was built by IBM's Advanced Systems Development Div., which also worked with AA on the initial development of the SABRE reservations system.

Getting ready to go places and do things in self-ticketing experiment in Chicago.

SHAKEOUT IN T-S: IS THIS IT?

Whether one chooses to call it a shakeout or a cutback, the computer industry currently is experiencing some developments that may prophecy a period of lean times. Prominent among those being hit especially hard is the time-sharing services field. Although some t-s entrepreneurs say their business is just great, they also observe that from the standpoint of

public acceptance and Wall Street activity, time-sharing has become shaky.

Actually, all this may be a reflection of a general tightening that has occurred during the last few months in the industry. Some mainframe and software firms are having it tough, and several t-s outfits are actively seeking buyers. Here and there, scaremongers cite the recent sharp drop in the price of Control Data stock as an indication of a computer industry recession, although there may be more examples outside the exchange listings to justify a bullish attitude.

Still, people in the industry are edgy. Several presidents of t-s companies have lost their jobs in the last few months. Also, a higher than average number of rumor is clogging the grapevine, and those checked out are found to have been exaggerated beyond reason. All exaggerations, of course, tend to be toward the morbid side. (A news leak of a $100 profit is never stretched in the retelling to a $100,000 profit.)

This is not to say that the industry is going great guns. It isn't. As this is being written, there's a people problem, but instead of being a problem of shortages, it's a story of excesses. Result: layoffs. In the case of Scientific Control Corp., layoffs last month reportedly stemmed from an overcommitment to sales efforts when products were late in getting into production. The company, of course, was also rebuffed in its efforts to get financing.

The tight money situation is doubtless contributing significantly to the fall doldrums. One is also hard put to discount the effects of recent unbundling announcements, although it is impossible to attribute to unbundling any specific portion of the early winter chill being experienced. One thing is certain: many companies have changed their game from expansion to becoming profitable. Two time-sharing firms interviewed by DATAMATION have acknowledged this. One company has laid off expensive people and replaced some of them with lower-salaried personnel. People costs are the largest fixed-cost item in the budget, it is said, representing a 2-to-1 ratio over equipment costs. Another outfit has been tightening up all operations since early October, cutting employment from 5-10%. No one has been fired, it is stressed, but those who have left aren't being replaced. And, until profits can be shown, there will be no more new centers opened.

From coast to coast, t-s executives report having interviewed former GE time-sharing salesmen who have been laid off. Some of these junior salesmen, no doubt disgruntled, say that GE had hired many more than they now need and thus have terminated a sizable number. This number, as told by the ex-GE men, ranges from 300 to 800, but the figure may be corporate-wide. Executives at GE's Information Services Division, which runs the huge t-s service, were not available last month for comment. Belying these figures was the firm's announcement of an expansion of its t-s activities. Users in Puerto Rico, it was said, will be able to hook into the Teaneck, N.J., computer center. Honeywell, too, is expanding its list of data centers while Univac is closing some of theirs.

This is the type of inconsistency that currently unfolds. As always, with a young industry, there's expansion here, contraction there, and the latter tends to get the big headline treatment. While some pundits foresee more t-s companies, rather than less, one must still note the pullback by Greyhound and Comnet, the latter withdrawing from Philadelphia and New York City.

Perhaps the pundits are correct. We hear that Burroughs is planning to get into the business — although it will take a couple of years — with remote TC-500's tying in at first to 3500's. The word is that it will not be conversational, and that they'll be offering specific applications services. It brings to mind the comment of one t-s executive who said, "I'd hate to be starting in this business now."

At Call-A-Computer, Warren Prince describes his firm's activities as being in a sort of holding action, awaiting delivery of its Standard Computers IC 7000. Of its seven t-s centers, four are said to be profitable. Over-all, the company's position would be one of profit, Prince adds, if the newest of the seven were eliminated. As with other t-s houses surveyed, Prince admits the company is losing some big jobs to the services having larger computers. The ability to offer memory chunks as large as 64K to a single user, as well as huge data bases, is apparently becoming a significant marketing edge.

"Users are becoming highly sophisticated," says Intranet Industries' Art Speckhard, while someone else describes them less flatteringly as butterflies, hopping from one service to another. Indeed, this may be one of the basic problems in conversational t-s: they all look alike, few have unique products or services, and fewer still have the resourses to develop proprietary lines. To avoid this identity, Speckhard is developing what he calls a full-services approach, marketing to vertical industries such as doctors and lawyers and offering to handle all their data shuffling/retrieving and billing needs.

Remote Computing's Joe Hootman is taking the juke box approach, paying royalties to those who have software packages that can be used or adapted for use on-line. Having seen the number of similar packages available, Hootman says he's appalled at the duplication of effort in the industry. A similar observation is made by Alan Hammersmith, who has just published a t-s directory. He was surprised to find so many nontime-sharing outfits, generally software firms, offering packages through vendors; they account for 25% of those in his directory.

No doubt, the direction taken by the t-s services industry will change from time to time, and at each turn in the road there'll be a few dropouts. The industry may be at such a turn now, a period when investor jitters are forcing top management to adopt a profit-first attitude. Although it is unclear yet, one would hope that it is the user who gains from all this.

NEW TERMINAL FIRM OFFERS RENT, DON'T BUY POLICY

Up until fairly recently, small manufacturing companies based all their production and marketing plans on the necessity of selling their products outright. The need for cash flow obviated any hope of renting their devices, and certainly no third-party leasing firm would be interested in handling short-term rentals of from three months to a year.

Large leasing firms, befitting their size, have been serving the larger manufacturing companies — some handling only IBM computer systems, for example — offering nothing less than one-year contracts with month-to-month rentals thereafter.

Recent developments, however, may be signalling a change in the nature of the manufacturing biz, with resulting advantages to the user, as well. A case in point is Data Computing, Inc., Phoenix, Ariz., a new and small manufacturer of time-sharing terminals, which was able to adopt equipment rental as its major marketing policy at its startup on its first product, a card reader/terminal. About two years ago, this would have been unthinkable.

"This arrangement greatly reduces the capital equipment cost to the customer of time-sharing services," observes Donald E. Oglesby, president of DataCom. "Instead of having to invest in a costly piece of equipment, he can rent it on a use basis." Adds Chandler J. Williams, marketing vp, "A strong factor in recommending the rental policy is that of obsolescence in the data processing equipment field. New and improved equipment is constantly being introduced, and the

time-sharing user is reluctant to buy a unit he fears may be out of date before he can depreciate it on his income tax return." Equally significant, the user can charge off his rental costs as a business expense, whereas the cost of equipment purchased is depreciated. Then, too, if he decides to discontinue using the gear, he doesn't have to search for a buyer.

The arrangement is also highly advantageous to the manufacturer. Enabling him to set up a much more flexible marketing program, leasing also has the potential of increasing his profits from a single unit by a factor of three or four over what he would get from selling it outright. According to one source, this profit margin is even greater with proprietary products and those that can be rented on a measured usage basis.

Providing DataCom with its leasing program was Manufacturers' Lease Plans, Inc., also of Phoenix, which is going after this growing market and offering custom-made leasing programs for the small manufacturer. MLPI, which shares both the risks and the rewards of a rental program, signs up only one company in a particular product line, much like an advertising agency. It handles Logic Corp.'s key-to-disc unit and Colorado Instruments' data collection terminals.

DataCom's first product was the Cardliner 10, a low-speed punched card reader/terminal that features only two moving parts. Under the agreement, the firm markets and delivers the unit to the customer. At this point, MLPI pays the manufacturer a percentage of the price of the unit, handing over also a promissory note for an amount to be paid within 6-12 months after a certain percentage of the rental income has been collected, whether or not the unit is on rental at the time. In phase three, there is a contingent note, stating the unit must be on rental or the client doesn't get all of the rental income from MLPI. In addition, when the unit is paid off, MLPI and the manufacturer split subsequent proceeds evenly.

Obligation of the manufacturer is to bear the marketing expenses, maintain the equipment or arrange elsewhere for this, and rent the unit to the second customer. As the legal owner, MLPI pays property taxes and insurance, performs credit checking, billing, and collection.

As for the user, he has the option with the Cardliner of taking a flat rental or paying on a use basis. He can have unlimited use of the C-10 for a flat monthly rental of $170, for example. On a use basis, he can choose to pay two cents a card for the first 5,000 cards a month, the charge dropping them to a penny a card for the next 2,500, and to a quarter of a cent for the next 42,500. The user also has the privilege of switching from one plan to the other after a three-month minimum period.

This ability to acquire and use equipment on a month-to-month basis, a boon to both the user and the manufacturer, thus lends credence to a recent statement: "The pride of ownership is rapidly fading out of the American business environment."

LEASCO ADDS EXECS AND SUBTRACTS EXECS

Since IBMer Frank McCracken has been installed as president of Leasco, the firm has taken on a strong IBM coloration with the elevation of Bernard L. Schwartz (from president to chairman of the board), the exit of Henry Sweetbaum (who was exec vp), and the entrance of Carl Vorder Bruegge, ex-director of marketing operations IBM/edp, to head Leasco Computer Services, the time-sharing arm of Leasco Systems and Research.

Rumor had it that Vorder Bruegge planned to cancel the order for Sigma 5's and 7's negotiated with XDS and go with 360/65's, but this is not so as yet. Vorder Bruegge has stated that plans are not definite, that Sigmas are being considered along with other machines and a decision will be made in the near future. Leasco has gone ahead with the installation of Hewlett Packard time-share systems that will eventually be tied into the planned network. These are said to be performing nicely in at least 10 cities.

The executive changes at Leasco are at least as confusing as the claims and counterclaims involved in its efforts to take over Britain's Pergamon Press, which is now in litigation. Leasco Systems and Research has also had a top executive change. Fred Hammer was replaced as head of the group by Dr. David Fox, who was vp of Leasco Data Processing and came to the firm when it acquired his Fox Data Processing.

A more recent loss to Leasco S&R was Dr. Jack Moshman. He left in October to become exec vp of Resource and Management Systems Corp., a Washington D.C. consulting firm.

Leasco's acquisition woes, which began with its effort (failed) to take over Chemical Bank New York Trust, continue with the lawsuit it has filed against Robert Maxwell, former Pergamon chairman, and eight others, claiming that the $22 million it paid for its 38% interest is too high. Leasco alleges that it bought the stock because of the Maxwell group's "deceit, frauds, schemes, artifices, and courses of business."

Whatever Pergamon's courses of business were, Leasco's appear to have been affected by the acquisition efforts. Not only have executives left and time-share plans are in abeyance, there is little evidence that Leasco's plans for marketing peripheral equipment have been brought to fruition. Saul Steinberg announced in March that a Leasco line would be on the market by July and number some 11 or 12 items by September. But then, we shouldn't be picky about this ... he has a few problems right now.

IBM'S SOFTWARE AND SYSTEMS HOUSE

The whispers that IBM has formed a software operation are true but the low-voiced sensationalizing is unnecessary since the company is only doing what it said it would. The Custom Contract Service Group, introduced as part of the unbundling program, is fulfilling its charter. And under soft-voiced Mississippian Cecil Webb it is writing up an increasing and increasingly varied job list.

The CCS charter is to assume "responsibility for the performance of specified tasks in the areas of systems design and analysis, application and program development, and systems installation and evaluation." More simply put, the group does system analysis and design, recommends hardware, writes software, implements the system, trains the staff and leaves the premises.

One thing Webb strives to make clear is that CCS is not in the facilities management business. Nor will it muscle into the federal government area or provide customer assistance similar to that provided by system engineers. But it will compete with Service Bureau Corp.

The federal business is left to IBM's Federal Systems Div. where CCS existed for two years as a pilot operation. SBC is a different situation. The wholly owned subsidiary of IBM is primarily interested in getting people to use its equipment; the same goes for IBM's Data Processing Div., of which CCS is part.

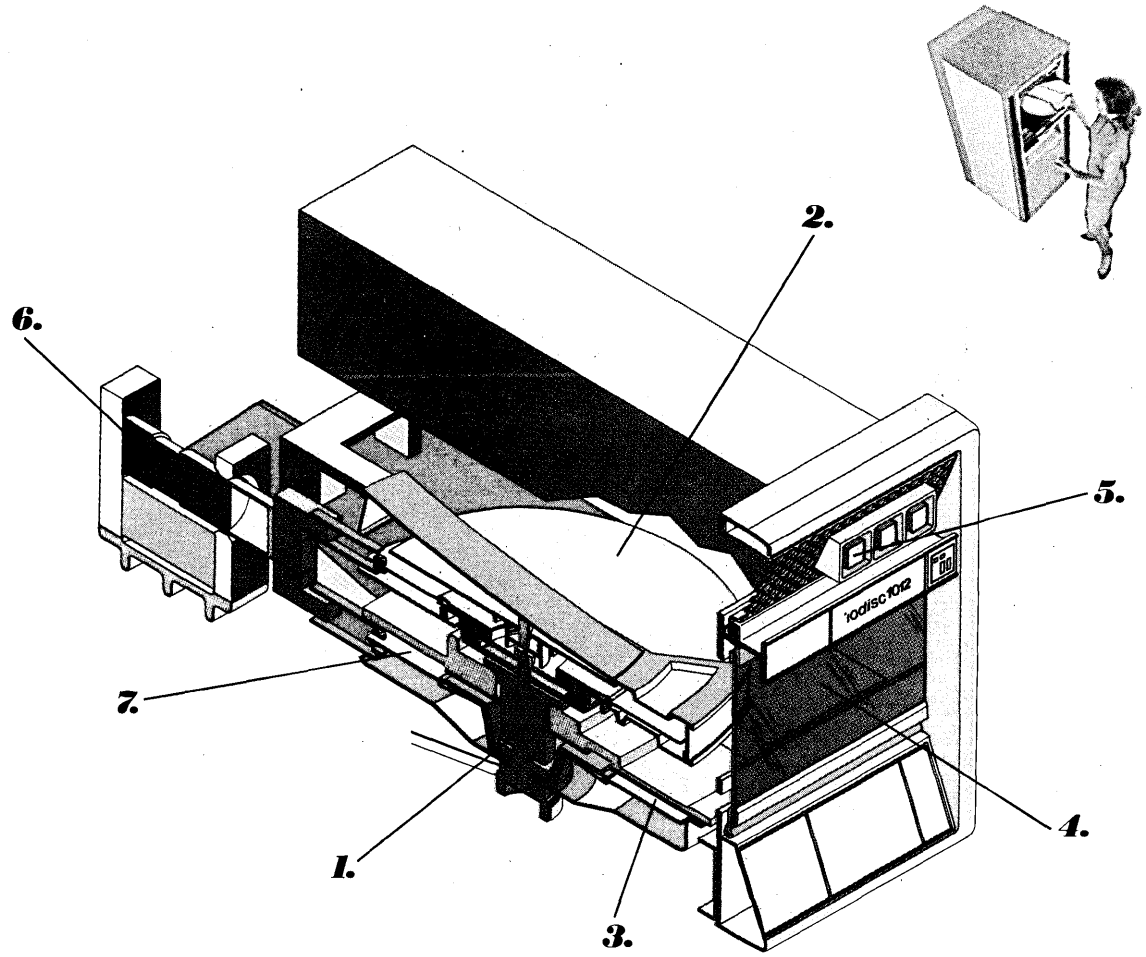
According to Webb, prime competition for CCS is coming from the other major computer manufacturers and the edp-savvy aerospace companies. The business they are competing for is custom work, large jobs, one-of-a-kind jobs. However, CCS isn't only interested in the million dollar deals. Among its current contracts is one with a bank in the $40,000 to $50,000 range. Webb also expects a lot of business in tailoring IBM program products.

Activity at CCS breaks down to

Seven reasons why one iodisc 1012 has "almost" the performance of two separate disc drives.

The IODISC 1012 — a removable disc in combination with a non-removable disc — has "almost" the performance capability of two separate disc drives. It's priced, however, "almost" as low as a single drive system. The price/performance advantages of the IODISC 1012 drive, in multi-application systems, are obvious. ☐ The IODISC series one thousand data storage system has the built-in flexibility to accommodate the specific use requirements of all systems. Incorporated into the IODISC system is an IODISC control. It has the capacity to control up to four 1012 drives in any combination and is available with various formats including IBM 1130 and 1800. The IODISC controller adaptor has interface features to facilitate the attachment to most central processors. An integral power system supplies two IODISC drives and the controller. ☐ The IODISC series one thousand data storage system is an example of IOMEC's total systems approach to data storage for the small-to-medium size computer market. The seven features listed below are just a few of the reasons why the IODISC 1012 drive has more application advantages than any other system. For even more reasons, write for the IODISC series one thousand data storage system brochure. ☐ iomec inc., 345 Mathew Street, Santa Clara, California 95050, (408) 246-2950.

1. TWO DISCS on a single drive provide the copying capability normally requiring two separate drives . . . *two for the price of one.*
2. REMOVABLE IODISC CARTRIDGE allows for unlimited off-line storage; fast input/output and cartridge interchange between systems . . . *increased system capacity and flexibility.*
3. FIXED DISC stores programs and fixed data to free the cartridge for pure input/output . . . *increased system capacity and flexibility.*
4. CAPACITY of two single disc drives . . . *lower cost per bit.*
5. FILE/PROTECT provides independent data protection on both discs . . . *system integrity and reliability.*
6. ADVANCED SERVO-DESIGN permits fast access times normally not available with small moving head file . . . *increased system through-put.*
7. INTEGRAL FIXED DISC has extended operating temperature range . . . *wider range of process applications.*



iomec inc

about 50% design work, 25% programming and 25% testing and implementation. Personnel for the operation is formed around a nucleus of people out of FSD, reportedly some 150. They have provided experienced first- and second-line management for the group. CCS has its own marketing direction and the dp division sales force to bring in business.

Business, according to Webb, is coming from state and local government (i.e., motor vehicle, tax, health service, Medicaid and Medicare administration), education (library control, registration systems), trucking (warehousing and dispatching control), airlines (maintenance and parts control), banking (credit card and credit check systems), retail food distributors, and manufacturing (petroleum processing and on-line production control systems).

BUSINESS SUITS ARE THE UNIFORM OF THE YEAR

As the computer industry cross-pollinates its companies with interchangeable personnel and new companies sprout across the land, the lawsuit has become perhaps the benchmark of progress and a symbol of the almost frenzied proliferation of ideas and their implementation that characterizes the industry. Aside from the famous suits against IBM by the Justice Dept., Control Data, Data Processing Financial & General, and Applied Data Research, as well as its subsidiary, Programmatics, a whole rack full of suits, some seemingly frivolous, have come into fashion.

It seems that IBM can do no right. Two suits have been brought against the computer colossus' announced unbundling policy, which was probably a response to the antitrust implications in the previous five suits. Motor Replacement Co., a Phoenix, Ariz., firm, has filed a $5 billion breach-of-contract action contending that IBM plans to renege on an agreement to provide "lifetime programming service" to users who bought IBM's equipment before June 23, 1969. The suit was filed by MRC on behalf of itself and other owners of IBM equipment, which accounts for the $5 billion price tag. MRC's equipment consists of a 6400-series electronic accounting machine the firm bought for $43K five years ago and has since received programming and related services free of charge. The computer in question uses handwired programs.

IBM termed the suit "without merit," and asserted that it has never offered a lifetime programming service to users.

The other suit against the unbundling policy was filed by Greyhound Computer Corp. in state court at Aurora, Ill. The leasing company feels that the policy will harm its own policies and relationship with its customers, and that when IBM reduced its leasing price by 3%, it "substantially affected the ability of the Plaintiff to recover the original purchase cost or investment." IBM's reaction to this is that "Greyhound, unlike most leasing companies, is committed in contracts with customers to maintain lease rates for its computer systems at a fixed percentage below IBM's lease rates." That can cut the profit. Greyhound considers that damage to it "substantially exceeds $100K," which seems a modest sum when compared to Motor Replacement's $5 billion. IBM labeled the suit as "wholly without merit."

Service Bureau Corp., an IBM subsidiary, is being sued by DataStation Corp., Los Angeles, for $1,200,000 on charges of violating antitrust laws by leasing 7094 time last year at "unreasonably low rates" in an effort to damage DataStation. SBC maintained time rates on the 7094 at a considerably higher level in other parts of the U.S., DataStation asserts, while offering time in the Southern California area at a price set to render DataStation uncompetitive. To enforce the antitrust charge, DataStation must show that SBC attempted to monopolize a sector of interstate commerce, which DataStation says is involved because the computers and spare parts come from outside California, SBC leases time to companies outside the state, and serves national companies with headquarters in L.A.

SBC denied the allegations, stated that "the suit is not meritorious and . . ." of course, ". . . it will be defended vigorously."

In another court action, the original IBM suer is being sued. CDC and its subsidiary, Commercial Credit Business Loans, Inc., have been filed against by Scientific Control Corp., Dallas (see p. 207) charging breach of contract and fraud in connection with a projected loan of $4.5 million by Commercial Credit to SCC that was cancelled after $800K had been advanced "secured by adequate collateral." SCC seeks $21 million in actual damages and an additional $20 million in punitive damages. In connection with the suit, SCC also said it is no longer considering granting a license to CDC or Commercial Credit to manufacture and market a communications terminal developed by SCC.

CDC expressed "complete surprise" at the suit and the termination of license negotiations, and said the suit "is without merit."

Now, we have the case of MAI Equipment Corp., a subsidiary of Management Assistance, Inc., which has announced that it will react to a demand for arbitration and an award for damages for an unspecified amount by Potter Instrument Co., Inc., with a suit of its own for "substantial damages" from Potter for its breach of faith in failing to deliver tape units and parts "on time and in accordance with the specifications set forth in the agreement between MAI and Potter dated June 6, 1967 . . ." Potter seeks termination of MAI's exclusive marketing rights to the tape drive manufactured by Potter.

Patent infringement is still (and will be) a popular lawsuit subject. One of the latest has Digitronics Corp., Albertson, N.Y., filing an action against Marketing Systems, Inc., of Montclair, Calif., claiming that MSI infringed Digitronics' Patent No. 3,408,572 by manufacturing, selling and using and contributing to the sale and use by others of controlled amplitude frequency shift single generators covered by the patent.

MSI dismissed the complaint with a counterclaim that Digitronics had maligned the integrity of MSI over "an alleged infringement on a minor electronics circuit patent," a patent that is, indeed, said MSI, invalid. The counterclaim also asserts that Digitronics has made implications of potential patent infringements to prevent any representation "calculated to interfere with the sale of MSI devices to its customers."

Vigorous defenses are expected on both sides.

Nonmergers and nonacquisitions after announcement of merger or acquisition became a way of life in some sectors of the industry and sometimes there was ill feeling. Take the case of Quantic Industries, which was to have been acquired by Sterling Electronics Corp. a year or so ago, but the deal was never consummated and Quantic went into dissolution proceedings. However, it won a petition to revoke the proceedings, thus continuing in business as a manufacturer of electro-optical devices, and has filed suit against Sterling for $400K charging breach of contract. Hell hath no fury like a company scorned.

Even show biz sang a chorus of sweet sue. The Columbia Broadcasting System filed an over $1 million suit against Image Systems, Inc., Stamford, Conn., charging that 11 former CBS employees are using proprietary laser scanning information and have competed for Air Force contracts using specs almost identical with those of CBS Labs, where the former em-

ployees had worked.

But there are happy endings. Last June, Texas Instruments, Inc., filed suit against Optron, Inc., and six former TI employees charging appropriation of trade secrets and "unfair competition relating to light sensors." Optron denied the allegations and in turn challenged the validity of certain TI patents. Now, harmony and accord prevail as all parties agreed to a settlement under whose terms Optron will pay an undisclosed sum to TI and be licensesd under TI patents, including those challenged.

Here come de judge.

PUT A COMPUTER IN YOUR WIFE'S STOCKING

Who else but Neiman-Marcus, the Dallas-based specialty store, could get away with it? Listed among the gift selections the store offers its 500,000 plus customers for Christmas are the following items: 18K gold calling cards (a dozen for $1500), a Kojah mink coat at $125,000-$150,000 (only one is offered, presumably there aren't enough poor Kojahs to go around), and a $10,600 kitchen computer. According to Edward S. Marcus, the computer was "an ideal selection for the catalog because it offers something unique to the modern homemaker who doesn't quite have everything."

Lady in kitchen with computer blocking way to refrigerator

Those who order one from their N-M catalog will receive one of the Honeywell 316's which comes attractively packaged by the manufacturer in its own pedestal base. Honeywell offers a two-week course in programming to go with the package, and even without the course the poor overworked housewife can make menu plans with the touch of a button. The computer is programmed to select a menu from the number code of an entree. Typical selections include an appetizer, two vegetables, salad, dessert, and wine.

Now some people — those that live out of cans like most of us — don't need a kitchen computer, so N-M has other selections for them. Could we interest you in a petting zoo? Complete with zoo keeper?

ANATOMY OF A SOFTWARE CONSORTIUM

To celebrate its third birthday, CAP Europe has prepared an annual report to show how Computer Analysts and Programmers of France, Britain, Belgium, Switzerland and Holland expect to chalk up $6.67 million worth of business this year.

At a time when at least one new name is added to the Registrars of Companies lists a week somewhere in Europe for the marketing of some specialized package or another (and another removed by the liquidators), the progress of CAP Europe is a comfort to those seeking international collaboration in European software.

The company was formed when two established software houses, with indentical names, in London and Paris decided to join forces. Both had set up shop in 1962. The French group of Bertrand Asscher, Jacques Lescault, Jean Citry and later Phillipe Dreyfus in France plumped for applications packages and bodyshop programming in a market that was deteriorating almost hourly through a shortage of programmers.

In London, Alex d'Agapeyeff and Barney Gibbens (with the advice of brilliant young accountant David Sheahan) were pitchforked into the compiler-writing business at a time when it was easier to squeeze blood out of a stone than to get contracts out of European industrialists for such esoteric jobs.

CAP Europe is made up of 42.5% each of CAP U.K. and CAP France and 15% Phillipe Dreyfus. Gradually the work of the two groups converged on systems design and basic software. Both companies found that contracts of this nature were drawing them more and more into the realms of the international commercial houses trying to sort integrated systems. Not unnaturally, they fell into each other's arms on an increasing number of occasions (or perhaps fell into the same prospect's waiting room).

But the way in which they complement each other's activity is well summed up by d'Agapeyeff in describing the problems of languages in working in Europe as enormous. He says there is a terrible danger of believing you understood the other man perfectly whereas, in fact, you got the wrong end of the stick while the minutes showed complete accord. If a policy decision requires two hours' discussion among single nationals alone, it may well need all day with a polyglot mixture of participants.

Against this type of background, the two CAP's got together to reproduce CAP Belgium in 1966, CAP Switzerland in 1967 and a Dutch CAP last year. By the end of the year the staff complement will be 700 for the largest pure software house in Europe and the largest locally controlled one that does not compete in the bureau business.

Curiously, they work for almost every manufacturer in Europe, including the United States firms, except Britain's ICL.

NEW MICROWAVE FIRM MAKES WAVES FOR COMMON CARRIERS

Following the successful bid by Microwave Communications, Inc., to obtain a common carrier license from the FCC (Sept. '69, p.241), a newly formed company named MCI Pacific Coast, Inc., Orinda, Calif., has applied to the FCC for permission to lease microwave channels on a common carrier basis for the Pacific Coast utilizing 54 microwave towers linking San Diego and Seattle and points in between. Richard D. Spight, president of the firm, said that the new system will provide 72 basic channels that can be used in more than 10,000 various combinations, with rates as low as five cents per mile per month, with no restrictions on how allotted channels are to be used.

MCI Pacific Coast is one of a group of autonomous but interrelated companies, including MCI and MCI New York West (which applied for service between New York and Chicago), that plan to cooperate in forming a national communications network through Microwave Communications of America, Inc., a national service organization in Wash. D.C. Their operations have been opposed by AT&T, several Bell System operating companies and Western Union, which have asked the FCC for an extension to Dec. 15 to reply to MCI New York West's application.

Initial cost of the system will be about $6 million, with financing by a number of private investors and the United Artists Theatre Circuit, Inc. According to Spight, the network could be operational within nine months after FCC approval. Leland C. Launer, exec vp, stated that MCI Pacific Coast will provide channels especially designed to handle data, with an expected rate of one error in 10 mil-

lion bits transmitted, and rates for these channels will be based on actual transmission speed rather than raw bandwidths. MCI Pacific Coast also will place no restrictions on user terminal equipment.

CII ANNOUNCES LARGEST EUROPEAN COMPUTER

1972 will see the end of *Plan Calcul,* the French government's five-year plan for subsidizing that country's computer industry. 1972 will also see the first installations of the CII (Compagnie L'Internationale Pour L'Informatique) IRIS 80 multiprocessing large-scale computer system. (Uniprocessors will go in in 1971.) The success of *Calcul* may, in the world's eyes, be determined by a multipart evaluation of the 80. The first question will be a straightforward one. Is the machine competitive? (or) Can it be built and sold at a profit? The second question is not quite so obvious. Was it worth doing?

CII is now building XDS computers on a licensing agreement that may last until the five year lifetime of *Plan Calcul* expires. In addition to the American designed machines, the company is turning out a line of mid-range business and scientific machines called the P-Series, which look much like American designed machines. In accepting its share of the French government's 700 million franc ($140 million) investment in the industry, CII had been given a charter to go its own direction, so that it could "... be one of the three or four companies in the world with our own way" (Sept. 68, p. 74). If the company fails to give its products their own identity, then quite possibly the exercise was not worth doing.

The easiest machine to compare the IRIS 80 with is probably a dualprocessor IBM 360/65, but only because a dual-processor 360/75 is not offered. Comparing the abilities of the two machines is very difficult, but although the names of the components are different, the numbers behind the names look much alike. For instance, I/O busses rated at 12MC link the memories and processors of the 80. Selector I/O Exchange Units (read "Selector Channels") provide one-, two-, or four-byte interfaces with up to 32 controllers and, as with Selector Channels, only one controller operates at a time. Two Selector I/O Exchange Units can be attached to a Multiplexor I/O Exchange Unit (Multiplexor Channel), one with a transfer rate of 500KC and one with a rate of 300KC. The maximum data rate of a Selector Unit is 3.5 MC; and the maximum for a Multiplexor unit is 450KC. Two I/O Exchange Units can share a memory bus.

The comparable IBM architecture is: six Selector Channels per cpu, eight controllers per Selector Channel, and data rates to 1.3MC, plus two Multiplexor Channels per cpu, up to 196 subchannels per Multiplexor (including up to four Selector Subchannels), and aggregate data rates something like 670KC. See the difference?

The 80 offers up to 16 banks of main core, from 256K to 4M bytes (IBM's offering goes to 2M bytes). The 80's cycle time is 650 nsec per four bytes; the 65's is 750 nsec per eight. A fixed point add on the French machine takes 850 nsec; on the IBM machine it takes 1.3 usec for a word twice as large.

The big differences in the IRIS 80 are supposed to be that the system is intended to be a multiprocessor, that a special hardware box has been added to assign a priority to every event and shuffle the tasks between up to four processors. The interrupt system allows for up to 222 requests, and is said to be probably the most advanced now in use.

The 80's software includes batch COBOL, Extended FORTRAN IV, and ALGOL, plus conversational Tex-Edit, BASIC, and FORTRAN IV, plus application packages such as PERT, LP, and APT. The SIRIS 8 Operating System allows for batch, remote job entry, time-sharing, and real-time processing.

About being "competitive." A dual processor 80 will sell for around $4 million in a configuration that the French feel is "typical." A "typical" dual processor 65 sells for about $5 million, but who can tell if the prices are for the same "typical's"? Peripherals for the two look much alike. The French machine seems to have an edge in the price/performance department, and its I/O may be stronger, but still it doesn't seem a whole lot different from its U.S. counterpart. And a lot of 65's can be purchased for 700 million francs.

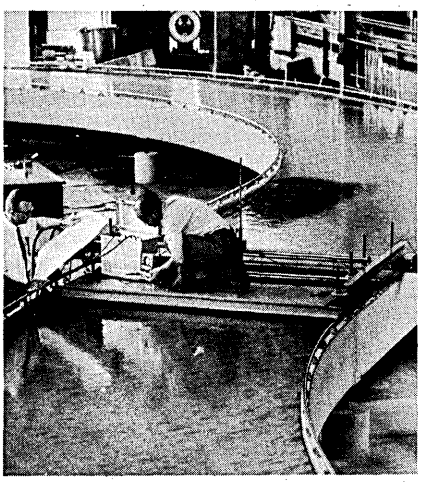
TYMSHARE TO FORM PARIS SERVICE CENTER

Tymshare, Inc., and two French partners have formed a new corporation with a service center in Paris that plans to go on the air next month. Initially, it will serve customers within France; ultimately, it plans to operate throughout the Common Market. The partners are CEGOS Informatique, a large French dp consulting firm, and The Bank Credit Lyonnais.

The new company is called Cegos-Tymshare with Gerard Bouvin as president. It will offer conversational and remote batch t/s services, with the help of an XDS 940 plus Tymshare's Tymnet communications package. Initially, the processing may be done on this side of the water, via satellite or undersea cable, and afterward this hookup will back up an XDS 940 to be installed in Paris. In the beginning, the marketing effort will be concentrated in the Paris metropolitan area, among scientific-engineering commercial and industrial users. The only other major supplier of commercial t/s service in France at the moment is GE.

ACROSS THE WIDE MISSOURI

To study the interacting effects of sand bars and ripples and water depth in the Missouri River, researchers at the Univ. of Iowa built a 120-foot model of the meandering river bed. Taking soundings from the actual river, they tried to duplicate conditions along the waterway to learn how

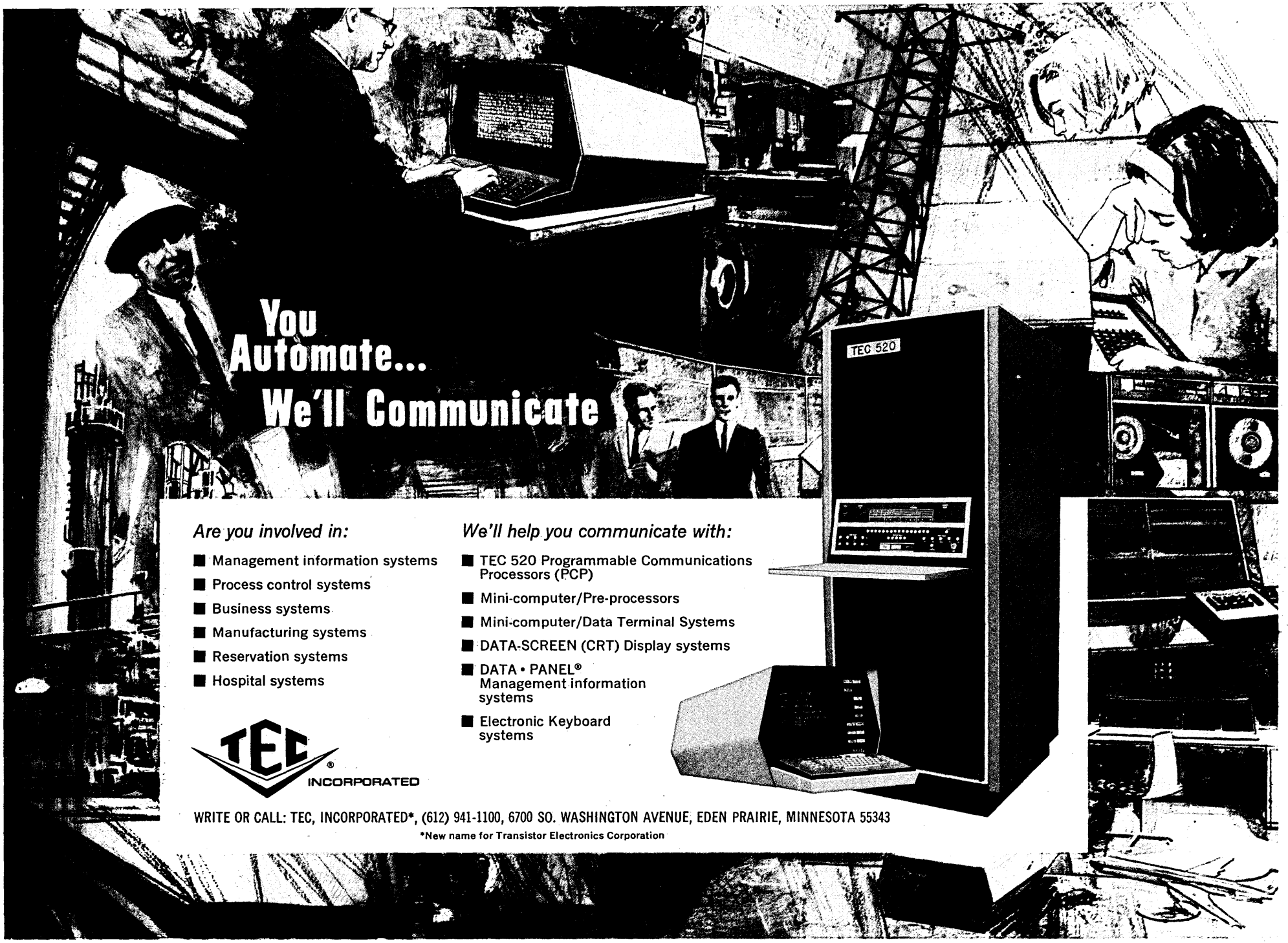


The 120-foot river model was built as part of an Army Corps of Engineers project.

to improve navigation and flood control projects without having to experiment with the real thing.

Such studies are complex, and tricky. For instance, by opening a dam on the river to make the channel deeper, the Army Corps of Engineers found that the water level went down instead of up. Trying to analyze that by manual means might have meant thousands of calculations, so the university enlisted the aid of an IBM 1800. The 1800 gets its inputs from a mag tape recorder on the boat that does the river depth soundings. After hundreds of passes over the course of the section of the river to be studied, the tape date is used to generate a numerical profile of the river bottom, which is punched out and sent off to be digested on a 360/65 — taming the Missouri, after all, is a little too much to ask of an 1800.

(Continued on p. 218)



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CIRCLE 217 ON READER CARD

news briefs . . .

SYSTEM/3 SOFTWARE LOWER THAN REPORTED

In a story on unbundling reactions (Oct. '69, p. 170) DATAMATION reported that software costs on IBM's System/3 would be "roughly 30% of minimum hardware costs." This was because an Application Customizer Service, which is available from $180 to $265 an application, was included in the estimate on a monthly basis, when it is, in fact, a single charge.

Basic IBM software for a typical card system would include RPG II ($35 a month) and utility programs ($10 a month for the set) — a total of $45. A typical disc system would include RPG II ($45 a month), the utilities at $10 a month and the disc sort at $10 a month. System/3 rental prices begin at $945 a month for the card model and $1,325 a month for the disc version. The basic software price, then, works out to around 3% a month.

BIRDS OF A FEATHER ASSOCIATE TOGETHER

The natural inclination to get associated, particularly in the face of a proliferation of programmers and data banks, has been manifest recently:

The International Association of Computer Programmers, Inc., has been launched in the Chicago area "to reflect the professional stature of the computer programmer in society and, through effective two-way channels of communication, remain alert to his opinions and needs." IACP will issue a monthly magazine, offer group insurance, and plans to form local chapters all over, whose members will attend meetings all over, even internationally. Affiliate and student memberships will be available as well as regular ones, and the association also plans to promote scholarships and educational seminars.

Association president is Lawrence Vanucci. Information about IACP can be obtained from Richard Lynch, executive vp, P.O. Box 57, Sycamore, Illinois.

The Association of Scientific Information Dissemination Centers is a new group composed of university, industrial and nonprofit information centers that are computer-based. ASIDIC aims to promote storage and retrieval technology, R&D for better use of data bases, and to recommend standards for bibliographic formats and codes. It looks forward to sharing its combined information, and plans seminars and workshops. Besides full membership, it offers associate status to interested organizations.

Officers of the organization will not be elected until March, 1970, but the chairman of the organizing committee is Eugene S. Schwartz, of ITT Research Institute, 10 W. 35th St., Chicago, Illinois.

And, California Educational Computing Consortium is a group formed by schools, colleges and nonprofits throughout the state, which hopes to set a national example. It is devoted to sharing information — and facilities — on computers in education. Its membership is also open to any government agency; the U.S. Forest Service is a member. CECC will hold a symposium Jan. 29-30 at Orange Coast College in Costa Mesa, to discuss CAI, administrative dp, teleprocessing systems and computer networks.

Chairman of CECC's executive committee is Dr. John Hopperton, California Western University, 3902 Lomaland Dr., San Diego, Calif.

HOW WOULD YOUR DP MANAGER DO AS COMPANY PRESIDENT?

Scary thought? Not if the man has been properly prepared to use his data processing management position as a stepping stone.

Going on the argument that future companies will succeed or fail on their ability to gather and analyze information, the Georgia Institute of Technology has instituted a program to train information managers to be corporate officers. "The reason is simple," said Alton P. Jensen, a senior faculty member and one of the architects of the information sciences program; "the information manager will be the most knowledgeable in the company."

Georgia Tech's School of Information Science was founded six years ago — then said to be the first in the country — with an assist from the National Science Foundation. It now offers graduate degrees, both MS and PhD, and will offer an undergraduate program in 1970.

The graduates are not programmers, although they know programming well. They also have had courses in such fields as theory of information communication and control, descriptive and mathematical linguistics, cybernetics, semiotics (the advanced study of the theory of signs and symbols and their artificial systems), etc.

The students have access to real machines, as well as texts, including the school's large Burroughs and Univac gear, and a PDP-8/i which they use as a demonstrator or as a terminal. Involved in the program are a 20-member staff, approximately 150 graduate students, and nearly 2000 undergrads — over 25% of the student body.

COMPUTER OUTPUT TO MICROFILM A GROWING-UP INDUSTRY

Computer Output to Microfilm (COM) devices are nothing new. At least one unit was operating as early as 1955, and DatagraphiX, the firm that was largely responsible for getting the ball rolling on a commercial basis, was doing business at least 10 years ago. Still, for various reasons — cost being a major one, habit being another — the units were not widely accepted. For instance, at the beginning of 1969, according to a National Microfilm Association survey, about 300 COM's were in use, 60 of them in service bureaus. Still, the survey predicted that there should be more than 1,000 COM devices in use by the end of 1970, and somewhere between 6,000 and 12,000 in service by 1975.

Why the big jump? Maybe because the cost is down so significantly. A line printer replacement good for 13,000 lpm can be purchased for less than $50,000 now. Maybe because it is more evident now that line printers choke the output power of large-scale systems than it was when most computerized jobs were those that had been manually done (and hence were not designed with the high powered output capabilities of a computer in mind).

Some other findings of the survey: two-thirds of the COM's are used in business applications; the average COM produces 24,000 pages of *hard* copy per month; 38% of today's users plan to add more units within two years; and, oh yes, 5,125,000 feet of film are used each month.

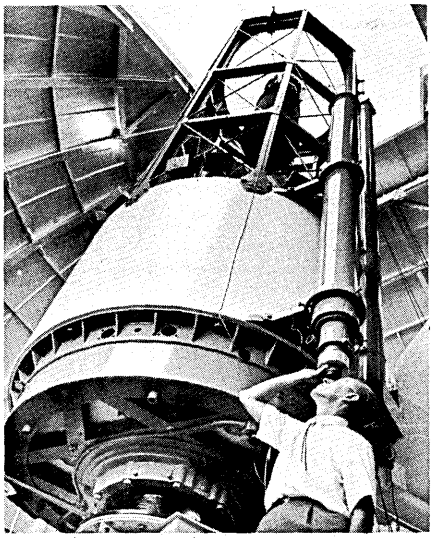
STAR LIGHT, STAR BRIGHT, MY 1130 WILL FIND YOU TONIGHT

The Lowell Observatory in Flagstaff was founded by Dr. Percival Lowell, the man who "discovered" the planet Pluto. Working with telescopes not strong enough to see the distant body, the good Doctor theorized that the planet was there and then directed five people who worked for seven years to determine its probable position. It was not until 1930, 16 years after Lowell's death, that a telescope was built that could optically detect the planet's true position — 1° from where it was thought to be.

Nowadays, of course, no one has to work seven years to calculate anything, and the astronomers at Lowell are using a computer to get the answers they need. Today they seek to learn the size of stars, their distance from the earth, their movements, and related facts with the aid of an IBM 1130. The 1130 reads paper tape collected from seven telescopes, correlates the inputs, and grinds out the

answers. With computerized techniques the astronomers there have been able to discern and study stars that exist in pairs — linked like dancing partners — and learn about them separately although they may be only two seconds (1/1800th degree) apart. Even the largest telescopes are only good to five or six seconds.

The next step in star gazing, the Lowell dp manager says, will be to



This 72-inch telescope, and its IBM 1130 assistant, are used to study stars millions of light years from Earth.

link the seven scopes to the cpu with microwave for on-line studies of celestial events, like eclipses, that won't wait seven years or seven minutes for men to measure them.

A CORE DUMP MUST BE AWESOME IN BRAILLE

"When I am on the computer," says Mike Lichstein, "I am on an even par with everyone else." Mike, like a growing number of programmers throughout the country, is blind, and that statement is quite an important one for him to be able to make. Mike works as a systems analyst doing economics research at M.I.T. What sets him apart, even from most other blind programmers, is that he is able to operate on-line conversing with a computer in a language that they both understand, Braille.

Alongside the Teletype at the M.I.T. Center for Sensory Aids Evaluation and Development is an embosser which acts as a slave to the tty, punching in Braille at tty speeds. A blind programmer using the embosser can interact with the host computer much as anyone else does. NASA has another copy of the embosser and other units are being built for testing in schools — for rapidly generating Braille copy for blind students (simultaneously with the teleprinter's normal typed copy) — and in dp departments, and in printing areas where a sighted person, with the aid of a terminal, can rapidly translate text into Braille.

M.I.T. is not the only agency at work on the problem. Among others, System Development Corp. is active in a blind programmer training course in Los Angeles County, NCR has produced a Braille printer for use on the Century Series computers, and IBM has lines of embossers.

M.I.T. may be one up on everyone, though, with the introduction of the Braille terminal and the voice synthesizing under development there (see Aug., p. 133).

COMPUTERIZED MEDICINE COULD HIKE LAWSUITS

Malpractice suits might stem from overestimating the future capabilities of the computer for medical diagnosis and treatment, Cleveland attorney Philip J. Hermann warned in a speech at the American Bar Association's annual meeting in Dallas. Other suits could arise, he said, from failure of the computer to assist in medical cases due to mechanical breakdown or errors made by the operator or in the program.

"Although it will undoubtedly result in improvement in diagnosis and treatment and patient management, it will also raise new problems in the field of medical and hospital malpractice," Hermann said.

The new technology may call for new rules, he said.

It is anticipated that in areas where the computer could have cured, minimized or prevented medical problems, failure to employ the computer where it may have been indicated, whether it be diagnosis, treatment or patients management, will enter into the question of whether current medical standards have been applied, he told the lawyers.

Initially, the first impact will be felt at hospitals, since the cost of computers would limit the number of private physicians using them, he said. However, once it is clearly demonstrated that the computer can lessen error in diagnosis and treatment it will attract the "conscientious" practitioner, he added.

"For the same reason, malpractice insurance carriers may also force the individual practitioner to cut down potential malpractice claims by requiring judicious use of the computer as a prerequisite to coverage or establish higher rates for those who do not enlist the aid of computers."

He foresaw that in 15 to 20 years, individual physician's offices may either be hooked up to a hospital or other institution offering computerized services.

"Hospitals in small cities will be connected by telephone to computers at large hospitals or medical schools. It is only a question of time until the average medical practitioner will be relying upon computers in the practice of medicine," Hermann said.

"The impact of the computer upon patient, doctor and hospital is bound to be profound," he concluded.

DISABLED VETS TRAIN FOR PROGRAMMING

Wounded Vietnam veterans are being afforded an opportunity to become programmers upon discharge from the service through a training program at the St. Albans Naval Hospital, New York.

The course consists of six hours per week of classroom work, with an equal amount of homework, over a three-month period. Unfortunately, no hands-on training is provided, although a one-day visit to a computer center is being arranged. Plans call for use of time-sharing, eventually. The men have been guaranteed jobs by the sponsoring Chase Manhattan Bank, which will either employ them or find jobs through contacts in other parts of the country.

The present class will graduate early next month, and is the third to be held since the program began early this year. Twenty-six men have graduated; all who were discharged and wanted to work are said to have been placed in programming jobs.

The program is being conducted by the 52 Association, a nonprofit organization dedicated to aiding wounded servicemen. The association is forming a fourth class at Philadelphia Naval Hospital, under the sponsorship of the Provident National Bank. The courses are open to any servicemen in the hospitals who can pass a programming aptitude test; there is no educational requirement.

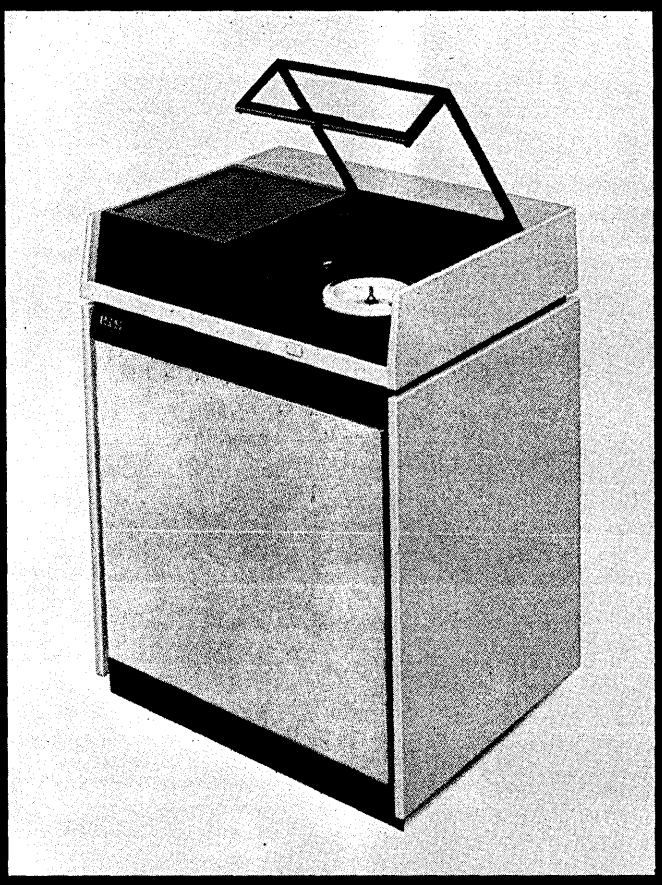
CDC'S NEW RESALE DIVISION TO PUSH REFURBISHED UNITS

When Control Data Corp. announced its newly organized Resale Systems Division, it defined "resale" as "strictly a marketing classification." "Used," on the other hand, referred to *used* equipment. What's the difference? Some resale equipment, used, refurbished, and sold with new computer warranties, will be sold at original prices. CDC people point to the 8090 system as an example in which the flourishing market requires that it be sold with its all-new price tag still affixed.

(Continued on p. 222)

the creative past points

"MEMORY," *an original painting by Rick Guidice from the ISS collection on the history of EDP.*



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Very simply, each new development has spawned more developments, erasing contemporary standards, setting even higher goals, allowing even greater advances.

The ISS 714 is the latest of these advances. The contemporary industry standard for average access time to an eleven-high disk pack was 75 milliseconds—with the 714 it's 32 milliseconds. Standard start-up time was 60 seconds—now it's 20 seconds. Improvements like these are backed up with increased reliability and serviceability as well, providing the most advanced disk storage drive available on the market today.

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CIRCLE 157 ON READER CARD

Prices on all systems have not yet been released, but an idea of what reductions in cost may be involved on some of them would go like this:

The 3400 with its 32K memory and disc operating system, originally priced at $940K, will go for $506K. This will include card reader and punch, printer, disc storage and three mag tapes. Variations in price will depend upon the configuration selected.

The 3600, originally listed at $2,700K, will resell for $850K. That includes card reader and punch, printer, two tapes, and four million characters of drum storage.

The 3800 with the same configuration as the 3600 will resell for $1,130K. The 3400 operates at 1.5usec.; the 3800, at 800nsec.

The new division will provide unbundled systems support to purchasers. Policies in the U.S. will be the same as those applying to standard — i.e., *new* — equipment. Internationally, CDC continues to be bundled for its standard and resale equipment.

The market? It's big, say CDC men, but they back off from making any public projections insofar as it affects their company. But, they continue, resale industry-wide should amount, conservatively estimated, to $1 billion by the mid-seventies.

Long-time CDC man James Murdakes will head up the new division, which will make its home in St. Paul. And H. E. (Gene) Agerton, who for 13 years has been selling for Univac, GE, and CDC, will run the Resale Marketing Department. He'll work out of corporate headquarters in Minneapolis. The two departments, Resale Systems and Resale Marketing, will be entirely separate, but, of course, working together.

BRITISH MACHINE BUILT TO LEARN BY ITS MISTAKES

The first phase of a cybernetics research program to determine methods of constructing machines that can learn in a manner similar to animals and humans has been completed at the Univ. of Aston in Birmingham, England, by a group under the direction John F. Young. The object of the effort is to build a machine that can learn by association, and the prototype, called ASTRA, is now able to receive 100 inputs from various touch sensors, and visual and sound sensing devices, and produce 10 outputs to such "muscles" as electrically operated actuators. Ultimately, finances permitting, the group will construct a machine capable of receiving several thousand inputs and controlling the output to several hundred function devices.

Young states that "features that can be added in varying degrees to these machines are those of probabilistic memory, of inhibition, and of forgetting. These features all appear in animal and human nervous activity and one aim of the present work has been to ensure that the engineering methods adopted do not prevent the easy introduction of the additional features experimentally at a later stage."

One of the purposes of the researchers is to develop possible methods for ascertaining how a given word or sound is recognized by animals or humans. However, using animals or humans as subjects in such an investigation is difficult because of their adaptability and ability to operate in complicated circumstances. With an advanced ASTRA, Young believes it will be possible to eliminate this facility for adaptation whenever required so that repeatable experiments can be performed. Yet, because of a probability factor, the machine will not necessarily be infallible. Young says that "It appears to be one basic principle of biology that 'to err is human.' Only by making occasional mistakes is it possible for an organism or a machine to learn and relearn from experience."

Sometimes.

U.S. TIME SHARING AIMS AT 2000 360/50 AND /65 USERS

U.S. Time Sharing, Inc., has begun general marketing of its "Share OS 360" system as the first step in a plan to build a nationwide commercial service center empire.

There are about 2000 360/50 and /65 users throughout the U.S., explains USTS President Porter Stone. "We think Share OS 360 will appeal to at least half of them. These are the shops where programmers now spend an inordinate amount of time doing crossword puzzles while waiting for program and data changes to be processed and output. Our system allows such changes to be made on-line, in a conversational mode; the updated programs are then run on a batch basis, under a priority interrupt scheme that gets rush jobs into the cpu and underway with no more than a five minute wait."

Stone hopes that some users who take the Share OS package will have excess machine time available that is suitable for supporting a commercial service center operation. USTS plans to buy this time and resell it to outsiders. "The system operator will get extra revenue, and we'll be able to set up additional dp centers with a minimum capital outlay," explains Stone. "We'll also be in a position to offer commercial machine time at lower rates."

USTS plans to market likely application software developed by 360 users — those who contract for the Share OS package as well as others. A new subsidiary — Time Sharing Applications Company — was formed recently to manage this effort. TSA is headed by Joe Campagna, formerly CDC's product marketing manager. His main job will be to recruit marketing and managerial types with expertise in businesses where application software is, or can be, widely used. Then, specialized subsidiaries will be spun off from TSA to sell in those areas. TSA, in conjunction with the specialists, will shop for suitable programs, which will be purchased outright, leased, or acquired on a royalty basis. TSA's in-house programming staff will then modify the software, as needed, for the commercial market. USTS will provide financing for the overall venture and, through its service center facilities, will provide machine time for those package buyers who need it. The software acquired from users will also be offered to all USTS service center customers.

Share OS 360 buyers will pay an initial charge to cover training of their personnel and a portion of the development cost; an installation charge, and a monthly service charge. The first will be "between $10K and $25K," the second around $25K, and the third around $10K, says Stone. "We'll provide a full complement of support services, including new versions of the Share OS 360 system as they are developed." Version 2 is scheduled for completion next Spring, and should be ready for marketing "in about a year," Stone added. Among its other virtues, Version 2 of Share OS 360 will permit load sharing among a number of computers. So, U.S. Time Sharing's headquarters equipment complex, in Reston, Va., will be able to supplement and back up the branch centers that evolve from the new marketing effort.

CODASYL COBOL VS. USASI STANDARD COBOL

The Conference on Data Systems Languages (CODASYL) has released the following statement on the relationship between CODASYL COBOL development and USA Standard COBOL.

"The release of the USA Standard COBOL (X3.23 - 1968) has identified the need for clarification of its status in relation to the continuing work of the CODASYL Programming Language Committee.

"The development of the COBOL language is the responsibility of the CODASYL Programming Language Committee. Standardization of COBOL in the United States is clearly in the purview of USASI Committee X3.

"The Programming Language Committee, recognizing its obligation to provide the orderly evolution of COBOL, will carefully consider the COBOL standard when clarifying and extending the language specification. The COBOL community must be aware, however, that the Programming Language Committee may adopt clarifications and extensions that cause the existing USASI Standard to cease forming a subset of the CODASYL COBOL language set forth in the *Journal of COBOL Development.*"

AFIPS SCHOOL STUDY SEES NEED FOR STUDY

A small, pilot study of the annual number of students graduated from private edp schools indicates the need for a major, national survey of the contribution of these schools to the manpower pool of the computer industry.

The pilot study, carried out by AFIPS as part of its general statistical research program, indicates that, even on a conservative basis, edp schools may produce over 80,000 graduates annually.

According to Dr. Bruce Gilchrist, AFIPS executive director, "the need for a major national study is indicated by the apparently large number of annual edp school graduates, the great variation in the length of courses offered, especially in the programming area, and the indicated transitory nature of a number of schools. It appears on paper that edp schools, for example, are turning out in pure numbers enough graduates in the area of programming to meet projected national needs. The question which has yet to be answered is whether or not these people have the right level of training to match industry's requirements. In this same area of programming, course length varies from 100 to over 1000 hours with most courses being in the areas of 250, 500, and 1000 hours."

Dr. Gilchrist points out that the estimated figures for edp school graduates are especially significant in view of recent projections by the U.S. Bureau of Labor Statistics. These indicate annual employment increases of approximately 50,000 each in programming, systems analysis, and computer operations.

There is general agreement that there is currently a lack of quantitative manpower data for the industry. While the Southern Regional Education Board, under National Science Foundation sponsorship, is collecting data on the number of college students receiving instruction in computing, there are no known sources of information covering manpower from other areas of training, according to AFIPS. Therefore, Dr. Gilchrist believes a national study is needed to provide detailed information. It would answer such questions as what the total enrollment is in edp schools, by type of course; the total edp school graduates, by type of course; the percentage of edp school graduates, total and by type of original training, currently employed in various capacities in the industry; current and projected industry minimum requirements for entry level positions; and projected industry programmer hiring policies in the event of an increased supply of college-trained programmers.

Copies of the pilot study are available at $3 each from AFIPS, 210 Summit Ave., Montvale, N.J. 07645.

FEDERAL PROCUREMENT MAY GET CLOSER LOOK

Bills establishing a commission to study federal procurement practices for two years and then recommend improvements were awaiting a House-Senate conference at press time.

The Senate version (S1707) would let the commission subpoena contractor records and cite balky firms for contempt; the House version (HR474) is much less controversial. The commission would look into several areas of interest to federal dpe contractors — e.g., technical support services, ways of reducing procurement paper work, and access to cost records.

Meanwhile, Sen. William Proxmire has proposed creating, within the Joint Economic Committee, a staff of 8-10 economists, statisticians, and program experts to help Congress evaluate DOD and other executive agency spending proposals involving systems technology. Four senators and 29 Representatives have introduced three other bills to provide basically similar support. This legislation would establish an Office of Defense Review, similar to GAO, to analyze defense policies and spending; a Joint Congressional Committee on National Priorities, to provide a continuing review of military vs. civilian needs; and a Temporary National Security Commission to study "the militarization of American society and the relations between employment, private industry, and defense spending."

BASKETBALL GOES ON-LINE TO GET A LINE ON PLAYERS

Jack Ramsay, perspicuous PhD coach of the NBA's Philadelphia 76'ers, is computerizing his search for new talent this spring. He hopes to be on an XDS Sigma 7 with a program that should help cull through the myriad aspirants in the annual NBA draft melee.

Each player will be graded numerically (1 to 5) on everything from shooting to booting: driving, passing, picking, shooting, speed, leadership, team play, lateral movement, fouling, switching . . . the works. And he'll be graded even by area college conference, marital and draft statuses, and whether or not there's an agent involved. The printout will give Ramsay over-all ranking of all players (regardless of position), ranking by area, conference and position, and a master detail report on every player scouted.

The Sigma 7 is Comserv's, a Philadelphia utility; the program (being debugged now) is Tom Lindemuth's, company programmer behind the scenes in Comserv's push to get this sporting venture off the bench. Comserv's configuration has a 64K word core capacity, 850nsec memory cycle, disc storage with eight 7232's, 49.6 megabytes, transfer rate of 376K bytes/sec, and average access time of 17msec.

The program — modifiable to operate in a real time, on-line conversational mode — is now being revised for hockey and baseball, and Jim McMonagle, Comserv's NBA marketeer, made a trip to Pittsburgh recently to chat with the Pirates about something or other.

HONEYWELL PUSHES NEW EDP SERVICE CENTERS

Honeywell's Information Services Div. is expanding with new services and even more service centers than originally planned.

Claude H. Smith, manager of the services group, reports centers will be added in Tampa, Dallas, Houston and Denver before mid-1970. In announcing formation of the division in January, Smith said there would be 12 centers with only three services — traditional batch on-site data processing, time-sharing, and software development. The centers will now number 16. The new services for the group are remote batch processing, computer facilities management and computer systems management consulting.

The step-up at Honeywell is due to indications that the market for services is increasing faster than expected. Smith voiced expectations of a $2 million market rather than the $1.6 million forecast. To handle the remote batch processing Honeywell is moving the H-2200 and H-4200 alongside its time-sharing 1648's. There is also a report that to get maximum capacity for this chore another manufacturer's computer may be used

(Continued on p. 226)

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We'd like to audition for you.

*Trademark of Honeywell Inc.

The Other Computer Company:

Honeywell

— at least until the H-8200 gets here with some time-sharing software.

The facilities management bug, which in the past has been very partial to IBM types, has strongly infected Mr. Smith. He considers it the "sleeper" of edp service and cites the McKinsey report for support. The McKinsey people said that 70% of the businesses with computers where making a bad job of data processing.

GIANTS NOT ENOUGH FOR PMS — MCA ALSO THREATENED

Peter James, prolific publicist and self-proclaimed industrialist, entrepreneur, and philanthropist, made big news in September when his Beltsville, Md., firm, Photo Magnetic Systems, Inc., sued IBM, AT&T, Western Electric, and Chesapeake & Potomac Telephone Co., charging infringement of a James patent covering uses of Touch-Tone pads in computer systems. The suit amounted to a claim for $2 billion in punitive and compensatory damages, which was sufficient to motivate national news media to carry interviews of James. But while the public smiled appreciatively at the thought of James attacking the giants, his firm was reaching further — all the way to Metroprocessing Corp. of America, the baby of Dr. Leon Davidson, White Plains, N.Y. MCS sells Fone-Tone portable acoustic couplers, using Touch-Tone pads for input. Though the larger companies, who are actually being sued, largely ignored the volley, MCA issued a press release.

According to the release, some MCA users received letters from PMS "apparently similar to the letters that PMS sent to AT&T and IBM in connection with the ... patent infringement claim. ... The letters from PMS are so worded as to make it appear that PMS is claiming that their U.S. Patent 3,381,276 covers all uses of standard tone generating telephone sets in or with computers systems. ... It is our intention ... to assist our Fone-Tone Terminal users, and any others who wish to make use of our help, in defending themselves. ... Dr. Leon Davidson ... pioneered as long ago as 1962 in developing the use of Touch-Tone telephones for alphanumeric computer input ... MCA is ... able to advise the users ... who may receive notifications of alleged infringement from PMS of at least three specific technical grounds on which the users' legal counsel could characterize the infringement allegations as being without merit."

These grounds are: (1) That the James patent does not cover systems that do not use the single-frequency, dual-button mode of operation of Touch-Tone pads. Standard Touch-Tone pads, other than those of PMS, use a twin-frequency, single-button mode, according to MCA. (2) The patent may be contested on grounds it does not give full disclosure of the procedures required by a user. And (3) "the implication in the PMS letters ... that their patent covers the normal ... mode of operation of Touch-Tone phones ... would ... tend to invalidate the patent. Prior use of Touch-Tone terminals and computers in the standard dual-frequency mode had existed and been described well before the filing date of the PMS patent (which was Sept. 15, 1965)." Among alleged instances of prior publication are several articles by Dr. Davidson going back to 1962.

Some small countries have started big wars in the past. Are there any other countries to be heard from?

ACM URBAN SYMPOSIUM OFFERS LITTLE NEW

This year's Urban Symposium, sponsored for the fourth consecutive year by the metropolitan New York ACM chapters, was the first to show a decline in size and impact from the previous symposium. And often the subjects being discussed did not directly involve computers, but only had the use of computers tacked on loosely, as if to justify being presented.

The day began with the keynote address by Edward F. R. Hearle, a vp of Booz, Allen, and Hamilton, Inc. There were many empty seats in the audience, and even fewer minority group members were present than last year. Hearle suggested that persons interested in the symposium ought to be computer specialists, urban analysts, and urban officials. But quite a few students were visible. He noted that many urban "data banks" have become "data dumps," and rely on such ill-defined terms as "social indicators" for justification. We all know the data banks *should* contain social indicators, but we don't know *what* these indicators are — and dictionaries lend little help.

Following the keynote address, Harrison S. Campbell, vp of the New York City RAND Institute, described that organization, jointly formed early this year by the city and RAND. It presently has the "full-time equivalent of about 60 research workers," and is involved in the solution of problems ranging from police to housing and the budget. Following Campbell, Jeffrey M. Zupan, chief systems analyst, described the Regional Plan Association's use of computers in studying the New York metropolitan area. He drew a loud round of laughter and applause when he displayed a bar graph that indicated there are two tremendous peaks in New York City traffic — at 9 a.m. and 5 p.m.! A panel discussion followed, billed as "The University and the City." The panelists, however, seemed bent on discussing universities — with little regard for the cities, and almost none for computers. A prime topic of discussion was interdisciplinary approaches to departmental organization.

The luncheon speaker was deputy mayor Timothy W. Costello, who daringly predicted the Lindsay victory, drawing a roar of applause. He went on to say that mayor Lindsay is often ruled by an "informed intuition" which is more accurate than advice from his expert advisers. That leaves little room for computers.

The afternoon sessions were divided into three areas: Techniques for Improving Municipal Services, Development and Application of Geographic Data Bases, and Computer-Based Transportation Projects. Twelve papers were presented. A few, however, involved computers only indirectly. Notably, in the transportation area, "Information Management in the Minicar Transit System," a discussion of a plan for public use of very small autos, hardly touched on the subjects of "information management" or computers, topics in which neither the speakers nor questioners in the audience exhibited interest.

KOREAN FIRM'S 360/40 WILL MEAN BUSINESS

The Korea Computers Corp., Seoul, Korea, has ordered a 360/40 for delivery in Sept. '70. The company was formed in mid-'68, a year that saw the country's Gross National Product increase by over 13%. Korea Computers claims to be the nation's first information systems organization, and offers programming, data processing, manufacturing (to overseas specs), marketing and consulting.

President of the firm is R. Alvin Kahng, who was formerly a consultant at Auerbach and at IBM, where he worked on the Advanced Time-Sharing System/360 project. Prior to that, he was employed by IBM's Systems Development Division, where he designed the IBM Interchange COBOL 7090/360, and helped in the development of the original NPL (now PL/I).

The largest computer in Korea will be the Korea Institute of Science and Technology's Control Data 3300, which is now being installed. It is being leased for $15K a month.

new companies ...

Microdoc has nothing to do with small doctors — it's a Philadelphia company consulting on microfilm information systems, including COM, micropublishing and microrecords. Its president, Thomas F. Deahl, was formerly managing editor of Auerbach's Graphic Processing Reports; he has formed the company because he feels "there is a great need for understanding the limitations as well as the potential of microfilm." ... The Jersey Tab Card Corp. has launched a subsidiary, **Accelerated Information Services, Inc.,** whose main function will be the recording of data from tape to microfilm to "eliminate using the computer as a printing press." Its hq is in Jersey City ... The **Micrex Corp.** has begun operations in Santa Clara, Calif., manufacturing both film and equipment for use with computer-based information systems. Its president, Leslie L. Burns, was formerly director of research for Memorex, was with RCA Labs for 22 years ... **Timeplex, Inc.,** Westwood, N. J., has come into being to develop and produce data communications products that will bridge the gap between the specialized requirements of the computer industry and the data services now available — or unavailable — from the telephone and telegraph companies. For openers, it has a line of multiplexor-concentrators ... Compace Corp. decided that interest in the concept of its Versicom modular communications system was high enough to warrant forming a subsidiary company, **Compace Communications Corp.,** in Minneapolis, to manufacture and market it. ... And the Datall Corp. has established **Fundamatics,** a division with service offices in S.F., New York and Chicago (hq L.A.) to offer back-office services to mutual fund concerns, taking over and computerizing all technical and clerical duties involved — including blue sky analysis. ... The credo of **Challenge Unlimited, Inc.,** states that it is "a newly established black enterprise, which finds its strength in the abilities and capabilities of its people." It is a black-organized and controlled general dp organization in Jamaica, N. Y., which is equipped to service either black or white banks, insurance companies, government agencies, manufacturers and retailers. It is also engaged in training personnel, designing systems, programming and facilities management. ... Another NYC firm, **PDA Systems, Inc.,** specializes in marketing information retrieval and distribution systems. One of its initial projects is a computerized registration and followup system for the Compso regional shows, which will supply a basic dossier on all registrants, so exhibitors won't lose them after the fact. ... **Ocean Data Systems, Inc.,** is based in Bethesda, Md., will furnish and coordinate marine data; its particular interest presently is developing environmental support programs for the oil industry — i.e., sea ice forecasting for Arctic operations. ... **Computer Typesetting Co.** will provide its services via telephone lines out of Louisville, Ky., on a nationwide basis. Its photocomp typesetters can handle more than 300 styles and sizes of type faces at 40 lines a minute. ... **Computer & Systems Resource Management, Inc.,** Dallas, will have three divisions: Systems Education, Systems Software and Facilities Management. It does not use computer hardware of its own, but utilizes or adapts those of its clients. ... CompuTech Research, Ltd., Tucson, Ariz., has arranged to install the first private computer center in Hermosillo, Sonora, via formation of a joint venture firm, **Tecnologia y Computacion SA de C.V.** in conjunction with a Hermosillo company, Velasco, Franklin & Assoc. The center should be open by mid-1970, will aid expanding business and mineral exploration activities in northern Mexico. ... A chain of automotive diagnostic repair centers will be operated by **Computer Car Clinics, Inc.,** as a subsidiary of Modern Data Techniques, Inc., Denville, N. J., in a joint venture with Nation-Wide Auto Auction, Ltd., NYC. ... **I/O Data Systems Corp.** will provide accounting and financial software and services to the Oakland, Calif., area.

mergers, acquisitions ...

"I have never before seen such a complementary business fit of two companies," said **Intercontinental Systems, Inc.,** president George M. Ryan in announcing an agreement to merge with **ITEL Corp.** in San Francisco. Peter S. Redfield, president of the latter company, was equally exultant, because the acquisition would make his company "one of the few well-capitalized manufacturers of computer peripheral equipment with its own worldwide marketing and maintenance force." Intercontinental, which makes "Dura" terminals and text editing devices, has an international staff of more than 600 people at 150 offices. All it will cost ITEL is $23 million. Already diversified in the dp industry, ITEL itself was formed earlier this year by the merger of a computer leasing company with a software/service concern, has since acquired another peripheral manufacturing firm. ... **E.P.G. Computer Services, Inc.,** has decided to expand into the leisure market by acquiring **Prudential Travel, Inc.,** one of New York's largest travel agencies. EPG expects to computerize tour packaging and furnish promotional material through using the automated composition services of another recently acquired subsidiary. ... **Computing and Software, Inc.,** L.A.-based computer center operator, is on an acquisition kick. By acquiring **Gratian J. Meyer Associates** it also acquired three affiliates, all in the Washington, D.C., area, specializing in direct mail and fund raising services. They are **Farragut Associates, Kaye Sullivan Associates,** and **Data Names.** C & S also has bought **Derivation and Tabulation Associates, Inc.** (DATA), in Orange, N. J., which publishes computerized technical information for the electronics industry. ... **DATA 100 Corp.** has agreed in principle to buy all the assets of **Rodale Electronics, Inc.,** Long Island manufacturer of airborne computers (among other electronic equipment), which will henceforth operate as a subsidiary and manufacture components for the Minneapolis company's terminals. ... **Vendere International Marketing Corp.** no sooner started as a dp hardware and software rep than it was bought into (for a third) by **Consolidated Analysis Centers, Inc.,** a software house. CACI then acquired all the stock of **Resource Computer Corp.,** an executive search consulting firm. All are in the L.A. area. ... A Philadelphia-based dp recruitment firm, **Executive Careers, Inc.,** New York firm which also is engaged in recruitment, plus consulting and marketing services. **Partners for Growth, Inc.,** a communications service and corporate counseling firm, has also agreed to merge into FAIM. In the meantime, FAIM has reached an understanding to consolidate with **Power Computer Systems, Inc.,** of Rutherford, N.J. ... **Foto-Mem, Inc.,** Natick, Mass., has agreed in principle to acquire **Wilkinson Computer Sciences, Inc.,** in Bedford, which produces small digital computers, until now as a subsidiary of **Semicon, Inc.,** which is agreeable to the transaction. ... Consolidation of computer companies in Puerto Rico already is occurring, with **Data Research Corp.,** a San Juan subsidiary of Brennand-Paige Industries, Inc., agreeing to merge into **Computer Corporation of the Caribbean.**

• While General Electric did not do a complete about-face when it decided to unbundle process control computer prices as of the beginning of December, it at least turned a right-oblique. It had announced previously that it would stick with package pricing, and while spokesmen pointed out that the

original decision was made for the business dp equipment division and apparently still holds, the process control separate price schedule showed a different attitude. From now on GE-PAC computer systems for automation of electric utility and industrial plants will not include software and services in their basic price. Customer training will not be furnished gratis, and application engineering assistance will be limited to one man-month. And equipment prices will increase about 6% for a typical system. The reason for it all is the same old one: increased component and labor costs.

• IBM has established a new division, General Systems, within the Data Processing Group. The division incorporates manufacturing, development, and programming activities in the area of low-cost dp equipment, including System/3, unit record equipment, card I/O machines, data acquisition and control equipment, and key entry devices other than data transmission terminals.

• Proliferation of Digital Equipment Corp.'s PDP-8, though not as great as that of rabbits, has reached the 5,000 mark and some four varieties. The plain 8 started the series in May 1965 and was replaced by the IC PDP-8/I only a year or so ago. The less costly 8/S debuted in the interim and has been succeeded by the 8/L, which DEC says "also makes maximum use of intergrated circuitry." Three thousand of the PDP-8s now in use are I's and L's. Earlier this Fall the 8/L population passed the 1500 point after only 18 months on the market. DEC modestly notes that it is now the fourth largest manufacturer of computers in terms of installations.

• Electronic Data Systems, Dallas, and the Pepsi Cola Company are parting — amicably. The Pepsi people feel their dp department is now big enough to do its own data processing, according to dp director Perry Davis, and Ross Perot's party also thinks it's time to leave. Davis said that EDS was brought in (in 1966) to push Pepsico into the third generation (still the younger generation?). At that time, the firm had a 1401 G card system and no daily processing. Pepsico now has 140 people, an H120, a 360/30 and a /40 going round the clock seven days a week. EDS's references for the Pepsico job were from Frito-Lay, whose facilities EDS was managing when Pepsico took over that company. Phase-out at Pepsico will be over a six- to nine-month period. At Frito, the phase-out will probably be longer. EDS has been there since 1964.

• The computer threat was felt all the way to an off-Broadway show in New York's East Village recently. A comedy named "Calling In Crazy" centered around a young man who walked off his job working at a computer center equipped with an IBM "Quester 9," because he thought the machine was out to get him. And instead of calling in sick to work, he called in "crazy." Everyone thought he was. Including reviewers and theater-goers, apparently, as reviews were unenthusiastic and attendance was so low the show only ran 10 days. But the computer really did come to "get" the hero in the end. Which everyone must have thought quite ridiculous. No one believed it.

• Last month Western Union stockholders approved the proposal to reorganize as a holding company (Sept., p. 155). When the restructuring plan is approved by the necessary regulatory agencies, Western Union Telegraph Co. will become a subsidiary of a new Delaware corporation, Western Union Corp., which will own all of the common shares of the Telegraph Co. Restructuring in this manner will provide WU with a "broader corporate charter, greater management and financing flexibility, and the ability to offer non-regulated communications services through separate subsidiaries."

• EDAPCO, Inc., is a seven-man service bureau established three months ago by Leonard Prather, a Negro who held various computer-related jobs with the federal government for the past 15 years. The new firm's staff includes six blacks, and the company has located in Newark's Central Ward, heart of the black community, which was torn by rioting two years ago. It is said to be the fifth black-owned s-b in the country, and is presently controlled by Prather, who obtained a loan from the Prudential Insurance Co., with 90% backing by the Small Business Administration. The firm's hardware includes two Honeywell KeyTapes and an H-125 with tape. Objective is to serve small and medium size businesses, but the first big contract is expected to come from the city of Newark itself: Last month EDAPCO was accredited by the New Jersey Local Property Tax Div., and hopes to handle the property tax rolls for Newark. It is the only s-b so accredited.

• Dataplan, the joint venture of Informatics and The Interpublic Group, has announced what is said to be the first commercially available data bank of international air fares and cargo rates. The data bank contains up-to-date (determined biennally by the International Air Transport Assn.) fares and rates for 200,000 pairs of connecting points and includes all variations in fares and rates that apply. All data is stored on mag tape and processed by an IBM 360/40 that is capable of creating custom tariffs for airlines (according to the cities and connecting points served) and specialized rate structures for freight forwarders (based on points served and commodities handled). TWA and Emery Air Freight are already using the data bank.

• The Association of Data Processing Service Organizations has announced its officers for the 1969-1970 association year. John L. Roy, president, Randolph Data Services, Cincinnati, was elected president; Bernard Goldstein, president, United Data Centers, New York City, vice president; T. J. O'Rourke, president, Tymshare, Palo Alto, Calif., treasurer. ADAPSO's membership has increased 40% in the last fiscal year, bringing its total to 235 companies in the computer services industry.

• Xerox Data Systems and Mitsubishi Electric Co. (Melco) have announced a technical information and licensing agreement that will enable the Japanese firm to manufacture and sell XDS Sigma 5 and 7 computers and related peripheral equipment in Japan and Okinawa. XDS will provide Melco with manufacturing and technical information relating to the two systems, and, in turn, XDS will receive all technical and manufacturing information that Melco develops and uses in the course of its Sigma 5/7 operations. The computers will be sold under the Melco name in Japan.

• Remote Computing Corp. has reduced the disc file usage charges of many of its time-sharing subscribers by a new pricing scheme structured on a per-file basis rather than on a total storage per user basis. By blocking his files to take advantage of the maximum discount for which he can qualify, a user can minimize his disc usage costs. For example, cost to store a file containing 2000 240-character segments drops from $10/day under the old schedule to $5.60 a day. The amount of the reduction depends on the size of the file stored. The new plan is expected to prove especially

attractive to users who require unlimited file space to accommodate large data bases that must be periodically created, stored, retrieved, updated, and stored again — as in insurance, inventory, medical and financial applications. Los Angeles-based Remote Computing also operates installations in Palo Alto, Calif., and Southfield, Mich.

• The Service Bureau Corp. is now offering its time-sharing customers MINIMIS, two business programs, as part of Call/360: BASIC, a service that previously was scientific and engineering oriented. The new programs are MMINQ, a record selection and printing program that provides the capability for file enquiry and the printing of both special and regular reports, and MMFILE, which provides file creation and maintenance capability.

• General Electric, through its new small business development division, which will be concerned primarily with marketing the products of its acquisitions, has invested in Consolidated Software, Inc., New York, and is now represented on the board of directors, replacing Programming Sciences.

• American Computer Accountants, Inc., recently formed Los Angeles firm, has acquired Univac's L.A. data processing center including a 9300 computer system and the entire staff of programmers, systems analysts and operators. The company offers TOTALTRAN software for conversion from second to third generation systems, data processing, conversion of IBM's System/3 unit record programs, keypunch services, and various commercial software packages. It also operates another data service center in Inglewood.

shortlines ...

Latest to come under scrutiny of the Federal Trade Commission for possible violation of the antitrust law is Xerox Corp., which announced that it has complied with an FTC request for information. Although well content with its lead in the duplicator-copier field, Xerox has been mindful for some time of an impending assault on its market by IBM. ... Control Data will augment on-line storage at its Washington, D. C. center to handle the programs of Nuclear Computation, Inc. The two firms have reached an agreement to make NCI's information on reactor design, fuel depletion and management, accident analysis and radiation shielding, and other nuclear source data, available commercially, nationwide. ... A four-part accounting package will be marketed to private users and service bureaus by Executive Computer Systems, Inc., Oak Brook, Ill., comprising general ledger, accounts payable, payroll, and accounts receivable. It is written in COBOL. ... A dp service center has been opened in Sunnyvale, Calif., by Applied Cybernetics Corp., which has established something of a record by setting it up from nothing but the bare walls in five weeks. The fast formula: not much sleep, fortified by a steady diet of take-out fried chicken and beer. ... International Computers, Ltd., (ICL) has increased its sales in France by 47% within the past year. A total of 132 computers having a combined value of ₣17 million have been ordered from Britain's largest computer company for export to France. ... As a result of securing a contract to supply IBM's Service Bureau Corp. with remote t-s terminals, Elpac, Inc., a 9-year-old electronics firm in Irvine, Calif., has decided to go further into the computer field, has recently reorganized with new management. ... West 26th street, in New York City, is becoming a center for computerized typesetting and graphic arts. No. 5 is occupied by CompuComp Corp., offering composition services, and No. 25 has been established as a base for Printing Industry Computer Associates (PICA), which offers printing MIS and a language called ULTRA-X, designed for typographers. ... Burroughs Corp. is planning to add more time-sharing data centers to its stable, has already bought a small-scale one in San Francisco from Univac's Information Services Div. But Burroughs made it clear it does not intend to set up in competition with users of its machines offering similar services. Nor does it intend to concentrate its facilities in any particular area of the country. Univac had another large-scale center in the S.F. area, which it has also sold — to University Computing Company. ... Looking forward to the computerization of the Pacific basin, System Development Corp. has opened a corporate office in Honolulu, headed by Harley J. Adair as manager of Pacific operations. ... On the Hong Kong scene, there are enough computers for now, reportedly more per capita than any other place except Japan, but not enough trained personnel to run them. Computer firms in the Crown colony have resorted to sending bright trainees abroad, so they can come back and spread the word. ... Back in California (another Pacific basin country), the computer will be used to untangle reservations to the state's crowded campgrounds and park sites. Computer outlets (operated by Computicket) will be available to the prospective camper — largely in San Francisco and Los Angeles — to let him know immediately if he has a chance of tenting tonight in any of the state parks. Most of the outlets will be in banks, stores and supermarkets. ... A systems management center devoted to bank dp will be opened in early 1970 by Arthur S. Kranzley and Company in Cherry Hill, N. J., for service to the tri-state Philadelphia area. It will include charge-card handling. ... General Automation has opened a Technical Application Center in Des Plaines, Ill., to provide Chicago-area users with consulting, systems engineering, applications programming, customer training, and turnkey responsibility of special projects.... A Management Data Systems Division has been formed by Bissett-Berman Corp., California electronics firm, to combine high-technology data collection hardware with computer control techniques. It will be directed by Marshall Williams.... Deliveries of the first two large-scale B6500 computer systems have been made to Burroughs installations in Detroit and London.

call for papers ...

National Telemetering Conference, Los Angeles, April 27-30. Sponsored by the Communications Technology and Aerospace and Electronic Systems groups of IEEE. Carrying out the conference theme of "Telemetry: Technology in Transition," telemetry applications to real-time systems, computer control and civil applications will be considered. There will be seven areas of interest in the sessions: aerospace, biomedicine, oceanography, law enforcement, transportation, business and industry, and advanced telemetry technology. Send 300-word abstracts to A. V. Balakrishnan, UCLA Dept. of Engineering, 405 Hilgard Ave., Los Angeles, Calif. 90024.

Eighth Annual Conference on Computer Personnel Research, New York City, June 23-24. Sponsored by ACM-SIGCPR. Reports of research, development, case histories, or results in selection and training of computer personnel are invited. Reports are also planned on job content, motivation, performance evaluation techniques and supervision and management of programming. Abstracts should be 600 words minimum, up to and including full drafts, submitted by Feb. 1 to Robert A. Dickmann, Program Chairman, SIGCPR, Johns Hopkins Univ. Applied Physics Laboratory, 8621 Georgia Ave., Silver Spring, Md. 20910. ■

new software

data management

MUSE (Machine-User Symbiotic Environment), a generalized information system for solving nonroutine management problems, is this firm's first offering. The objective of the system is to make the most of time-sharing and provide the nontechnical user an easy means to access a very large data base. Operator language is free-form English. Nouns, verbs, prepositions, clauses and common punctuation marks are used to write interrogative, declarative and imperative sentences. Identifiers in the system are nouns or noun phrases that permit abbreviations or extensive use of synonyms.

Initially, MUSE is on a Tymshare XDS 940. Macros and programmed operators permit transfer from one make of computer to another, and the vendor expects eventually to have MUSE on other popular time-share machines. On the 940 it requires 64K of virtual memory, a real-time clock, multiple access memory, memory interleaving, and selector and multiplexor channels. Suggested minimum storage is 4 million characters of drum or other fast storage, 64 million characters of less than 100 msec direct access disc store, two tape drives and a card reader.

MUSE has been in development for a year and a half, and general development will end early in 1971. It will be licensed to users at $100K. Although MUSE is first appearing on commercial time-sharing, the company feels its main users will be the large firms with dedicated in-house time-sharing systems. They, not the time-sharing vendor, can afford and justify the massive storage for private data bases. META-LANGUAGE PRODUCTS, INC., New York, N.Y. For information:

CIRCLE 700 ON READER CARD

file compression

The fact that this program compresses a linear bit string representing alphabetic data would have been reason enough to christen it LINEAR "A." In addition, however, some history buff must have had a hand in the naming, because LINEAR A is also the name assigned to a language used on ancient artifacts found in Minoan sites on Crete and other Greek islands. That language is, so far, undecipherable, but the LINEAR A-encoded data streams can fortunately be deciphered and expanded back into the original contemporary English.

The many data processing installations that do not use file compression techniques on their alphanumeric files probably do not realize that a program such as this can cut down on storage costs, on transmission costs, and can be used to increase the reliability of transmitted data. The transmission cost thing is so significant that even Bell Telephone is reported to use compression techniques in data transmissions—even though Bell doesn't pay anyone but Bell for its line time.

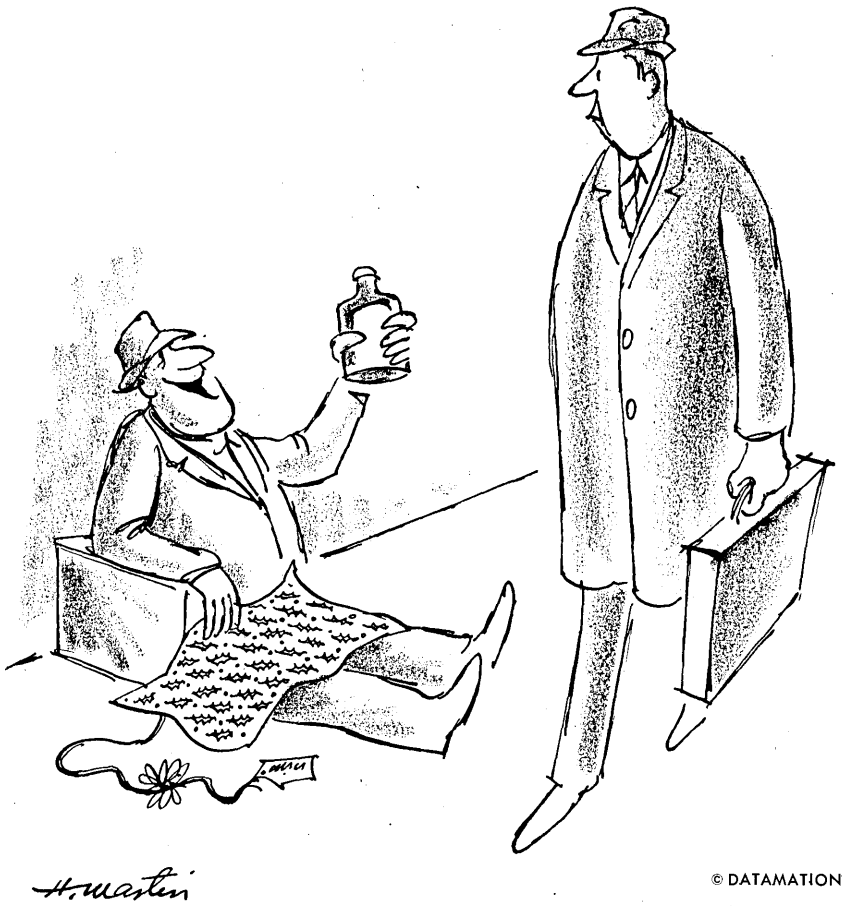
By cutting down on repetitive data (such as "Smith" in the phone book), replacing common words with shorter symbols, and pulling redundant words, LINEAR A is claimed to achieve as much as a 50% reduction in file size. The FORTRAN programs involved are written in about 2,000 statements and operate on 6 bit-8 bit data.

Service bureau or time-sharing service users—who now pay from 50¢-60¢/1000 characters stored—should pick up the price of LINEAR A fairly quickly: First, the installation charge ranges between $500 and $2500, since the system must be custom tailored for each user. The subsequent monthly charges are based on the savings resulting from the installation of LINEAR A. For example, Academy Computing will take 50% of savings in communications line costs, and around $1/reel of tape saved in a batch file, and another $1 for every one million characters saved on disc. ACADEMY COMPUTING CORP., Phoenix, Ariz. For information:

CIRCLE 701 ON READER CARD

general ledger

Ancom Systems had such a difficult time finding a company name that was not already being used—even had all their literature sent out under the name Syscom at one point—that for safety's sake it hasn't even assigned an acronym to its latest product. The "general ledger" system provides for forecasting and measuring financial progress, reporting on several levels,



© DATAMATION®

"Hey, Charlie! Thanks for your season's greetings!"

and integrating budgets, forecasts, and actual performance into a single analytical system. Analyses can be produced at a department, division, or company level—or at three levels beyond that.

Written in COBOL for the 360, and requiring less than 32K of storage, the package produces the following reports: batch edit, batch balance, voucher register, general ledger listing and summary, trial balance, forecast to budget, balance sheets, profit and loss, and many others.

The system does not require a predetermined or fixed account numbering structure. All codes are assigned by the user and changed without programming. One special capability is the comparison of results to both forecast and budget and the ability to adjust the forecast to produce a new budget each month. The price, with all bells and whistles, is $7500. ANCOM SYSTEMS, Los Angeles, Calif. For information:

CIRCLE 702 ON READER CARD

fuzz forecast

Law Enforcement Manpower Resource Allocation System forecasts when and where police will be needed to combat crime and answer calls for assistance. LEMRAS uses a computer to analyze police records of calls for aid. The system then projects the number and types of problems that can be expected for any section of a city. It also estimates how much of a patrolman's time will be spent on each call. The projections are used to help police allocate patrol forces more effectively. The data used includes every type of police call, including reports of crime, calls for assistance at fires, traffic problems, public disturbances, and family disputes. LEMRAS has been tested in Los Angeles, Kansas City, Mo., and Norfolk. It runs on a System/360 Mod 30 or larger. Rental is $350/mo. under license agreement beginning February. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 703 ON READER CARD

skills inventory

A new skills inventory system features selective retrieval of combinations of personnel parameters such as experience, education, special interests, and salary level. The basic file contains Social Security number, descriptive data, and coded data. The codes can be automatically converted to equivalent descriptions when retrieved and reported. Input format is flexible. Retrieval is by selection cards specifying conditions and logical combinations of conditions to be met.

Up to 32 independent retrieval requests may be run at one time, producing three reports: an occurrence count vs. selection criteria, list of Social Security numbers for selected personnel, and an optional report containing descriptions and codes which the user selects. Formats for up to 100 different reports may be stored in the system. The package is written in COBOL and BAL, and runs on a 65K 360/30 or larger under DOS. Price is $3800, including installation, modification when necessary, maintenance, training, and documentation. CULLINANE CORP., Boston, Mass. For information:

CIRCLE 704 ON READER CARD

three from univac

Three new packages from Univac consist of a Linear Programming System for Univac 9000 series computers; a Mathematical Programming System for the Univac 494 system; and a Functional Mathematical Programming System for the Univac 1108 and 1106 computers. The packages are suitable for use in such areas as investment planning, production scheduling, dynamic capital budgeting, advertising media selection, job shop scheduling, fleet assignment, and fleet composition.

LPS features include bounded variables allowed with multiple bound sets, bounds on rows allowed, multiple objective functional rows allowed, multiple right-hand sides allowed, automatic inversion, automatic output and product form of inverse algorithm.

MPS is for solving linear programming problems on the 494. It includes its own monitor with the OMEGA Operating System. It comprises matrix and report generation, an optimization algorithm, a transportation algorithm, file maintenance and debugging aids, and I/O format options for compatibility with a variety of computers.

FMPS, designed for large-scale users in the petroleum, chemical, transportation, steel, automobile, paper, and service bureau industries, is also applicable for use by the military and universities, and banking and financial concerns. UNIVAC, Philadelphia, Pa. For information:

CIRCLE 705 ON READER CARD

basic translator

BASIC is a good learning language, and is offered on many, many time-sharing systems. It enables novice programmers to become productive more quickly and nontechnical types to use a computer more easily and efficiently. But it is not all-powerful—not even almost all-powerful. This software house supplies two conversion programs for taking BASIC programs to the FORTRAN and Extended BASIC levels. In preparation are two more transla-

new software...

tors, for going to COBOL and to PL/I.

BASIC to FORTRAN was written in PL/I, contains 2000 statements, and requires an IBM 360 system with OS/360 and 128K bytes of storage. It features fairly explicit error messages that enable the programmer to do his own error detection. The package will be sold outright with permission to duplicate it but not to sell conversion services. The price is $3000. If the buyer has duplicate systems he need only buy one package, and even if he doesn't he still gets a break. A second conversion package will cost him $2000, and all others will cost $1500. INTERNATIONAL CONVERSION SYSTEMS, New York, N.Y. For information:

CIRCLE 706 ON READER CARD

gpss/360 version 2

An improved version of IBM's General Purpose Simulation System/360 is now available as a program product. A major feature of GPSS/360 Version 2 will allow the simulation process to be suspended at any prespecified time. The program will print out a complete report, including the model's status. The new version enables users to run FORTRAN programs during a simulation. These FORTRAN programs may be used to calculate the results of changes or to introduce new variables. Version 2 is compatible with Version 1, and will run under both OS/ and DOS/360. Rental is $20/mo. under license agreement. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 707 ON READER CARD

general ledger

Time-sharing is the special domain of this general ledger program package, as it was originally prepared as a part of a package offering for use by service bureaus. Available for any user with his own system now, the FORTRAN system requires 16K of core in its standard version (but could be segmented) and supports a variety of terminal devices, including Teletypes. Its operating mode is called tutorial conversational mode, which describes the vendor's intent.

Maximum flexibility is claimed for I/O formats and processing functions as operations involve assembling a choice of options. Users are not restricted to a preset chart of accounts, but enter that chart with their initial inputs. Subsequent updates and processing are automatically based on their personalized chart.

The variety of selectable reports includes: trial balances, balance sheets, P&L, cash flow, subsidiary ledger de-

tail, etc. These can be prepared off-line to conserve line time. Included in the system's $25,000 price are up to three demonstration seminars, two full weeks of in-house installation and training, documentation, and some assistance for one year. MILLER-ELLIS COMPUTER SYSTEMS, INC., Los Altos, Calif. For information:

CIRCLE 708 ON READER CARD

corporation grader

A software package called MAP (Management Achievement Profile) is being used in a service that compares a company's annual report with those in the same industry group, or other specified group of corporations, to measure its percentile ranking within the group and to determine how well the firm is doing in relation to its own goals. MAP rates 50 different financial measurements to form an achievement profile or optimum profile. The service may be used alone or in conjunction with Economatics' MAID merger-acquisition analysis package (see Sept., p. 221). If a company's request is within the scope of the existing MAP data base, a one-shot profile will cost $100. Econ matics will sell the MAP package for $1500, including data base and installation, and any one of the 15 industry groups may be updated annually for $50 a model. MAP is written in FORTRAN IV and can be run on almost any computer with a FORTRAN compiler and 20K of core. ECONOMATICS COMPUTER SYSTEMS, Pasadena, Calif. For information:

CIRCLE 709 ON READER CARD

jcl generator

The JCL/360 Control Statement Generator is intended to reduce reruns caused by JCL errors. The claim is that the JCL produced will be accurate and complete and require the programmer to spend 50% less time in defining his JCL parameters. The program lists the basic input parameters, provides a listing of the generated control statements, and produces a punched deck of the generated control cards. Each generated control statement is alphabetically sequenced and is identified with the job name to be processed. An option permits generation of a complete job system, ready to execute. JCL/360 delivers an estimated 450 control statements per minute. It runs on any System/360 Mod 40 or larger with minimum 70K and operates with PCP, MFT, and MVT. Rental is $240/mo.; purchase $4950. Included are user manuals, worksheets, and two four-hour training seminars. COMPUTER AUDIT CORP., Washington, D.C. For information:

CIRCLE 710 ON READER CARD

honeywell dos

os/200 is a modular, disc-oriented, operating system designed to provide multiprogramming on Honeywell Series 200 computers, Models 1200 and up, with minimum 48K. The expandable system can execute and control up to eight concurrent data processing operations. os/200 uses hardware barricades to protect each program's area of memory from destruction by others' programs. The multiprogramming capability provides sufficient power to handle two full production jobs, including sorts and compiles; data communications to and from remote locations; and up to five data transcriptions—all simultaneously. The new operating system is upward compatible for users of Mod I and Mod II operating systems, and is available to all users of appropriate hardware as part of Honeywell's "bundle." HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 711 ON READER CARD

small 360 multiprogramming

Heurs/1 provides multiprogramming capability for System/360 Mods 25, 30, and 40, under DOS. Up to seven jobs may be run concurrently and output may be simultaneous or through any combination of peripherals, including printers, mag tape, disc, cards, or paper tape. The package requires no additional hardware or modification to present equipment. For $15K the user receives the source deck, a battery of 18 utility programs, and documentation. Installation costs an additional $100-250/day, depending on problems encountered, and includes two man-days of personnel training. Heurs/1 is available for additional cpu's owned by the same firm for half price. HEURISTIC CONCEPTS, INC., Westwood, N.J. For information:

CIRCLE 712 ON READER CARD

decision table to cobol

DECISUS is a mixed entry decision table to COBOL processor which follows the announcement of the firm's earlier limited entry processor. Both versions check for completeness, contradictions, and redundancies, and each features the "else" rule, rule ϕ, exit, and loop verbs. The system is available for any machine whose vendor provides a COBOL compiler. The limited entry and mixed entry versions sell for $6K and $9K, respectively. SOFTWARE MARKETING, INC., New York, N.Y. For information:

CIRCLE 713 ON READER CARD

cpm scheduling and plotting

Amsterdam was the scene ("Internet" 1969, Second International Congress on Project Planning by Network Analysis) for the introduction of CPMS, the Computer Plotting Matrix System. The program can use the same card decks prepared for a CPM or PERT program to produce plots of the systems being studied. If the programs themselves are not finished, the programmer can get quick and accurate draftings through the use of special sketching forms and simplified inputs. In the second case, only the I-J activity input data (the node number assignments) need be entered into CPMS. Outputs from the program are either IBM standard or CalComp-compatible plotter commands.

CPMS uses an IBM 1130 with 8K of core. It is written in FORTRAN IV, so conversions might not prove too difficult. The package price is listed as around $3000.

To complement CPMS, the same vendor has a CPSS package, called CPM Scheduling System. CPSS does quickly and conveniently the same kind of job that IBM's Project Control program does slowly and awkwardly, its vendor claims. Operating at rates reported as several times faster than Project Control, CPSS also automatically generates exception reports and allows for adding changes and running from a disc-resident file for processing updates. It is priced at about $3000, and meant to operate on an 1130. Customers who want both programs can save about $1000 over the individual prices of the programs. TEVCO, INC., Sacramento, Calif. For information:

CIRCLE 714 ON READER CARD

dos utility programs

MACROGEN and MACROPRT are two new utility programs for System/360 DOS. MACROGEN provides a tool for modification of tape or disc files and for the creation of files of test data. The modification function is similar to the 1400 series "disc record load." MACROPRT, short for "macro print," provides the facility to call out and print any portion of a tape or disc file. It is designed for debugging. This program is claimed to be the "only known print program capable of operating in a 'file protected' environment." Both programs operate on 2400 series tape drives, 2311 or 2314 disc drives, and 2321 data cells, and are written in COBOL. Price of MACROGEN is $350, and MACROPRT is $250, including documentation and instruction manuals. MACRODATA, INC., Union, N.J. For information:

CIRCLE 715 ON READER CARD

law office record maintenance

An on-line real-time time accounting system designed for large law offices has been developed by Intranet Industries, which is now offering the service in the Los Angeles area and expects to open ten more Univac 1108 time-sharing centers throughout the country within the next year. All billables, rec-

ords of conferences, time spent on a particular account, and other client matter, are entered to the central computer via an IBM 2741-type terminal on the user's premises. A hard copy record can be retrieved any time during the month, according to the user's requirements. User training and SE support are provided by Intranet. It will probably cost a typical 50-man law office less than $50/lawyer/month for the service: up-to-date records during the month, immediate access to any client matter, and monthly reporting. INTRANET INDUSTRIES, INC., Los Angeles, Calif. For information:

CIRCLE 716 ON READER CARD

cobol precompiler

CBLSHORT is a COBOL precompiler which permits use of abbreviations for such reserved words as PICTURE, VALUE, FILLER, and COMPUTATIONAL. It also allows the programmer to supply up to 50 of his own abbreviations. Input to the program can be an existing program, a program written with the abbreviations, or additions to an existing program written with abbreviations. The program will realign, renumber, and re-identify any COBOL source whether or not any shorthand terms are used, since it will accept either the reserved words or the abbreviations for them. The package is written in COBOL, and is available for the System/360 in source or object deck form. The source deck with listing sells for $500, and the object deck alone is $150. Both include operating instructions and sample job stream deck. GENERAL ELECTRONICS, Cicero, Ill. For information:

CIRCLE 717 ON READER CARD

information retrieval

The ACCESS information storage and retrieval program operates in both a conversational mode and a batch mode which features deferred run, callback, and background processing capabilities. Some 35 verbs are available for on-line conversation with data files. These provide for record and file manipulations, string manipulations, and math functions much like extended BASIC's repertoire. The businessman-user using the system can pull any single piece of information, combine it with other data from his files—or input from the terminal, to make comparisons, forecasts, etc.

By taking advantage of the callback and deferred run options, a program can be entered for operation at any time during the night or day, then printed out on a line printer rather than the originating terminal. Similarly, a job which requires a growing data file can be scheduled to run at a time when that file is not being added to.

ACCESS is available in several forms, ranging from simple rental to facilities management contracts. For a dedicated application, the machine language programs could be placed on a customer's own GE 255 or 265 at a price between $30,000 and $60,000, depending on the custom-tailoring required. Or a customer can choose to pay $10/hour for on-line time (with no additional cpu time charge) plus 50¢ per 1000 characters stored. If instead of using Teletype-compatible terminals at low speeds someone wants to go to 125 cps transmission speeds, the connect time is billed at $75/hour. The time-vending service is offered through offices in Tulsa, Phoenix, Houston, Los Angeles, Palo Alto, Corpus Christi, and Santa Barbara.

Whether used on a purchased or rented system, ACCESS will give the terminal access to all 16K of the GE's core for processing, but will also use the GE's communications box for file handling without troubling the cpu. ACADEMY COMPUTING CORP., Santa Barbara, Calif. For information:

CIRCLE 718 ON READER CARD

free trial precompile

SPEEDBOL is a COBOL precompiler which provides mnemonic abbreviations for the most frequently used reserved words, and also permits the programmer to add his own abbreviations of data and procedure names and to use only those SPEEDBOL abbreviations he chooses. The system, including documentation, sells for $300. It runs on System/360 OS or DOS. And if you have any doubts, a SPEEDBOL demonstration deck which will analyze any COBOL source program, indicating where SPEEDBOL abbreviations may be substituted, is available on a 30-day trial basis. The trial deck only runs under DOS, however, and requires a 2540 reader/punch and a 1403 printer. SPEEDBOL is the first package offered by this software house. PIONEER DATA SCIENCES, Wilbraham, Mass. For information:

CIRCLE 719 ON READER CARD

data base manipulation

"Questran" is the name of the inquiry language used in conversing with the Multi-Purpose Information Processor (MIP), a file manipulation program which allows for creating a data base, altering it, and extracting information from it. To build a MIP-compatible file, a user may start from scratch using a special variable format input or may start with his own tape or card files of fixed length records.

Capabilities include adding to or al-

tering fixed-length records, pulling records, and adding records; therefore the system is touted as a file converter as well as an information system. Written in assembly language for the 360 series, the package requires a configuration which includes at least 65K bytes of storage, two disc units (2311's), and two nine-track drives. It will operate under DOS or OS, and is retailed for $15,000. DYNAMIC COMPUTER SYSTEMS, INC., Houston, Texas. For information:

CIRCLE 720 ON READER CARD

dos for the h-p 2116b

The Hewlett-Packard 2116B now has about five operating systems. This one is for dedicated processing, without multiprogramming or time-sharing. It requires at least 3K of core in an 8K system, and has been given a job control language, file management routines, I/O buffering, and hardware memory protection features not common to the rest of the HP supervisors. The monitor shuttles the source program, loader, assembler, and compiler between disc and core as needed. I/O drivers and other program modules are independent of each other or of the system hardware configuration. Since H-P pricing is still "bundled," DOS is free to everyone with the hardware to use it. HEWLETT-PACKARD, Palo Alto, Calif. For information:

CIRCLE 721 ON READER CARD

decision table to cobol

DETOC II is an improved version of DETOC, a decision table to COBOL processor announced in January. It generates COBOL statements directly from decision tables, which can then be run through a compiler without an intermediate programming step. Advantages in the use of DETOC II are said to be decreased debugging time and improved documentation. The system requires a minimum 32K. Price of $11,500 includes maintenance, training, and updating. INFORMATION SYSTEMS LEASING CORP., Jenkintown, Pa. For information:

CIRCLE 722 ON READER CARD

graphics control

Graphics Remote Access Priority Handler & Interrupt Control System (GRAPHICS) is a software package for controlling keyboard-driven crt's, such as the IBM 2260. The program, written in COBOL, uses a common overlay area for single-purpose functions, operates in a single partition of 24K minimum, and interfaces with existing operating systems in any machine which supports COBOL. Functions include station start-up, privileged access password handling, page storage and retrieval, priority interrupt queuing by terminal function, process overlay control, system cycle down (for file checkpoint), and standard program interfaces. A set of data management routines store intermediate results in a general scratchpad area for subsequent retrieval, permitting the problem program to reside in the common overlay area. Variable assignment of this scratchpad to core and/or disc provides flexibility in cases of restricted core storage. Price of $15,000 includes three weeks of on-site assistance in installation, a standard access method such as BTAM or OS/LOCAL, and a sample problem program. TURNKEY SYSTEMS INC., Norwalk, Conn. For information:

CIRCLE 723 ON READER CARD

test data generator

Datamacs is a test data generator for use with COBOL programs. It works through the use of control cards interspersed through the data division. The programmer, after placing the control cards in his source deck, follows his normal pattern of compiling and testing. The program will generate any kind of file, including tape and disc. It will operate under either OS/ or DOS/360 and will be regenerated for any system which supports a COBOL compiler and minimum 32K core. Price is $4,500. MANAGEMENT AND COMPUTER SERVICES, INC., Philadelphia, Pa. For information:

CIRCLE 724 ON READER CARD

pdp-10 cobol

A COBOL compiler for the Digital Equipment Corp. PDP-10 which requires no mass storage and can be used in time-sharing or batch mode is now available from an independent vendor. The package, called COBOL-10, can be run with all I/O devices supported by the PDP-10 monitor, and requires a minimum of 12K core. The command language of the COBOL-10 compiler can specify any input device for the source file, and any output device for the macro and listing files. COBOL-10 has a full complement of verbs, including COMPUTE, and permits both random and sequential file access. Records may be blocked or unblocked, fixed or variable in length. It automatically handles blocking and deblocking, label writing, and checking end-of-file and end-of-record termination. Format is flexible, with sequence numbers optional, and few punctuation rules. (For instance, periods are required only in a few places in the procedure division, but not after each statement.) Also, statements may continue from one line to the next with no special indication, and indented statement lines need not begin at any special character position.

COBOL-10 has a library for inserting source language routines into a program via the COPY verb. In addition, MACRO-10 assembly language routines may be written into a COBOL-10 program by using the verb ENTER. The complete system, including documentation and a programmer's reference manual, rents for $1K down plus $1K/mo. for a minimum of one year. CODON CORP., Waltham, Mass. For information:

CIRCLE 725 ON READER CARD

digital logic t-s

LOGCAL is a time-sharing program to simulate digital logic. It provides an interactive environment in which a logic circuit designer can enter and test his circuit from a time-sharing terminal. LOGCAL simulates the operation of standard logic elements, including gates, inverters, flip-flops, counters, and shift registers. Approximately 750 logic elements can be simulated, each with an arbitrary number of inputs. Use of the system is said to eliminate the "breadboard" phase of development. The package provides several levels of circuit testing, from an overall check of logic function, to a detailed trace of circuit operation. Circuits can be modified from the terminal, and marginal testing carried out. The program simulates operation with actual circuit propagation delays. It is available from the vendor as a service on the firm's GE-430 t-s system, or as a package, at a cost of $5-10K depending upon conversion difficulty. LOGCAL is written in FORTRAN IV with some BAP assembly language. COMPUTIME, INC., Ft. Lauderdale, Fla. For information:

CIRCLE 726 ON READER CARD

typesetting

Installations using a Stromberg-DatagraphiX 4060 computer output-to-microfilm device strictly as a line printer replacement now get a free bonus from the manufacturer, a software package capable of making the 4060 into a typesetter. The package will accept text in any character code and any format up to 4K bytes/block from 7- or 9-track mag tape. Called AUTOTYPE, the system produces composed and typeset pages on 16mm or 35mm film with page and column headings, rules, page numbers and repetitive text or logos. Up to 64 fonts can be called on for headings, captions, or text, and variable type sizes are also available to the AUTOTYPE user. The typesetting is run under the control of a 78-command language called ACL (Autotype Command Language). STROMBERG DATAGRAPHIX INC., San Diego, Calif. For information:

CIRCLE 727 ON READER CARD

What English queen had six fingers on one hand?

Don't lose your head over a little historical trivia. We'll give you a big hint: She lost hers.

Not good enough? Henry VIII's second wife?

Not yet? The hexadactyl was Anne Boleyn, of course.

But it's not trivia we want to expand your mind with. It's a simple fact: Vermont Research is the memory company.

We're the company that expands the capabilities of your computer with the best drum and disk memories available. And we're the company that has just expanded our own capabilities.

We've introduced a new controller and two new memories: a disk with a 1 million bit capacity, and a drum with a 143 million bit capacity.

But you probably know that. Otherwise we'd like to help you with your memory.

Vermont Research
CORPORATION

Precision Park – North Springfield, Vermont 05150
Tel: 802-886-2256 TWX: 710-363-6533

DRUM AND DISK MEMORIES – CONTROLLERS

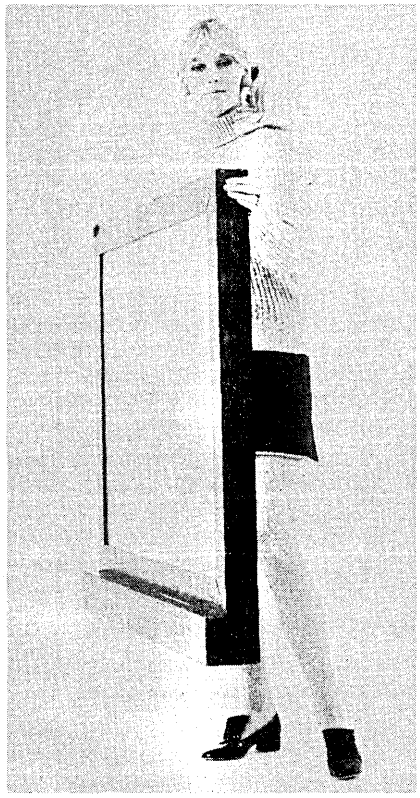
EXPAND YOUR MEMORY

CIRCLE 124 ON READER CARD

new products

3'x4' display screen

This large scale display screen has an active display area of 30 x 42 inches and can show almost any stationary two-color image that a tv screen blown up to that size could. But the Magnyx 3400 is not a tv. It is a magnetized board with small metallic particles that can be arranged to form an image. Its resolution is comparable to using



.05-inch squares and its display will last until erased.

Erasure and rewriting is done with a single stroke of a magnetized bar that is drawn over the surface of the display. The process takes about 15 seconds, but can be made several times faster optionally. Inputs are accepted from a telephone line or paper tape or keyboard or other digital device by the standard version, but an optical scanner can be added for going from transparencies. The scanner can accept a film strip—even of cartoons or graphs—with up to five images. It optically translates the image to a bit stream it can handle and copies it onto the screen. A department store could use the combined system to show first a Santa Claus, then a toy department ad, etc. It could also find uses in airline terminals or at racetracks, for instance. The screen itself (which is two inches thick and weighs 45 pounds) is called the 3401 and will sell for $2200; the scanner will go for $2000 and be called the 3420. PERIPHERAL DATA MACHINES, INC., Santa Ana, Calif. For information:

CIRCLE 401 ON READER CARD

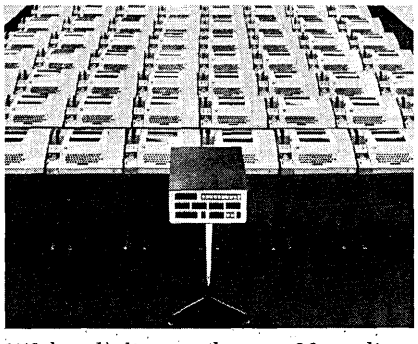
1000 ips tape drive

It has always been possible to transfer the contents of disc packs to magnetic tapes for archival storage or when the data is infrequently used, but the transfer process has been slow, demanded several tape reels, and resulted in much slower access times for later reading. The High Speed Tape Deck is designed to alleviate some of these problems. A sort of intermediate between today's general purpose tape drives and disc packs, it runs at speeds to 1000 ips (compared to 120 ips for a conventional tape handler) and records at 3200 bpi. The unit represents an order of magnitude improvement in access time and transfer rate. There seems to be no competition as yet for this product which, depending on the amount of customizing required, will be vended for $12,000-$50,000. RECORTEC, INC., Mountain View, Calif. For information:

CIRCLE 402 ON READER CARD

communications cpu

Third in what is expected to be a continuing series of minicomputers is the Micro 812, a microprogrammed communications concentrator capable of interfacing up to 96 low speed (110-



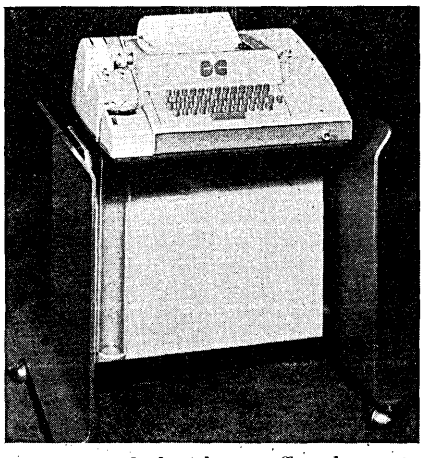
150 baud) lines and up to 32 medium speed (to 1200 baud) lines. These lines can use up to six different baud rates simultaneously. In addition to being a sophisticated line switcher, the 812 is a computer in its own right, with 83 instructions including 17 control instructions, 16 conditional jumps, 12 shifts, 6 i/o instructions, 16 register operations and 16 memory reference instructions. Its core is delivered in sizes from 1K-32K bytes, and word lengths to 32 bits can be used. Its i/o can include serial concurrent, parallel Teletype, and direct memory access.

Data transfers are fully buffered in blocks of up to 255 characters. The basic configuration, priced at $10,000, provides the cpu, a 4K x 9 bit core, power fail protection, memory parity, a real-time clock, and six communications rate clocks. Deliveries require only 30 days. MICRO SYSTEMS INC., Santa Ana, Calif. For information:

CIRCLE 403 ON READER CARD

commercial processor

There are a lot of minicomputers on the market, most of which are best suited for process control or stand-alone scientific applications. The businessman with commercial data pro-



cessing needs has been offered terminals to service bureaus or the computer-in-a-desk variety of more expensive systems. The Datacomp 404 is a minicomputer with a miniprice and a bent for doing business dp. Proving that there was still a hole to be filled in supplying mini's, the builder was backlogged with orders for 250 units before he had time to put out an official product announcement.

The 404 does as much as possible with a minimum of hardware. Among the functions listed as "built-in" are: decimal arithmetic, a Boolean command set, binary arithmetic, a binary logic command set, decimal arithmetic (including scaling), and decimal logic. The 404 does automatic code conversions and formatting, has 16 addressing modes including double-index and relative, and can work with word lengths of 16, 32, 48, and 64 bits, eliminating the need for multi-precision routines.

(Continued on page 238)

The registers are difficult to define. Basically, there are two index registers, one 64-bit accumulator, four 64-bit divided registers, and a status register. The problem is complicated by the facts that the larger of these can be segmented for use as multiple registers, that some are multipurpose, and that the first 16 words of core are also used as registers. Inter-register transfer operations add to the over-all flexibility, and these operations work on those 16 core words, too.

For i/o speed some adaptions have been made. First, the i/o bus can be accessed directly by the arithmetic unit but the i/o bus, in turn, can turn on the direct memory access channel. When the dma is going full force, at about 500KC, the system still has a 100% compute power—no cycle stealing here.

One last feature to consider about the use of the hardware is the instruction format. In a 32-bit instruction, the first 16 bits describe both what word and what device, and the second 16 bits describe formatting, editing, and code conversions to be done on the data accessed.

The 404 can be ordered as a dedicated (one tty) processor or for use in a time-sharing environment with up to 16 teleprinters and even with multiple processors. With a 1K core and tty, the 404 would sell for $7950 ($9950 with 4K). Add-on terminals, for billing or inventory control applications, or whatever, could be much cheaper since they could be largely stripped. Secondary processors would not need all of the power given the central cpu and could go for as little as $1500—$2000. Standard software will include a single-pass assembler which can generate relocatable machine code, a tape editor, diagnostics, and a time-sharing exec. CLARY DATACOMP SYSTEMS, INC., San Gabriel, Calif. For information:

CIRCLE 404 ON READER CARD

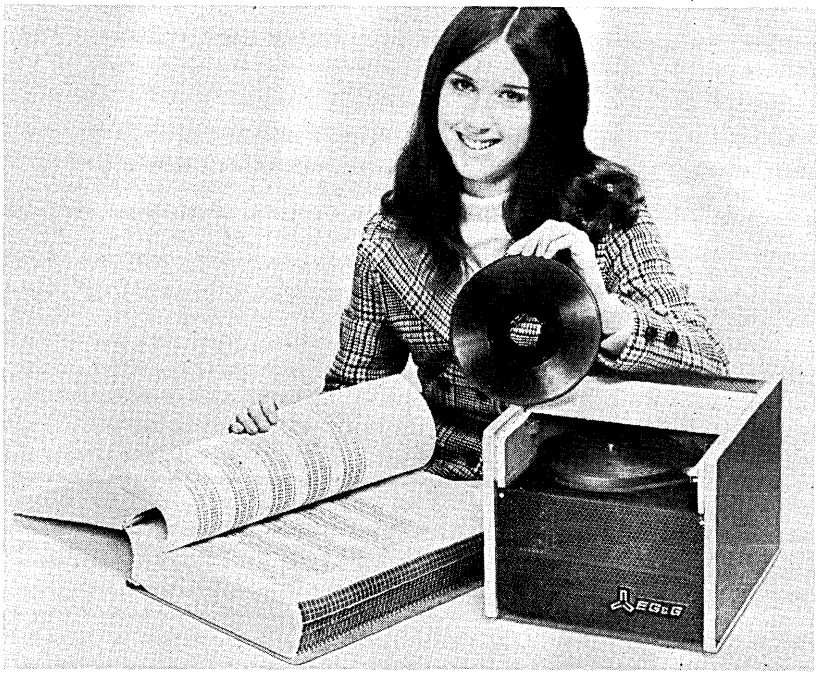
voice response system

First product of a new company by the same name is a voice response system. The system is complete with hardware and software, is field expandable, and provides computer-generated real-time voice response. A portable acoustic-coupled terminal with a touch-tone pad is used, together with a programmable concentrator. Vocabulary of up to 1024 words, and up to 64 lines is available. The concentrator permits the system to be used as either a stand-alone unit or as a peripheral to a computer system. Primary applications for the system are expected to be found in such tasks as order status, order entry, order processing, production and inventory control, credit checking, etc. Price of the basic system, with 32 words, 2 lines, is $17,550. Each additional 31-word module is $3800, and each additional line, $850. The concentrator, known as the Programmable Director, sells for $10-$15K depending on requirements for the specific application. Hardware interface to most computers, including System/360, is $7500. Acoustic terminals are $300 for 16-button keyboard, and $1200 with a complete alphanumeric keyboard. VOICE RESPONSE SYSTEMS, INC., Elmsford, N.Y. For information:

CIRCLE 410 ON READER CARD

(Continued on page 241)

PRODUCT OF THE MONTH



the platter memory

The good old days are back. For those of you who liked the Victrola and hate magnetic tape here is a phonograph-type disc for storing data. The manufacturer offers it as an on-line program source, off-line store for lookup tables and other permanent data or the medium for distributing processed information to far-flung locations.

Physically the system is the record—the Dataplatter Digital Record—and the playback unit, or Dataplayer. It is the product of adroit integration of several technologies, according to the manufacturer, among them such things as modulation techniques, bandwidth compression, digital technology, and systems design.

The Dataplatter comes in three sizes: 7 inches with 5 million bit capacity, 10 inches with 20 million bits and 12 inches with 40 million bits. Data is on both sides of the records. The manufacturer presses the records and duplicates. He claims that records can be updated and distributed within 48 hours. The user submits the data for the platter on magnetic tape.

The Dataplayer can interface with a computer or terminal or printout unit. It contains stylus assembly, turntable, power supply, plug-in boards for input interface and search logic, readout and error check electronics and output interface. The search logic permits positioning of the stylus at the head of any specified block of data in 2-10 seconds. Read-out rate is 16,000 bps serially. The unit can also be set for parallel transfer of data.

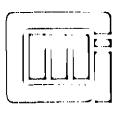
Extolling the product, the manufacturer notes that it has all the advantages of the phonograph record—it is compact, tamperproof, adaptable, indestructible under typical operating conditions—and the unique advantage over tape and disc packs in that the recorded information cannot be damaged, altered or accidently lost in storage due to physical alteration of the base material or oxide or to electrical change in the magnetic field.

Price for the Dataplatter ranges from $1 to $5 depending on the quantity purchased. The Dataplayer price ranges between $600 and $2,000 depending on configuration. EG&G, INC., Bedford, Mass. For information:

CIRCLE 400 ON READER CARD

Flawless.

Lasting brilliance, unequalled toughness and precision craftsmanship combine to make the perfect diamond a universally accepted standard of quality. Similarly, flawless performance and long-range durability combine to make precision-made Graham tape the accepted standard of quality in the magnetic computer tape industry. When the prime requisite is quality, the tape must be Graham.



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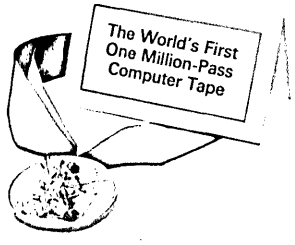

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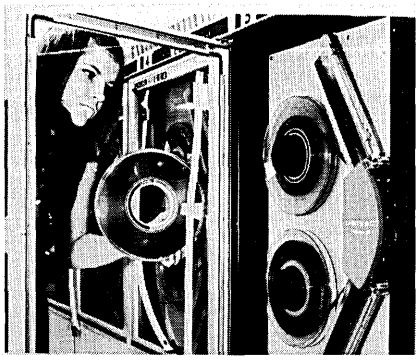
tape units for univacs

The UNISERVO 12 and UNISERVO 16 magnetic tape subsystems for the Univac 1100 and 400 series computers offer twice the data transfer rates, increased storage capacity per reel, and, it is said, greater reliability than earlier UNISERVO units. The UNISERVO 12 has a tape speed of 42.7 ips, data rates up to 68KC, rewind time of three minutes (2400 feet), and a 25 msec reversal time. A nine-track UNISERVO 12, consisting of one master tape unit, three slave units, and controller will rent for about $2500 a month or may be purchased for $95K.

The UNISERVO 16 has a tape speed of 120 ips and provides a transfer rate of 192KC. A dual access feature provides simultaneous read / read, read/write and write/write operations and complete system redundancy by the addition of individual power supplies for each control unit and independent access paths to each UNISERVO



16. Rewind time for a 2400-foot reel is two minutes; reversal time, 10 msec. A nine-track UNISERVO 16 subsystem, consisting of four tape units and controller will rent for approximately $4400 a month and sell for $170,000.

Both units provide phase encoding, dual density recording, seven and nine channel capability, and are compatible with industry standards. Initial deliveries are scheduled for third quarter of 1970. UNIVAC, Philadelphia, Pa. For information:

CIRCLE 405 ON READER CARD

document reader

The Type 243 Optical Document Reader operates on-line to any Honeywell Series 200 computer except the 8200, and is intended for use by firms that mail bills for return with a customer's payment, such as insurance premium notices, utility bills, etc. Documents used as input can be prepared on any device that prints the OCR-A type font. Up to 70 characters per document can be scanned on a single pass. The 243 can process from 600 to 1100 documents per minute on a continuous or demand-feed basis. Documents can be 3 to 4 inches high, 3½ to 8 inches long, and vary in thickness from 20-pound paper to 100-pound card stock (same as a punched card).

Programming features include a single read command for continuous or demand feed. Also available are commands for rejects, stacker selection, error detection, double-document test, interrupt test, blank document detection, and unreadable mark detection. The unit contains three output stacker pockets that hold up to four inches of documents and an input feeder that holds up to eight inches.

Prices range from $1475/mo. ren-

tal for five years to $1700/mo. on a short-term contract. Purchase is $67,300. A mark read feature is available for $275-320/mo. or $12,600 purchase. First deliveries are scheduled for the third quarter. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 406 ON READER CARD

commercial processor

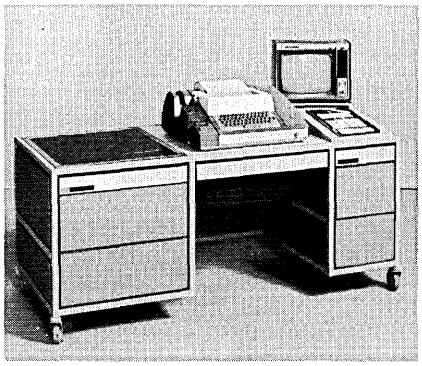
Someone noticed that there are over 3800 large wholesale distributors in the country doing lots of business. That same someone designed a computer system that just happens to do the job most wholesale distributors need to do, including invoicing, accounts payable/receivable, inventory, payroll, general ledger, etc. The resulting product was composed of equal parts of hardware, software, stand-alone processing and service bureau time, and looked so versatile that it will now be marketed as a general purpose system.

In terms of hardware the standard 2000 series system contains a 4K Nova computer in a desk (16-bit word and 2.6 usec cycle time), an ASR 33 Teletype, a console, crt display, data set, automatic phone dialer, a three-tape cassette tape transport, and a Control Data 3800. For roughly $39,950 the user gets all the hardware except the 3800 and a hook-up to a line to Palo Alto's InterAccess dp center. If the customer prefers to lease the hardware, he would be tabbed for about $700/month. If he then chose to do remote processing on the 3800 as well as in-house processing, he would be billed on a transaction basis rather than on a connect time basis.

The idea behind the single data center idea is that multi-office firms can have a single data base for communications and records keeping. The idea behind the terminal built specially to access this data center is that the software used in the data center is compatible with the stand-alone software developed for the smaller system.

Still, on a stand-alone basis, the 2000 can do its own general ledger work and almost all of the standard kinds of jobs for wholesale distributors and their kin, plus be used for circuit board layout and other graphics purposes.

The circuit board use implies a larger configuration, one that would include 8K of core, a more elaborate



control panel, a 356 lpm line printer, a light pen, another triple-tape transport, a more sophisticated supervisor and a bigger price tag—$46,950 (about $1100/month). IBM-compatible tapes, digital plotters, card readers and other gear can be added; and Teletype terminals, IBM 2741 terminals, and Burroughs TC 500's can all access the 2000 when it is working as a stand-alone or configured as a communications concentrator. MILLER-ELLIS COMPUTER SYSTEMS, INC., Palo Alto, Calif. For information:

CIRCLE 407 ON READER CARD

plotter interface for century

First deliveries of a controller that interfaces various CalComp plotters with NCR Century series computer systems are scheduled for next month. Three basic types of plotters may be used: drum, microfilm, flat bed. The controller, called the Model 119, can be purchased for $9500. CALCOMP, Anaheim, Calif. For information:

CIRCLE 466 ON READER CARD

(Continued on page 242)

new products ...

key to tape

The three Series N models offered use full size 10½-inch tape reels and record 80-character records at 200, 556, or 800 bpi on 7-track or 9-track ½-inch tape. Each recording station uses its own tape deck, accessed through a console keyboard with an incandescent light panel. The panel operates very nicely in a sort of tutorial mode, displaying the last character entered, field definition, and the program for each field. (For example, the beginning of the alpha field is indicated as "START ALPHA.") This feature is in contrast to many of the competitors' units which offer matrices or difficult-to-decipher codes.

Options can take the record lengths to 160 characters and put two programs on-line. Check digit verification, conversion from 7-track to 9-track tape, and a pooling capability are also optionally available. Peripherals are expected to be added, including punched tape and punched card readers, a high-speed printer for output of information from the tape (something Burroughs must have seen as a missing link while doing its five-year study,

and something everyone ought to have), an adding machine, and communications gear.

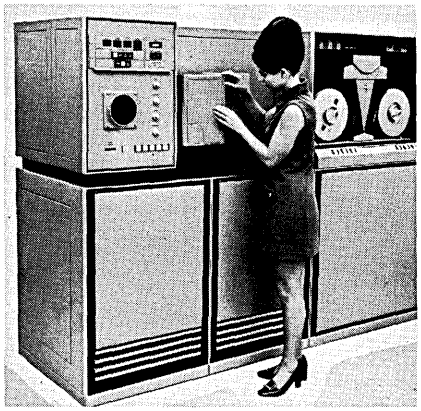
Prices on the base units will range from $8400–$12,200, rentals from $165-$277/month. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 408 ON READER CARD

tape to microfilm

There are, roughly speaking, three kinds of computer output to microfilm devices: some that are direct line printer replacements and sell in the $50,000 and up range; some that are graphic art quality printers/plotters and sell for upwards of $200,000; and some systems that are a mixture of both. The 300-3 is one of the latter.

Faster than a speeding line printer (at 12,000 lpm), more powerful than a line printer replacement (plotting points at up to 16.8KC with a resolution equivalent to a 1K x 1K matrix), and able to take on BCD or EBCDIC at a rate of 36KC, the 300-3 is the top of the 300 series which also includes, logically enough, the -1 and -2. The smaller



machines lack the plotting ability and differ in data rate (18KC for the -1, and 36KC for the 300-2). The 300-3 sells for $139,000 while the 300-1 goes for $85,000 and the 300-2 for $120,000. More is said about all of them in the COM charts included in this issue. COMPUTER INDUSTRIES INC., Van Nuys, Calif. For information:

CIRCLE 409 ON READER CARD

point-of-sale system

Friden, which formally acknowledged the existence of its MDTS point-of-sale system more than a year ago, has now officially announced its availability. The Modular Data Transaction System comes in three basic configurations: (1) an off-line individual store and forward system designed for a single retail store, or for a chain that needs only a few terminals per store; (2) an off-line collective store and forward system, for a single multiterminal store; and (3) an on-line, real-time system.

The basic unit in all three configurations is the data terminal (pictured), a self-contained, free-standing unit with computer logic, including a 512-word memory. It contains a cash drawer, readout, printer, keyboard, and instruction keys that light in the proper operating sequence for varying selling locations. The terminal can accept cash, COD, credit and debit transactions, prepares internal audit tapes, computes change and tax, provides sales receipts, and processes charge sale slips in multiple copies. It captures all pertinent information at the

point-of-sale for merchandising, accounts receivable, credit, and sales analysis purposes. The terminal alone sells for between $2500 and $3000, depending on quantities purchased within a given time.

In the individual store and forward system, each terminal has a companion module ($650), which is a mag tape unit for storage of transactions prior to transmission to a computer. It stores up to 50K characters of information and can be polled. The information is transmitted via a communications modem (a 202E9 which costs about $13 a month) in ASCII to the computer for processing. As an option, up to 10 individual store and forward modules can share the same modem.

The collective store and forward configuration consists of up to 180 ter-

minals two-wire connected to a line concentrator, which acts as a buffer, a format controller for MDTS storage units, and as a communication controller for the computer. There are two storage units—a computer-compatible magnetic tape file ($12K) whose tapes can be taken to a computer center for processing, and a disc file ($12K) with a 10 million character capacity. The disc file can contain a negative credit authorization file that can be interrogated from data terminals. Coded reasons for refusals are presented on the readout at the terminal. When desired, the concentrator may be polled for transmission of stored sales information and updating of the credit file. Transmission to the computer may also be accomplished through the storage units via 201B (2400 baud) modem or up (if faster communication speeds are desired). The concentrator can cost anywhere between $7800 and $21,000, depending on the number of terminals (in 20-terminal increments) it handles.

In the on-line real time configuration, terminals are two-wire connected to the line concentrator, which communicates directly to the computer via a modem. In this environment, the central computer may contain either a negative or positive credit file.

Friden has calculated that in an 80-register store, the price of a whole off-line MDTS system (the terminals and all peripherals) is about the same per register location ($3000) as an 80 electromechanical register installation. FRIDEN DIV., SINGER, San Leandro, Calif. For information:

CIRCLE 411 ON READER CARD

small processor systems

Most minicomputers are a mixed blessing. They come with a small enough price tag and a fast enough processor, but they come without really sophisticated I/O. The Command 690 systems, although they do include a miniprocessor, are built to overcome the mini's inherent drawbacks. Although other vendors have claimed "total systems capabilities"—the vendors that have not can be counted on the thumbs of the left hand—the Command 690 seems to really do the job well.

The architects began with a mini and added eight I/O channels something like those of a Univac 1108. To these channels can be tied 400 cpm card readers, 25 cps printers, 300 lpm line printers, teleprinters, paper tape devices, mag tape devices, modem interfaces, Teletype multiplexers, analog to digital and digital to analog converters, or almost anything else.

A typical configuration for stand-alone scientific computing might have 8K of core, a 1.1 megabyte disc (with 20 msec average access time), two tape units, a card reader, incremental printer, keyboard/display, modem, supervisory software and assembler, BASIC, FORTRAN, and ALGOL-N, and sell for $79,200.

A concentrator/remote batch terminal is advertised with 8K, the modem, Teletype multiplexer, card reader, incremental printer and software for $45,360.

Almost any kind of configuration can be ordered from simple-minded black-box controller on up. At present these are based on the 16-bit, 2.6 usec cycle time Nova. ITS INDUSTRIAL COMPUTER LABORATORIES, INC. Salt Lake City, Utah. For information:

CIRCLE 413 ON READER CARD

"data access" modems

Carterfone has developed two data couplers capable of operation into AT&T's Data Access Arrangement now available because of the recent tariff that allows data communications users to direct-connect their terminal equipment modems into the telephone lines. The model DM328 is capable of hard-wire and acoustic operation through the standard telephone handset. It features half or full duplex asynchronous operation at up to 300 bps, in originate only mode, and is Bell 103 series compatible. EIA RS-232B interface is standard. Model DM328 sells for $410. The Modem DM318 is capable of hard-wired operation into the DAA and can be used only with DAA or private line. Unit price is $395. Quantity discounts are available on both models. CARTERFONE COMMUNICATIONS CORP., Dallas, Texas. For information:

CIRCLE 414 ON READER CARD

s/3 card holder

The BP-900 holder for the 96-column cards used in IBM's System/3 can be attached to warehouse shelving with metal clips (for inventory control applications) and is also available with adhesive strip (BP-900T) or with magnet (BP-930). A sample of the holder and price list will be sent to requesters. BEEMAK PLASTICS, Los Angeles, Calif. For information:

CIRCLE 412 ON READER CARD

computer output microfilmer

The computer output to microfilm field is mushrooming. Some ten years ago, or so, about the only model sold was the SD 4020. Now CalComp alone makes four or five units, including the model 1670. The 1670 is an on-line/off-line device that can print out up to 10,000 lpm on 16mm, 35mm, or 105mm (microfiche) film. It uses a CalComp-built controller that is shared with big plotters in the company product line, and sells for something around $117,000 (our estimate) plus mag tape (at an additional $16,500-$19,500). One interesting feature is a cartridge tape drive used for faster program loading. Detailed specifications will be found in the COM charts included in this issue. CALCOMP, Anaheim, Calif. For information:

CIRCLE 415 ON READER CARD

360/30 disc for the 1130

1130/Access disc storage is a system said to equip the IBM 1130 with the random access storage capabilities of the 360/30. Essentially it is a software independent disc controller that inter-

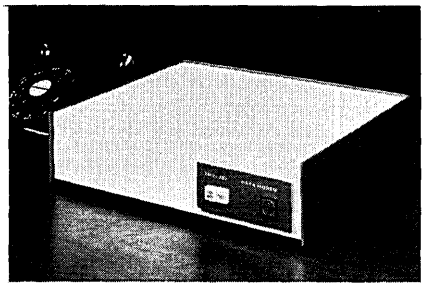
faces an 1130 and an IBM 2311 disc drive. It allows the 2311 ten-surface disc pack to replace the usual 1130 complement—the single disc IBM 2310—by making the computer view the 2311 as five individual 2310's. According to the manufacturer this not only provides the 1130 with five million to

50 million bytes of data (up to five 2311 drives can be connected per Access controller), but enables the computer to compile up to 30% faster, assemble up to 45% faster, sort up to 80% faster and load up to 120% faster. The connection can be made without any software modification. Monthly rental for 1130/Access is $1295 with a single controller and a single disc drive. Purchase price is $41,760. Delivery is two months after order. INTERCOMP, Cambridge, Mass. For information:

CIRCLE 416 ON READER CARD

data sets

The TMX-202 FSK data sets operate on private microwave channels, dedicated leased lines or two-wire dialed-up facilities at speeds of from 50 to 1800 bps. The digital interface meets



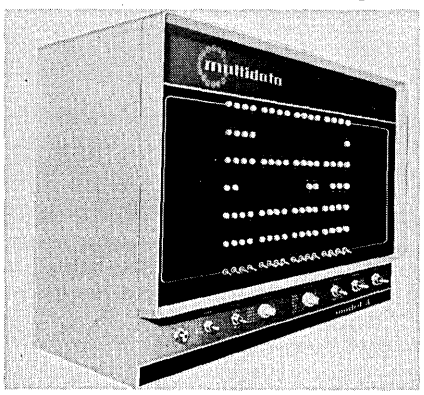
EIA RS-232B, CCITT V24, or MIL-STD-188B specifications. Calculated MTBF is approximately 20,000 hours. The 202G is a desk-top single-channel-end data set; the 202C provides up to 12 full-duplex channel ends within a 19″x3¾″x21″ rack module. Both sell for $835. COLLINS RADIO CO., Dallas, Texas. For information:

CIRCLE 417 ON READER CARD

16-bitter

Perhaps simply for luck, the first computer to come down the Multidata assembly line was tagged the Model A. Unlike the Ford, however, the computer comes with a variety of options. A $14,995 outlay will bring a 4K x 16-bit memory, the processor, a 32K word disc, a memory access controller, I/O bus, and a teletypewriter with paper tape gear. The memory access controller proves to be a big part of the system, since it allows for running programs large enough to fill the disc in the 4K core. Programmers need not trouble themselves with overlays; the memory controller does that automatically by dividing core into 256-word pages and shuffling the pages between the core and disc. A memory map contained in 20-msec registers in the controller keeps track of what went where and provides various forms of memory protection by coding the pages.

The cpu has an 880 nsec cycle time, eight programmable registers, 125 instructions, and a demand multiplexed I/O system good for up to 100K words/sec. (An optional direct access channel can bring this up to 1M words/sec.) The machine's design al-



lows for up to 256 interrupts. The fixed-head disc has a 17 msec average access time and can be expanded to 64K or 128K words.

Peripherals include a 300 cps paper tape reader, a 120 cps punch, a 300 cps cartridge tape drive, 400 cpm card reader, a non-impact line printer, and a crt. Software includes an assembler, FORTRAN IV compiler, utilities and diagnostics. MULTIDATA, Westminster, Calif. For information:

CIRCLE 420 ON READER CARD

additions to ocr system

Control Data has added features to their Model 935 stand-alone optical character recognition document reader that enable it to read handprinted numerics and special characters and documents printed on very thin paper, and to accommodate up to 12 pocket stackers for expanded sort capability. The 935-1 reads a single line of the USASI numeric font, and the 935-2 reads up to three lines of both letters and numerals. Both systems use the CDC 1700 computer for control and to process the captured data. The 935-1 sells for $105,470 and rents for $1930 a month (on a one-year lease); purchase price of the 935-2 is $159K, or $3160 per month on a one-year lease. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 421 ON READER CARD

bulk card terminal

This terminal is specifically designed for computer users who transmit large volumes of punched card data for processing and require printed or punched card output. The Series 2440 remote transmission terminal reads cards at the rate of 400/minute, transmits data at 250 to 300 cps over standard lines, punches 100 to 400 cpm and prints at 300 lpm.

The terminal has two 200-character stores, a polling/selection or contention mode of operation and automatic answering and blocking. The printer has 120 print positions (expandable to 132) and horizontal and vertical tabulation. The card reader does selective field reading.

Four models are in the series—the 2441 for card input and printer output; the 2442 also card input but both card and printer output; the 2443 with printer output only; and the 2444 with card input and output. Purchase prices range from $30,660 to $48,090. Monthly rental for a Model 2444 (on a five year contract) is $675. A Model 2442 on similar terms goes for $1,055. Deliveries will begin in the first quarter of 1970. HONEYWELL, Wellesley Hills, Mass. For information:

CIRCLE 422 ON READER CARD

univac 1108 front end

This company started out with every intention of being a time-sharing service bureau, at least that's what it looked like it was going to be. When the firm got going with its Univac 1108-based services, it decided that all the available hardware was not what it should be, and it started to build its own. This product, the TAU (Terminal Access Unit) 6213, interfaces up to 32 serial teletypewriter channels onto one 1108 I/O channel. The 6213 automates the functions involved with using phone lines for data transmission, such as answering and disconnecting calls. It will cost something under $30,000 and the first one is already placed—the vendor kept that one for his own service bureau. INTRANET INDUSTRIES, INC., Los Angeles, Calif. For information:

CIRCLE 418 ON READER CARD

hex help

The HEX-A-RULE programming aid for the analysis of hexadecimal computer printouts is a 13½″ stainless steel rule featuring the appropriate scales and reference data for third-generation users. The rule sells for $5 (prepaid) and may be personalized for an additional $1.50. HEXCO, INC., Houston, Texas. For information:

CIRCLE 419 ON READER CARD

crt display

Program control is the prime feature of the Series 20 crt displays. It allows the programmer to alter the refresh rate, cursor behavior, and character placement on any of the available screens—the 11-inch or 17-inch rectangular, or the 24-inch circular. Up to 4K characters can be displayed on any of the three screens, as well as limited graphics which permit bar charts and PERT network diagrams. Composite figures

can be displayed using an overwriting facility which also increases the character set from 60-120 characters.

The displays are controlled by a unit which is separate from the keyboard controller. Options include an 8K byte buffer, a light pen, a computer and peripherals for creating a stand-alone system, and an interface to Sigma computers.

The price for the 11-inch model is $2700, for the 17-inch it's $3200. The eight-crt controller goes for $6200. Keyboards cost $1200 each and their controller is $2600. The buffer sells for $11,600. For the comparison shopper, an eight-unit system using 11-inch screens, with keyboards, controllers, and buffer would be approximately $52,000. CANADIAN MARCONI CO., Montreal, Quebec, Can. For information:

CIRCLE 423 ON READER CARD

cassette terminal

The Model 5800 TWINDEK terminal expands the capabilities of an ASR or KSR 33 teletypewriter by providing batch I/O transmission at 110 cps over voice-grade telephone lines via a 202C modem. Twin UDAC incremental ¼-inch magnetic tape decks, one read and one

write, are used for data storage, and up to 200K characters may be stored on the reusable cartridges. The terminal also features an unattended remote poll capability—the computer center may collect data when there is not a peak load on the computer or phone lines. On-line conversational operation is retained with the TTY by by-passing the TWINDEK.

The complete terminal (including KSR-33) will sell for $3230. It is also offered as a plug-in field modification to existing ASR and KSR Teletypes at $2450. Lease plans are also available. Options include interfaces for IBM Selectric's and other Teletype-like terminals, and a Prompter ($400) that takes the place of a preprinted form by using programmed or prerecorded tape cartridges to format items on the tty, allowing the operator to fill in the blanks. UNIVERSAL DATA ACQUISITION, Houston, Texas. For information:

CIRCLE 424 ON READER CARD

software-first mini

The CSI-16 computer is the first product of a firm which previously confined itself to software consulting, and had only five employees as many months ago. The machine, which was scheduled for public unveiling at the FJCC, is designed to satisfy software requirements, rather than the other way around. Three compilers, ALGOL, BASIC, and Extended FORTRAN IV (less double precision and complex data forms) are offered on the 16-bit machine. All three are one-pass, operable in less than 4K words of memory, and are said to generate object code which is "generally as efficient as the code generated by the one-pass Assembler" as a result of the system's instruction set.

The system architecture is a multiprocessor configuration consisting of four basic blocks: the central processor, the interrupt processor, the I/O list processors, and the memory. The basic system has a total of 265 bits of register storage. The central processor provides hardware for fixed- and floating-point arithmetic operations, program relocation, plus indexing and hardware algorithms for basic compiler-language functions. Hardware registers are a 32-bit accumulator, two 32-bit buffers, a 16-bit index, a 16-bit program-relocation register, a 16-bit program counter, a 6-bit operation code register, a 16-bit memory address register, a 16-bit memory data register, and three 1-bit status registers. Two 16-bit memory protection registers are optional.

The CSI-16 is provided with 4K words of memory. Full cycle time is 1 usec. Memory is expandable to 16K in 4K increments at $3,950 each. Expansion to 32K is possible through use of an extension chassis and additional power at $1,250 extra. The system accommodates a variety of I/O devices, including Teletypes, paper tape, cassette and standard mag tape, discs and drums, printers, and analog devices. Price of the basic configuration is $10,750. First deliveries are slated for next month. And a 24-bit system, at $14,950, won't be far behind. COMPILER SYSTEMS INC., Ridgefield, Conn. For information.

CIRCLE 425 ON READER CARD

voice response system

PAR-16/256 is a voice response system including a front-end multiplexer that provides internal switching of audio signals to input lines. The system is said to use a "unique switching technique which reduces switching hardware by an order of magnitude while at the same time permitting a large line/vocabulary capacity." A patent is being applied for. PAR-16/256 has a 16-line and 256-word capacity and employs an Alpha-Data disc for storage. Expansion to 128 lines and 1024 words is available. The unit is compatible with standard Touch-Tone or Teletype interface equipment, and interfacing may also be provided for private communications systems. The firm will provide the interface equipment to integrate PAR-16/256 into any computer system and can tailor the vocabulary to meet specific needs. Price of $30K includes interface for the Nova minicomputer; extra cost for other machines. Delivery requires 30 days ARO. COMPUTER SYSTEMS & SOFTWARE, INC., Orlando, Fla. For information:

CIRCLE 426 ON READER CARD

tty coupler kit

The Model 701C fully asynchronous coupler kit converts audio tone from standard voice grade telephone line to digital signals, allowing any Model 33 Teletype to operate as an acoustic data terminal with a standard telephone. After plugging the Teletype power

cord into a standard outlet, the telephone receiver is placed into the coupler's cushions, power turned on, and the desired destination dialed. As soon as the carrier tone is received, the unit is ready for communication. A slide switch selects either the full or half duplex operating mode. The full duplex operation allows the Teletype to be used simultaneously for receiving one message and transmitting another. In the half duplex mode, the transmission is identical with the terminal readout.

The kit is available to OEM's supplying terminal equipment to time-sharing users in a minimum quantity of 50 for $345 each. Single units including the Model 33 ASR Teletype (called Model 500A) will be supplied for $1600 and with the Model 33 KSR (called Model 500K) for $1200. OMNITEC CORP., Phoenix, Ariz. For information:

CIRCLE 427 ON READER CARD

data entry by the six pac

This data entry system is a combination of up to six keyboards and six tape drives plus a control unit. There is no tape handling for the operators, how-

ever, and the data can either go directly into the computer or onto a tape transport.

The Series 6000 keyboard is a 64-character keypunch configuration. Display is either Nixie tube—one alphanumeric for data or program character and a three-position digital column count—or panel light for status signals. There are two levels for program formatting and a free format entry mode controlled by a switch. Operating modes are program entry, program verify, data entry, data verify, search and pool.

The control unit holds time-sharing electronics, the power supply, one tape per keyboard (it can be shared by two or up to six keyboards), core memory, logic and interface circuitry and the variable record length adjustment. Record length can range up to 496 characters. Standard interface for the series is System/360, but others are optional.

Tape drives, housed under dust covers in the controller, are continuous drive, pinch roller units using 8½-inch reels of ½-inch tape. Data is serially recorded at 800 bps. The units have automatic read after write and parity checks.

Optional equipment with Series 6000 includes an IBM-compatible tape transport, a typewriter for hard copy, a line printer and a record counter. Customer services include system planning, programming assistance and programs for direct on-line data entry, and operator training. Cost for Series 6000 ranges from $16,200 or $360 a month for a two-station system to $42,000 or $925 a month for a six-station system. COMPUTER ENTRY SYSTEMS CORP., Silver Spring, Md. For information:

CIRCLE 429 ON READER CARD

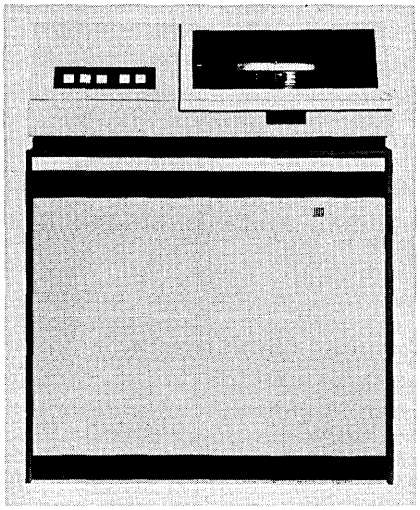
remote crt terminal

The Executerm 60, an IBM 2260-2265 compatible stand-alone remote terminal with a 9" (diagonal) crt, will display 240 7x8 dot matrix characters in six lines of 40 characters or 480 characters in 12 lines. An optional multistation adapter will allow hook-up of eight and/or 16 terminals to a single line. The MOS memory has a refresh rate of 66 cycles/second. Editing features include page roll and character and line insert and delete, and a hard copy printout option is available. Transmission rate is 1200 bps in 8-bit ASCII in full or half duplex using a Bell 202 data set or equivalent. The terminals will sell for between $5K-$6K, depending on configuration, and will be installed and serviced by RCA Service Co. Lease plans will be offered. COURIER TERMINAL SYSTEMS, INC., Phoenix, Ariz. For information:

CIRCLE 430 ON READER CARD

disc drives

Lured by the hyperactive disc storage market Bryant has produced a series of drive units. The basic unit is designated the Bryant 1100. It is IBM 2311-compatible and also compatible with



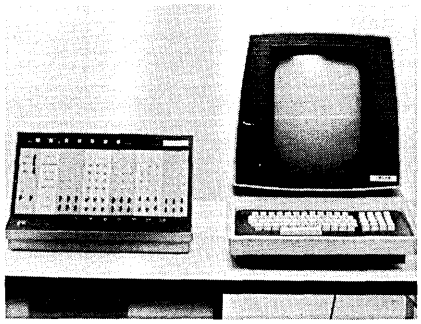
any similar device that has the IBM 284 controller interface. Other models are the 1101, which interfaces with the 2841 controller, and the 1102 and 1103, which interface with the control processor of the IBM 360/20. Capacity of the units is 7.25 million bytes and transfer rate is 156KC. The units will rent for $445 a month. Purchase price is around $15,000 and there are quantity prices for OEM's. Delivery is two months from date of purchase. BRYANT COMPUTER PRODUCTS, Walled Lake, Mich. For information:

CIRCLE 428 ON READER CARD

miniprocessor

Brought into the world as a deceptive intelligent terminal (deceptive because it could imitate any number of other terminal devices), the PDS-1 will try to imitate both the terminal and the cpu for its second act. In the transformation to a processor, the terminal gained a console and an expandable memory (up to 32K of 16-bit words with a 2-usec cycle time). The rest of the system was already there, including eight index registers and one general purpose register, an optional direct memory access channel, and—though not much mentioned—a two-pass assembler. Listed as options for the mini are a real-time clock, a disc, and memory protect. No compiler is available to date.

Hardware delivered with the cpu includes a largish crt (for displaying



up to 1040 characters), a 4K core, and keyboard. Base price ranges from $9450-$6545 depending on quantities. Additional memory runs $3450/4K. IMLAC CORP., Waltham, Mass. For information:

CIRCLE 431 ON READER CARD

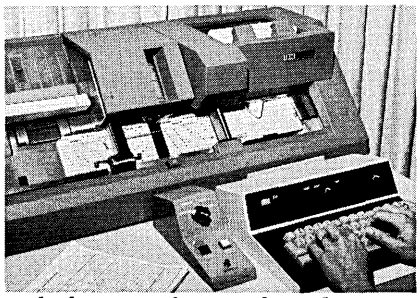
3-speed terminal

Teleprint-30 is a portable, Teletype-compatible terminal, consisting of a nonimpact printer for permanent records, a 53-key keyboard, paper tape reader, and paper tape punch. Each of these four modules operates independently or in conjunction with any of the others, utilizing ASCII code. Options include additional characters and expanded keyboard. The unit sends and receives data manually or automatically, and can be used for data entry, data verification, etc. It may be used as an off-line terminal, on-line parallel wired terminal, or an on-line communications terminal. Printing speed is 10, 15, or 30 cps by switch selection. Price is $937 each for the printer only for single units, decreasing to $687 in quantity. FOTO-MEM, INC., Natick, Mass. For information:

CIRCLE 432 ON READER CARD

card verifier adapter

The DRC Verifier-Adapter converts any IBM 024, 026, or 029 card punch to a card verifier, making punching and verifying operations immediately interchangeable on the same machine



with the turn of a switch, and permitting immediate correction of errors. Rental is $28/mo. including installation (compared to about $70/month for a verifier). The unit is said to neither void nor alter IBM services or lease contracts. DATA RESEARCH CORP., Ft. Lauderdale, Fla. For information:

CIRCLE 433 ON READER CARD

inexpensive discs

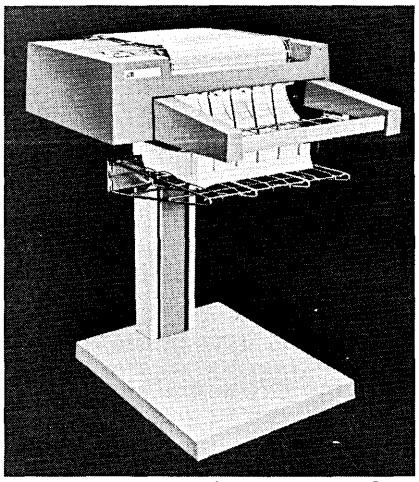
Built for the bottom end of the GE computer line, the 100-series, the DSS110 is offered at $625/month for a controller and single disc drive or $950/month with two drives—roughly the equivalent in price of a fast line printer. Each drive has two discs with two recording surfaces, and each removable disc has a capacity of 2.3 million bytes or 3.07 million 6-bit characters. Up to four drives can be attached to a single controller, resulting in a total storage capacity of 9.2 megabytes.

When used with the GE 115, 8K of core is required. This figure goes to 12K for the 120 and 16K for the 130. Processing with any of the computers can be in sequential, indexed sequential or random modes. Purchase prices are listed as $26,376 for a single and $13,728 for each additional drive. Deliveries start in September, 1970. GENERAL ELECTRIC, Phoenix, Ariz. For information:

CIRCLE 434 ON READER CARD

forms stacker

The model 401 Formstacker handles the paper output of computer printers, accepting any continuous fanfold form at print rates to 2000 lpm and skip rates to 80 ips. The unit takes any form, including 11-pound single-part

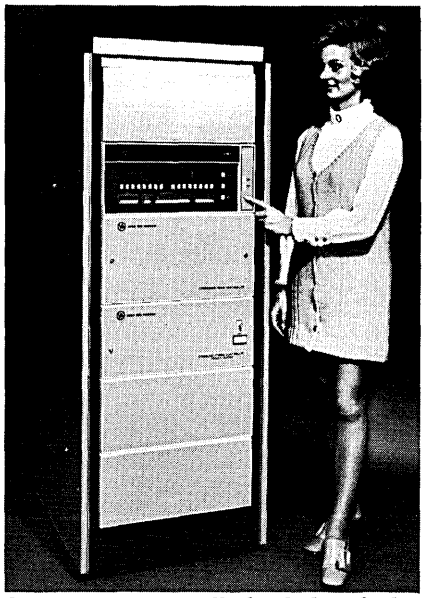


paper, in widths from 4-18 inches. Forms stack into a wire tray that lowers automatically as the forms fold in. An open-side design lets the operator remove the stack while the printer continues running. The unit rolls up to any printer without special setup. It sells for $1600. ADVANCED TERMINALS INC., Maple Glen, Pa. For information:

CIRCLE 435 ON READER CARD

communications concentrator

Take one Varian 520/i, add one 520/i-60 communication controller, mix in up to 60 110-baud phone lines, and four full-duplex 2400-baud lines and presto! a 520/DC system is formed. Since the imbedded 520/i is a byte machine, the resulting system operates on a character-by-character basis. Transmissions can be asynchronous or synchronous, and the 520/i uses one set of its registers for I/O and one for



data processing. Fully loaded with the maximum 64-line configuration, the "i" is using only about 40% of its compute power, so transmission delays are not expected.

The 520/i-60 is used to translate serial transmissions into byte-parallel for the computer; the controller attaches to the cpu I/O bus and sends a standard interrupt when a character has been assembled.

The Data Concentrator system is available with as few as four com lines, and runs about $32,500 in a 32-line full-duplex system. VARIAN DATA MACHINES, Irvine, Calif. For information:

CIRCLE 436 ON READER CARD

ocr turnaround

First product of a new firm which intends to devise products to solve paper handling problems is ReaDoc. The basic unit consists of an optical scanner, a numeric keyboard, and an adding machine housed within a desk-sized unit. The scanner is said to be capable of reading characters and lines that might be rejected by other scanners because of smudging, mutilation, etc. ReaDoc is intended to process accounts receivable or subscription mail, at an average speed of 300 documents per hour.

Batches of opened mail are delivered to the ReaDoc operator. She puts individual documents (bill stubs, subscription forms, etc.) under the scanner, which then reads the account number. The amount of the accompanying check is entered manually

through the numeric keyboard. The amount is flashed on a display in front of the operator for verification. If an error has been made, she can clear and rekey. The account number and payment are then automatically recorded on paper tape or punched cards. The keyed-in dollar amount is also fed to an adding machine for batch control and deposit totals. Checks and documents are imprinted with batch and corresponding sequence numbers as they are gathered in separate stacks within the machine.

ReaDoc is available as a stand-alone unit or as an 8- to 12-unit system under the control of a PDP-8/L computer. This permits use of remote units with data from each station recorded on a shared disc drive until a batch is completed. On completion, batch information is read off the disc and recorded on magnetic tape. Batch information and batch totals are simultaneously printed out on a high-speed printer. Selling price per ReaDoc is $24K, but the firm envisions rentals as their primary source of income. Pricing is a la Xerox, with a minimum rate of $600/mo. for the first 30,000 transactions (2¢ per document), and 1¢ per document thereafter. There is no additional charge for the multi-unit systems using the PDP-8/L, since the addition of the computer and an ASR-33 tty obviates the need for adding machines and punches on the individual units. Delivery requires about 30 days ARO. ALLIED COMPUTER SYSTEMS, INC., Madison, Conn. For information:

CIRCLE 438 ON READER CARD

teletype replacement

The $835 EIS Telewriter is directly interchangeable with the Model 33 KSR Teletype but its operating noise is below that of an office typewriter. Keyboard output and printer input is in serial 8-bit ASCII code, standard EIA RS232A interface. Other interfaces are obtainable, including direct connection to a Bell Model 101C modem. ELECTRONIC INFORMATION SYSTEMS, Boulder, Colo. For information:

CIRCLE 439 ON READER CARD

300 bps data set

The Model B acoustically coupled data set operates in the originate mode (answer mode available as an alternate) at rates greater than 300 baud. The Model B operates in either full or half duplex and is equipped with carrier detect circuitry that enables the output circuit to the terminal and the transmitted tone only during the reception of an adequate signal, eliminating typewriter chatter prior to hookup and preventing early transmission from the remote computer. The modem is comparable to the Western Electric 103 data set and is compatible with EIA RS-232B specification. Model B sells for $325. The company is also marketing the Model E, a data set/terminal tester with a cassette recorder for $550. LIVERMORE DATA SYSTEMS, INC., Livermore, Calif. For information:

CIRCLE 437 ON READER CARD

acoustic coupler/modem

The ForData Model 1600 acoustic/inductive data coupler will automatically respond to incoming calls, switch on your terminal unit, and release the line upon completion of transmission. The coupling is made through an adapter which fits over any 500-series telephone instrument without interfering with normal use of the telephone. The 1600 operates at transfer rates up to 175 bps and is therefore compatible with most tty paper tape reader/transmitters and card readers. The unit is fully compatible with Western Electric 100-series dataphones in either the originate or answer mode, and will interface with equipment conforming to either Teletype or EIA RS-232B standards. The 1600 can also be operated manually. Single unit price is $395 f.o.b. Portland. FORD INDUSTRIES, INC., Portland, Ore. For information:

CIRCLE 441 ON READER CARD

univac 1100's memory

Unitized is the appellation for new memory systems for the Univac 1100 computers. The manufacturer has produced an alternate main memory for the 1106 called Unitized Storage and a subsystem, Unitized Channel Storage, which is expected to get greatest use with the 1108.

The Unitized Storage permits the 1106 user a less expensive alternative to Multi-Modular Storage (MMS), which has been standard with that system since its introduction earlier this year. The Unitized core has the same 1.5 usec cycle time as the MMS but does not allow instruction overlap. Two Unitized Storage modules, each 131,000 word capacity, single plane, single port units, can be used with the 1106. Only one module is needed to support the Exec 8 operating system. A module costs $205,875 (MMS of the same capacity costs $411,750).

Unitized Channel Storage is a core store subsystem for real-time and multiprogramming processing. It replaces

"Little Billy Malton, of Tarville, Ohio, deserves goods valued at $3.56."

the Univac 432 drum memory without software modification. The subsystem consists of a controller and up to four modules of 1.5 usec cycle core, each with a 262,000 word capacity. Price for the basic system—single controller and single module—is $270,240 or $5330 a month on a one year rental. Delivery for both items is set for the fourth quarter of 1970. UNIVAC, Blue Bell, Pa. For information:

CIRCLE 442 ON READER CARD

tape system

An IBM-compatible magnetic tape system, including controller, interface and software for the PDP-8 computer, reads and writes 800 bpi 7-track records. The system consists of a CEC Model 640 Controller Interface and an Ampex Model TMZ Tape Transport. Computer access is by a three-cycle

data break facility with a transfer rate of 19.2 KC at a tape speed of 24 ips. A single 2400-foot tape reel will store in excess of 100 million bits, the equivalent of 8000K of computer memory. Software includes an operating system builder/monitor package that allows fast-access program swapping and features a single-pass binary paper tape loader; a modified PAL-III assembler that accepts mnemonic I/O commands for the system; and a diagnostic routine that checks all capabilities of the controller and tape transport. The system is also available in a 9-track version for the same $9700 price tag. COMPUTER EQUIPMENT CORP., Dallas, Texas. For information:

CIRCLE 440 ON READER CARD

mini cassette transport

Compu/Corder 100 is a cassette-loaded tape transport for use with minicomputers. It features bidirectional direct access capability that enables a user to access any file on a tape containing 3.6 million bits within an average of 15 sec. The unit is provided with interfacing to DEC, Varian, and Data General machines, with others available optionally. Read/write speed is 5 ips, and bidirectional search/fast rewind is 120 ips. Block length is dynamically variable, limited only by tape length. Recording density is 1000 bpi, and bit-serial, biphase-encoded wide field recording technique is used, providing tape transfer rate of 5000 bpi. The cassette contains 300 feet of tape, preformatted with an address track, certified after the tape is wound in the cassette. Price is under $3000. SYKES DATATRONICS, INC., Rochester, N.Y. For information:

CIRCLE 443 ON READER CARD

interchangeable disc

Model DDR-1 is an interchangeable disc recorder which is expandable from 32K bytes (8-bit words) to 524K bytes per side of each disc; and, with expander-type slave recorders, to 2 million bytes. Average access time is 16.66 msec.

The technology of the DDR-1 is strange, combining mechanics, electronics, and *fluidics*. The unit features an interchangeable 14-inch nickel-cobalt plated disc on which data is recorded by fixed read/write heads. An air bearing spindle ensures concentricity, and fluidic logic controls spindle movement to achieve accurate disc positioning and prevent contact between disc and heads. Each disc is stored in a

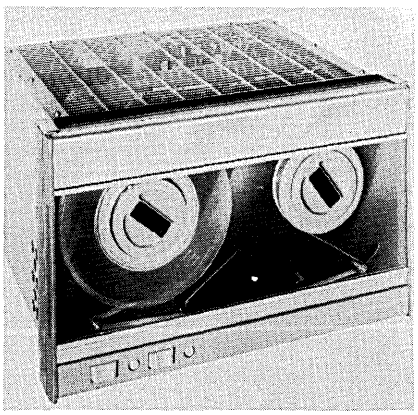
separate sealed DISCLOSURE. With a DISCLOSURE inserted in the main housing, fluidic logic actuates a picker arm which pulls the disc from the DISCLOSURE and positions it in a "miniature clean room" under the heads.

Options include anticipation logic for programming, format writer, indicator panel, program read or write lockout, and manual read or write lockout. Custom interface design services are available, and each DDR-1 comes with some programming support from the firm. Price is about $15K for most small-scale computers, such as PDP and Nova. Quantity prices are available for OEM's. Delivery requires about six months. It's the first product of the year old firm. DIGITAL INFORMATION STORAGE CORP., Berlin, Mass. For information:

CIRCLE 444 ON READER CARD

tape handler

The Model 3600 tape handler is IBM 360 compatible and sells for $3,000. It operates at 24 ips, handles 8½-inch reels of ½-inch tape at 800, 566 or 200 bpi and rewinds at 120 ips. The



OEM directed unit features IC components and printed circuit motors and a bi-directional single capstan drive that is photoelectrically controlled by a pulse width modulated servo. A combination of pulse width and peak signal detection techniques have increased noise discrimination and a split head has reduced deskewing to a single adjustment. Delivery is scheduled for early 1970. DIGITRONICS CORP., Albertson, N.Y. For information:

CIRCLE 445 ON READER CARD

ascii i/o typewriter

The EECO 1651, modeled around a Selectric typewriter, is compatible with all ASCII-coded systems and can operate on-line as a keyboard-printer for transmitting and receiving data at 15.3 cps. Hard copy can be prepared with upper and lower case characters as standard. All of the ASCII nonprint control codes are provided. The 1651 functions as a basic I/O typewriter when interfaced directly to a computer I/O bus, or as a remote computer terminal when interfaced to a modem and telephone lines. The OEM product sells for $2500 per unit, quantity discounts available. ELECTRONIC ENGR. CO. OF CALIF., Santa Ana, Calif. For information:

CIRCLE 449 ON READER CARD

character encoding

Series S will encode documents with Magnetic Ink Character (MICR) and Optical Character (OCR) fonts. There are two groupings in the series, the

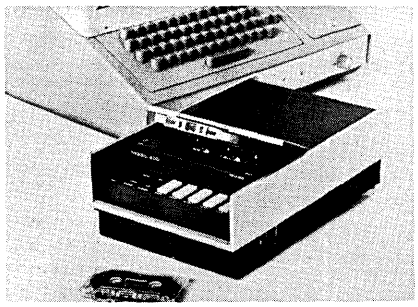
new products ...

S100 single pocket encoder, and the S200 which will offer multiple sort pockets—either 5, 9 or 13. Available fonts are the E13B and the CMC-7. Both unit groups are capable of full field encoding and have a programmable format to accommodate fields specified by the user. Data is input on a 10-key keyboard and stored until all information is collected permitting one-pass encoding. The encoders print magnetic characters at the rate of 20 a second. A sequential record of data entered and encoded on each document is maintained on a drum printer. Sorting pockets on the units can hold up to 500 average size documents. Price for the machines range from $5,600 to $13,900. Lease price range is $130 to $295 a month. First deliveries are set for the fall of 1970. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 446 ON READER CARD

incremental cassette unit

This vendor claims to have the only true incremental recorder cassette. The units of the 400 series read and write incrementally by character. The others, it is claimed, record either by



block or by record. Recording onto the ⅛-inch tape (like other cassette recorders, the 400's really use .150 mil wide tape if anyone's fussy) is done at a rate of 120 cps. Reading can be at either of two selectable rates between 10 and 120 cps.

Four models make up the series: an 8-bit serial model 400; the parallel entry unit for 8-bit ASCII (model 405) expected to be the most popular at $2100; a parallel entry for 5-bit BCD numeric code, the 415; and a scientific and research model 425 which records parallel entry BCD in a format of five 4-bit digits and a parity track. All use dual-capstan drive, make character and block parity checks, can backspace, and sell for under $2500. Packing density is 333 bpi, which results in about 140,000 characters on two tracks. MOBARK INSTRUMENTS CORP., Sunnyvale, Calif. For information:

CIRCLE 447 ON READER CARD

acoustic covers

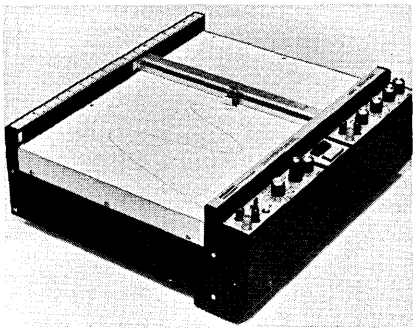
An acoustic cover to deaden the sound of keypunches and verifiers and another to fit a Teletype were designed not only to make things quiet but also to look good and still give the operators access to their machines. The model 810, built for teleprinters, cov-

ers the tape mechanism, the control panel and the printing mechanism. Another panel is also available to cover the keyboard when a tty is primarily used for receiving only. The model 159 for keypunches and verifiers has a lift-up plexiglass cover with a balancing weight so that it can be left in any position. The Teletype cover will go for $149; the keypunch model for $98. So far one can only speculate whether the girls will bring the noise level back up to normal when they find they can more easily talk over the sound of their machines. GATES ACOUSTINET, INC., Santa Rosa, Calif. For information:

CIRCLE 448 ON READER CARD

graphic recorders

Houston Instrument is replacing all previous flat bed X-Y and T-Y recorders with a new Omnigraphic line whose basic unit will accommodate an X-Y, strip chart, T-Y or several special designs in one main frame. Model 2000 is the basic X-Y main frame, which is priced at $770 in single quantities and is expandable with a variety of plug-in



modules without modifications via the remote connectors. As a strip chart, the Model 3000 sells for $710 plus modules. Multispeeds and the multiple choice of input functions from the modules are features. The 13 plug-in modules include DC coupler, DC ranging, DC switching with or without time base, DC attenuator, and range in price from $25. Operating conveniences include electric pen lift, event marker and positive paper feed or roll take-up. HOUSTON INSTRUMENT DIV. OF BAUSCH & LOMB, Bellaire, Texas. For information:

CIRCLE 450 ON READER CARD

disc pack tester

The Disk Pack Test System, DPTS 600, simulates computer testing of IBM 1316 or equivalent packs. The on-line system certifies and tests six-high disc packs in 2-6 minutes and features dual threshold error capturing. A printer option is available. A complete system consists of a test processing unit, a controller-simulator with a fixed test program, and two disc drive units. The test controls can be set by the user to the GSA specifications or adjusted to his own standards. A base system consisting of a test processing unit with fixed test program sells for $20,800, including installation. INTERSCAN, Oklahoma City, Okla. For information:

CIRCLE 451 ON READER CARD

data sets

Founded this September to manufacture OEM data sets, this firm is already prepared to deliver the Model VA300, compatible with the Bell 103A set. It provides full duplex FM transmission of asynchronous serial binary data at speeds to 300 bps over the switched or DDD telephone network. The two initial versions are the VA300A, which operates with the data access arrangement for manual answering and dialing, and the VA300B with an automatic coupling unit for automatic answering and manual dialing. Originate only and answer only versions are also available. Basic unit price is $175 with an EIA RS232B interface listed as an option; for originate only or answer only versions, subtract $10. Delivery is three-five weeks ARO. THE VADIC CORP., Palo Alto, Calif. For information:

CIRCLE 452 ON READER CARD

tone calling keyboard

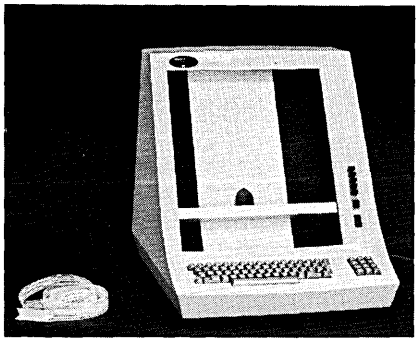
The Datatone KTCT (Keyboard Tone Calling Terminal) has 28 tone buttons (control points) arranged in seven columns of four buttons each (other layouts available). The first 16 positions are identical with those used on Touch-Tone telephones. Numerals 1 through 26 correspond to the letters of the alphabet, and the two remaining buttons are for upshift and downshift to provide the alphanumeric capability. The KTCT (also known as Model S8KTT28XD) is designed for use with a data set or acoustic coupler and may be used with the vendor's Datatone Receiver Tone Calling Terminals (RTCT) for computer input, punched

cards, and control operations. The device, which comes with encoders and power supply, is compatible with all standard telephone company practices. Base unit price is $795; quantity discounts available. TREPAC CORP. OF AMERICA, Englewood, N.J. For information:

CIRCLE 453 ON READER CARD

data communications terminal

The Magnyx 6630 is a data communications terminal that allows correction of original copy before transmission to a computer. Copy can be electronically erased word by word, line by line, or block by block. Applications include modifying rough drafts and debugging and reviewing lengthy programs or tabular copy. The copy viewing area is



15″ x 17″, but instead of a conventional crt it is a magnetized board with small metallic particles that are arranged to form an image.

The Magnyx 6630 is completely compatible with the ASR 33, 35, or 37 and with the IBM 2740 or 2741. The printing can be silently placed on any paper, roll, sheet, or fanfold. The printing speed is 30 characters/second with 132 characters across the page. There is a selection of 96 characters with both upper and lower case. Data transmission rate is at 300 bps. The portable, self-contained unit is compatible with any IBM 360. Options include paper tape, acoustical coupler, half spacing, vertical tabulation under computer control, and signature answer back. Price of the basic configuration is $3400. PERIPHERAL DATA MACHINES, INC., Santa Ana, Calif. For information:

CIRCLE 454 ON READER CARD

rotating file controller

A small computer looking for a way to improve its memory might need the model 9024 universal rotating file controller, a device which can link it to discs or drums with transfer rates up to eight megabytes/sec. The controller takes care of tasks common to all controllers, such as serial/parallel conversions, track selection, sector addressing, read/write control, status reporting, and error checking. The 9024 uses a horizontal parity check and a longitudinal sector check sum to assure valid data transmissions. It provides for a variety of storage formats and can be used with fixed or movable head memory systems. Plug-ins are available for connecting computers such as the PDP-8, Interdata 4, Varian 620/i, or H-P 2116B to devices such as the IBM 2311, Vermont Research 1016, DDC Series 7300, and Data Disc series 7200. Its price is $7000 less options. TIME-ZERO CORP., Torrance, Calif. For information:

CIRCLE 456 ON READER CARD

tape cleaner/tester

The Tape Evaluator Cleaner is an off-line desk-top handler for 2400-foot reels of ½-inch magnetic tape. Operating at 120 ips, it cleans and tests a full reel in about six minutes (two for cleaning and four for testing). Its recording format is 7- or 9-track 800 bpi. The device counts and records the total number of dropouts in digital form. Self-sharpening blades remove loose oxide and debris from both sides of the tape, and vacuum airflow carries the particles away. A capstanless unit, tape tension is also controlled by vacuum pressure and is not sensitive to tape speed or reel fullness. The TEC sells for $6250 and is available six weeks ARO. RECORTEC INC., Mountainview, Calif. For information:

CIRCLE 457 ON READER CARD

tape to card converter

The Model C780 for translating five-, six-, seven-, and eight-level punched tape to punched cards can be field installed as an attachment to the IBM 29 card punch. Wiring on a removable plugboard permits converting tape punched in any code, including full 128-character upper and lower case ASCII. The system converts at 20 cps with a nonprinting IBM 29 and 18 cps with the printing model. Normal manual operation of the card punch is not impaired by attachment of the C780. The basic machine sells for $4300, and rentals start at $160 a month. GENERAL INSTRUMENT CORP., Hawthorne, Calif. For information:

CIRCLE 458 ON READER CARD

megabit minidisc

A one-million-bit fixed head disc memory, the Model 7203, is available to minicomputer manufacturers at a quantity price of $3900. Plug-compatible interfaces are available from the vendor for most minicomputers. The 7203 contains complete electronics—head selection matrix, read and write amplifiers for both data and clock heads, all TTL logic for write encoding and read decoding, clock derivation for the serial-by-bit output, and a power supply with write-protect circuit. Average access time is 17 msec; transfer rate, 3 million bps. DATA DISC, INC., Palo Alto, Calif. For information:

CIRCLE 459 ON READER CARD

core memory for mini's

A complete core memory system for OEM, the DC-34 is printed circuit board mounted with a 900 nsec read/write cycle. The TTL IC system is also available with a 750 nsec speed. The 3D DC-34 is intended for use in the main frame of digital computers and is assembled in increments of 4K and 8K. Average price for the 4K configuration is $2200. An 8K memory sells for around $4000. Deliveries are currently running about three months after receipt of order. DATACRAFT CORP., Ft. Lauderdale, Fla. For information:

CIRCLE 460 ON READER CARD

numerical control system

The APT/3AX numerical control tape preparation system has been upgraded to include rule surface, multiple check surface, index and copy logic, and conical forms data capabilities. The system uses the APT language to provide three-axis continuous path tapes. Programs written in APT/3AX are compatible with all APT III systems, and additional tape preparation programs may be run on expanded APT/3AX systems.

The APT/3AX processor performs three operations to compile a part program in the APT language. In the first pass, statements are checked and data tables generated for the part program statements. In the second pass, the table data is used to compute geometric surface equation coefficients. In the final operation, cutter centerline data is computed and a machine control tape generated. The complete system, including a Sigma 2 computer, rents for under $4K/mo. The vendor, formerly known as Infocom, Inc., is FORDAX CORP., Wellesley Hills, Mass. For information:

CIRCLE 461 ON READER CARD

3/4" crt's

A new crt intended for special applications and OEM's is a tiny ¾-inch diameter tube which utilizes a 20-line raster to display virtually any type of graphic symbol—letters, numerals, foreign characters, dollar signs, etc. The characters may be of any size or style. The tubes are controlled by a character generator which can handle over 100 tubes. The character generator is programmable to meet requirements for entry code definitions and character styles and configurations. Prices range from about $25-70 per tube, depending on quantity (100 tubes are $25 each). MADATRON CORP., Whippany, N.J. For information:

CIRCLE 465 ON READER CARD

system spotlight

information for this series is invited applications submitted must be installed and operational

APOLLO TRAINERS

procedure simulation

There is no room for on-the-job training for Apollo astronauts. Once they are aboard their vehicle they must do everything right the first time. The crews' training is taken, instead, on board two types of land-based simulators, the mission simulators in which they "fly" whole missions at a time, and the procedure simulators in which they must first practice every job function or mission subset, including launch, rendezvous, and lunar landing.

These procedure simulators—there is one for the Lunar Module and one for the Command Module—are operated by a hybridized Control Data 6400 large-scale computer located at the Manned Spacecraft Center in Houston.

computer and peripherals

CDC 6400 with 65K (60-bit) words of core storage; 1 usec cycle time
10 Peripheral Processing Units with 4K (12-bit) words of core storage each; 1 usec cycle time
Two EAI 231R analog computers plus analog/digital interfaces
plus one operator's console, two crt terminals, two 1000 lpm printers, one 1200 cpm card reader, two 75 ips tape drives, four eight million character disc packs, one 74 million character disc, and one 250 cpm card punch

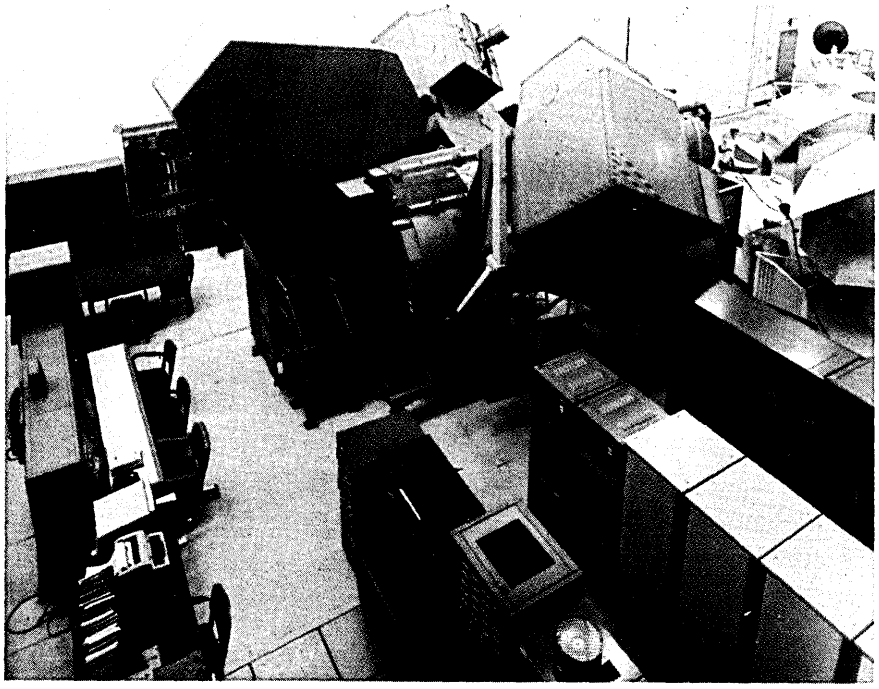
application

Sitting at his station in the darkened interior of the Command Module Procedure Simulator (CMPS), a crew member is faced with the same array of switches and displays that exist at his station in the real spacecraft. Out one "window" he can see the earth, rotating and coming toward him or going away from him depending on the two to four hour portion of the flight being simulated. Out the same window he sees a star field, moving as his craft turns and rotates in space, and later maybe even the lunar landing module.

His gauges and dials and controls all operate, telling him his attitude in space, acceleration, fuel pressure, etc., and responding to his movement of the flying controls. His on-board primary guidance system computer (the DSKY) allows him to access any of its 12 programs and returns him accurate answers.

At the same time, the Lunar Module Procedure Simulator (LMPS) may be active—in the same flight sequence or any other. Crewmen there see the lunar surface come closer to them and can practice flying over it, or landing, or returning. The LMPS has its DSKY computer, too, to give it rendezvous guidance instructions or landing data, and also an abort guidance system computer called DEDA. DEDA operates on a single program but allows its operator access to several loops.

Just outside the land-locked craft all of the illusions are explained. A large earth globe mounted on swivels serves to fill in the picture at one window. A single tv camera moves closer or further from it as the globe rotates on its axis. A large sphere with ball bearings imbedded in its surface reflects the glints of light that the astronauts see as stars. A second camera focuses on a model of the Lunar Excursion Module.



The cumbersome-looking Lunar Module Simulator is less dramatic in appearance than its real counterpart, but equally difficult to fly.

There is no lunar globe. Instead, the view from that LM window is produced from moving film strips.

Beyond each module and its equipment is a master control console; beyond that, the CDC 6400.

hardware

The CDC 6400 has a less than average complement of normal peripherals —tapes, discs, and such—but linked to two of its channels are interfaces to two EAI 231R analog computers. Each analog cpu, in turn, interfaces to one of the procedure simulators.

Each of the simulators is immensely complex. For instance, the LMPS has approximately 600 discrete I/O lines. There are 44 lines going to single lights in the simulator (for altitude, temperature, lunar contact, etc.), just under 200 coming from switches or buttons in the simulator (for radar slew commands, manual roll, pitch, and yaw commands, etc.), 47 going through digital to analog conversion (for showing percent of fuel remaining, roll attitude error, etc.), 24 analog to digital conversion lines (for picking up the inputs from the commander's hand controller, for instance), 45 more lines for controlling DSKY and DEDA computer displays, and 52 more for driving the external visual displays like the film strips.

Each of the simulators is monitored, in addition, by a crt terminal. Here an operator watches for fuel consumption, acceleration, velocity, thrust, etc., calling for hard copy records as necessary.

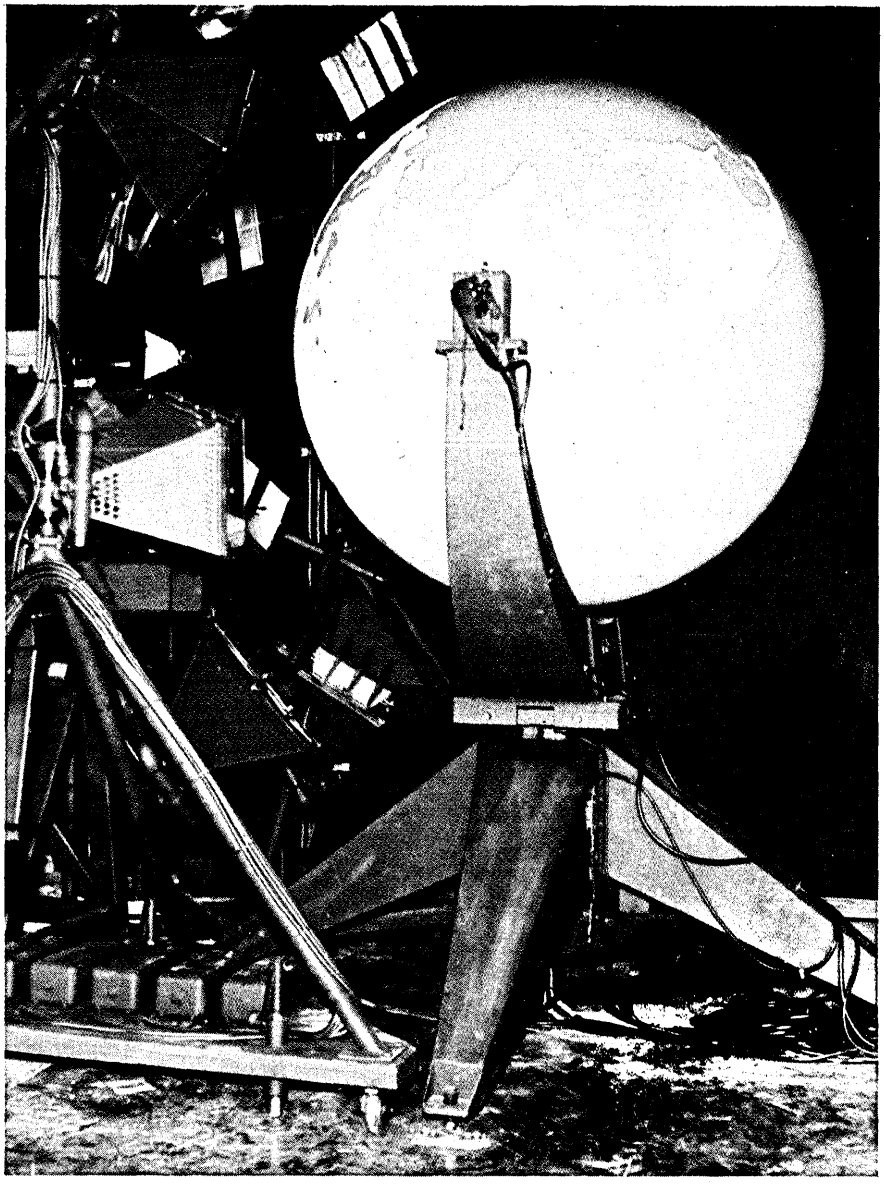
software

The hardware complex operates under the control of CDC's TCOS (Time Critical Operating System), which is capable of monitoring both simultaneous real-time simulations and batch processing, or one simulation with online debugging in the background.

All real-time jobs are run in 100 msec time frames rather than on an interrupt basis. The only time that the 100 msec frames are interrupted is when a computer operator manually reallocates core storage to switch the job load. A dynamic scheduler chooses from among the waiting jobs to ensure that a task requiring a larger amount of processing time is initiated in time to terminate in its 100 msec slot.

Each real-time job has a dedicated Peripheral Processing Unit under the control of a hybrid interface driver associated with it. The PPU issues data to the analog and simulator, collects data from them, monitors the interval timer, and issues a real-time start to the monitor at each time increment for its job.

Finally, the applications programs that make it all happen are written in that most common of all simulation languages, FORTRAN. ■



The earth model seen from the "window" of the Command Module Procedure Simulator is mounted on gimbals so that it can move realistically.

The Bug Slayer

No computer stamps out program bugs like RCA's Octoputer. It boosts programming efficiency up to 40%.

Programming is already one-third of computer costs, and going up faster than any other cost in the industry.

A lot of that money is eaten up by bugs—mistakes in programs. With usual methods, programmers don't know of mistakes until long after a program is written. They may have to wait days for a test run.

RCA's Spectra 70/46, the Octoputer, takes a whole new approach based on time sharing.

It substitutes a computer terminal for pencil and paper and talks to the programmer as he writes the program, pointing out mistakes as they are made.

The Octoputer is the only computer available today that has this capability. It's as much as 40% faster. And it works on IBM 360 and other computer programs as well as our own.

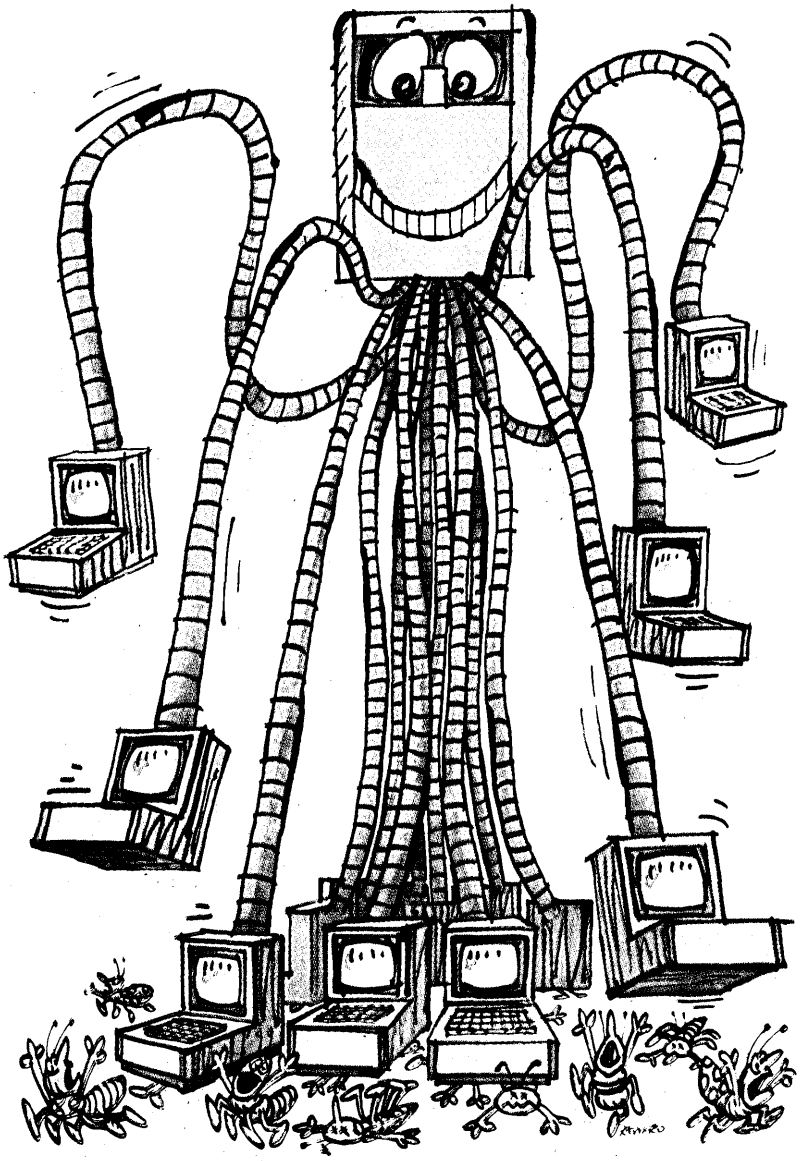
Costs go down. Programs get done faster. And you need fewer programmers—who are scarce and getting scarcer.

Of course, Octoputer does more than just slay bugs.

It's a completely new kind of creature that does time sharing and regular computing together.

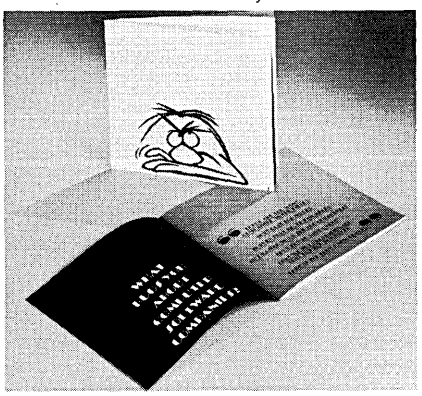
The Octoputer concentrates on remote computing because that's where the industry is going. We got there first, because communications is what RCA is famous for. It puts Octoputer a generation ahead of its major competitor. It can put you ahead of yours.

RCA COMPUTERS



new literature

SOFTWARE FORSOOTH: Buyer's guide for those in the throes of software selection comes up with 13 major (and common) complaints against the purveyors, and counters with advice, for 16 pages. The gripes were collected from interviews with dp managers and once-burned skeptics. Sullen statements run from "If an outside firm fouls up, it's my neck," to "By the time we turn over all the data to a vendor, it's easier to do the job ourselves."



Most are parried neatly, albeit defensively. The only one that brought them up short was "Many companies exaggerate their abilities." To which the one-line rejoinder was: "Sad, but true. So, ask for references, not resumes." COMPUTER DYNAMICS, INC., Berkeley, Calif. For copy:

CIRCLE 728 ON READER CARD

SOFTWARE CONTRACTORS: New software information service in the form of a volume with descriptions of about 400 software houses will be published next month. Information provided includes staff profiles, the basis for qualifying personnel for various titles, gross sales of the firms, billing rates, geographic coverage, number of personnel, specialization areas, hardware experience, etc. The information has been derived from the companies themselves, but the vendors intend to verify it by obtaining information from users who retain the services of listed firms. A year's subscription is $350, including the initial book and six updates. SYSTEM INTERACTION CORP., New York, N.Y. For information:

CIRCLE 729 ON READER CARD

TAPE SAVING: Claiming that from now on there will be no such thing as a bad tape, folder describes plan for total rehabilitation of tapes, once purchased. No replacements are henceforth needed, and all rehabilitated tapes are certified for 0-5 errors and a minimum of 2000 feet. Extended services are also offered. GENERAL KINETICS INC., Reston, Va. For copy:

CIRCLE 730 ON READER CARD

IT'S THE HUMIDITY: 12-page booklet explains the importance of humidity for dp installations, maintaining dry air can be the cause of static electricity, card irregularities and sudden equipment failure. Guidelines for humidification rates in various installations are given. The three types of humidification equipment — evaporative, atomizing and steam—are differentiated, and specific equipment is listed. WALTON INDUSTRIES, Moonachie, N.J. For copy:

CIRCLE 731 ON READER CARD

TELECOMMUNICATIONS: 85-page report prepared at the National Academy of Engineering is titled *Telecommunications for Enhanced Metropolitan Function and Form*, arrives at a suggested program for systematically determining applications of communications technology to improve urban living. Among the functions discussed, which need improved information acquisition, transmission and processing, are health care, education, business, welfare, transportation and public allocation and distribution of resources. One chapter gives examples of how the technology already has improved urban functions, i.e., city administration and law enforcement. Tables on interindustry transactions are included. NAE COMMITTEE ON TELECOMMUNICATIONS, Washington, D.C. For copy:

CIRCLE 732 ON READER CARD

COMPUTER GRAPHICS: 352-page study made at MIT for the Navy, *Interactive Computer-Mediated Animation*, by R. M. Baecker, investigates the use of interactive computer graphics in the construction of animated visual displays. AD-690 887. Cost $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

CARD FOR CONVERSION: In the space of 2½ x 3½ inches, plastic wallet card contains digital angle conversion chart comparing N, 2^N bits, degrees per bit, minutes per bit, seconds per bit, and least significant bit as a percentage of full scale from 0 to 25 bits in increments of one bit. ASTROSYSTEMS, INC., Lake Success, N.Y. For card:

CIRCLE 733 ON READER CARD

BUYERS BIBLE: Five of the "best known professionals" in the field of edp equipment and software analysis have produced a looseleaf reference service

"For some reason, the computer keeps rejecting his ticket."

© DATAMATION®

A Place Called Home

An unusual city, San Francisco. A place that seems to breed unusual sights. Fortunate indeed are San Franciscans who live within sight and sound of the water that virtually encircles the city. Residents of areas such as Sea Cliff or near Baker's Beach or in the Marina are quite used to the waves that pound just inside the Golden Gate.

And San Francisco is a home away from home for music and art lovers who enjoy the world renowned Opera and Symphony. We also have the 49'ers and Raiders, alternating with the Giants and Athletics, to provide a year 'round schedule of professional sporting events.

San Francisco can be what it's all about. It's just one of the fringe benefits of Friden's career package for the computer professional. Calling the San Francisco Bay Area home can be as near as your resume. Forward it to Joe Schuler, Systems Design & Development, 2350 Washington Avenue, San Leandro, California 94577. Friden is an equal opportunity employer.

SINGER
FRIDEN DIVISION

SYSTEMS FOR THE NEW GENERATION: Communication Analysts-Business computer communications and software; Applications Analysts-Computer systems analysis; Systems Programmers-Assembler and compiler development; Systems Writers-Software manual development

CIRCLE 520 ON READER CARD

new literature ...

on hardware, software and the suppliers. The service is called Datapro 70 and it is available this month. Subscribers will initially receive some 300 pages of reports and a looseleaf binder. Each month they will get around 50 pages of new and updated reports. Orders received before December 15 are eligible for the charter subscription rate of $160. Regular subscriptions cost $190. DATAPRO RESEARCH, Jenkintown, Pa. For information:

CIRCLE 734 ON READER CARD

COBOL COMPILERS: Report compares COBOL compilers, including the GE-635, U-1108, B-3500, IBM-360(F) and CDC-6400, with the recently published U.S. Standard. Late addition is IBM's new OS COBOL compiler, bringing the total comparisons to six, the total pages of tables to 44-plus. Available at cost: $3. INFORMATION MANAGEMENT, INC., 447 Battery St., San Francisco, Calif. 94111.

SIGPLAN PROCEEDINGS: ACM has published the proceedings of the symposium on extensible languages sponsored by the Special Interest Group on Programming Languages last spring in Boston. Panel discussions and reports covered GPL, Algol 68, Basel, Imp, PPL, Proteus, EPS, and PL/I. Speakers included Alan Perlis, Tom Cheatham and Doug McIlroy. Cost: $4. ACM SIGPLAN, 1133 Avenue of the Americas, New York, N.Y. 10036.

STORAGE PLANNING: 104-page catalog contains tips and illustrations on space-saving for storage areas in factory, warehouse, store and office. The type of equipment specified is presented with data processing in mind, and is compatible with expanding needs. Layouts for new storage room are included. Different kinds of equipment are categorized and indexed. Free to those in dp; $1.50 to others. BERNARD FRANKLIN CO., Philadelphia, Pa. For copy:

CIRCLE 735 ON READER CARD

COMPUTERIZED MACHIAVELLI: Niccolo Machiavelli's classics of manipulation, *The Prince* and *The Art of War*, have been analyzed by the computer to extract concepts arrayed in 27 categories, such as 'will,' 'energy' or 'means,' giving his thoughts in indexed form on ageless problems and applications. Designed originally for business and industrial use, this analytical method is used here in less technical detail and the book is intended more as an education and research aid. Analyses are upcoming on Clausewitz, Mao Tse-tung and Shakespeare. Cost for the 154-page Machiavelli: $3.75. CASYN-DEKAN, INC., Holly Sugar Bldg., Chase Stone Center, Colorado Springs, Colo. 80902.

DATA SET DATA: Complete specifications and features of four data set models, as well as tips on data couplers, threshold sensitivity and error rate, are given in four-page folder. The sets are available with either of the two methods of receive coupling: magnetic (for 500 type telephone sets) and acoustic (for AE type 80 sets). Each model is configured for originate only, or for originate and answer. ELECTRONIC VOICE, INC., Long Beach, Calif. For copy:

CIRCLE 736 ON READER CARD

IC LOGIC: 122-page manual describes, specifies and gives construction details for more than 60 T^2L integrated circuit logic cards. Both standard and special purpose designs are included. Mechanical packages and accessories are also listed, for use as digital data systems building blocks. GENERAL DYNAMICS ELECTRONICS DIVISION, Orlando, Fla. For copy:

CIRCLE 737 ON READER CARD

CONTROL LOGIC: 288-page handbook contains control information for designers, manufacturers and users of electronic or mechanical logic, with hardware specifications and application notes on products. Subjects cover solid state logic, industrial control logic, machine control, and an industrial data acquisition and control system. Numerical control products are included. DIGITAL EQUIPMENT CORP., Maynard, Mass. For copy:

CIRCLE 738 ON READER CARD

LIBRARY CONTENTS: Index to applications reference library containing reports on analog/hybrid computer subjects is offered, with a publication request card attached. Reports cover technical studies, educators' demonstrations, applications, and user case histories—all available at no charge. An explanation of the index code precedes it; the index alone is 15 pages. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J. For copy:

CIRCLE 739 ON READER CARD

MEDICAL BILLING: The Abacus system for doctors and medical groups is described in six-page brochure. The billing system furnishes reports on daily transactions, master file changes, insurance claims, referring physicians, statements and trial balances. It also covers delinquent accounts, follow-up statements and status inquiry. Terminals transmit to a central 360/40 com-

new literature . . .

puter. EXECUTIVE COMPUTER SYSTEMS, INC., Oak Brook, Ill. For copy:

CIRCLE 740 ON READER CARD

CHECKOUT AND CALIBRATION: Eight-page catalog summarizes applications and specs on 40 items, comprising computer interface and automatic test equipment, phase sensitive instrumentation, and resolver/synchro test instruments. Last page also lists 13 technical articles and papers giving application data on AC instrumentation, automatic checkout, and computer interface problems. NORTH ATLANTIC INDUSTRIES, INC., Plainview, N.Y. For copy:

CIRCLE 741 ON READER CARD

SWITCH LIGHTS: Capabilities and dimensional specifications of 11 series of switch lights are detailed in folder, applicable to computer operations. The features of each series are charted, include two colors, divided and hidden legends, moisture sealing, momentary or alternate action and multiple switches. KORRY MANUFACTURING CO., Seattle, Wash. For copy:

CIRCLE 742 ON READER CARD

MASS MEMORIES: Eight-page brochure plus data sheets explain type of standardized mass production memories for immediate use, rather than specific tailoring to each terminal. All-silicon semiconductors are used. Basic modules come in sizes of 1,024 to 20,480 bits, with further expansion possible by use of multiple modules. All necessary electronics to make a plug-in system occupy no more than 130 cubic inches. Data sheets include complete specifications. TETRA CORP., Minneapolis, Minn. For copy:

CIRCLE 743 ON READER CARD

NUMERICAL CONTROL: 217-page new (second) edition of handbook tells generally the what, how and when-where-why of N/C, including how to implement and program a system. It gives the basic language of N/C, the controls applicable to various types of machines, and discusses both adaptive and direct computer control and the justification for using N/C in particular situations. Preparations for installing N/C are also given. Cost: $2; $3 for first class mail. BENDIX AUTOMOTIVE & AUTOMATION CO., 12843 Greenfield Rd., Detroit, Mich. 48227.

DISPLAY PANELS: 12-page brochure on display panel systems shows variation in concepts and design, from those in small consoles to an 88-footer now installed in San Francisco. Integrated panels as compared to those designed in-house are considered, with time and cost factors in mind. Interface capabilities are described, as well as electrical/mechanical design and manufacturing considerations. TEC, INC., Eden Prairie, Minn. For copy:

CIRCLE 744 ON READER CARD

HEURISTIC PROGRAMMING: 94-page report discusses programming facilities required for artificial intelligence, and introduces the Heuristic Programming System. A formal programmer's manual, with a sample program and its proposed implementation, are included. AD-690 446. Cost $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

THE DP OFFICE: Card and disc storage, filing supplies, index maintenance systems, insulated files, microfilm equipment, planning boards, tape storage and work station furniture are color-illustrated and described in 28 pages. Items include everything from card holder frames to electromechanical monster files for discs and master

decks. Microfilm equipment includes camera, processor, reader/printers, and book units for COM or microfiche. REMINGTON RAND OFFICE SYSTEMS DIVISION, Marietta, O. For copy:

CIRCLE 745 ON READER CARD

POSTING THE BEAMS: Six-page brochure offers aid to building materials suppliers with Lumberjac-I, a system which automates all documentation and accounting. The NLBMDA product code is expanded to eight digits, eliminating operator conversion, and an override control lets the operator handle odd-ball operations. Cost information is not included in the customer copy. Samples of forms and reports are given. CLARY DATACOMP SYSTEMS, INC., San Gabriel, Calif. For copy:

CIRCLE 746 ON READER CARD

T-S SOFTWARE: Bulletin sheets describe COGO-10, civil engineering language; SEDIT (Super Editor Program), and ECAP (Electronic Circuit Analysis Program), for use by the electrical engineer in design and analysis of electronic circuits. All are used in the time-sharing network set up by AL/COM. APPLIED LOGIC CORP., Princeton, N.J. For copies:

CIRCLE 747 ON READER CARD

SYSTEMS AT HOME: 12-page brochure describing course in systems and procedures is offered for home study, including one sample lesson (out of the total of 50). The course is designed as a refresher in the latest techniques, for retraining men from other fields, or for beginners. It is sponsored and copyrighted by the Association for Systems Management. Information on employment and salary of systems analysts is given, along with a description of each lesson in the course, and the faculty and advisory board. NORTH AMERICAN INSTITUTE OF SYSTEMS AND PROCEDURES, Newport Beach, Calif. For copy:

CIRCLE 748 ON READER CARD

DISPLAY FOR 360: A general-purpose alphanumeric display that is both hardware and software compatible with the IBM/360 is described in four-page brochure. The Videomaster 7000 interfaces at transmission speeds of 1200 or 2400 bps; 960 characters can be displayed on a 74-square-inch screen. The display requires no special power or air conditioning and stands alone—the logic, memory, character generator and power supply unit may be separately located. ULTRONIC SYSTEMS CORP., Moorestown, N.J. For copy:

CIRCLE 749 ON READER CARD

And the rumor is that Armer will resign from the ACM nominating committee and take his stand with the counter conference movement, which includes Joe Weizenbaum, Dan McCracken, and other edp luminaries.

SHARE WILL SHARE ALIKE WITH SELECTED VENDORS

We hear that SHARE will incorporate as a non-profit. The move, as we understand it, is triggered by the fact that the big IBM user group is planning to open its doors to selected vendor members. And vendors who don't make it just might want to sue SHARE for restraint of trade. The incorporation might serve to protect the SHARE executive board from personal lawsuits. Not all vendors will be eligible, and vendors will not be voting members, nor will they be able to go to other than general meetings except by invitation. Although extremely unlikely, if not impossible, rumors are already rumbling about the distant possibility of SHARE becoming a public corporation. Share the wealth?

SHARE, by the way, is looking for an outfit--noncommercial--to run its library. For a fee. What with unbundling and the possibility of profit from packages, that library is not likely to grow, however.

MA BELL WOULD RATHER SWITCH THAN FIGHT

"Ma Bell will allow its switched system customers to supply their own network control signaling units by late next year or early '71." So says Lionel Winston, president of Comtel, Inc., who has a pretty good record as an oracle. To protect the net, AT&T will develop technical standards and require all customer-supplied NCS equipment to meet them, Winston adds. Other sources agree that the only practical way AT&T can keep up with its rapidly growing maintenance headache is by letting others supply--and maintain--some terminals.

UTAH COMPUTERNIKS BECOME CANADA DRYBACKS

Six experienced computer specialists from the Univ. of Utah are joining Computime Canada Ltd., which will shortly establish an ambitious time-sharing network to serve major Canadian and northern U.S. cities.

Headed by A. S. Gill, the firm will offer remote batch and conversational service, featuring the 1108 and Sigma 7. Initial sites will be Vancouver, B.C., and Toronto. The firm, HQ'd in Vancouver, will offer an XDS on-line accounting package under an exclusive franchise.

Joining Computime from the Univ. of Utah are Joe Rice, Richard Maxwell, Jim Palkovic, Roy Willie, Jr., Craig Rasmussen, and John Warnock. J. Richard Sherman will head up marketing.

NATIONAL SHOWROOMS SLATED BY NEW LEASING OUTFIT

Planning a national net of sales/distribution showrooms for computer products is newly-formed Applied Computer Marketing Corp., Torrance, Calif. The centers, analagous to auto showrooms where demos can be performed, will also be the base for a service organization to handle maintenance and hardware and software application support.

ACMC, headed by Alan Spafford, is affiliated with conglomerate KDI Corp., Cincinnati. It will also handle marketing, market consulting, leasing for the products of KDI's own firms and those not affiliated. Thus, it will be a source of early cash flow for small makers of peripherals whose buyers would rather lease. But in the west, ACMC handles Datacraft computers, and is undertaking national sales of communications systems from fellow KDI affiliate, Interactive Data Systems, Irvine, Cal.

FJCC FLASHES

What may have been the best crack of the conference came at a press preview of Don Lebell's social implications session. Answering a question, Herb Grosch opened with the statement "I'm not a professional agitator, but . . ." Interrupted Lebell, "Oh yes you are". . . Las Vegas was another Boston, a replica in miniature of that city's crowds and shortages last spring. It was almost impossible to get an outside phone line (exhibitors used 1000 lines). Several people reported that it took them two hours to get from the airport to the hotel, probably an hour's walk. Elevators and meals were slow, service extremely sluggish. It looked as if a couple of people, at least, solved the problem: one mobile home was seen camped on the parking lot outside the conference center. And one man appeared at a session with hiking boots, a pack and sleeping bag on his back . . . One attitude towards Las Vegas was expressed during a conversation on the problems of trying to survive the FJCC. Asked one man: "How would you like to live here?" The answer: "Nobody lives here." It's true . . . Overheard in an elevator: "What this industry needs is a two-week conference." Said another: "Yeah. One hour a day." Amen.

ONE FRIED EDITOR LOOKIN' FOR YA, OVER EASY

This month's Look Ahead would have been Look Out if it weren't for a friendly, sassy waitress in a Barstow cafe. On the way back to Pasadena WHQ from the FJCC, a forgetful Datamation editor stopped for breakfast in Barstow, but left behind him a folder containing some of this month's late flashes. A phone call to the cafe located the folder, and the manager read the items to Datamation, interspersed with comments on style and spelling. Welcome to the staff, Fran Raney of Fran's Cafe, Barstow, California.

RUMORS AND RAW RANDOM DATA

Note for entrepreneurs: Know your moneyman. We've heard of two companies this month which were in the middle of registration proceedings when their underwriters went broke. You do things when you think you're about to get a million dollars that you wouldn't do otherwise, like open branch offices . . . Somebody we trust told us that General Automation has a backlog of 2000 machines. Shades of DEC . . . Look for IBM to come out soon with the new version of a 2314 disc with doubled bit and track densities . . . Another move to undermine the IBM-compatible makers: IBM is allegedly about to unleash a head-per-track disc uit. Called ZEUS, it's about the only salvage from the supercomputer project killed a few months ago at Menlo Park . . . Look for increased pressure on IBM's unbundling policies to come from a national association of university controllers, SHARE, and the ACM special interest group on university computer centers. And the Univ. of Cal., representing a potful of computers at umpteen campuses, is also reportedly readying an attack . . . DEC's 16-bit PDP-11 was not announced at FJCC. But one attendee assured us it would be before next spring, since DEC is committed to deliveries then . . . SBC's rumored to have issued a directive for a 25% staff cut . . . Sales of the Honeywell 316 are way beyond projections (1700 backlog), and way beyond production capabilities (just over 200 produced this year). As a result, the plant in Tampa is being turned over to the production of logic modules for the 316 and other models . . . AFIPS to limit number of exhibit booths in future jcc's to 1000.

world report

ESRO TURNS ON WITH INFO RETRIEVAL SYSTEM

The European Space Research Organisation, which plans and tests the jointly designed scientific and applications satellites for universities and industry, has switched on a large information retrieval system. It is based on a 712K store IBM 360/65 at Darmstadt near Frankfurt. So far, high speed telephone links have only been made to the organisation's research and environmental test laboratory at Noordvijk in Holland and the headquarters in Paris, where crt terminals have been installed. There have been difficulties in linking up a third lab at Frascati in Italy because of obtaining guarantees on data link quality from the Italian communications authorities.

Information is centered at Darmstadt, which is the satellite tracking control unit for all Esro satellites and the computer processing house for data gathered from sounding rockets launched mainly from a firing range at Kiruna in the north of Sweden, and in Sardinia. The operating system for the 360/65 occupies a 180K slab of memory, and the installation is unusual in being one of the few to retain a data cell as a mass storage file. This holds the key to NASA abstracts and reports generated at the various national space research establishments in Europe.

Information retrieval is only a tiny part of the work load on a system that handles spacecraft design work, models for orbital calculations, and data reduction obtained from Esro's world network of telemetry stations. But the information retrieval system is forming part of a scheme for Eurodoc, a plan to bring all the major scientific information retrieval schemes in areas such as aeronautics, nuclear science, and so forth, into a standard system.

A further step in the development of international information networks has come with an agreement between Gesselschaft Deutscher of West Germany and the American Chemical Society, for the former to market the Chemical Abstracts Service publications and computer-based information services.

GETTING TO THE SUBURBS ON TIME

The Paris suburban railroad, one of the most congested major city transit systems, is getting into the automation act with a near $20 million scheme for fare collection and passenger control. An installation that includes 23 Philips P-9201's and 31 CII-10010's will be based on a network of 409 multiticket machines and 543 passenger control gates connected on-line to data processing machinery. Although the French Government-backed CII has slipped delivery on some of its hardware, the backlog of orders, influenced particularly by customers in the public sector, is believed to be building up to the $500 million mark.

STRUGGLES OF TECH GAPS

In one of the latest examinations of the technological gaps between America and Europe, a research team of the Commission of European Communities produced a strategy for the European electronics industry. They concluded the gap had roots not so much in research as in the structure of its industry and markets, and not surprisingly decided that an insistence on developing

industries on national lines could only lead to eventual takeover by more efficient American corporations. The team, drawn from France, Germany and Italy, found that only small firms in America had a highly specialized product, but these "small" firms had turnovers of eight to ten times that of European counterparts. Government intervention, which has been so strong in the data processing field, is beginning to extend into the electronic components field. This manoeuvre leads to heavy public backing of national research programmes, but must ultimately hamper a sensible reorganisation to get strong intra-European groups. An example of what the analysts may have been talking about has come to light in some comparative figures published of the trading position of IBM's subsidiary in the United Kingdom and the Government-backed British firm, ICL. Last year IBM (U.K. Ltd.) was said to have made an $80 million profit on a $290 million turnover compared with ICL's $9 million profit, $210 million turnover. And ICL's profit forecast for this year is $13 million.

1970-80 AND WHAT'S GOING TO HAPPEN

A useful breakdown of UK computer industry trends 1970-80 has been made by the Hoskyns Group of consultancies. The year-end user expenditure on data processing is put at $950 million and growing at 25% a year. This accounts for about 1.2% of GNP and a rise to 3% of GNP by 1975, then to 4% in 1980 when it will be around $5 billion. The buck is expected to split this way for 1968: Hardware, $298 million; terminals, $2.8 million; data transmission, $2.9 million; software in-house, $287 million; software external, $4.3 million; operations, $208 million; consumables, $95 million; consultancy, $5.9 million, and service bureau, $47 million.

The background to these statistics is discussed with other comparative information of the trends from unbundling and changing structures in manufacturing. (Hoskyns Group Limited, Boundary House, Furnival St., London EC 4; price, £5, or $11.90.)

BITS AND PIECES

Britain's Post Office has let a contract for a new $18.5 million research centre for telecoms. It is expected to house a big t-s centre with 500 terminals for telecommunications research when completed. Probably an updating of an existing Burroughs 5500. It will also include work on introduction of computers as the message switching centres of the country's telephone exchanges . . . Queen's University, Belfast, Ireland, has started an international physics program library. It is stored and indexed for an ICL 1907 . . . Interscan Data Systems, which holds the exclusive marketing rights in Europe for Scan Data's range of OCR systems, has installed its first units into service bureaux . . . Interdata, Inc., has formed a wholly-owned UK subsidiary to market its range of small gp processors and special purpose communications processors throughout Europe . . . The Marconi Company has developed a vehicle tracking and control system for vehicle operators--especially bus companies, fire services, police and ambulance services. It automatically locates and identifies every vehicle in the network and detects immediately variations from schedule or route.

washington report

WIMMIX TO BUY COMPUTER MIX

"Packard definitely intends to buy more than one make of cpu," said a knowledgeable source last month, shortly after the Deputy Secretary of Defense OK'd the big Wimmix buy. A minimum of 34 systems, each costing $1-5 million, will be acquired initially under an RFP scheduled for release around the end of this year; up to 53 more systems could be ordered as part of this same procurement. In 2-3 years, a second RFP is planned, covering any additional systems needed.

The initial buy will include "about a third" of all Defense Intelligence Agency installations, plus all Pentagon command posts, plus all or most unified, specified, and component command HQ's. Currently, most of these use IBM hardware. A data management system will be a "desirable requirement."

DDR&E thinks the two buys will lead to acquisition of two different computer makes. They'll be similar enough to allow virtually total program interchange. Reportedly, Wimmix implementors will get $1.5 million to improve software transfer techniques.

But "more than 2-3 years will have to elapse before we're ready for a follow-on," says a member of the Joint Technical Support Agency, the JCS group that will implement Wimmix. JTSA will be in charge of disbursing the $1.5 million even though most of its staffers oppose a multisource buy.

An industry source believes the vendor who wins the first competition will have a "big advantage" in the second.

CREDIT ACCESS BILL PASSED

The Senate unanimously passed the Fair Credit Reporting Act (S 823) last month. The bill gives consumers far more control over their credit bureau files. In most cases, a credit bureau would have to tell an individual he was being investigated. Confidential information gathered by the investigator could not be shown to government agencies without a court order, but the subject of the investigation could obtain the whole report free by asking for it in writing. Obsolete information would have to be erased, and if the individual challenged any facts, the agency would have to re-investigate.

COMNET TIGHTENS NET

Comnet, Comress's service center subsidiary, has closed its two B5500-equipped branches--in East Orange, N. J. and Philadelphia--and connected their customers to a dual B5500 complex in Washington via f-x lines. New programs, related to such applications as liquor inventory control and travel reservation bookkeeping, are being added to the Comnet library, which has been science-oriented until now. Comnet is also selling time on the Comress 360/50 in Rockville. That system is scheduled to add CRBE this month and conversational t/s next spring. Comnet President Ralph Johnson says his last fiscal year was profitable, but he hedged when asked whether the current one would be.

people

A traditional aura is evident in some appointments to positions in computer companies of late. In Los Angeles, **Herbert Hoover III** has been elected president, chief executive officer and a director of Digitek Corp. **Thomas E. Dewey, Jr.**, son of the twice-run Republican presidential candidate, is now on the board of directors at Allen-Babcock Computing, Inc. And in Philadelphia, **Endicott Peabody,** of the Massachusetts Peabodies, and former governor of that state, has become a board director at Scientific Resources

Corp. . . . Not so traditional is the naming of **Penny Kaniclides** to be president of an N.Y.C. firm, Telstat Systems, Inc., which researches, analyzes and furnishes financial and economic data in computer readable form. Previously the only woman vp at Standard & Poor's and the founder of their computer division, she has been joined by three other S&P execs in forming the new company. . . . The Diebold Group has created the new position of controller, and appointed **William A. Howe** to fill it. He was formerly manager of cost control and budgets for P. Ballantine & Sons. Diebold explained the watchdog post was needed to manage the firm's expansion (now in 14 cities, two continents). . . . Two erstwhile financial execs for Computer Sciences Corp. have taken key posts in other companies. **Philip E. Trimbach,** former CSC controller, is now vp/finance director at HF Image Systems, Inc., in L.A. In Chicago, Computer Technology, Inc., has elected **David K. Layser** financial vp, the same post he held at CSC, and also with CCI Corp. in Tulsa, before making his latest change. . . . **Thomas L. Taggart,** previously president and board chairman of Redcor, has been named financial vp and treasurer of Informatics, Inc., L.A. area software/service house. . . . At Farrington Manufacturing Co., N.Y.C., **Norville E. White** has resigned as chairman of the board, saying that his goals to make the company a financially solid-based competitor in its field (optical scanners, readers) while creating a new management team, have been accomplished. President **Peter F. McCloskey** will take his place. . . . **Harry L. Cooke,** of RCA Corp.'s David Sarnoff Research Center, has been named general chairman of the 1970 Spring Joint Computer Conference. A senior member of the IEEE, he also served the 1968 SJCC as chairman of local arrangements. With RCA since 1950, he is presently manager of information services and technical relations. . . . **Jim Adams** has left the Association for Computing Machinery in New York to become Director of Education Automation for the American Bankers Assoc. . . . One of the founders of Applied Logic Corp., **Dr. James R. Guard,** has been elected president of the Princeton, N.J., firm. He helped conceive and build AL/COM's time-sharing network. Former president **Richard M. Colgate** will continue as chairman of the board and concentrate on corporate planning and development. . . . Named chairman of the board at Remcom Systems, Inc., in Dallas, is **David Mason,** former president of Link Aviation, Inc., who is expected to be "a valuable asset" in the company's plans for the '70's peripherals market . . . Honeywell has made some top organizational changes: **C. W. Spangle** was elected vp and exec in charge of the computer and communications group, succeeding **Charles L. Davis,** who has been elevated to a newly created post as exec vp of computer, communications, aerospace and defense activities. Sharing responsibility as associate group exec with Spangle will be **Edward C. Lund,** also elected vp. He has managed the communications and data products division since its formation. Another newly created post, vp of computer operations for Honeywell's Computer Control Div. (Framingham, Mass.), has been taken by **Neil D. Morrison** . . . North American Rockwell's NARISCO, recently set up to manage mass commercial information, has five new vp's: **Melvin J. Sargeant,** control and data communications systems; **Ronald G. Taylor,** software systems; **Ben E. Acton,** eastern operations;

people . . .

Ronald W. Sykes, marketing and contracts, and **Edmund F. Hogan,** special market development. . . . **Edward W. Karn** has been elected president of ITT Data Services. One of his past assignments was the design and development of SAC's command and control system, and subsequently the programming, systems analysis and testing thereof. . . . In government: President Nixon has appointed two more task force committees, one on Science Policy, to be headed by **Dr. Ruben F. Mettler,** executive vp of TRW Inc., and another on Priorities in Higher Education, chaired by **James M. Hester,** president of NYU. . . . The U.S. Office of Education itself has appointed **Dr. Lawrence P. Grayson** to be responsible for planning and evaluating computerized R&D programs in its Bureau of Research. . . . The Air Force Systems Command has a new chief of staff for its Electronic Systems Div., **Col. Charles G. Johnson,** freshly returned from Thailand. . . . Once again a plane crash has taken the life of a top electronics executive. **Joseph C. Myrick,** vp/product engineering director of Rixon Electronics, and one of the company's founders, was piloting his private plane when it went down near Hyattstown, Md. . . . At Caelus Memories, Inc., San Jose, Calif., **Dave Jones** is now vp/gm, will direct and coordinate activities of all departments. And **William M. Gaskins** has been named vp/gm of Caelus Data Products, will direct and coordinate activities of all departments in *that* company. . . . Recently elected **Robert N. Windsor** is vp/gm at Computer Communications, Inc., in charge of products. He came to Los Angeles hq from the company's central systems center in Minneapolis, has had 14 years line management experience. . . . **Dr. Lawrence Frost** has been promoted to the presidency of Digital Applications, Inc., succeeding **James E. Townsend,** who resigned to confine his duties to DAI's parent company, Levin-Townsend Computer Corp., where he is exec vp. DAI also has a new board chairman, **William T. Robbins,** who is also a director of LTCC. . . . After 11 years with IBM in various managerial positions, **Dr. Robert A. Dunlop** has joined Logistic Distro-Data, Inc., in N.Y.C., as vp of operations. IBM's MIS/360 software was developed under his direction. He also will be exec vp of a new associate company, Information International, Inc., which is developing a time-sharing network. . . . **Jesse R. Lien** has become a senior vp at Sylvania in charge of their Electronic Systems group, and will move his hq from the west coast (he was formerly in charge of western operations at Mountain View, Calif.) to Waltham, Mass. **Robert L. Smith** has been appointed manager of Sylvania's Systems Applications group, also in Waltham. . . . **Donald E. Campbell,** president of Lynch Communication Systems, Inc., since 1955, submitted his resignation as such, but immediately assumed the "newly created office" of board chairman. His successor is **Donald L. Oestreicher,** another long-time executive of the San Francisco firm. . . . Selected to head up General Electric's new Advanced Technical Planning department in Charlottesville, Va., is **Edwin E. Parker,** who joined GE as a student engineer in 1931. He will be particularly concerned with industrial automation systems. . . . Raytheon has created the position of director of product research, which has been filled by **Howard E. Wing, Jr.,** who has just returned from a year's leave of absence as a Sloane Fellow at MIT. . . . **Frank R. Lautenberg** has been promoted to president of Automatic Data Processing, Inc., Clifton, N.J. **Henry Taub,** former president, will continue

as chairman of the board, and **Joseph Taub** has resigned as exec vp, but will serve as a director and consultant. . . . **Dr. Jacob Millman,** author of five extensively used college textbooks on electronics (two in conjunction with H. Taub, see above), and professor of electrical engineering at Columbia Univ., has been elected vp of Compu-Scan, Inc., Leonia, N.J., developer of OCR systems. The company's president and exec vp were both Dr. Millman's students 20 years ago at Columbia. . . . **Mike Baran,** formerly on the marketing staff at System Development Corp., has become Director of Finance and Administration for Applied Computer Technology in L.A. . . . In Phoenix, **Ray V. Work,** a founder of National Computing Industries, and the man for whom that software company's WORK TEN language is named, has been elected president. He also devised another language, RSVP, for special reports. While with IBM, he pioneered in bank and credit card systems. . . . In International operations: Britain's National Computing Centre has a new director, **Dr. A. A. Robinson,** appointed by the Minister of Technology to succeed **Prof. Gordon Black,** who resigned last May. Robinson was director of the new University of London computer center, has been involved in computer projects since 1947. . . . **John Palester** will direct Raytheon's international systems as vp of Raytheon Overseas, Ltd., but will remain at Lexington, Mass. . . . **Roger Phillips** is now president of Viatron Computer Systems International Corp. Charles French is vp. . . . **Nathaniel B. Snow** is president of Comed, Inc., a newly formed division of Comsi, serving the medical field in the Chicago area. Besides being in management in several CPA firms, Snow has been supervisor of the management info sections for Illinois' Dept. of Mental Health. . . . **Keith W. Sehnert** has been named vp and director of R&D for Commed, another similarly-named physicians' and hospital service firm, a subsidiary of Comress, Inc., in Rockville, Md. . . . BASF Systems, Inc., Bedford, Mass., has appointed **James Moran** as vp of operations. The company is a subsidiary of a German magnetic recording products maker; Moran was formerly manufacturing manager of Ampex Corp.'s magnetic tape division. . . . **Col. Darwin E. Ellett,** 29-year Air Force veteran, has become vp of systems for World Computer Corp. in Dallas. He spent four service years as exec director of the Army and Air Force Exchange Service worldwide hq in big D, and has been responsible for planning and installation of computer systems for retail operations. ■

recruitment advertisers' index

For the convenience of those readers interested in professional opportunities, we have gathered in this and the following pages the advertisements of these industry firms and professional placement agencies:

SOFTWARE DEVELOPMENT
and
PROGRAM DESIGN

Enlarged company R/D has created need for software systems design and programming personnel. New, computer controlled, commercial telephony switching systems requires individuals with 2 to 4 years experience in real-time, assembly level, software development for responsible positions in these development areas:

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Commercial Applications

Rapidly growing computer peripheral equipment manufacturer seeks commercial programmers and systems analysts for internal corporate 360 OS MVT system. A cross section of business applications are implemented with Cobol and some Assembler on this large multiple CPU system.

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Software Development

Several clients including user, hardware manufacturer, and consulting companies seek software systems professionals to assume key responsibilities in developing a cross section of new software. Opportunities to develop compilers, I/O subroutines, real-time teleprocessing systems, as well as work in areas of diagnostics, graphics—display software, interface packages for various CPU's, etc. Large and small client companies offer the above in Southwest and in New England—salaries open.

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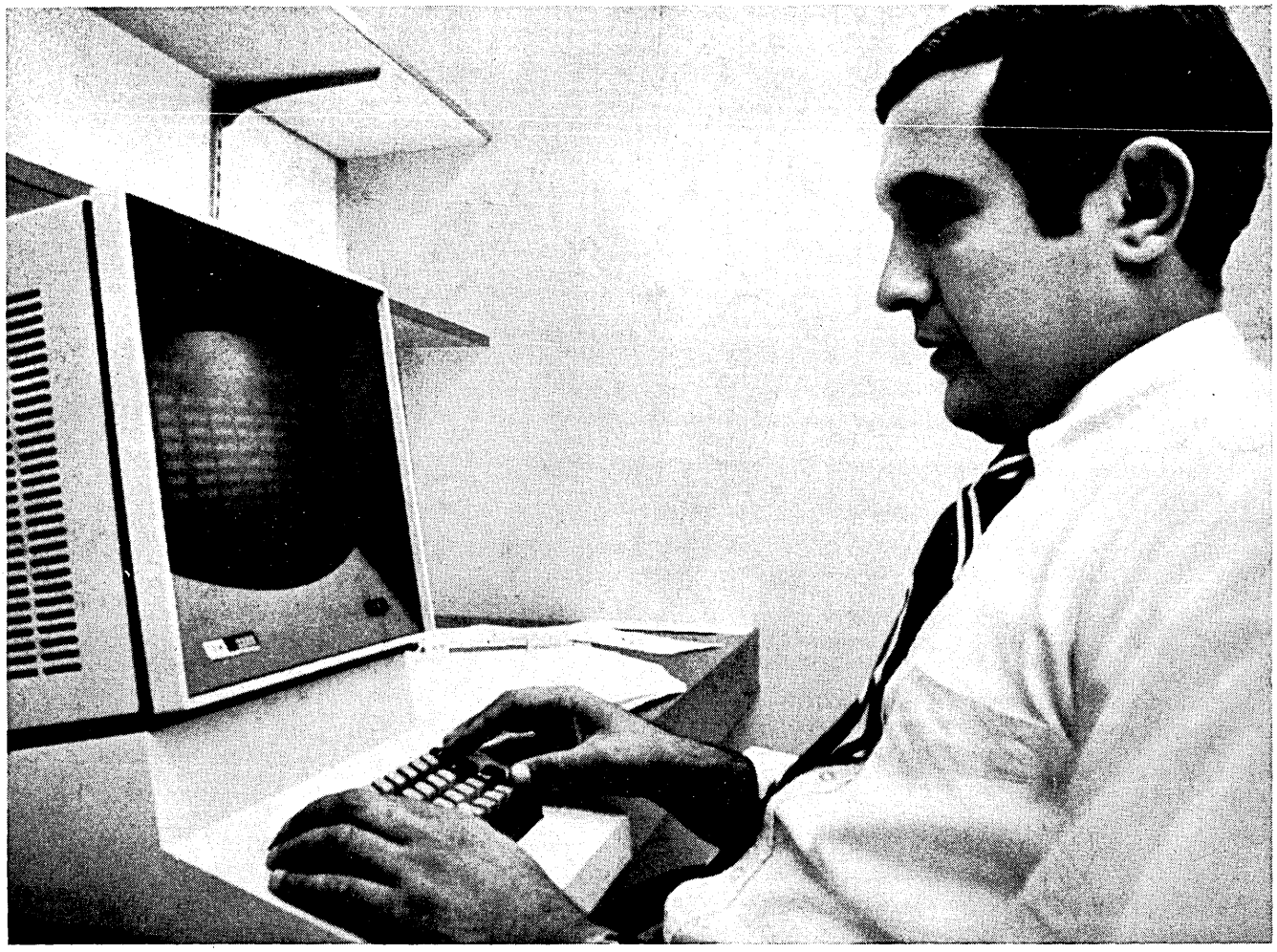

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books

***Digital Computer Methods in Engineering*, by Shahen A. Hovanessian and Louis A. Pipes. McGraw-Hill Book Co., Inc., New York, N. Y. 1969. 400 pp. $14.50.**

By the intelligent admixture of methods of numerical analysis, multitudinous topics of basic mathematics, assorted engineering applications, and a few computer programming techniques the authors intended to produce a meaningful text on the elementary concepts of numerical methods of solving engineering problems by digital computers. They hope this text will be useful to "engineers and scientists who desire to achieve a working knowledge of digital computer calculations and programming methods for subsequent application in their field of practice," and will simultaneously be used as a one-semester junior-senior-level text for students with only two years of engineering mathematics and no programming experience. This is indeed a herculean task or an impossible pipe dream. It is not at all surprising that the authors should have failed to achieve their goal.

The book consists of 10 chapters and one appendix, each of which could be taken independently for the study of a specific subject or a specific application. Unfortunately, the depth of coverage in each case, be it on the mathematical, analytical, numerical, computational, or applicational aspects, is woefully shallow. On the other hand, the material is presented in a painstakingly careful and lucid manner.

Each chapter is replete with numerous example problems illustrating the basic facts presented, followed by a step-by-step procedure for an analytical solution, and then perhaps a computer program written in either FORTRAN or BASIC. While the illustrative program is carefully analyzed and explained, it would not aid the student in writing his own program if he were completely unfamiliar with such languages, as assumed by the authors. Nor, as admitted by the authors, are those example programs intended to be paradigms of computational efficiency, but rather are selected for their simplicity of logic. There are only three flowcharts in the book to illustrate the logic of the programs. Each chapter concludes with many simple problems, most of which are supplied with answers or hints. At the end of each chapter one finds a totally inadequate list of references, most of which are repeated several times. What might have been a saving grace for the text—an up-to-date comprehensive annotated bibliography which would lead the student to the real world of numerical and computer methods in modern engineering mathematics—is completely lacking.

Chapter One (48 pp.) deals with the fundamentals of determinants, matrices, and systems of linear algebraic equations. For the most part, rules and properties are only stated. Chió's method of evaluating determinants, Gauss' method of elimination, triangulation, and the Gauss-Seidel method of solving simultaneous equations are discussed and illustrated.

Chapter Two (69 pp.) considers the eigenvalue-eigenvector problem for matrices, and quadratic forms. Pertinent definitions and properties are presented without motivation or derivation. The major numerical methods are those of A. N. Krylov for the determination of the characteristic equation, A. M. Danilevsky's method for the same with a BASIC program for implementation, and Danilevsky's method for finding the eigenvectors. An application to the natural modes of a vibrating shaft with three discs is given.

Chapter Three (48 pp.) deals mostly with roots of polynomial and algebraic equations using Horner's, Newton's, Graffe's, and Lin-Bairstow's methods. A short discussion of Lagrange's interpolation formula follows and the chapter ends with an all-too-brief discussion of least squares. A computer program for least-squares implementation in FORTRAN is given.

Chapter Four (27 pp.) is concerned with time-frequency domain analyses and the discrete Fourier transform. The Cooley-Tukey method is explained. It is dubious that this chapter would be useful for a student with only two years of college math.

Chapter Five (30 pp.) touches on the classical methods of the calculus of finite differences. The references completely neglect any of the classic works in this field.

Chapters Six through Eight (120 pp.) concern themselves with numerical solutions of ordinary differential equations, boundary value problems, differential-difference equations, and partial differential equations.

Finally, Chapters Nine and Ten (42 pp.) discuss the most rudimentary aspects of linear and dynamic programming in a very cursory way.

An appendix on linear differential equations (15 pp.), which seems inappropriate, concludes the subject matter of the text. *(Cont. p. 276)*

books ...

In summary, it is difficult to understand the motivation for writing such a book—when there exist many fine texts dealing with each of the covered subjects in depth—and when one can easily acquire "canned" subroutines, designed by experts using sophisticated numerical methods, to perform all the operations considered.

—CARL B. SOLLOWAY

***Progress in Operations Research, Vol. III. Relationship Between Operations Research and the Computer*, edited by Julius A. Aronofsky. John Wiley and Sons, Inc., New York, N. Y. 1969. 561 pp. $18.75.**

There is always a demand for "state-of-the-art" reviews presented in a manner meaningful to the practicing engineer or analyst. This volume of reviews is the third in a series by the same title, and No. 15 in a series, sponsored by the Operations Research Society of America. The preceding books of the series have established a clear style, devoid of the obscuring fog of abstract generalization; the present volume is presented in the same highly readable manner.

The book consists of 14 separately authored chapters (including an introduction and a conclusion), covering various types of applications of computers to operations research problems. The editor (Aronofsky) has obviously taken a great deal of trouble to provide some coherence of style and appropriate cross references for related material in the separate chapters. The book thus becomes something more than just a compilation of reviews. Unfortunately, the same degree of effort does not seem to have been applied to the inadequate index.

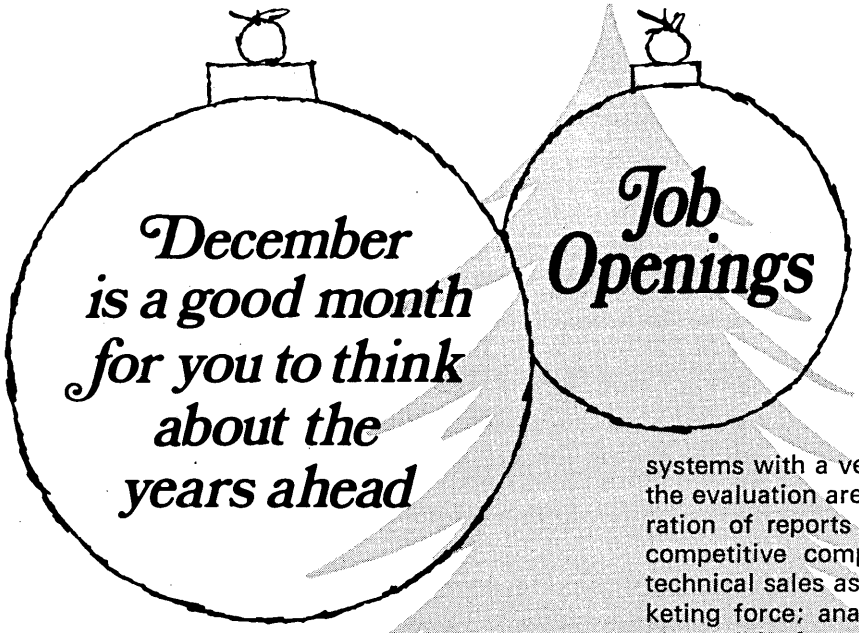
Four excellent chapters are devoted to mathematical techniques, covering programming (mostly linear), integer programming, and nonlinear systems (called heuristic search). They should prove enlightening and stimulating to the interested reader, even if he has but an elementary knowledge of linear programming techniques.

The chapter on integer programming by M. L. Balinski and K. Spielberg (100 pages including a bibliography of over 200 titles) provides a truly outstanding summary of both techniques and applications in this, the most rapidly advancing, branch of the programming field. Integer programming techniques are required whenever fixed costs or descrete events (such as trips by designated individuals) enter the problem. The authors provide a brief discussion of several excellent examples (including the crew-scheduling problem of United Airlines) with literature references to a great many more. The comparison between algebraic techniques (analytic in theory and numerical in execution) and enumerative methods (numerical in both theory and execution) is supplied, and complete with tables summarizing the performance on several typical problems and approximate computer running times for these examples.

Unfortunately, the rest of the book does not deliver this level of performance. The remaining chapters on mathematical techniques provide useful summaries for the experienced worker. However, they do not supply any discussions of examples, or references to such discussions, which are so vital to enrich the experience of the novice. It is also unfortunate that the book contains no discussion of queuing theory or its important applications to inventory control and insurance risk problems.

The chapters devoted to methodological discussions of simulation, ill-structured problems, computer-organized design of hardware, etc., all provide clear statements of fundamental assumptions and rules for formulating problems. These chapters provide some mention of the types of available applications, with very little discussion or comparison of results. The chapter on the uses of simulation does supply a list of five tests of validity which could be applied to various simulation procedures, but with no actual illustrations of the execution of these tests. One is left with the impression that these chapters would provide useful buzz-words for a proposal writer but not useful substance for a serious worker.

It is frequently argued that the more methodological disciplines deal with general areas of activity which cannot be specified in precise mathematical language. Under such circumstances, the best policy would be to present case studies and then allow the reader to analogize to his own problems. The generalizations should follow the results of the case studies, not precede them. The chapter on uses of simulation gives an inadvertent hint of the benefits of such subsequent analysis. In discussing possible simulations of the operation of various levels of management, the author mentions results showing the simulation of group behavior (lower levels) to be much more realistic than the simulation of individual decisions (higher levels). A summary of the parameters involved in these studies would have been more



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Minimum of one year experience with remote terminal devices is especially useful, although not essential. Duties: software to support state-of-the-art remote terminal design, development and testing, and program design for latest technology equipment. Programs will be written in several languages and executed on various computers.

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useful and would have cost very little space.

There are two ways in which a field such as operations research can progress. One is by developing new techniques to solve recognized problems—and the mathematical chapters of this book provide an excellent summary of such progress. However, more important to the vitality of the discipline is the progress in recognizing new problems to solve. Although such progress is being made (even more rapidly than the progress in techniques), the methodology chapters of this book are sadly deficient in such reporting.

—PETER GOTTLIEB

***CODASYL COBOL—Journal of Development 1968*, National Bureau of Standards Handbook 106. July, 1969. 344 pp. $2.75 (Order from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)**

The Journal of Development is compiled by CODASYL's Programming Language Committee (PLC)—the group responsible for the creation and maintenance of COBOL. It is the fifth in a series of published language descriptions, the previous volumes being COBOL-60 (1960), COBOL-61 (1961), COBOL-61 Extended (1963), and COBOL-Edition 1965 (1965). A sixth volume, COBOL-1964 was circulated within CODASYL but was not released to the general public.

The Journal is divided in three parts. The first section, covering the history of COBOL, chronicles the development of COBOL from its birth in 1959, the participation of organizations, and the publications.

The second section, "Philosophy of COBOL Use," presents the over-all concepts of a number of special language features such as sort, report writer and inter-program communication. Because the formal description of the individual language elements is done in alphabetical order in the third section, this second section is the only place where the uninitiated can discover the relationship among those elements with a common function, and how that function is realized through COBOL.

The third section, "Language Specifications," contains the formal, syntactical description of each COBOL element. This section, intended to be independent of its predecessors, contains both the largest number of pages and the real meat of the publication. Included in it are: a glossary and descriptions of basic language concepts; the elements of the four program divisions — identification, environment, data, and procedure; segmentation; the library feature; the reference format; and a list of reserved words.

The primary purpose of the Journal is, as its name implies, to document the work of the PLC. Its intended audience is the members of CODASYL, COBOL implementors, serious students of COBOL (including members of the USASI committees), and the data processing community, in that order. As a result, the document is written and arranged in a way that renders it of little value to someone attempting to learn COBOL or a programmer trying to code it. COBOL texts and implementors' manuals are invaluable for these purposes.

As its preface indicates, the Journal does not represent USA Standard COBOL. It is, rather, the source book from which the Standard was selected, and from which future changes to the Standard will arise. The Journal represents the most current, up-to-date view of COBOL available and thus is an accurate predictor of the future state of both USAS COBOL and COBOL implementations.

Oddly enough, the Journal was first made available to the public by the Canadian government in April of 1969. The same document is now available from the U.S. Government Printing Office. Revisions are circulated to those on the CODASYL mailing list every few months and, presumably, one year's worth of revisions will be collated and made available to the general public at yearly intervals by both publishing agencies.

—HARRY HICKS

book briefs

(For further information on the books listed here, please write directly to the publisher mentioned.)

***Commercial Time-Sharing Services and Utilities*, by Richard T. Bueschel, Andrew G. Stephenson, and Douglas C. Whitney. Macmillan & Co., New York. 1969. 95 pp., paperback. Free to members of the American Management Association.**

This handy little book would seem to be a good investment for the potential user of time-sharing services. In simple and clear terms, it defines time-sharing; describes its history; and discusses business applications, the selection of appropriate services, computer utilities and regulations, and future trends. In addition to comprehensible explanations, it also gives very concrete and useful information; e.g., a list of com-

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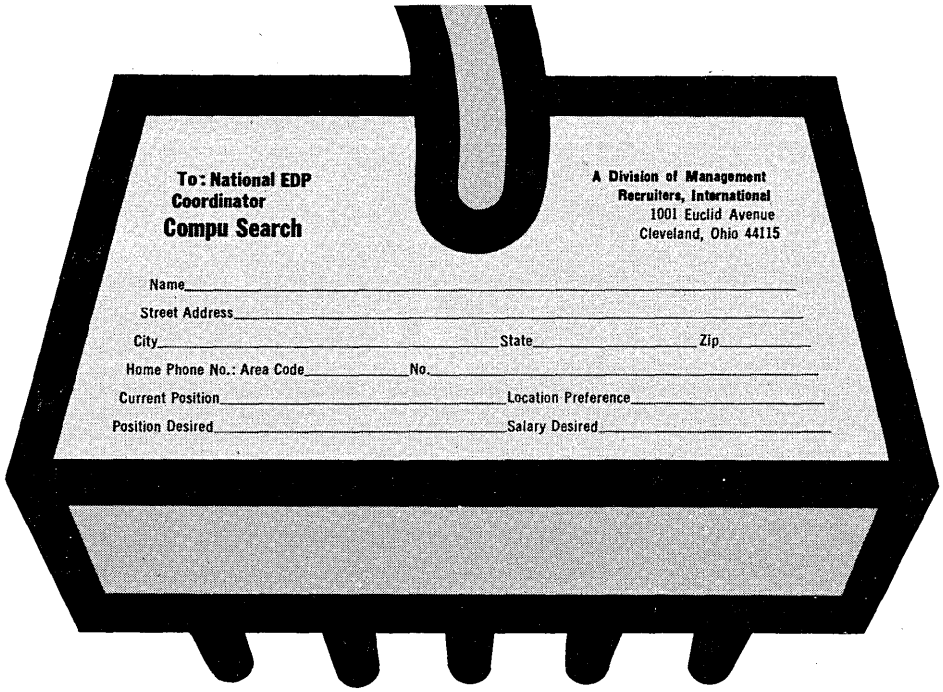

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panies offering time-sharing services, examples of computer programs, and a sample machine configuration. A glossary is also included.

***Computer Readings Series; An Introduction to Computer Systems*, compiled by Edward O. Joslin. College Readings Inc., Washington, D.C. 1969. 386 pp.**

This series of books tries to keep the reader informed of the latest developments in the field of data processing by publishing reprints of articles from other sources, none previous to 1967 and the majority from 1968 and 1969. This volume is intended to supplement a standard textbook in an introductory course in data processing.

The book is divided into three sections: background, applications, and technology. The first contains overview articles on the computer industry —its past, present, and future. The second section describes applications in such varied fields as medicine, education, urban systems, airline reservations, and others. The technology section describes the hardware and software components of a computer system as they are today and may be tomorrow.

***Management Systems*, by Thomas B. Glans, et al. Holt, Rinehart and Winston, Inc., New York. 1968. 430 pp. $10.95.**

***Instructor's Manual for Management Systems*, by Thomas B. Glans, et al. Holt, Rinehart and Winston, Inc., New York. 1968. 122 pp. Included when the book is purchased in multiple copies, otherwise $1.95, paperback.**

According to the author, the life cycle of a management system consists of three stages: (1) the study and design of the system, (2) its implementation as a new system, and (3) its operation within the organization for which it was designed. This book concentrates on the first stage. The material is covered thoroughly and in great detail to provide an information source for beginning students as well as a reference source for experienced personnel in management and systems design. The book deals mostly with computer-based systems, but the concepts also apply to manual and semi-automated methods.

The study and design of management systems is divided into three phases. The first phase, *understanding the present system*, gives techniques for collecting information and preparing a report describing the present system. The second phase, *determining the requirements for the new system*, shows how goals, objectives, and activities can be translated into systems inputs and outputs. The third phase is *designing the new system*. It concludes with a complete final report on a new system plan for a case study.

Several useful documentation forms are presented, and examples and ideas from actual case studies are included.

The primary purpose of the *Instructor's Guide* is to provide suggested answers for the questions contained in the text. The questions are designed for either an academic or a training situation, and may be assigned as individual or team projects. Two training course outlines are given; one for a management course, the other for a survey course.

***Introduction to FORTRAN II and FORTRAN IV Programming*, by D. K. Carver. John Wiley and Sons, Inc., New York. 1969. 224 pp. $5.95.**

This book is designed as a textbook for college students at the freshman or sophomore level. Its aim is not only to tell about machines and programming, but also to allow the student to *try* programming.

FORTRAN II-D and FORTRAN IV are the languages selected because they are both simple and popular. To facilitate the teaching of these languages, the chapters and sections of the book

are designed to be presented in any order in accordance with the make-up of the class, course objectives, or the computer available.

The IBM 1620 has been used to illustrate the language and program operation. The use of FORTRAN IV on the 360 and the 1130 have been dealt with in separate chapters for those interested in only specific computers.

A series of well-tested problems for computer solution are included to acquaint the student with a particular FORTRAN programming technique. The appendices contain more detailed information on error messages, character coding, control cards, etc. and a special appendix describes the 1627 plotter and its associated FORTRAN statements.

***Critical Factors in Data Management*, edited by Fred Gruenberger. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1969. 146 pp. $7.50.**

The papers presented in this book deal with the problems associated with the management of large data bases on third-generation computer systems. The titles and authors included are:

"Time-Sharing Systems: Analytical Methods," by L. Kleinrock

"Data Base Management: The Keystone of Applied System Architecture," by C. W. Bachman

"Survey of Management Information Systems and Their Languages," by J. Fry and J. Gosden

"Systems Design of a Computer for Time-Sharing Applications: In Hindsight," by M. Pirtle

"Time-Sharing Software: What's Good and What's Bad," by B. W. Arden

"Data Management on Wall Street," by F. M. Verzuh

"Peripheral Equipment for Data Management," by T. N. Leiboff

"Large Data Base Mobilized for Service," by B. Peters

"Communications and Data Transmission," by F. H. Westervelt

"General Purpose Systems: The MARK IV File Management System," by J. A. Postley

"Structure and Organization of Very Large Data Bases," by N. S. Prywes

"Government Policy Implications in Data Management," by M. R. Irwin.

***Installing and Managing a Computer*, by Brian Rothery. Brandon/Systems Press, New York. 1968. 156 pp. $9.**

This book describes the project of installing and managing a computer and the problems that are most commonly involved. It is written from the point of view of the manager who is about to install a computer or convert to a new one, and follows the chronology of events related to installation. The chapters therefore cover (1) planning, (2) systems, (3) input, (4) programming, (5) operating the system, (6) implementation and maintenance, and (7) the environment.

***Elementary Numerical Analysis*, by Charles B. Tompkins and Walter L. Wilson, Jr. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1969. 396 pp. $10.50.**

"A course in elementary numerical analysis," according to the authors, "should be useful . . . as an introduction to classical methods of *computing* estimates. . . . " After describing a typical system of computing numbers and some common errors in computing, this introductory text discusses some of the methods for producing usable estimates by formulating mathematical models of a problem. The iterative algorithm is presented as an essential element in the programming of automatic digital computers, and its application in many contexts is described. Other topics covered are: Taylor's formula, Weierstrass' theorem, iteration processes, interpolation, least square estimates, and Chebyshev estimates.

This text covers most of the material for a three-semester course in numerical analysis. ■

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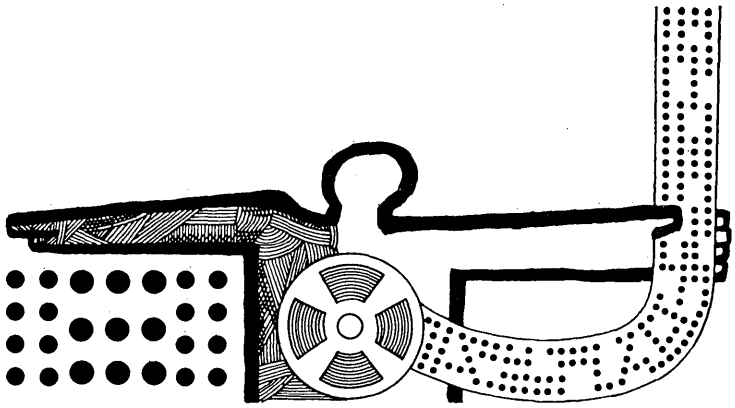

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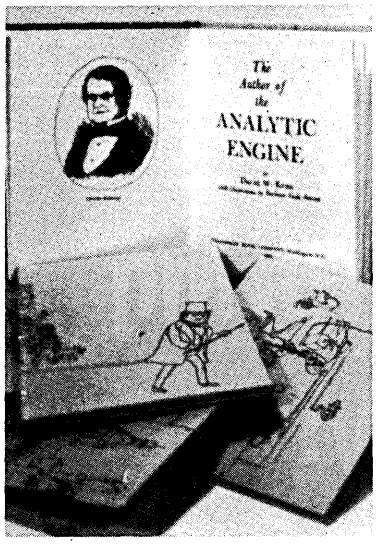

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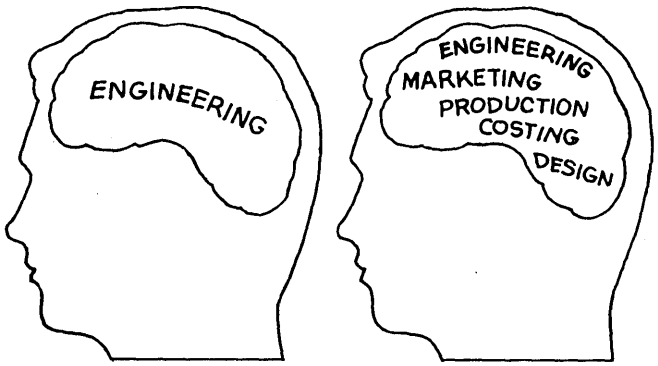

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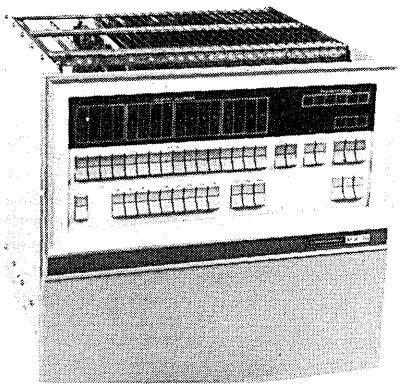

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QUALITY ASSURANCE BEFORE THE FACT— THE FEASIBILITY STORY

I am not a carpenter or a mechanic, so I usually want expert advice when I buy do-it-myself hardware. The liberal attitude of some large chain stores toward replacing defective merchandise is no help to me when I've chosen the wrong tool for the job. I shop at Busy Bee Hardware. I prefer Busy Bee because their clerks demonstrate familiarity with the art of getting things done with tools. They act like pros.

Nevertheless, I once bought from them a rubber-like screwdriver. It looked like a good, solid screwdriver, but several uses of it as an extension of a pair of vise-grips exposed the solid-appearing metal as a new species of rubber—a species notable for stubbornly retaining whatever distorted shape it is caused to assume.

This new sort of material might be called "use-relative rubber." It retains its shape and its usefulness as long as it is not unduly stressed, but becomes distorted and relatively unserviceable when it is overused. I still use my distorted screwdriver, but only to chip paint from crevices.

Busy Bee didn't hear a complaint about the purchase because my initial outrage was mollified by this reflection: in the field of hand tools, traditions of usage have developed which make these rubber-like screwdrivers very reasonable implements to own. In its traditional application, the screwdriver I bought would have performed well. The tradition that defines the range of usefulness for the average screwdriver might be stated as, "If men had intended their screwdrivers to have levers on them, they'd have built them that way." I made a bad purchase because I stupidly ignored the existence of a principle which approaches Common

Law in the fields of carpentry and mechanics. I still shop at Busy Bee Hardware, and I refer my friends to them, because they are still the pros.

The field of electronic data processing is less than 25 years old. There are, as yet, few well-established traditions of usage, despite efforts on the part of some salesmen to suggest the opposite. The resort to such persuasions as, "Oh well, that's a proven procedure (-component, -device, -level of manual intervention) in your application," will represent a company as a pro only so long as the system which the company sells does not become rubber-like in the customer's hands. I doubt that such words will echo long enough in the customer's mind to mollify his outrage at the moment of truth, and *he will not be aware of ignoring any tradition* of usage. *He* will *not* return to his Busy Bee pros; *he* will *not* refer his friends to them.

Since few traditions of usage exist, it is necessary for the data processing industry to provide its customers with guidelines equivalent to, "If men had intended . . ." Some of these guidelines are: the points on the scales of input volume, input value size, etc., at which outputs will be degraded, the probable extent of degradation from optimal system performance, and exactly what "optimal system performance" means in each specific application. The customer is more likely to be satisfied if he is aware of the *usage* limitations of his system and the results of *abusage*. Furthermore, in order to know that the system he is buying will suit his purpose, he needs to know these things *before* its design has been completed, rather than *after* it has been delivered.

However, the typical procurement

of a data processing system proceeds in such a way that it leaves the customer ignorant of many of these vital data until the system has been delivered. Magnetic tape density may be as useless a datum to a specific customer as the tensile strength of the steel used in my screwdriver would have been to me. But such details, while they may be meaningless to the customer, are necessary to the formulation of accurate usage limitations. Current procurement practices discourage early development of design details.

Currently, customers request bids on completed, delivered systems. In doing so, they contribute to the ultimate system design both their conceptions of their needs and their conceptions of the industry's ability to satisfy them. This contribution is a real one, because the bid the customer receives must include a charge for developing a *relatively unknown* amount of the detail necessary to make accurate usage statements. The amount of detail is unknown to the extent that the customer is not an expert in electronic data processing.

The inexpert buyer who describes to his bidders the form and content of the system he needs is not fully exploiting the resources of the industry. I did the same when I did not ask my Busy Bee pro, "Will this screwdriver survive as an extension of a pair of vise-grips?"

A change in procurement practices can significantly reduce over-all system cost, and the industry can initiate and influence that change. Emphasis should be placed on more frequent requests for bids on feasibility studies rather than on delivered systems. The feasibility study reduces the amount of unknown detail in the customer's view of his needs, simply because that is the burden of effort. For the same reason, a *bid on a feasibility study* reduces *uncertainty* concerning the amount of unknown detail. In making such a bid, manpower presently devoted to a hasty study of feasibility, *plus* a system specification to some level of detail, *plus* a cost analysis on the completed system, can be concentrated on determining what unknowns lie between the general system conception and the specific system reality. As these unknowns are more explicitly identified, ultimate customer satisfaction will be more certain.

What benefits may the customer reasonably expect from the added expense of a feasibility study?

1. Clearer knowledge of his needs and the industry's capacity to satisfy them.
2. Documented objectives.
3. Documented design alternatives.
4. Documented system limitations.
5. Early identification of system installation problems.
6. Early identification of system development problems.
7. More reliable delivery date.
8. Fewer surprise expenses due to add-ons.
9. A system which is more reliable and more efficient; one which is easy to use and wastes less time because of operator confusion.

The low cost of a feasibility study, when coupled with the above long-term benefits, make it a very good investment indeed.

—ROBERT J. OUELLETT

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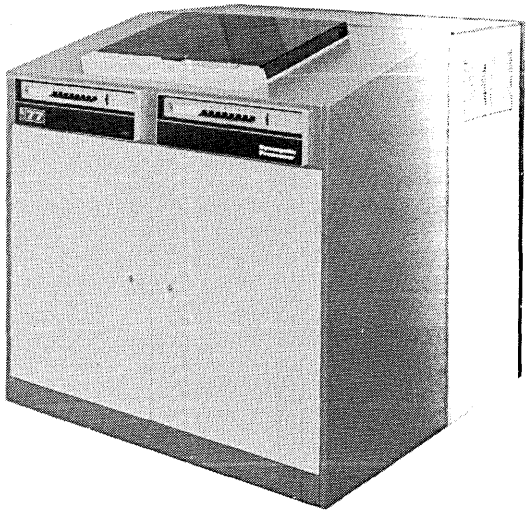

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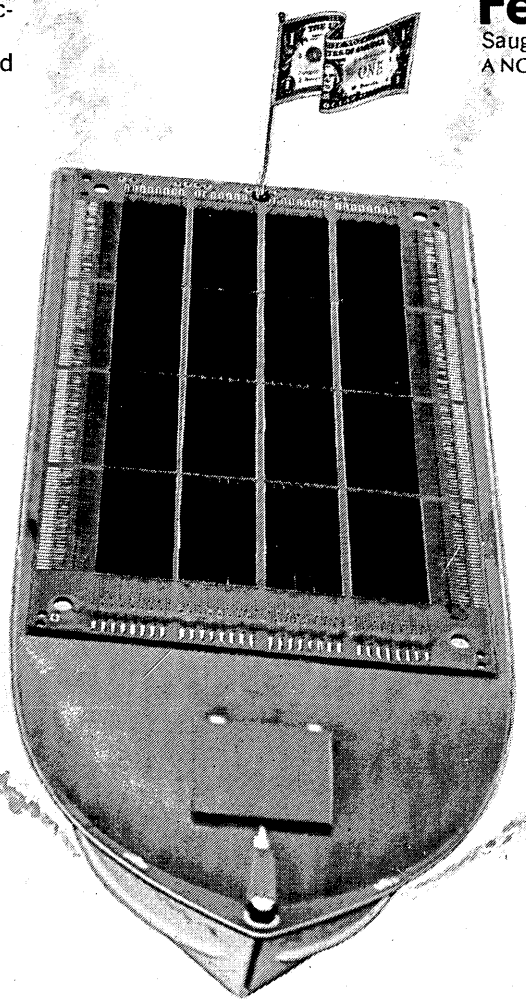

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