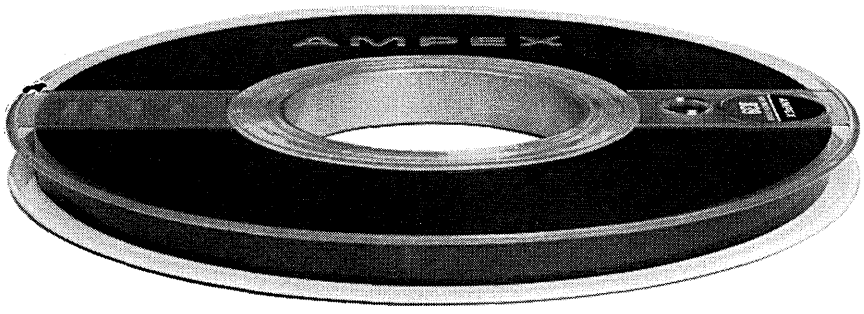
DATAMATION®

67

December

THE INCOMPLETE WORLD OF EDP

Clean and comfortable



when we ship it

when you store it

Our computer tape is clean and error-free. We think that our superior cleaning process makes it cleaner than anybody else's, but of course we're prejudiced. Point is, to be computer tape at all, it has to be clean and free from dropouts.

But we don't stop at merely making clean tape; we make sure that it gets to you clean and that you can keep it clean. Here's how:

Our exclusive environmental shipper which we call the Tape-Safe keeps dust out and your tape "clean and comfortable." Clean, because the polystyrene foam won't shed like cardboard; comfortable, because it cushions the tape in transit against shock and damaging fluctuations of temperature and humidity. Best of all, it's free with your minimum order of Ampex tape for IBM and IBM-compatible computers.

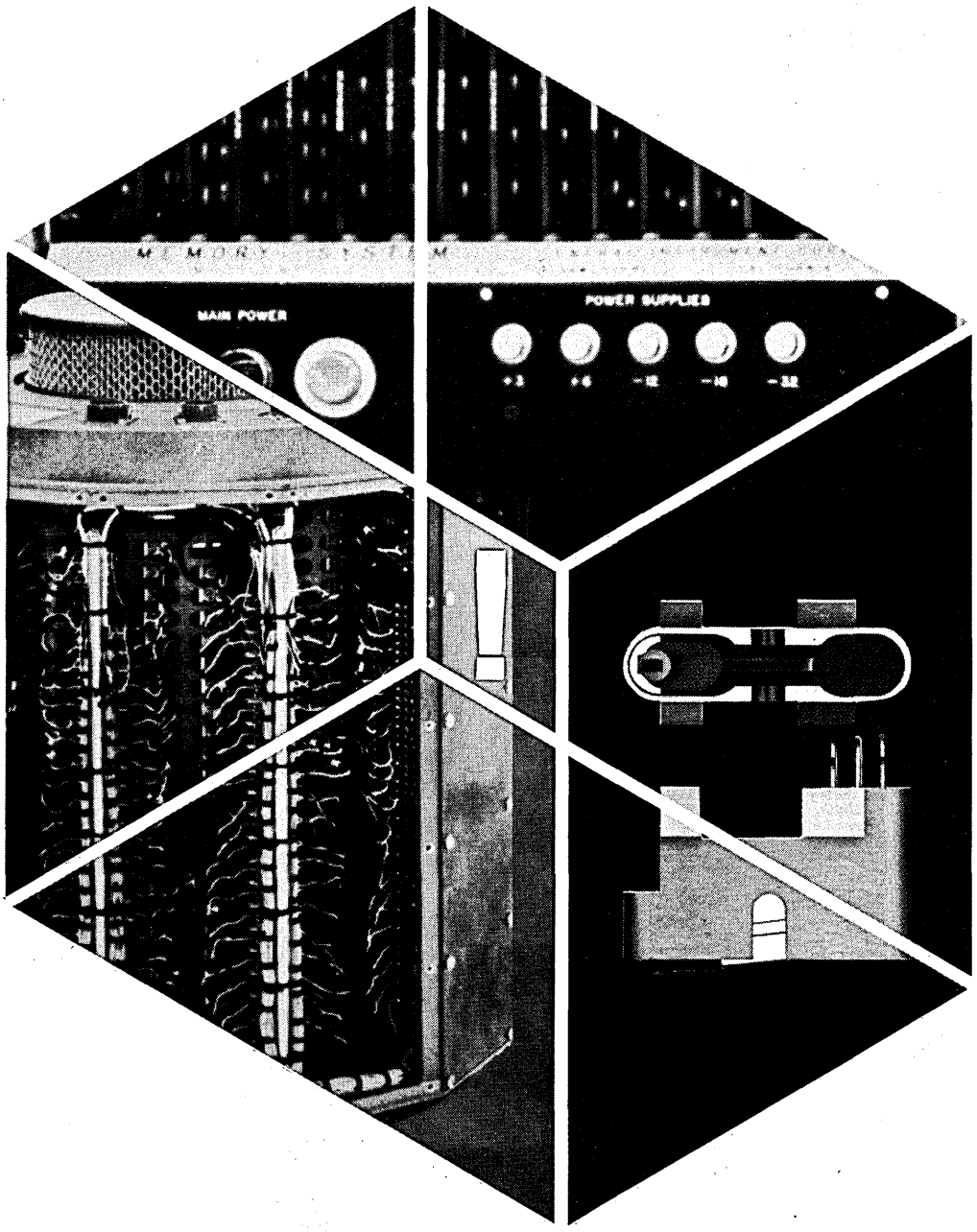
Then, for the only sure protection in storage, we pack our tape in a unique all-plastic canister. It keeps tape clean because it cannot generate contamination and its positive seal prevents outside dirt from getting in; comfortable because it protects against shock and humidity. This canister is even encased in an airtight poly bag during shipment. From then on, it's up to you.

FREE! If you'd like a few suggestions on how to keep tape clean, write Tape-Safe, Ampex Corporation, 401 Broadway, Redwood City, California 94063, for a copy of our TRENDS Bulletin No. 12, "Care and Storage of Computer Tape."

AMPEX

Career opportunities? Write Box D, Redwood City, California 94064.

CIRCLE 1 ON READER CARD



SINGLE SOURCE RESPONSIBILITY FOR A COMPLETE MAGNETIC MEMORY SYSTEM!

Component integration can be costly and time consuming if a memory system is purchased piecemeal. Magne-Head engineers and technicians form a team with the proven capability to interface with any digital data source at the source input-output terminals. ■ Write today for free DRUM MEMORY SYSTEMS BULLETIN.

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MAGNE-HEAD DIVISION

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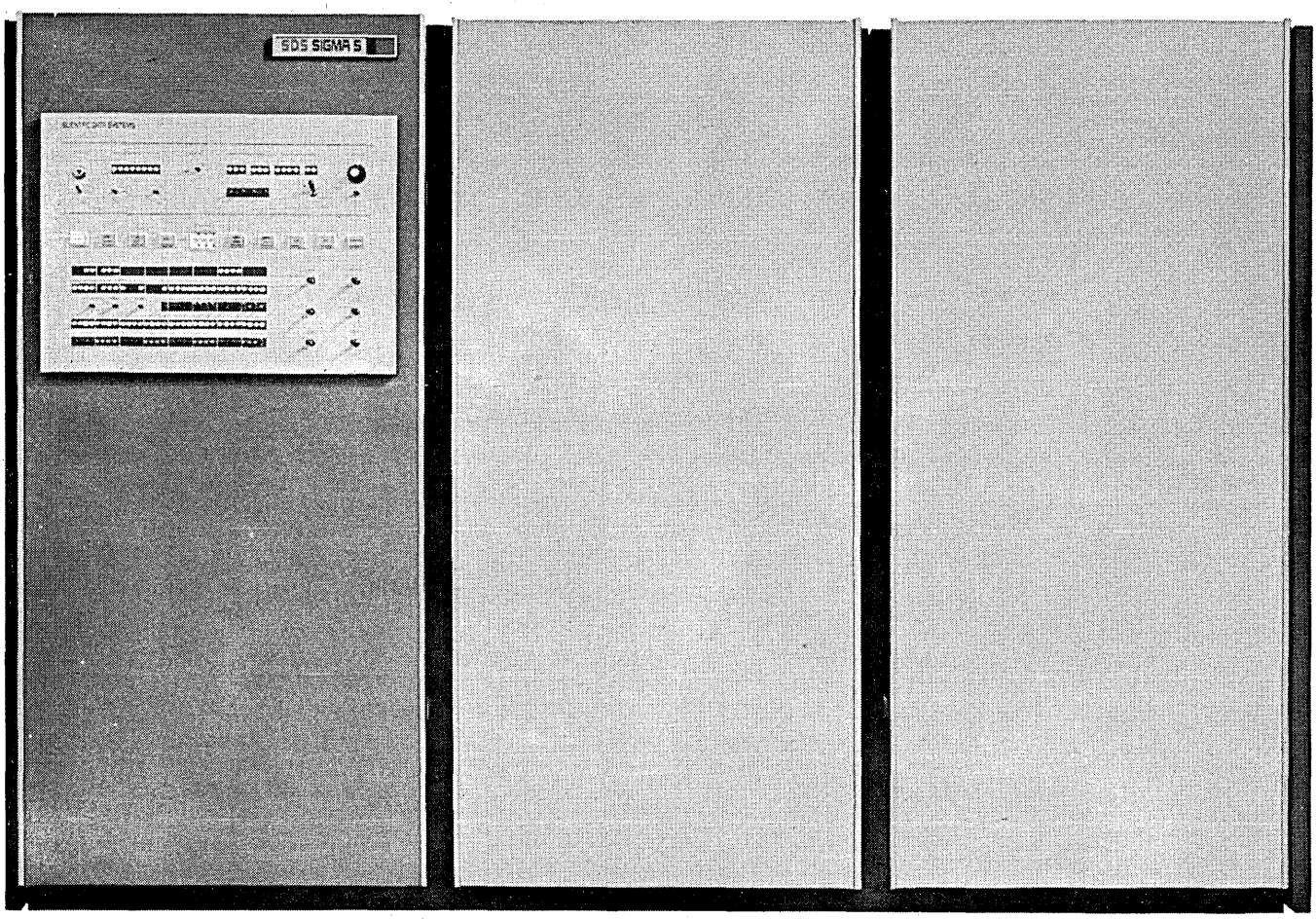
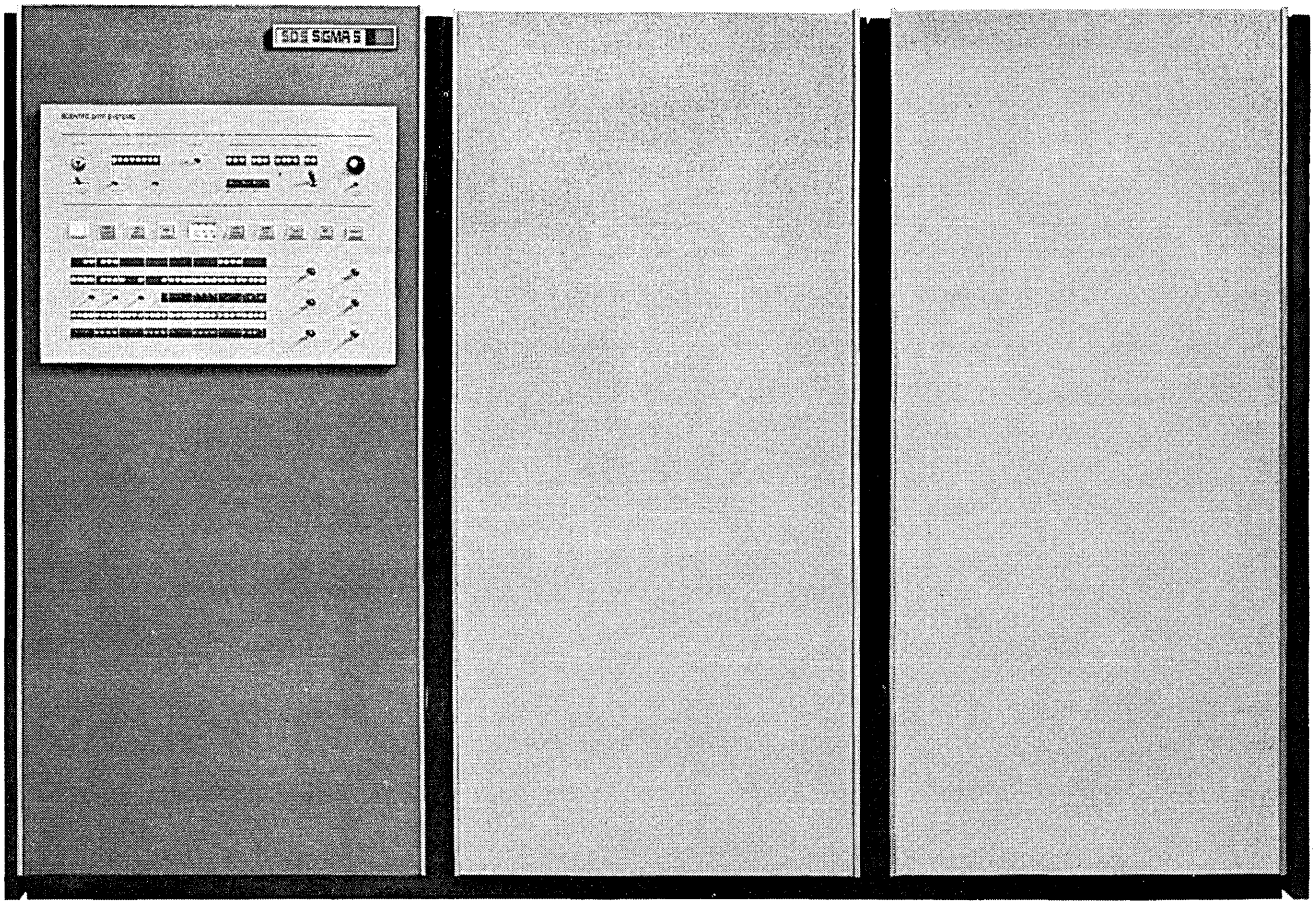


Buy a Sigma 5 real-time computer for less than $250,000.



Get a Sigma 5 general purpose computer free.

Sigma 5 is two of our best computers.

In the foreground it's a real-time computer. It has all the hardware and software features that are important to a systems computer. Built-in, not added-on. Very fast reaction time; an 850ns memory with multiple ports and buses; and up to 224 priority interrupts. A variety of System Interface Units make it easy to adapt Sigma 5 to just about any system, and Sigma 5 uses the same basic Sigma 7 software that's been working in the field for a year.

In the background Sigma 5 is a general purpose computer. Use it for batch processing, for data reduction, for FORTRAN computation, to run your payroll, keep track of your inventory, or do any other computing tasks you need done. Sigma 5 will do its general purpose computing whenever it has microseconds to spare. It will operate with complete protection for your real-time memory areas and registers, even if the GP programs run unchecked. And when it's interrupted, Sigma 5 will save the registers and its place in the program, and switch to real-time in 6 microseconds flat. (It only takes one instruction.)

Sigma 5 is completely modular. You can start with the basic $118,000 system and add memory modules (up to 131,072 words of 32 bits, in 4 K modules) and peripheral units to suit your needs. Sigma 5 uses the same powerful peripherals developed for Sigma 7, including I/O Processors that operate independently of the CPU at rates up to 32 Megabits per second, and Rapid Access Data Files that take most of the waiting out of accessing data. You can add these units whenever you need them, now or in the future. And when you're ready for time sharing, all you'll need is a Sigma 7 CPU. The software and the peripherals are all compatible.

If you place your order for a Sigma5 now, you'll get it in about 12 months. That's probably not the best delivery time you can get on a computer.

But it's the delivery time on the best computer you can get.

SDS

Scientific Data Systems, Santa Monica, California

CIRCLE 5 ON READER CARD

DATAMATION

december
1967

volume 13 number 12

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This issue 72,111 copies

IN PROPRIETARY SOFTWARE ...THEY'RE TOPS

Now Available . . . PDQ, AUTOFLOW, and ESI. A complete array of proprietary software systems from Applied Data Research, Inc.

PDQ (Program for Descriptive Query) is an Information Retrieval system, designed by COMPASS, an ADR subsidiary, for use with IBM System/360 computers, models 30 and larger. PDQ has been designed for use by persons without computer backgrounds; it will be used for information retrieval in industry, research facilities, colleges, universities, and governmental agencies.

Some of PDQ's varied applications include: retrieval of documents describing, for example, literature, and experiments for scientists and engineers; retrieval of outpatient or clinical records; retrieval of chemical compounds, categorized according to their properties; retrieval of sales information, categorized by product, interest and geographical area; retrieval of mailing lists for direct mail advertising plus retrieval of advertising media information; and retrieval of securities, categorized by type, industry and growth potential.

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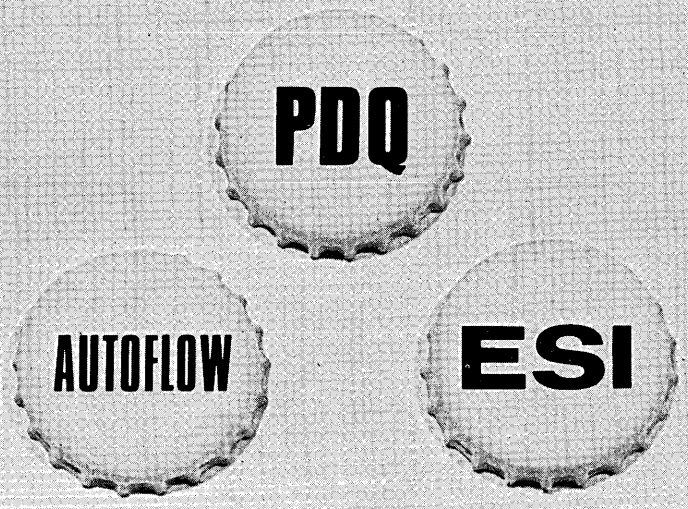

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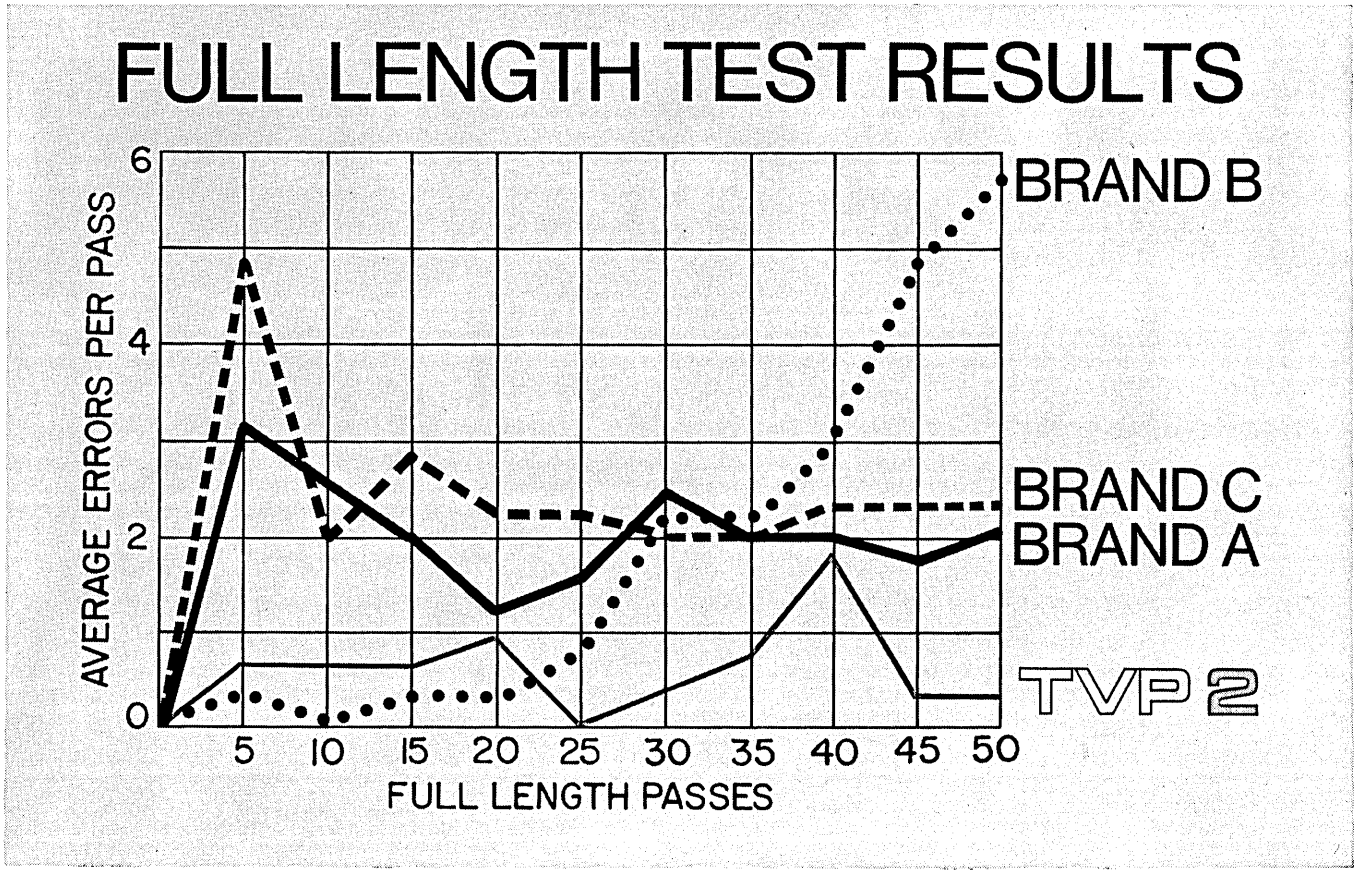

NOW... pick your computer tape

□ The only meaningful way to evaluate computer tape performance and reliability is to test it, over a series of full-length passes, under actual operating conditions.

□ The above graph reflects a recent performance study in which Computron's new TVP2 was compared directly with three leading "premium" tape brands. The curves above illustrate typical test results in terms of total errors (bits below 50% dropout level) for all tracks, during each of 50 passes.

□ Note that Brand C showed a rapid error build-up over the first few passes then leveled off at a relatively high error rate. Similarly, Brand A showed high initial error build-up, which then dropped to a somewhat lower level. Brand B had good initial error characteristics, but exhibited rapid error build-up during the remainder of the test.

□ Only TVP2 demonstrated a consistently low average error rate throughout the test. This is another example of TVP2's Total Value Performance.

□ Consider this the next time you select your computer tape.

TEST PROCEDURE

1. Equipment calibrated and adjusted, according to equipment manufacturer's specifications, and cleaned, prior to testing each reel of tape. (No further cleaning allowed during test).
2. A new unused 2400' length of tape which has been certified at 800 BPI free of permanent errors is used for this test.
3. Write 3000 character (all bits) records in the start-stop mode at a density of 800 BPI.
4. Read while writing checking for all errors, in all tracks, which fall below the 50% dropout level.
5. Count all errors. No retries allowed. Error count includes temporary and permanent.
6. High speed rewind to the beginning of tape and repeat steps three and four until 50 passes (120,000 head feet) are completed.

TVP2

COMPUTRON INC
CROSBY DRIVE, BEDFORD, MASSACHUSETTS 01730
GENERAL ELECTRIC/BASF GROUP

CIRCLE 8 ON READER CARD

DATAMATION 67®

december
1967

volume 13 number 12

automatic
information
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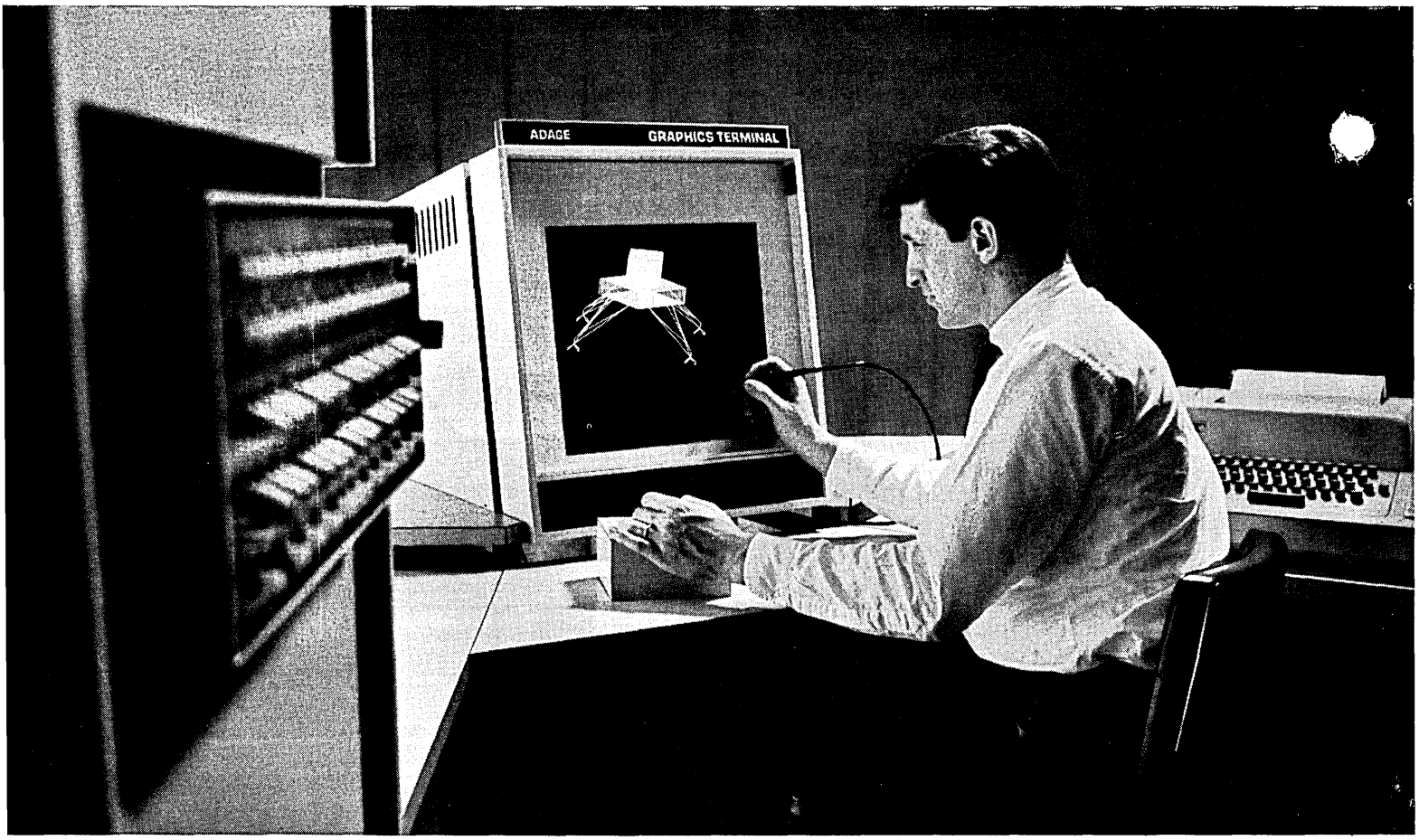
industry & science

datamation departments

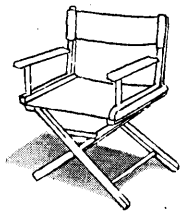


if you think the story is spectacular wait till you see the picture

As the complexity of CRT displays increases, and as the need for user manipulation of the picture increases, it is more and more the case that the central computer cannot provide the required on-line processing — or that communication lines cannot handle the high throughput rates. The graphics I/O terminal itself must include the necessary display-processing capabilities. That's why every Adage Graphics Terminal has its own Ambilog 200 computer with special arrays for high speed coordinate transformation.

Hybrid techniques exclusive with Adage provide extraordinary image-processing power and make possible dynamic 3-D displays which move with full six degrees of freedom. Objects containing over 5000 lines can be presented without flicker even with frame-to-frame dynamic changes. And pictures are always bright and clear, thanks to scope-driving circuitry that's way ahead of its time.

Starting with the AGT/10 at $60,000, standard models are available with either 2-D or 3-D capability, perspective generation, three-dimensional windowing, and intensity-modulated depth cueing. Options include dataphone interface, joystick control, analog tablet input, hardware character generation, and photographic hard-copy output. Complete systems software is provided with every terminal for local image control, for console I/O, and for communicating with the central facility.



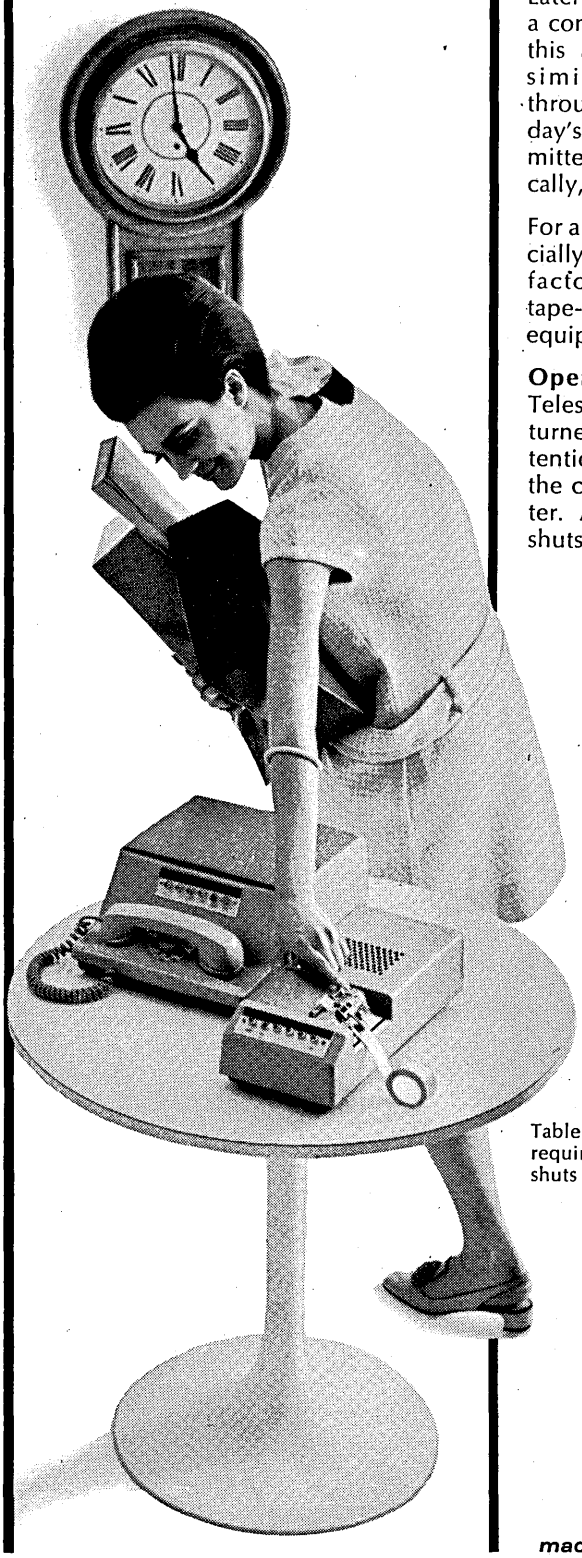
Now that you've read the story, don't miss the picture. A free 16mm demonstration film of the Adage Graphics Terminal in action is yours just by writing on your company letterhead to David Sudkin, Manager of Marketing Services, Adage, Inc., 1079 Commonwealth Avenue, Boston, Mass. 02215

Adage INC

calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
Jan. 15-17	Use of Data Mechanization & Computers in Clinical Medicine	Waldorf Astoria New York, N.Y.	Dr. E. R. Gabrieli, Clinical Info. Ctr., SUNY at Buffalo, N.Y.
Jan. 22-26	Course: Computer Oriented Circuit Design: Fee: $275	Univ. of Calif. Los Angeles	UCLA Ext., 10851 Le Conte Ave., Los Angeles 90024
Jan. 25-26	First Annual Symposium on Interface of Computer Science and Statistics	Miramar Hotel Santa Monica, Calif.	Los Angeles ACM, P.O. Box 90698, Los Angeles 90009
Mar. 14-16	Sixth Annual Symposium on Biomathematics & Computer Science	Shamrock Hilton Houston, Texas	Univ. of Texas, Div. of Cont. Educ., P.O. Box 20367, Houston 77025
Mar. 18-29	Course: Systematic Methods for Computer Aided Design of Computers. Fee: $375	Univ. of Calif. Los Angeles	Eng./Physical Sci. Ext., 6532 Boelter Hall, UCLA, Los Angeles 90024
Mar. 20-22	Symposium on Critical Factors in Data Mgt. Fee: $75	As Above	As Above
April 3-5	Numerical Control: Tomorrow's Tech. Today	Philadelphia Pa.	Numerical Control Society, 44 Nassau St., Princeton, N.J. 08540
April 8-10	Users' Meeting: Small IBM Computers	Pick Congress Chicago, Ill.	COMMON/Laura Austin, Admin. Div., General Motors Inst., Flint, Mich.
April 16-18	Second National Symposium on Law Enforcement Sci. & Tech.	IIT Research Inst. Chicago, Ill.	IIT Research Inst., 10 W. 35 St., Chicago 60616
April 23-25	Fourth Annual Conf. on Data Processing	Sheraton-Chicago Chicago, Ill.	NRECA, 2000 Florida Ave., N.W., Washington, D.C. 20009
April 30-May 2	Spring Joint Conputer Conf.	Convention Ctr. Atlantic City	AFIPS
May 1-3	Annual Convention	Ft. Worth, Tex.	Assn. for Educational Data Systems
May 3-4	Fifth Annual Nat'l. Colloquium on Info. Retrieval	Univ. of Pa. Philadelphia 19104	Dr. David Lefkowitz, Moore School of Elec. Eng., Univ. of Pa., Philadelphia

KEYED TO MOVE DATA FAST...AND AUTOMATICALLY



It's 5:00 p.m. in Los Angeles! In the branch sales office of a nationwide company, the day's work is done. All sales orders and other vital data have been recorded on punched tape by an operator using a Teletype automatic send-receive set.

As she leaves for home, the operator inserts the tape into a Telespeed 750 high-speed tape-to-tape sending set, flicks the "on" switch, then forgets about it!

Later that evening, the home office a continent away, in sequence polls this and other Telespeed 750's in similar sales offices scattered throughout the country. Thus, the day's accumulation of data is transmitted to the home office automatically, unattended, and at low cost.

For any multibranch operation, especially where time differences are a factor, Telespeed 750 high-speed tape-to-tape data communications equipment offers many advantages.

Operates unattended! Once the Telespeed sending set is loaded and turned on, it requires no further attention. It is polled automatically by the company's data processing center. After polling, the sending set shuts off automatically.

Table model Telespeed 750 sending set requires no operator during transmission; shuts off automatically.

Reduces cost. By confining transmission to night hours, data can be sent when communication lines are less busy, more economical.

Even if transmission is done during the day, the speed and efficiency of Telespeed data communications equipment lets you take advantage of every minute of line time.

Because transmission is automatic, the operator can devote her entire working day to logging of data. Thus, she can process all orders and other data received at the branch for later transmission; no need to carry over to the next day, no delay in handling important information.

Teletype equipment is fast. The Telespeed 750 machines operate at 75 characters per second; 750 words per minute. The time required to transmit a full day's sales orders, or other data, can be reduced to a matter of minutes.

Increases accuracy; improves customer relations. A major acceptance corporation, providing installment loan service for thousands of their retail outlets, uses Telespeed 750 equipment to good advantage.

Their many branch offices across the country average 300 transactions daily. Every afternoon, the processing center contacts the branches allowing each branch three minutes time, including the time required to make the connection. Thanks to the speed of Telespeed 750's, the transmission of the punched-tape data, almost 60 feet daily from each office, can be handled in 1½ to 2 minutes.

The company's computer is now able to update each account, determine collection action, and prepare notices daily.

Results: streamlined office procedures; increased accuracy in handling accounts; improved customer relations for the retailers! They no longer worry about payment reminders being sent to customers who have already paid.

The Telespeed 750 receiving set collects all branch office data recorded on the punched tape; all automatically, all unattended.

Gives you the jump on competition. With competition ever-increasing, the company that "services" best is the one that gets the most business. Telespeed 750's, working with data processing equipment in auditing, production, inventory control, and shipping, give any company a competitive edge.

High-speed tape-to-tape transmission is but one example of the many capabilities of Teletype data communications equipment. Discover why Teletype equipment's versatility is the low-cost answer to your data communications needs. Read our new brochure, "HOW TELETYPE EQUIPMENT MOVES DATA FOR YOUR BUSINESS OR INDUSTRY." For your copy contact: Teletype Corporation, Dept. 81M, 5555 Touhy Ave., Skokie, Ill. 60076.

TELETYPE

CIRCLE 10 ON READER CARD

letters

a critical appraisal

Sir:
Since reading the May issue I have scanned your pages in vain for an admission that Robert V. Head's article, "Management Information Systems: A Critical Appraisal" was really a parody. In an age when a million technical articles are published every year, we are all too often presented with banal "appraisals" of generalized concepts like MIS ("artificial intelligence" and "management science" are other favorites). Mr. Head's article reads like a brilliant parody of the worst of these, and prompts me to make a critical appraisal of my own.

It begins, as such articles invariably do, with the statement: "The subject of . . . has been much discussed, and much maligned, by both systems professionals and management people over the past few years." I have omitted the term "MIS" to illustrate that virtually any other such abstraction may be substituted here without loss—the sentence remains equally inaccurate and tedious. Mr. Head then devotes six long pages to an unbelievably boring and thorough enunciation of the obvious, backing it up with illustrative pictures of shaded triangles ("a conceptual framework") in case we don't get it. The use of pompous phrases ("contemporary data base concepts, which facilitate the retrieval of data elements in response to unstructured and non-predetermined management requests . . .") and dynamic-sounding words ("challenge", "drastic", "powerful") masks the fact that nothing is actually being said. A spurious reasonableness is achieved by the liberal application of qualifiers like "possibly", "perhaps", and "it would appear". Mr. Head, whose command of cliche is total, winds up with a masterfully trite summary ("much has been accomplished . . . much remains to be done . . . challenges to be faced are many . . .") which leaves the reader almost ready to commit murder out of boredom and irritation.

This turgid article is a masterpiece of its kind, but Mr. Head really should acknowledge his satiric intent. The subject of parody has been much discussed, and much maligned, over the past few years, and although much has been accomplished within this volatile field, it would appear that much remains to be done within the unstructured framework of contemporary concepts.

DAVID M. JONES
Chelmsford, Massachusetts

sixes and sevens

Sir:
The item headed "Australia Estimates Computer Population" (Sept., p. 83) is more than a little curious. The item refers to an "IBM survey" and later to a "CDC estimate". The CDC estimate of 357 installations was hardly an estimate. My mazazine, *Data Trend*, published a list of all computer installations in Australia at the end of 1965 and gave the installed figure as 357. CDC gave this figure and cited the source in evidence given before a parliamentary enquiry in April 1966.

The figure of 460 orders and installations quoted as coming from an

IBM survey is actually the figure for installations only given in IBM's evidence before the same parliamentary committee. IBM, however, stated categorically that the figure was taken from federal government departments independent survey. The Federal Department, the Department of Labour and Industry included Burroughs E2000 machines as computers.

Further on, the item states that the Australian Federal government had changed from a policy of purchasing small scientific computers to large-scale systems. This is particularly interesting because the first computer purchased by the Federal government was an IBM 7090 which is hardly a small scientific computer. This purchase was followed by orders for CDC 3600 and 3200s and Honeywell 800 and 1800 systems. The first small scientific computer purchased by the Federal government was an IBM 1800 in late 1965.

The next comment I have to make is that the "large systems, all owned by the commonwealth government, reportedly have been successful and productive installations" appears to have been badly misreported to your correspondent. He may have missed, for example the widespread daily paper publicity given to the chaos at Dept. of Defence: one task having taken 5½ years from commencement until now and still uncompleted. This task is for the control of the Air Force's spare parts. With only some 200 aircraft to look after, with the greatest charity one could hardly describe this installation as successful. This installation is also the largest computer complex in the country with systems installed for Navy, Army and Air Force in close proximity. Again your correspondent apparently doesn't consider a CDC 6400 (Adelaide Univ.), IBM 360/50 (Univ. of NSW, Australian National University) large-scale computers.

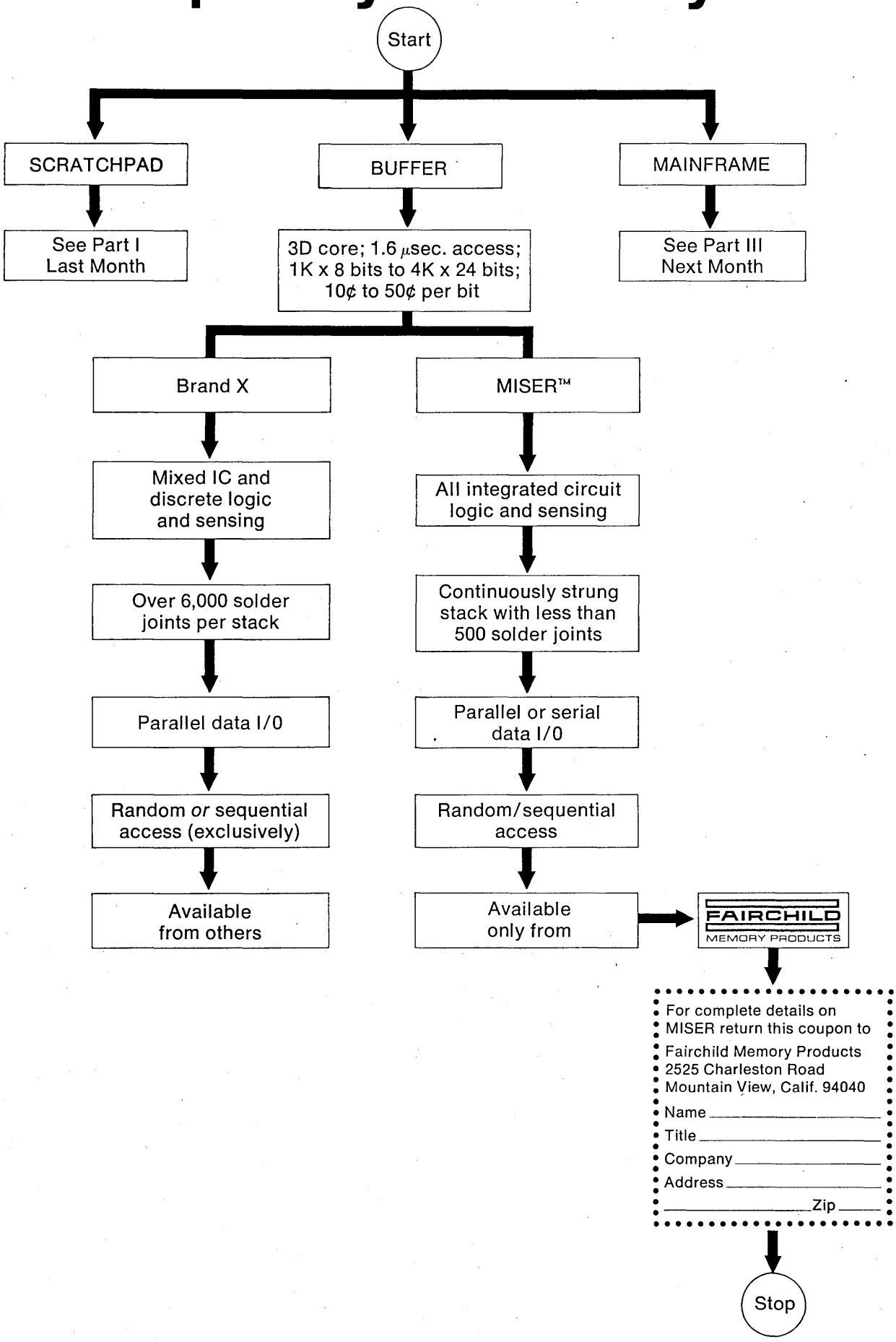
In the interests of accuracy may I now tell you that as at 10/23/1967 there are 582 digital computers installed in Australia and 149 undelivered orders.

F. X. LINTON- SIMPKINS
Editor
Data Trend Magazine
Sydney, Australia

dp and the government

Sir:
The thoughtful, affirmative expressions (Oct., p. 21) concerning my efforts in the field of government management of data processing are very deeply appreciated. Perhaps the most gratifying aspect of our recent hearing was that we now have com-

How to improve your memory: Part II



CIRCLE 11 ON READER CARD

petent data processing management officials in the Executive Branch to whom we can address "solid, tough questions."

But effective management of data processing, as important as it may be, is not an end in itself. Our primary consideration is optimum usage of these fantastic techniques to improve the efficiency and the responsiveness of government generally.

JACK BROOKS
Chairman
Government Activities Subcommittee of the
Committee on Government Operations
Washington, D.C.

the myth separators

Sir:

The article, "Marketing the Computer," by Lawrence Schwartz and George Heilborn (Oct., p. 22) was a most informative explanation of the marketing aspects of the computer industry.

The authors have effectively separated the myths of the industry, as propagated by one manufacturer, from salient marketing consideration.

T. G. TERZAKIS
Mountain View, California

os for olrt

Sir:

The article "Operating Systems for OLRT" by Leon Davidson (Oct., p. 27), comments on executives for computers such as S/360. These executive programs are for "dedicated" on-line real-time communications-oriented systems such as banking, airline reservation systems, etc.

A computer with an operating system similar to what the author described is the Univac 418. In a system at the NASA Manned Space Craft Center, a 418 with a FASTRAND drum and 44K of core memory operates a remote terminal communications and an inventory control system in on-line real-time fashion.

The FASTRAND drum contains the inventory of a tape library with about 40K tapes, the computer executive, utility programs, and the communications systems program.

The 418 can also run assemblies while the inventory system and communications programs are running. This can be done because the 418 has an executive priority routine. The executive routine takes a relatively small portion of the 418 memory. Programs running in the 418 can also be rolled in and out of the computer onto the FASTRAND drum as needed. As a matter of interest, the tape library inventory operates through mod 35 ASR Teletypes remote to the 418.

The communications system operates through Univac 1004's as the remote terminals, which submit jobs to two Univac 1108's connected to the 418. The tape library inventory system and the communications system were developed in-house at NASA-MSS to run in conjunction with the 418 real-time executive.

ROLFE POPE
San Diego, California

Mr. Davidson replies: The 418 is a good example of a computer designed specifically for on-line real-time use (communications switching and control). By providing separate hardware locations to receive the interrupts from the various I/O devices and channels, and by other thoughtful provisions in hardware to minimize software needs, the designers of the 418 were able to use an Exec routine which occupies only a small portion of the memory (which is small enough to begin with, and only 18-bit words at that).

By contrast, when one tries to put the Option 4 version of OS/360 into a mod 50, for OLRT functions, there is precious little core space left over for the application programs in a 256K (byte) core. One must expand to 512K to get any work done. As I said in my article, S/360 is recommended for OLRT projects which don't have to worry about size and costs. Admittedly, the 418 is a communications "front end" to the 1108's, in Mr. Pope's installation, and is not in the same size or cost range as a 360/50. However, the functional design of the 418 as a real-time computer is better than the catch-all design of S/360, which simply was not designed to do real-time well, and hence suffers from very inefficient software in OS/360.

●

Datamation welcomes your correspondence concerning articles or items appearing in this magazine. Letters should be double spaced . . . and the briefer the better. We reserve the right to edit letters submitted to us.

SYSTEMS SOFTWARE

Let the facts speak for themselves. Within the last year, we've won 6 out of 10 competitive bids on total software architecture. Produced dozens of integrated program packages for manufacturers and users. Batch monitors, realtime operating systems with symbolic, on-line debugging, compilers, and meta-assemblers. All IDC software is modularly constructed, easy to use, readily adapted to changing needs. Designed to get more action in time sharing, batch, background-foreground realtime and third-generation environments. Ever wonder how IDC delivers so many performance-packed features, with complete documentation, on time or ahead of schedule and priced so very low? You'll be pleasantly surprised when you find out. Just write or call IDC and we'll tell you our secret. IDC, 1621 East Seventh Street, Santa Ana, California. Phone: (714) 547-8861. Offices in Boston, San Francisco, London.

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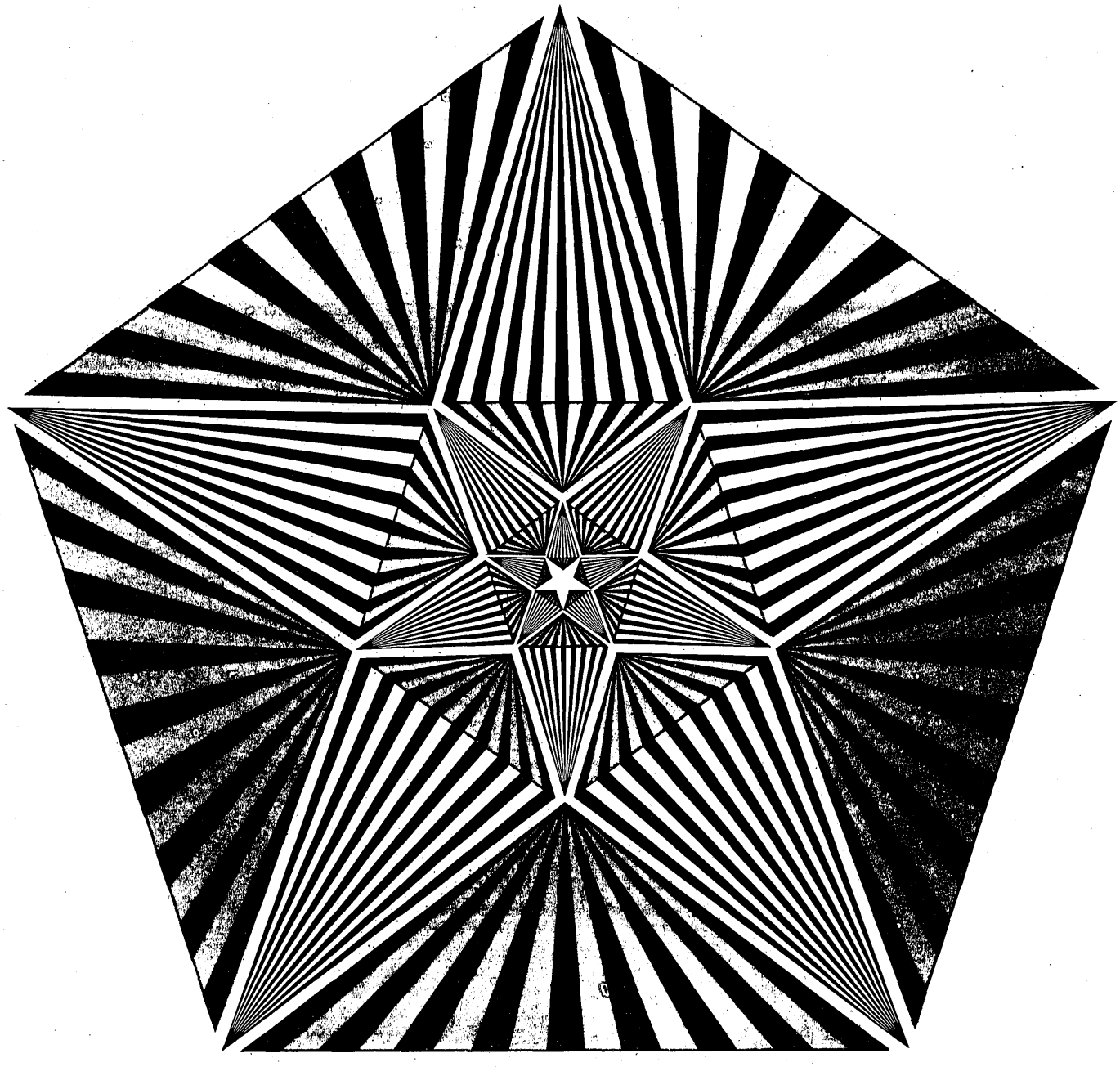

SOFTWARE PERSPECTIVES

CIRCLE 13 ON READER CARD

Please don't call EMR's 6130 Computer small

If you think the *ADVANCE* 6130 computer from EMR is just another "little" computer, take a closer look. You could be fooled by the price—low enough to compete with any small machine—or by the 16-bit word length, characteristic of small-scale systems. But that's where the comparison ends.

Analyze the 6130 and you'll realize it's the most productive system available. The instruction repertoire and internal architecture put it in a class by itself.

SMALL SCALE

To the potential buyer of a small-scale computer, there are a number of capable machines which are available to "do the job." However, aren't you looking for a system that can "do the job—plus"? The plus being able to expand to accommodate your next requirement. Many of the small-scale computers (under $35,000) that are being sold cannot provide the user with any realistic approach to expansion.

The 6130 is in a different class, it is designed for expansion. With the 6130 you can add a second processor easily, with no operational software problems. This additional processing power is relatively inexpensive when compared to installing larger systems.

This built-in capability for growth insures that you won't be looking for another new system next year and have to face the re-programming problem.

HIGH PRODUCTIVITY

Next, how about the buyer who has a problem that actually requires a large-scale machine, but does not have the funds? The 6130 has a capability that stretches into this high-productivity market.

Historically in the computer field, the user's main problem is to justify a large financial investment to his management. Once the computer is installed, and the user can demonstrate to management what can be accomplished, he can build a good argument for expansion. The expansion is normally in the way of adding more peripheral equipment and additional core memory. This is further indicative that, with the large-scale approach, the user has started out with more "computer-power" than needed—and is paying for features that he cannot use or can do without. As the load increases, a point is reached where he has all of the options that use the software to the limit, but by that time, he runs out of "computer-power."

In the case of the *ADVANCE* 6130, the high-productivity user may run out of computer-power sooner but would be in a position to add another 6130 processor to immediately increase his computer power at a small financial addition. One 6130 can handle background processing while the second handles preprocessing and input/output. If this would not be an acceptable approach, a more powerful processor could be added and the 6130 retained as a satellite.

The 6130 alone can successfully offer this approach as competitive small computers are just not powerful enough to handle the general purpose requirements.

ADVANCE 6130 FEATURES

- 16-bit data word with parity check and memory protect.
- 750 nanosecond memory cycle time as standard.
- Exceptionally large repertoire of more than 100 instructions.
- Three hardware index registers with indirect address.
- Relocation register with double indexing allowed is standard.
- 128 interrupt priority levels.
- Hardware multiply and divide a standard feature.
- Up to 128 external interrupts.
- Single instruction interrupt with both individual and group enable/disable allowed.
- FORTRAN, real time FORTRAN and macro assembler available.
- Interlaced multiplexed I/O channel allows up to 16 devices to be connected to single channel.

If your application fits in either category, we urge you to contact EMR Computer Division immediately. The address is: 8001 Bloomington Freeway, Minneapolis, Minnesota 55420. Or call our Manager of Marketing collect, 612-888-9581.

We want to tell you about our not-so-small 6130.

EMR COMPUTER DIVISION

look ahead

360 SOFTWARE LEADS TO THREATS

IBM 360/67 users, after a brief experience with release 1 of TSS, are happy they have it at last, think it's a great improvement over early versions, but don't feel that's saying much. One problem area is remote terminal support. Right now a 512K system handles 4-8 terminals efficiently, according to reports. One user says it must handle 15-20 remotes by June '68, or "we'll start looking elsewhere." Another is sure that their aim of 30 units on-line to a single-cpu 67 will require an additional 256K. Other complaints are that Fortran and assembler under TSS are not compatible with OS counterparts, and PL/I and Cobol are not even offered. Time before crash for this release is said to be 1-5 hours, not great, but a far cry from the 5 or 6 minutes between failures of early test versions. So far, TSS happiness is the Fortran compiler. A Share meeting in Los Angeles this month should net more data on planned improvements for releases 1 and 2, due out next June.

SOFTWARE HOUSES FORM GROUP, ELECT OFFICERS

Provisional by-laws and an organization have been established for a new association of software firms, the result of a meeting in Los Angeles Nov. 14. Bill Wolf, president of Wolf Research, was named president, and Walt Bauer of Informatics first (and western) vp. Eastern vp is Charlie Adams, we believe. There will be two classes of membership: companies with over $10 million annual gross will pay $3000 per year and get two votes; companies with less than that will pay $1500 and get one vote.

THE GROWTH PATTERN AT COMPUTER SCIENCES

The growth of 8-year-old Computer Sciences Corp., expecting a $50-million gross this year, has Wall Streeters scrambling to get in. CSC executives are moving too, but in the opposite direction: out. The pressure to retain or accelerate this growth rate has caused the departure, while they still have their sanity, of such brass as Jack Strong, Bob Dee, and Bob Head. Now Wes Niemond and Chris Chrysler have left to form a software firm under Marshall Industries called Marshall Information Sciences. And ex-CSCer Joe Hootman is rumored to be starting a new company.

One of the few on the input stream is Norm Carter, who joins CSC as vp-general manager of a new division focussing on the educational market. They'll develop educational systems, hold seminars and courses, and get into research with sponsoring companies.

A slackening of the once-prevalent pressure, we hear, is being felt by the group developing the Computicket system. Instead of rushing to get an operating system on the air, this group reportedly

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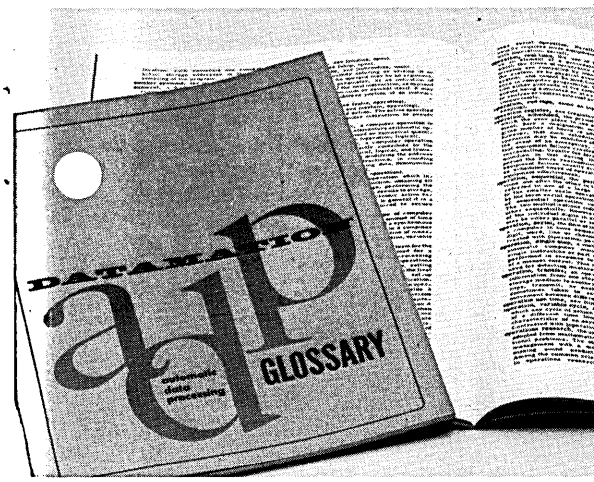

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has been sidetracked onto a related, ancillary project. "Just spinning wheels," one member describes it. This has caused speculation that the system is up for sale, maybe explaining Computicket Corp.'s move to New York City from Los Angeles. But a spokesman explains it as an attempt to counter the marketing of competitive ticket reservation systems. Computicket, he says, will be on the air next June.

Meanwhile, CSC pushes lawsuits against recently acquired Politz Research and alumnus Dave Ferguson.

BANKS MOVE TOWARD LOCKBOX NETWORK

For years business firms have been getting their accounts receivable payments from regional banks, using them as collection points—the lockbox idea. But companies are in a hurry to know which bills are paid so that credit can be extended, shipments released. To cater to this market is a pilot program sponsored by Manufacturers National Bank, Detroit, the start of a national network of bank data gatherers.

The bank has been joined by banks in 15 cities nationwide in getting compatible communications devices: stand-alone tape systems (Mohawk 1103 or NCR 735, made by Mohawk) and Dataphone 202C. Direct dial-up will provide fast tape-to-tape access to data for business customers.

The idea, says MNB, is not to carve out any marketing advantage, but to set the course for all interested banks in data transmission, standardizing on such things as message format and account number.

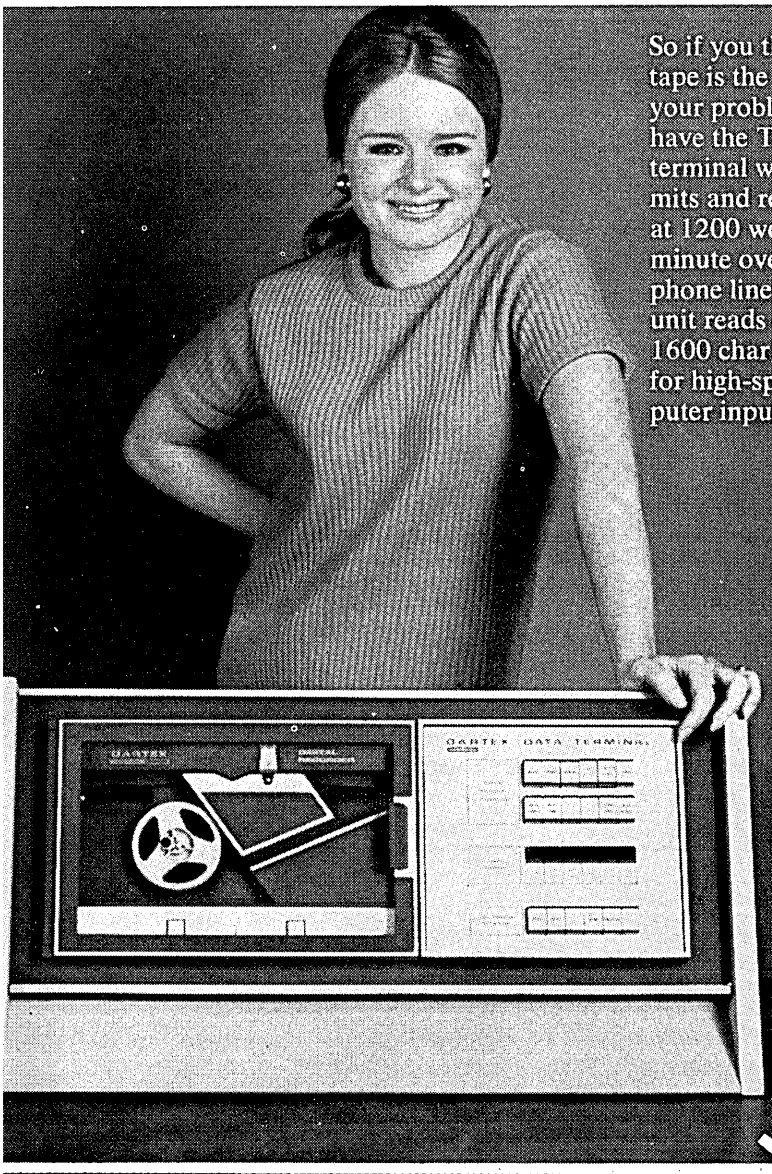
Banks in the initial 16 cities will have their own gear installed by the end of January. They can then offer a compatible, off-line mag tape network to any company. The subscriber need only lease the same gear (tape system is $225/month, Dataphone about $45/month depending on the state) to enable it to get daily reporting over direct dial long-distance phone lines. The network is designed so that no switching centers or control factors are involved.

GE SHIFTS MEDINET PLAN, STARTS BIG REORGANIZATION

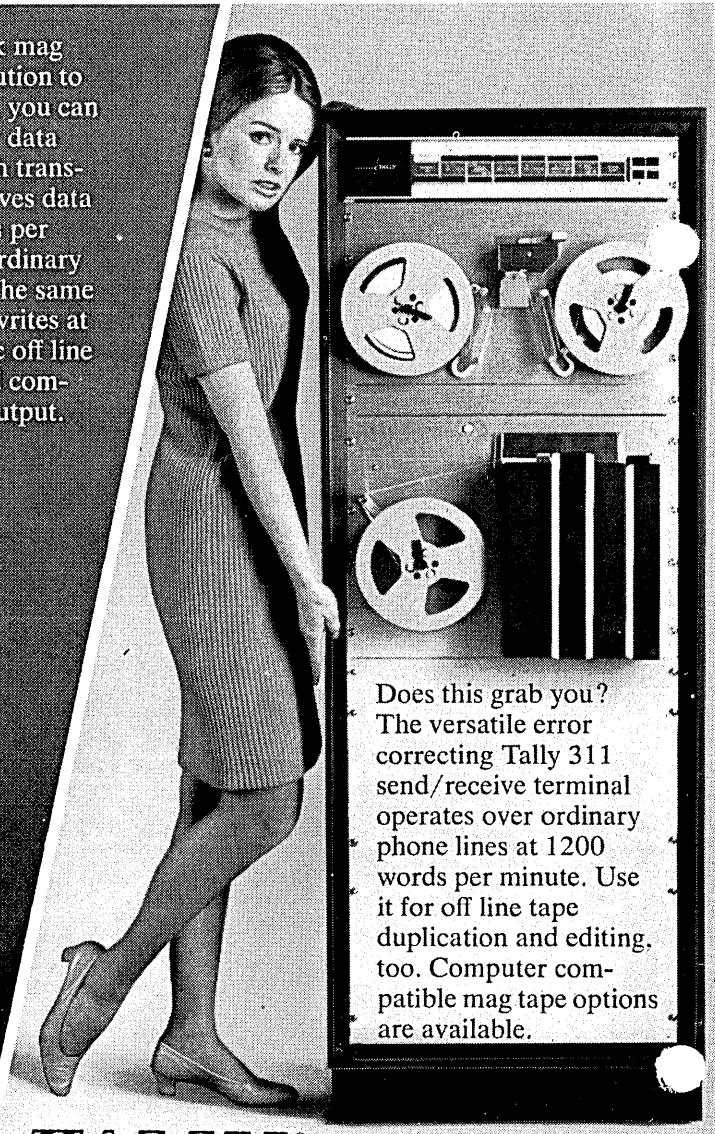
GE says the reorganization at Medinet does not mean abandonment of plans for an on-line time-sharing service network for hospitals. The dozen hospitals participating as experimental users have been assured that conversational services will come, but about a year late since the economics required a shift from the 485 t-s system being developed for the last 20 months to a non-product-line t-s system in the 600 series, to be announced as available to other GE service bureaus 1st quarter 1968. It means that Medinet programming effort can be applied to the firm's lucrative t-s services.

Jordan Baruch, director of Medinet, has gone back to BB&N, though he'll remain as a Medinet consultant, and a successor has not been named at writing. And some t-s programmers are leaving the fold. For the immediate future GE has shifted Medinet emphasis to applications programming and batch and remote batch processing—services more readily lucrative and easier to program. Observers guess that some products developed by the Baruch group will be converted to 600 series use, such as a high-level interpretive language and a typewriter terminal that interfaces with a carousel-type projector and a large-core-stores CRT such as Tektronix recently announced. GE says the 485 won't be abandoned.

(Continued on page 119)

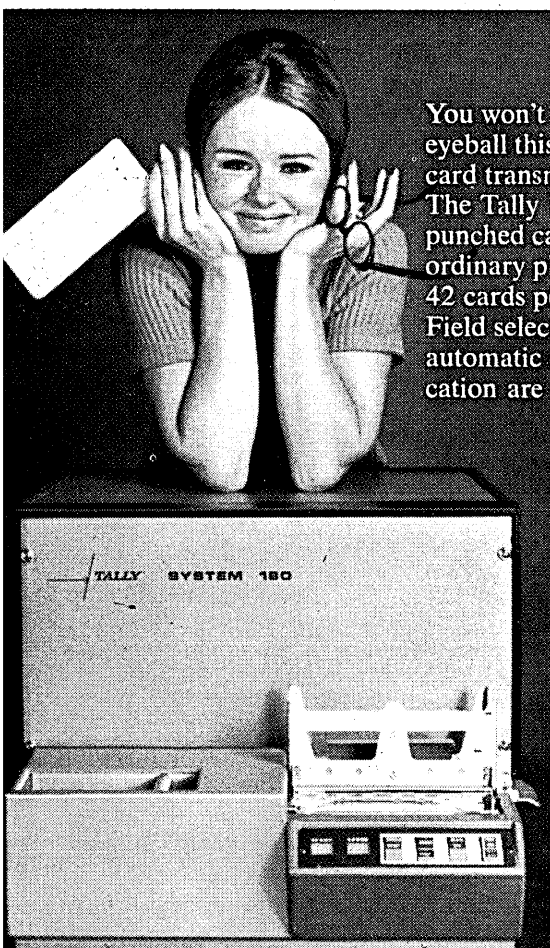


So if you think mag tape is the solution to your problem, you can have the Tally data terminal which transmits and receives data at 1200 words per minute over ordinary phone lines. The same unit reads or writes at 1600 char/sec off line for high-speed computer input/output.



Does this grab you? The versatile error correcting Tally 311 send/receive terminal operates over ordinary phone lines at 1200 words per minute. Use it for off line tape duplication and editing, too. Computer compatible mag tape options are available.

TALLY



You won't need bifocals to eyeball this solution to the card transmitter problem. The Tally 180 transmits punched card data over ordinary phone lines at 42 cards per minute. Field selection and automatic error indication are standard.

A little schizo about data communications are you? Relief's at hand. Tally systems transmit all three media... paper or magnetic tape or cards!

How about that? Now you can use Tally systems to transmit, receive, and store data in any form you want or in any combination of ways. For the diversity of Tally systems lets you go tape-to-tape, card-to-tape, mag-to-perforated tape and so forth. So before you see your analyst, see your Tally data communications consultant. For his name and complete information on Tally data terminals, please write Robert Olson, Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Phone: (206) MA 4-0760. In Europe and the U.K. address Tally/APT, Ltd., 6a George Street, Croydon, Surrey, England. Phone: MUN 6838.

editor's read*ut

ARE WE FOR REAL?

During one of those rare quiet moments at the most recent computer conference, we got talking to a friend about conference sites. He hadn't been to Atlantic City, which seemed to us to offer an old-fashioned, otherworld movie-set atmosphere . . . an unlikely backdrop for the gathering of forward-thinking technologists. It had seemed to us unreal, and our friend had commented that it was for that same reason that he preferred Las Vegas as a convention setting. The complete artificiality of that desert gambler's mecca seemed to him particularly appropriate as a setting for the discussion of computers.

Anaheim is something else.

From our hotel, we could look out on a miniature Matterhorn topped by a huge, revolving Christmas star. The symbolism escapes us. The rest of the view was equally inspiring: the fake elegance of the Disneyland Hotel, the tremendously confusing pastiche of restaurants and motels and their garish signs, the constant haze and/or smog, and . . . crowded off in one corner, what was left of an orange grove, hard by the screaming roar of the freeway.

In the hotel room, preparing to leave for the opening day's activities, we heard the TV tell about the return of three prisoners freed by North Viet Nam, listened to the statements of four deserters proclaiming disagreement with this country's action in Viet Nam. We wondered if Shirley Temple Black would be allowed to rejoin her old movie buddy, George Murphy, in Washington, D.C. On the way out of the parking lot, we were nearly rammed by a car coming out of a blind alley alongside the hotel.

We had spotted the huge clam-like structure of the Anaheim Convention Center from our hotel and headed for it, only to discover that a few thousand cars had beat us to it. Parking a half-mile away, we trudged toward the exhibit hall across a huge lot devoid of markers. Inside long lines of people waited to register. The exhibits were handsome, the aisles wide. The industry's marketeers (exhibitionists?) had put their best foot forward, and if there was little new in the way of equipment, it was presented with style.

The sessions offered the usual range of good, bad, technical, general, meaningful and meaningless. The conference luncheon represented an unusual double bill: the "micro-keynote speech" of Sam Alexander, industry pioneer and recipient of this year's Harry Goode Award . . . and outsider Ray Bradbury, science-fiction author, playwright and poet. Alexander told us we "ain't seen nothing yet," and Bradbury told us we are esthetically bankrupt.

Meanwhile, the exhibits and the sessions droned on.

We wondered if there were not something especially significant about the setting of this latest gathering of the technological clan.

Inside the convention hall, men of above-average intelligence discussed, watched and touched the machine. Outside was a wondrous accumulation of evidence that man is careless, greedy and stupid. Given the marvelous benefits of the machine, what will he do with it?

COMPUTERS IN JAPAN

by G. B. LEVINE

In 1961 I first visited Japan to discuss semiconductor licenses; at that time the total number of computers operating in Japan was less than 100. Today there are more than 3,000 computers installed there, slightly fewer than in Germany, but more than any other country except the U.S.

the market

In the twelve months prior to April 1, 1967, a total of 845 digital computers were installed in Japan. Their value was $186 million.

The Japanese break computer systems into four size categories—according to the actual price of the specific installation. Thus, an IBM 1401 system may be classified as large, medium or small.

Category	Average System Price	Monthly Rental
large	over $700,000	($17,500/mo.)
medium	$110,000-$700,000	($2,750-17,500/mo.)
small	$28,000-$110,000	($700-2,750/mo.)
super-small	under $28,000	(under $700/mo.)

Large Size. Last year, the category of large computer systems was second in installed value. New installations accountd for $55 million, or 29.6% of the total. The 53 systems installed were almost double the year-earlier figure, while value was up 64%.

Large systems usually include:

IBM: 360-40, 360-50, 1440
Nippon Electric Co. (NEC): NEAC 2200-500
Hitachi: HITAC 4010, 5020, 8400, 8500
Fujitsu: FACOM 230-50

Medium Size. For a number of years there have been more medium-size systems sold than any other category. Medium computers accounted for 37.5% of the units, and 52.5% of the value of all installations in Japan's fiscal 1966. (Year ending March 31, 1967)

By the Japanese definition, medium computers include:

IBM: 360-30
IBM: 360-20
NEC: NEAC 2200-200, 300, 400
Hitachi: HITAC 3010, 8200, 8210, 8300
Fujitsu: FACOM 230-20, 230-30

Small Size. The small computers installed last year were approximately equal in quantity to the medium-size systems, but naturally were valued at a much lower amount—$21 million or 11% of the total.

These systems include:

NEC: NEAC 2200-100
Hitachi: HITAC 201, 8100
Fujitsu: FACOM 230-10

Super-Small Size. Computers called super-small were first reported on for the year ending March, 1962. Last year, sales totalled 167 systems, valued at $3.2 million, or 17% of total value.

These include:

NEC-1200 series

In each of the last five years, the number of new computer installations has increased substantially over the preceding year (Table 1). These increases have ranged from a 113% jump in 1964 to 13% in 1966. The fiscal year ending March 30, 1967, showed installations up 33% from 1966, and predictions are for minimum annual increases of 20% in the next several years.

computer usage

Rental and Purchase. Approximately 80% of Japanese-made computers are now acquired on rental. This percentage has been increasing steadily since 1960, when rental arrangements were first made available, and were utilized for 5% of that year's installation value. Cumulatively, 67.8% of the value of Japanese-made computers, through March 1967, have been rented.

"Foreign" computers (Table 2) meaning mainly IBM units assembled in Japan, have been heavily on a rental basis since the first installations in 1958. The rental ratio has fluctuated from year to year, between 60% and 90%, with the cumulative total at 71.5%.

Most non-IBM equipment imported into Japan has been for direct sale rather than rental.

Last year the problem of "returns" of obsolescent computers became significant in Japan. One maker is estimated to have accepted returns equal to 7% of sales.

User Industries. Computer usage is widespread in Japan, with retail and distributive organizations leading with 301 installations.

Electrical and electronic equipment manufacturers have

Mr. Levine is president of Mentor International and has had over 15 years' experience in marketing and other aspects of international electronics. Before founding Mentor he was director of international operations at Fairchild Semiconductor and previously electronics program manager, long range planning, for Stanford Research Institute. He is a graduate of MIT.

a total of 222 computers installed, of which 153 are Japanese-made. Considering that about 60 different computer models are made in Japan, it can be assumed that a large percentage of these installations are for demonstration, test, or experimentation.

Banks account for another 197 computers, followed by 184 in the chemical and oil industries, 160 in various service industries, 145 in transport equipment, and 137 at universities. The central government is a major user, with 102 computers, while other government and quasi-government organizations have 98, and prefectural or local governments another 98.

Table 1

NUMBER OF COMPUTERS INSTALLED ANNUALLY IN JAPAN

Fiscal Year Ending March 30	Large >$700,000	Medium $110,000-$700,000	Small $28,000-$110,000	Super-Small <$28,000	Total
1958	..	1	2	..	3
1959	2	1	5	..	8
1960	2	16	8	..	26
1961	5	41	20	..	66
1962	8	77	32	2	119
1963	12	135	49	32	228
1964	37	157	157	134	485
1965	23	234	140	165	562
1966	27	291	142	176	636
1967	53	317	308	167	845
Cum. Total	169	1270	863	676	2978

Table 2

FOREIGN SHARE OF JAPANESE COMPUTER MARKET (INCLUDES IBM, JAPAN)

Year	% of Value					% of Total Systems				
	Lg.	Med.	Sm.	Tiny	Total	Lg.	Med	Sm.	Tiny	Total
1958	N	N	..	N		N	N	50	N	33
1959	100	100	44	N	93	100	100	40	N	62
1960	100	76	37	N	79	100	69	50	N	65
1961	100	69	13	N	73	100	68	10	N	53
1962	100	71	43	N	82	100	68	41	N	61
1963	88	65	21	N	67	83	53	18	N	39
1964	94	48	70	N	70	92	38	68	N	41
1965	75	49	76	N	57	74	50	75	N	43
1966	51	47	70	..	48	44	45	66	..	37
1967	60	43	39	1	46	60	42	34	..	32
Cum.	72	49	33	..	55	68	45	31	..	34

N—No foreign systems sold

The over-all average value of computer installations in Japan is $240,000, which not surprisingly falls within the "medium" size category. There is, however, quite a size variation by user group.

In general, the largest installations have been made in public utilities, with an average value per system of $410,000. Next highest are computers installed at insurance companies and securities firms, each averaging $370,000.

Slightly smaller installations in banks and government organizations average about $340,000.

At the other end of the spectrum, 50 installations were made in non-ferrous metal companies, at just under $100,000 each.

Another 55 went to precision equipment makers, at an average $110,000. These were the most frequent users of "small" computers.

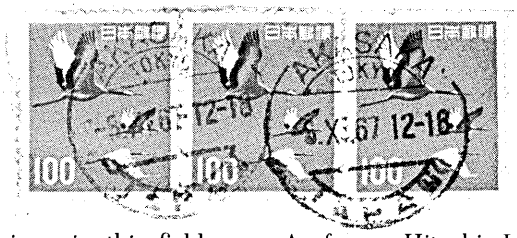
japanese manufacturers

Since 1958, seven Japanese companies have begun serious attempts to establish positions in digital computers. Matsushita has since dropped out. Of the remaining six, Hitachi, Nippon Electric Company, and Fujitsu are the leaders, with Toshiba, Oki, and Mitsubishi following.

Hitachi. Hitachi has the largest market share of the Japanese makers, estimated at 16% (of value) in the most recent fiscal year. Hitachi has achieved its position primarily through sale of medium and large computers, although the recently introduced HITAC 8100 and 8201 are expected to compete in the small-computer market.

Hitachi signed a 10-year technical assistance agreement with RCA in 1961, and based its early computers, HITAC 3010 and 4010, on RCA designs. Like other Japanese firms, Hitachi prefers to emphasize joint research rather than use of purely foreign technology. Thus the HITAC 8000 series, though based on Spectra 70, includes Japanese develoment work. Japan's first large computer, Hitac 5020 was also largely a Hitachi product.

Mr. K. Takita, general manager of Hitachi's Computer Division, told me, "It seems to me that the progress of today's electronic technique owes much to the pioneer spirit and vitality of the American people, and I always claim that we Japanese, too, should follow American



enthusiasm in this field . . . As far as Hitachi, Ltd. is concerned, when it was founded about 60 years ago, the first president of this company—Namihei Odaira—placed technical research and development before anything else, adopting the slogan, 'Electric Equipment Created by the Japanese People's Own Head and Hands' . . . we will make all possible efforts to continue progress along with the spirit of our founder, namely 'establishment of our own technology' . . . In the coming years, I hope that Hitachi will be able to win the world's high appreciation of our computer system through exports."

Nippon Electric Co. NEC is just behind Hitachi, and its sales last fiscal year of $38 million were 15% of the value of the Japanese computer market. NEC is the leader in the number of computers installed, due to its concentration on small and "super-small" units, including the 1200 series, for which over 800 orders have been received. Plans for larger computers are intended to give NEC full-line capability.

NEC made a 10-year technical assistance agreement with Honeywell in 1962, but has since devoted considerable effort to its own development work.

NEC has been expanding its computer capabilities rapidly, and now has over 5,000 employees in manufacture, sales, service, development, planning, data processing, and component production.

As a result of its leading position in communications, it has a strong position in data transmission as well.

My contacts with NEC have always impressed me. Its president, Mr. K. Kobayashi, has guided the company to a position of technological leadership and consistent profits. Dr. Osawa, managing director, is an example of the outstanding engineering capability to be found in many Japanese executives of electronics companies.

Fuji Tsushinki Co. Fujitsu is third in volume of sales, and holds about 10% of the Japanese market. The company is particularly proud of having achieved this position without benefit of foreign technical assistance, except for certain peripheral equipment technology obtained from Control Data.

An area of particular strength is in numerical control for machine tools, in which Fujitsu is the Japanese leader.

Partly as a result of its independence from foreign technology, Fujitsu receives certain assists from the Japan-

ese government, such as having its FACOM computers selected for display at the New York World's Fair and the Montreal EXPO.

Mr. Hanzo Omi, executive director of Fujitsu, is already well known to the U.S. as a fellow, and first Japanese director, of the IEEE. In a recent Tokyo conversation he described the Fujitsu computer philosophy: "The main reason for which we initiated development of computers was the prospect that the technique could be useful for the fundamental technologies of electronic switching equipment.

"We have self-developed and commercialized electronic computers and input-output devices.

"As to the export of electronic computers, Fujitsu occupies a very advantageous position since our FACOM computers are free from any restriction resulting from technical license agreements with foreign companies."

Fujitsu claims it is the only Japanese company to have exported its computers, and lists Bulgaria, U.S.S.R., the Philippines, and the Republic of Korea as recipients. Magnetic tape units have also been sent to the U.K.

An example of the hot competition for key personnel in the computer industry was the recent "recruitment" of Mr. Ando of IBM Asia Corp. as president of Fujitsu FACOM Company. Movement of engineers and executives from company to company had been almost unknown in Japan, where recruiting is generally confined to the university graduating class.

At the Kawasaki factory of Fujitsu, I am always surprised at the scope of products in development or assembly. Like the other Japanese computer makers, Fujitsu wants to make *all* of its own computers, peripheral equipment, and components. As an example, Fujitsu, or its affiliated companies, makes computers from super-small to large size, as well as magnetic tape equipment, line printers, paper tape punches and readers, core memories, semiconductors, and related products. To an American, the sales volumes on individual products seem to be too low to be economical, but pride and the desire for independence seem to prevail.

Toshiba, Oki, and Mitsubishi. The other three Japanese computer makers, though lagging Hitachi, NEC and Fujitsu in market share, are also of interest.

The Toshiba and Mitsubishi groups are in process of being merged, under the guidance of General Electric, with which each has a strong relationship. The merger is unusual since it will unite two of the rival Japanese Zaibatsu: Mitsui (of which Toshiba is an associate company) and Mitsubishi.

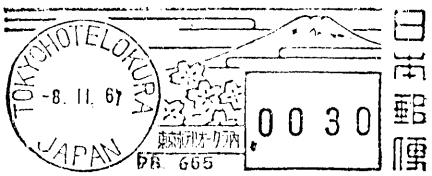
The Oki Electric Company is affiliated with the Univac Division of Sperry Rand in a joint venture called Oki-Univac, which last year increased its sales at a faster rate than NEC or Hitachi. Since Oki has 51% of the joint venture, official Japanese statistics recently were amended to count Oki-Univac sales as domestic rather than foreign.

other organizations

There are three Japanese organizations which have a strong role to play in the computer industry and market.

JEIDA. The Japan Electronic Industry Development Association (JEIDA) was established in 1958 by Japanese electronics manufacturers. Work in electronic computers is the most important phase of its activities, and includes operation of computer centers, research and development, public relations, and standardization. Mr. T. Saito, executive director, told me, in 1965, of his confidence in the ability of Japanese industry to develop world-competitive computers, given enough time. He noted a shortage of software (and trained personnel) as a potentially limiting factor. JEIDA now says ". . . the joint efforts of the Japanese government and industry in research and development will sustain the continual development of the computer . . . which is still regarded as the symbol of the advancing electronics industry of Japan."

JECC. Another organization, Nippon Denshi Keisanki or Japan Electronic Computer Co. (JECC), was formed to lease the products of the Japanese computer manufacturers. The makers are responsible for marketing and service, but JECC serves as a government-assisted finance company. My visits to JECC reveal a dedicated group of men intent on helping Japanese makers to compete against "foreign" computer companies. To the Japanese,



any company not 51% owned by Japanese is foreign, no matter where it manufactures, or whether it is a joint venture or not.

MITI. The Ministry of International Trade and Industry (MITI) is by now well known as the agency most concerned with protecting the industrial structure of Japan against foreign encroachment. With respect to computers, two key decisions have been made by MITI:

In reviewing the potential effects of capital liberalization, MITI has drawn the following conclusions on the computer industry:

In Japan, sales are expected to increase by at least 20% per year for the next five years and the industry will be dominated by large manufacturers. The Japanese computer makers are rated internationally competitive in raw material costs. They are slightly behind foreign firms in over-all capability, technology level, and manufacturing cost, and very far behind in scale or production and dependence on foreign raw materials.

The official Japanese evaluation is that foreign capital penetration would have an enormous effect on the local industry with the net result being almost complete take-over.

As a result, new foreign investments in computer manufacture in Japan, even as a minority partner in a joint venture, are basically prohibited.

I believe there are both legitimate justifications and reasonable challenges to the Japanese position on foreign computer investment. The Japanese have a unique and successful social, cultural, and industrial system, which is vulnerable to foreign invasion. Certainly it is "fair" for them to protect this environment.

On the other hand, many of the measures they have taken are not fair in the sense that these measures have not been similarly applied against Japanese computer makers by other countries.

To the Japanese electronics manufacturers, I suggest that the present restrictive measures (not only on computers, but also on most significant segments of electronics) will unify and intensify a long-lasting resentment among electronics industries in other countries which could some day adversely affect Japanese exports.

To non-Japanese computer makers and governments, I urge careful consideration of the composite industry-government position in Japan, described only briefly in this article, before determining either tactics or strategy towards Japan. ■

RECENT DEVELOPMENTS IN THE EUROPEAN MARKET

with mergers emerging

by W. K. de BRUIJN

According to the report "Computers in Europe 1966," published in October of that year by the Netherlands Information Processing Research Center, the estimated number of computers installed at the end of the years 1966 and 1967 was approximately 6,000 and 7,200, respectively, for the EEC, and 8,500 and 11,400 for the whole of Western Europe.

Fig. 1 shows the estimated development up to 1975, as it was published in this report. From 1965, there is now a new line drawn to show how actual installations differed from the original estimates. Since this difference is substantial (due to the remarkably fast growth of the numbers of computers installed in the last two years), it is reasonable to question the possible accuracy of the 1975 forecast. In addition to the fact that the report does suggest that this forecast is conservative, there is one other factor to consider before judging the accuracy of this estimate: The number of computers installed is not distributed evenly over a period of months and years; they go in waves. These waves correspond roughly to the introduction of new generations of computers. A study of the increase in computer installations over the past 10 years shows that these waves were highest about 1957/58, 1961/62, 1966/67, which are almost exactly the years when IBM's 650, 1400 and 360 series were installed in mass. This is true because IBM accounts for nearly 60-70% of the computers installed in the various European countries with the exception of Great Britain. It may, therefore, be

Fig. 1

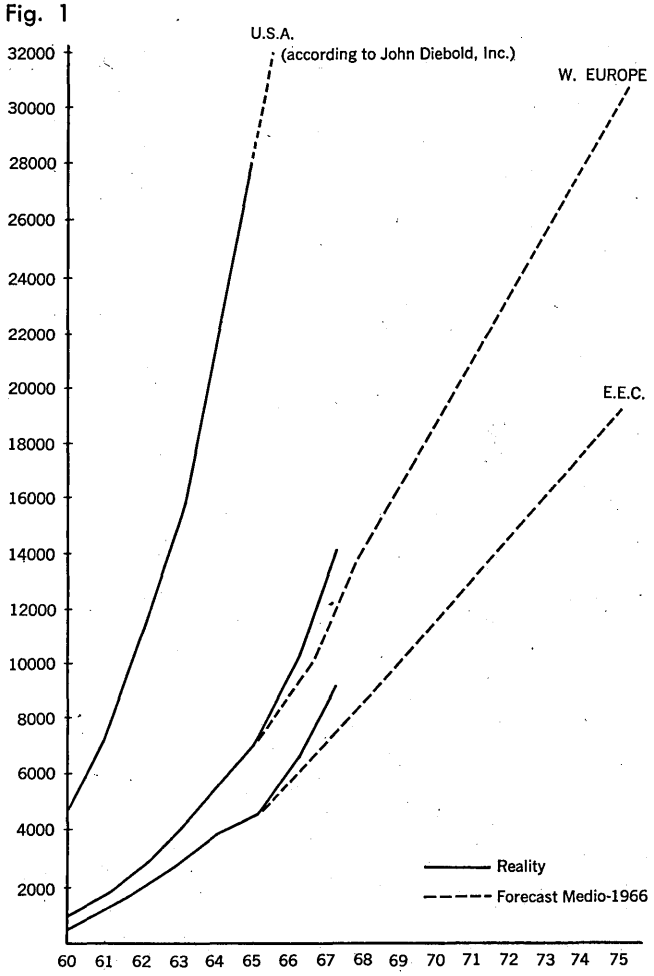


Table 1 Computers Installed

	1965	1966	1967
European Economic Community			
Belgium/Luxemburg	235	340	520
France	1250	1850	2600
Germany	1800	2700	3800
Italy	850	1200	1700
Netherlands	260	400	600
	4395	6490	9220
Great Britain	1400	2150	2850
Denmark	130	155	190
Finland	70	110	150
Norway	85	120	150
Sweden	280	400	600
Switzerland	300	430	610
Austria	125	170	220
Spain	100	175	230
Others	75	100	140
	6960	10300	14360

expected that the number of computer installations will be lower in the periods before and after these peak years. Table 1 shows the number of computers installed at the end of each year; Table 2 includes those on order. It is necessary to state that the figures for 1967 are estimates. To compare progress in the different countries, the report used a ratio of the number of computers per million of the working population (exclusive of the agricultural and fish-

Senior member of the scientific staff of the Netherlands Information Processing Research Center, Mr. de Bruijn has written articles in both Dutch and English on international aspects of edp. Recent credits include "Fifteen Facets of Administrative Automation" (1964), "Use of Computers with Local Government in Western Europe and North America" (1965), and a report of the further development of the European computer market (1966).

ery workers).[1] If this ratio is calculated for the figures given in Table 2, and based on the population data (from 1965) the following data are obtained.

Table 2 Computers Installed and on Order

	1965	1966	1967
European Economic Community			
Belgium/Luxemburg	350	540	625
France	1850	2700	3300
Germany	2800	4000	4700
Italy	1200	1800	2000
Netherlands	405	640	725
	6605	9680	11350
Great Britain	2050	2950	3500
Denmark	190	210	250
Finland	110	160	180
Norway	125	160	180
Sweden	410	650	720
Switzerland	400	660	730
Austria	175	240	260
Spain	175	250	280
Others	105	150	180
	10345	15510	17630

The ratios show a marked difference from country to country. The reason that Switzerland especially shows such a high figure is most probably because of the enormous labor shortage in that country. The percentages of foreigners in the total working class of a country was. 30% for Switzerland, France 8%, Belgium 6%, Germany 5%, and Netherlands 1.5%. These percentages give some insight into the shortage of labor in these countries.

Another reason for the differences between the figures in Table 3, is the degree in which a country is industrialized. However neither labor nor the degree of industrialization

Table 3 Computers per Million of the Working Population (Exclusive of Agricultural and Fishery Workers)

	1965	1966	1967
European Economic Community			
Belgium/Luxemburg	103	159	184
France	124	181	221
Germany	127	181	213
Italy	82	123	137
Netherlands	106	168	191
Great Britain	88	126	150
Denmark	106	116	140
Norway	114	145	163
Sweden	132	210	232
Switzerland	182	300	332
Austria	67	92	100
Spain	27	38	43

can explain all these differences, especially when it is considered that Great Britain shows a relatively low ratio compared to countries like France and Germany. This was once explained by stating that the average computer installation in Britain was larger than those in the other countries. Though the division in Table 2 shows a tendency in this direction, this is not a large enough factor to confirm such an opinion.

A division of computers installed and on order according to large, medium and small machines gives averages of 4% large, 33% medium and 63% small. If the three biggest European countries in this respect are compared to these percentages, the results are as follows

Table 4

	Big	Medium	Small
Western Europe	4%	33%	63%
Great Britain	6%	37%	57%
Germany	3%	34%	63%
France	5%	28%	67%

Conclusions based on these percentages should be cautious, however, because much depends on which machines are considered to belong to which category. There is, however, a suggestion that users in Great Britain install somewhat bigger computers than is the case on the continent.

Another possible division of computers is by generation. Here the following percentages (again careful judgment is necessary) may be calculated (Table 5).

Table 5 Generation

	First	Second	Third
Western Europe	7%	60%	33%
Great Britain	11%	58%	31%
Germany	5%	64%	31%
France	5%	57%	38%

These percentages suggest that on the continent there is a tendency to replace a computer more quickly than in Great Britain. Again, in the case of both these tables, it should be taken into account that much depends

Fig. 2 Proportional Distribution of Computers in 1965 Over the Various Groups of Users

Inner circle = E.E.C. (4.102 computers)
Outer circle = other European countries (3.194 computers)
Numbers in circles represent percents of total

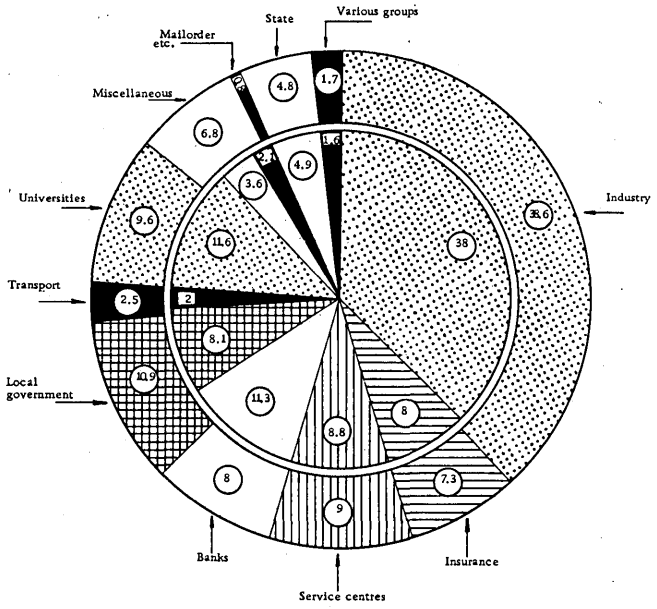
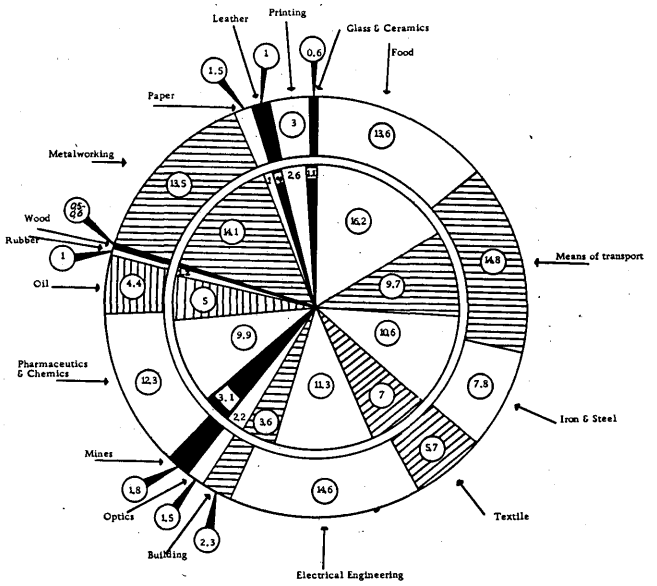


Fig. 3 Proportional Distribution of Computers in Industry 1965

Inner circle = E.E.C. (1556 computers)
Outer circle = other European countries (1235 computers)



[1]Based on real population data of the years concerned.

on definition and personal viewpoints. Those who are interested in making their own comparisons of this type based on their own opinion and definitions, could do so by using the European Computer Census[2]. The results will certainly differ since machines are included in that publication which are not taken into account in the calculations in this article. Examples are Bull/GE G 55, Friden 6010, ICT 558, NCR 390/449/500.

The development of computer manufacturing in Europe is still that of continuing mergers. Notable was the recent merger between English Electric-Leo-Marconi and Elliott Automation in England. Less notable (because the companies concerned are smaller and in general less well-known outside their own country) but more numerous, are the mergers taking place in France. Apart from the normal reasons for merging, such as the necessity to stay competitive in a very difficult market, there is a need for research money. It is impossible for small companies to keep things going while money is tied up by renting equipment to customers. The curious fact has emerged that a growing turnover of rented machines results in losses for the manufacturer.

An important stimulus to the European manufacturers has emerged. This is the fact that in the major European computer-producing countries, government has awakened to the importance of keeping such an industry alive and healthy. As a result of this, Great Britain, France, and to a somewhat less extent Germany, have all taken measures in this direction. Countries are pumping large amounts of money into their national computer industries. But to do so, effectively, it is better to have a few big industries than many small ones; hence, government pressure on the small companies to join forces.

There is an ever-growing number of new computer users from the smaller business firms. Many of these formerly used punched card equipment, but there is also a substantial number that did not do so. The groups that are now joining the ranks of computer users are local government organizations (mostly municipalities), agricultural organizations (such as cooperative buying and selling organizations), auction marts, newspapers and printers for typesetting purposes, and organizations with many members such as automobile associations and trade unions. A new group will certainly be formed by the hospitals which have so far kept aloof, but seem to be showing more interest. Figs. 2 and 3 (both taken from the report to the Netherlands Information Processing Research Center) show how the distribution of computers over the various users group was at the end of 1965. There is no indication that at the present significant changes in this distribution have taken place. ■

[2]Diebold ADP Newsletter, April 17, 1967

EUROPEAN SOFTWARE MARKET

peddlers & programmers

by EDWARD K. YASAKI

The software market in Europe today has more potential than profit. In England and on the Continent, there's neither a huge military machine nor an affluent government that's willing to spend its money on the development of advanced computerized systems. There's no space program that can generate millions of dollars of contracts for programming services and computing time. And the few mainframe manufacturers who might contract out for compilers are, through mergers, becoming fewer in number each year.

These factors, the presence of which is taken for granted in the U. S., have contributed to the continuing growth of the software business in the States. To investors, it is a glamor industry. In England and Europe, it is not a glamor industry—not a twinkle in the eye of investors.

Even on the business dp front, the customers with money just aren't there in adequate numbers to support many large software houses. "We're a smaller nation and poorer, but it's also the innate conservatism," explains Michael Jackson of John Hoskyns & Co. Ltd., London. The idea of having to pay for software that the manufacturer traditionally has supplied, except among large corporations, just hasn't caught on. (The same can be said for users in the States.) Users in England, Jackson adds, don't think in terms of any long-term savings to be derived by buying custom software. "You must sell a 5-pound note for 4 pounds 10."

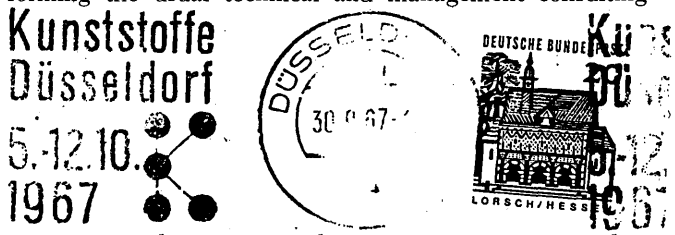
Europeans are aware of what's going on in the States, of advances being made in the software world, but they're not willing to spend for what they need, says Arthur Speckhard, president of Computer Sciences International in Brussels.

Despite this bleak outlook, the London *Times* recently

told the European computer industry to brace itself for a "second invasion from America"—this time by software firms.

americans abroad

But so far no American firm has made it big in England or Europe. CEIR probably made the earliest and most valiant effort, opening an office in London. But CEIR Ltd. is now wholly owned by British Petroleum. In London, also, Information Development Co. of Santa Ana, Calif., has a wholly-owned subsidiary, IDC Ltd., which was opened earlier this year. With a 15-man staff, the firm is working about equally for users and manufacturers, performing the usual technical and management consulting



activities, and writing applications programs, compilers and systems software.

Most talked about of the American firms is Computer Sciences International, which recently opened an office in London but which is headquartered in Brussels. One of the worst-kept secrets is that CSI is writing the software for an upcoming series of computers by the huge Philips firm in Holland. Indeed, Philips owns 25% of SCI; the rest is held by Computer Sciences Corp. The Belgium-based firm, also less than a year old, has over 40 people on its payroll, of whom almost 30 are technical types—and half of them are Europeans.

In the Hague, Netherlands, Auerbach Corp. has a two-year-old office now headed by Georges Picot, the former head of Univac in France. A Frenchman by birth and an American by nationality, Picot heads a 15-man group consisting of some eight technical people—engineers, mathematicians and programmers. Although their main source of income is from large industrial firms, for whom they perform hardware evaluation, system design and application programming, the group also gets into product planning and market analysis.

With a longer history on the Continent is Informatics. They've been in Holland since September of '64, got their first contract in November of that year. Working for manufacturers—a message switching system for Univac at Zurich, systems programming for Philips, compilers for Electrologica (now owned by Philips) and for the Swedish firm Saab—Informatics currently is doing between $175K to $200K of business annually. But now the staff that once numbered 12 is down to three. "There's a disadvantage to an American firm selling a service in Europe that's not faced by a firm selling a product," says Informatics vp Dick Hill. Even in the States, products are easier to sell than services, but this disadvantage is accentuated to marketers in Europe, Hill says.

One way around this for a software firm, of course, is to get into the marketing of software packages. And Informatics, currently marketing its Mark IV file management system, sees much potential for it in Europe. Computer Sciences, too, has proprietary packages—the Exodus I and II for program conversion to the ubiquitous 360. But CSI's Speckhard also sees a market for large systems—not just a payroll package but a system to handle the entire personnel area of a corporation, not just production control but something to cover the movement of all material that comes in and goes out the door. Application packages, Speckhard says, would be more easily marketed if they were in the manufacturing end, where differences are fewer between countries, rather than in the financial area.

"Psychologically, the idea of selling packages at a fixed price is better than selling bodies to do the same job," Speckhard adds.

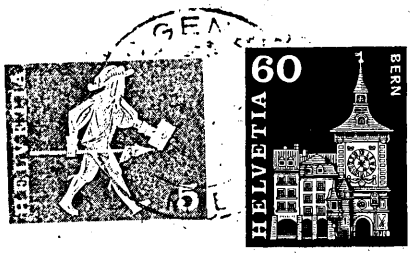
Informatic's Hill supports this. The cost to a European firm for one American programmer supplied by a U.S. house runs between $40K to $45K per year, he says.*

How does this cost compare with the going rate on the open market? In Paris, programmers get between $3,000 and $6,000, and an analyst might get upwards of $8,500. In England, it's not much different.

The cost factor aside, there's an additional problem that U.S. firms find with their Stateside programmers. They don't make an effort to learn the local language, says Auerbach's Picot, who has three American programmers on his staff. The Germans and French don't want proposals written in English, Picot adds, explaining that it's not only a question of nationalism. A proposal might be read by several people in a company, and not all can read English. With something like a technical proposal, a client naturally feels he should understand every phrase and word.

hiring & training

The cost of transportating bodies back and forth across the Atlantic is but one of many to be considered. The employment contract, a common instrument on the Continent, is another. This document stipulates the compensation to the employee, where he is to work, and anywhere from a two- to four-month notice before it can be terminated by the employer or employee. This means that a firm would have to count on that period (one more) before the new man will be able to report for work. Contracts vary in different countries, based on common practice and local labor laws, but by the time a man has put in 15 years for a firm, it would take a year's notice to fire him. The story is told of a manufacturing company



that wanted to close down one of its plants, but because of the employment contracts the cost in salaries exceeded the loss that could be expected from continued operation; that plant reportedly remains open today.

Unlike their counterparts in the U.S., European software firms—no doubt by necessity—perform more training. Many of the larger houses take people with no experience and run them through two weeks to a month of classroom work, followed by on-the-job training under heavy supervision. Some will even take university grads with a programming course or two under their belts, unlearn them, and send them through the course. Almost always the training is for in-house use, but John Hoskyns & Co. is preparing to run courses for outsiders, as is being done in the U.S.

The idea of changing jobs, of course, is still not generally accepted in Europe. But because of U.S. influence—and, perhaps even more, the influence of the

*While there are American programmers in Europe, the practice among U.S. firms is to rotate them back to the States after 12-18 months. This is supposedly necessary to keep them up-to-date with latest advances.

computing industry—the practice is becoming more common. Also changing is the long-held preference of Europeans to work for a university or a large, well-known company. To both have been attached a certain prestige unattainable elsewhere. But among programmers, at least, the software houses are gaining in popularity as the places to get better salaries and wider varieties of work, if not high status.

The added incentive in the States, the stock option, is something not available in Europe. The laws governing this sort of activity are different, and, besides, many of the firms are privately held. Profit-sharing and higher-paying managerial posts are given to motivate employees, but seldom does one get any greater "piece of the action."

In France, for example, the requirements to become a public corporation are so stringent that it's not even considered. As a result, the three largest programming organizations, other than those of computer manufacturers, are privately held—two by banks and one by a holding company. The largest of these, the Societe d'Economie et de Mathematique Appliquees (SEMA), is a 1500-man organization doing some $20 million a year in business. Somewhat comparable with Planning Research Corp., SEMA is engaged in everything from marketing, urban and economic studies to contract programming and the operation of a CDC 6600-equipped service bureau. Its Informatics Div. has 325 people, of whom only 70 are programmers. This division also includes the operation of the service bureau. Highly scientific in its orientation, SEMA works heavily with FORTRAN and, for simulation problems, its own MIC-MAC compiler. But it's also anxious to get into the commercial dp field. "I'm sure that we will use COBOL more and more," says Robert Lattes, head of the Informatics Div. According to Lattes, about half the companys' revenue is from its programming effort, much of this for users of the service bureau.

More closely resembling the classic software house is CAP Paris, which, with its sister firm CAP London, is held by Geneva-based CAP Europe. Between the two offices, there are some 400 people pulling in over 2 million annually. For sheer programming, says CAP Paris's head Jacques Lescault, contradicting Lattes, this is more than SEMA.

Unlike the London office, CAP Paris is engaged in body shopping—a significant part of the business, according to Lescault. Of its 250 programmers, more than 50 are working at other sites. The firm is engaged only in programming—50% of the jobs in applications programs—and derives only about a quarter of its income from manufacturers.

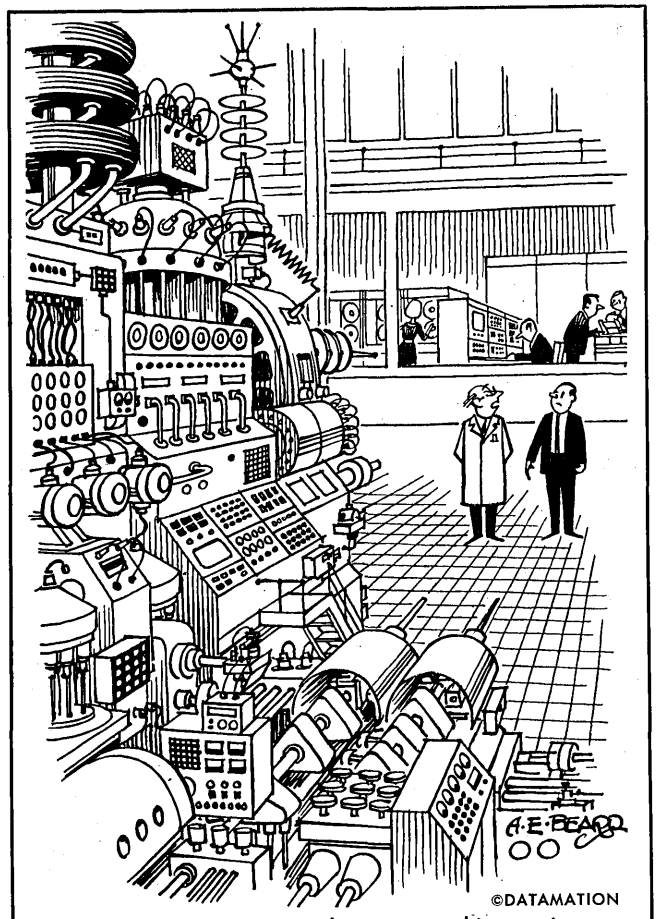
The London half of this sister act, under Alex d'Agapeyeff, was started in May of '62, six months later than its Parisian affiliate. A loan of $2,100, which started the firm, was repaid during the first year; at the end of its fifth year CAP had 75 people and an annual volume of $700K. Now in its sixth year, the firm has experienced a doubling of manpower and sales during the last two fiscal years. Their work, performed for both users and mainframe makers, has included systems software, compilers, and applications programs.

But to hear d'Agapeyeff tell it, the big immediate market is in providing what he calls "middleware"—manufacturer-supplied software that's been made to work properly and also tailored to the needs of the user. CAP does much of this work, as well as applications programs, for service bureaus, and therefore sees no future in opening its own bureau.

A crosstown rival that engages in both programming and service bureau activities is Systems Programming Ltd. Known locally as a body shop operation, SPL has indeed used body shopping to become what managing director Ken Barnes calls the "largest independent commercial computer consultant in the U.K." Formed by Barnes and two others—all in their 20's at the time—in January of '64, SPL now has some 120 people, anticipate a gross this year of almost $750K. Almost half of this comes from its overseas offices, located in Stockholm, Geneva and Copenhagen. All of these facilities were started with contracts that required SPL to supply warm bodies; using these people as the nucleus, other contracts were solicited and an office established. There are 18 people in Stockholm, eight in Geneva, fewer in Copenhagen. In the mill are offices in Edinburgh, Scotland, and in Melbourne, Australia. SPL even has two of its 360 programmers working in New York with an affiliate, Republic Systems. They can absorb the travel and accommodations costs and still supply men at a lower rate than U.S. firms, says Barnes.

SPL, Barnes admits, lacks the funds to market proprietary software and therefore hasn't examined the market. But according to Michael Jackson of neighboring Hoskyns & Co., a software house, to get a payoff from constructing good software, should use that software in a service bureau—or sell it. The market for proprietary packages, therefore, appears to be an excellent entree for an outsider to get into Europe. (According to SPL's Barnes, the only way an American company can get in will be to buy out an existing firm, allow it to be run by local people, but inject experience from the U.S.)

Although this market is considerably smaller than in the U.S., it continues to spawn small groups and support handsomely some large firms. As Michael Jackson says, the price of software is going down and the price of manpower is going up. "This proves we're in the right business." ■



"And now our computer is busy researching on its vast potential, its staggering implications and why the hell it doesn't work."

SOFTWARE IN FRANCE

a developing industry

by SERGE SELETSKY

1967 has been a crucial year for the French data processing industry: it was the first year of existence for the government's Plan Calcul, established in order to give France a national and independent computer industry. (As a French minister, A. Peyrefitte, said, "We do not want to be out of this domain, but that does not mean we are forbidding the others to be in.")

In October 1966, R. Galley was nominated Délégué Général à l'Informatique, a position which allows him to supervise the coordination and centralization of the various French dp activities. In order to stimulate the efforts of private enterprise, the government prodded the merger of the electronics companies into a single company; as a result, CAE and SEA became the CII (Compagnie Internationale pour l'Informatique).

In April of this year, an agreement was signed between the government and the CII to establish the framework for the technical and financial program for the coming years. At this time, the P Series of computers was launched: P0, P1, P2 and P3, with their military counterparts. These are small- to medium-scale computers with multi-programming and time-sharing features. First deliveries are planned for 1970.

The governmental and private money invested for the next five years in CII is approximately $200 million. The government has assured research and development contracts amounting to $80 million; half of this has to be refunded by the CII.

The lack of a national integrated-circuit industry is already a problem in this supposedly American-independent enterprise; however, recent mergers between CGE, Philips and Radiotechnique, and between Thomson-Houston and CSF might allow these new groups to compete with American companies implanted in France like Fairchild and Motorola.

At the same time, in order to develop a peripheral equipment industry, the SPERAC company was created (Compagnie des Compteurs and Thomson-Houston).

The latest development in the Plan was the official settlement on August 29 of the Institute de Recherche d'Informatique et d'Automatique (IRIA). The institute has to promote long-term research in all fields of information sciences, to secure the education of qualified personnel, and to establish the objectives of the national efforts.

In 1967, nearly $20 million was devoted to plan Calcul by the government; in 1968, it will be about $29 million.

ge-bull

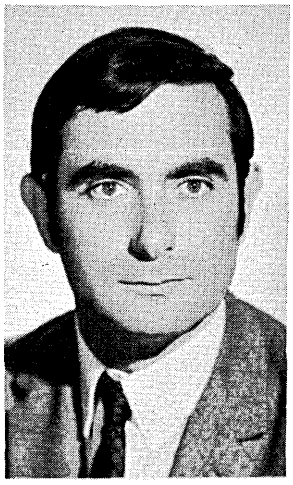
The actions taken by the government were not the only possible ones. For instance, it is somehow peculiar to see Bull, once the biggest and most capable French computer company, standing outside the national effort. This is due to the fact that Plan Calcul's decision was taken too late. In 1963, due to Bull's financial difficulties, the government was compelled to accept the offers of General Electric. Hopes were that American management, money and technical know-how would settle things. On the contrary, the situation is getting worse. Besides the failure of the GE 600, disaffection with the GE 400 and the American decision to stop production of such machines as the M40 or the Gamma 140, which were good ones, discouraged many people.

Bull had 14,000 employees in 1963; they now have 8,000: many of those who left were technically well qualified. The commercial network, which greatly aided Bull, is falling apart: finding no compatibility between Bull and GE computers, users are switching to another manufacturer, mainly IBM.

Another alternative for the government would have been, in spite of all the difficulties, to set up a European corporation. This would have been the solution to many financial, commercial and technical problems. There have been many contacts with the English and the Germans, but nothing important has arisen from these discussions.

The French are also very interested in the Eastern European market. Although less successful than the English in this endeavor, they are attempting to develop an intellectual collaboration.

If we look over the approximately 2,000 installed computers, we find some important computing centers. Some of those are dedicated to scientific applications (for

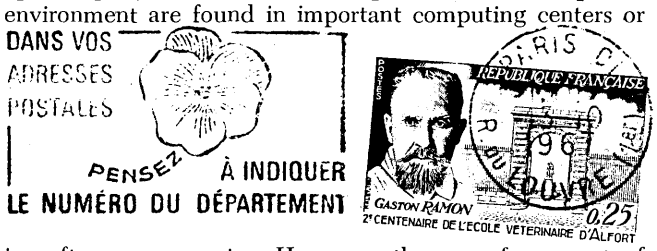


Mr. Seletsky is an engineer in the systems department of Centre d'Analyse et de Programmation in Paris, and is responsible for the development of software on a message switching project. He has a Licence de Physique from Ingénieur de l'Ecole Supérieure d'Electricité, and an MS in computer sciences from CalTech.

instance, there are several CDC 6000 series used in domains like electric power, oil companies, aeronautics, atomic energy or weather forecasting); the others belong to the classical set of banks, insurance companies and big industrial companies.

There are a few large scale real-time systems like the Air-France reservation one or multi-terminal installations for bank and insurance companies. Process control is developing quite rapidly, and there have been some nice realizations. Still, there are many things to be done within smaller companies and governmental agencies. For example, there is a lack of very sophisticated or experimental systems. For instance, there is no real t-s or valuable information retrieval system.

As far as software is concerned, most users are bound to the manufacturer's package. People able to get into operating systems and to adapt them to a specific environment are found in important computing centers or



in software companies. However, they are few; most of them are trained in the field and some by an academic institution.

Most people just fight with the intricacies of the existing OS. For instance, among IBM customers, DOS is the most popular. The European tendency of over-using assembler languages instead of compiler languages is part of a more general tendency which tries to derive the most capability from a given computer. This tendency is fading with the third-generation equipment. For instance, IBM, which has the biggest share of the market (75%), points out that for its 360 series, COBOL is the most widely used language, followed by FORTRAN; there are a few PL/I users. 95% of the whole 360/20's run with RPG. Many second-generation users wrote their Autocode programs into COBOL, thus preparing emulation for third-generation systems.

Problem-oriented languages like SIMSCRIPT and COMIT are practically unknown, and besides some military applications there is little use of real-time languages.

ALGOL is still considered as a powerful language, but is practically unknown and unused outside the universities.

It is worth noting that part of the software of U.S. companies like CDC and IBM is made in France (emulator and teleprocessing techniques for instance).

As anywhere else there is a dramatic lack of specialists. The French educational system is at the present not ready to face the problem. Data processing is still considered a minor subject by many people; it is not a "noble" one such as pure math. Being more a technique than a science, the universities refuse to approach many of its practical aspects.

There are, however three universities (Paris, Toulouse, Grenoble) which have gained some experience in language theory and compilation (especially ALGOL). There have been some attempts in designing original systems inside universities. But the lack of scientific interest, the difficult intrusion of students in such practical projects, the small-scale collaboration with industry and the spare credits, did not permit the realization of sophisticated systems.

As far as business is concerned, the problem is especially crucial because there is practically no training institution available. Much hopes are placed upon IRIA, which should prepare highly qualified personnel. Presently, nearly all systems programmers are trained in the field; those who have worked in the U.S. are highly prized.

The French have the tendency to prefer things which are conceptually and intellectually perfect. This tendency which puts math on a high level is, in most cases, not well adapted to data processing. A computer has to work, and does not need to be the emanation of any Turing machine.

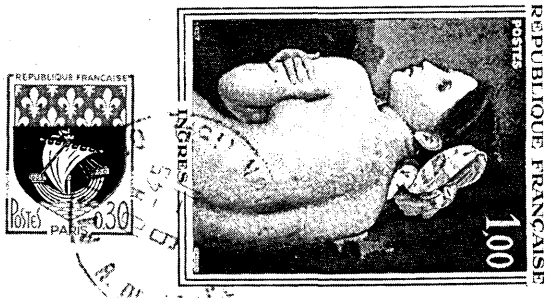
There are many economic reasons of course: the smaller scale of French companies and their financial capacity; the lower salaries, which do not make computers always profitable; the small amount of government contracts. The poor state of communication networks prevents teleprocessing techniques from real expansion.

Despite the small number of national computer manufacturers and of government contracts, software business is in a good position. The number of significant software companies may be estimated at less than ten. About half of them make a $1 million volume and two get over $2 million. Some of them work for all Europe; they have good experience in system programming; they have written compilers and have realized the software of real-time systems (process control, military projects, message switching). Most of these companies were created in the early 60's. They employ up to 300 people. Besides the "pure" software companies like CAP, others have related activities in such different fields as service bureaus and education. SEMA, which is the largest management consulting firm in France, wishes to act in France like CSC in the U.S. with a service bureau (CDC 6600), a software department and other information services.

There are many reasons for the present situation in France. First of all, there is a general lack of knowledge about the computer industry, especially in governmental administration. It is one of the Plan Calcul's objectives to promote information processing within business administrations.

What problems there are concerning data processing in France are similar (and often worse) all over Western Europe. Aside from England, which succeeds in keeping a certain independence, every Western European country is subordinated to U.S. data processing. This subordination is concretely outlined because the great majority of installed computers are American (outside England), and also because a man in the field is compelled to "think" American: the terminology, programming languages and technical literature all come from the United States.

What is even more alarming, is that not only do the Europeans not *make* the tool, but they *use* it on a small scale, and within a limited number of applications. Quoting Diebold*, there was, in mid-1966, one computer



for 9,600 non-agricultural persons in France; one for 2,000 in the United States. Trying to *implement* more sophisticated systems (not only knowing that they exist) will lead people to gain a better knowledge of data processing techniques.

However, it would be too early to make any conclusions about the future of data processing in France. The recent governmental awareness of the importance of data processing could be a good start for significant development. It will be only in a couple of years that the beneficial technical, educational and economical effects of the Plan Calcul will be realized. ■

*Diebold European Computer Census, ADP Newsletter, April 17, 1967.

help that gnp

PRODUCTION CONTROL IN THE U.K.

by CHARLES WHITE

The National Computing Centre in the United Kingdom is the chosen instrument of the Ministry of Technology to keep Britain abreast of advanced developments in computer technology. The urgency of the NCC's task is related to government policy in two ways. On the broad economic plane there must be a pursuit of every means to improve the real expansion of the Gross National Product and to make the best use of available resources. Within the confines of government housekeeping the management of technology is an agonising matter. As soon as one set of escalating project costs has been justified, another excessive profit by government contractors is uncovered. The Mintech men are therefore edging toward cost method stipulations in contracts, which are meant to ensure that what is said to be a cost is not going to result in the Ministry subsidising the inefficiencies of individual firms. Computer-aided production control techniques are seen to be the only way out. If general agreement in industry can be brought about on computer-based control strategies, then a stipulation about "adequate cost control methods" can be made to carry a *de facto,* if not a *de jure,* meaning.

Shortly after it was set up, therefore, the NCC set off to talk to manufacturers with practical experience of computer-aided production schemes. The basic object of the exercise was to brew up project plans inside the NCC for the most relevant research and development areas. As fallout from these information exchanges the NCC has published a fascinating report which surveys experience to date in the U.K.

approach to industry

As a start, the NCC circularised 217 companies asking them if they would like to cooperate and 91 companies offered assistance. These were boiled down to 40 firms who were either visited, questionnaired or both. The split of computer hardware is nearly typical of the U.K., in that IBM held 17 firms and ICT 16. The staff details of 23 of the computer departments were obtained and, excluding data preparation staff, none of these ran into three figures.

The Steel Company of Wales topped the bill with 86. Half of the equipment used had no backing random storage. Of the second-time-around installations, 12 still had no use for random access, and one company stated it was considering changing to serial file processing in a disc system now being designed. The trend in the use of programming languages has definitely been to the use of COBOL. All of the experienced users of COBOL definitely intended to continue with it and were abandoning low level languages.

All of the installations visited by the NCC had well-loaded machines. About half were operating in excess of one shift and four were operating three full shifts. One company had been operating for nearly two years, loaded up to three shifts for seven days per week, and had still managed to expand their systems. Each time they needed some more capacity they refined one of their existing systems to make it run faster!

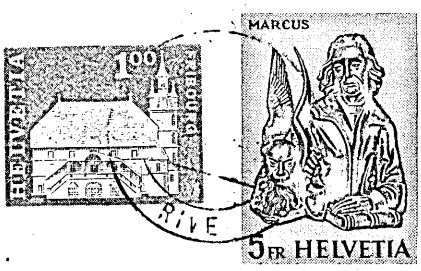
Production control work often represented a substantial proportion of machine time. Examples which can be quoted are operating 75, 125 and 90 hours per week, of which 55, 70 and 20 hours respectively are on production control.

One of the companies visited produced a table, (below) showing how the production timing had improved even while the company was growing rapidly.

special techniques

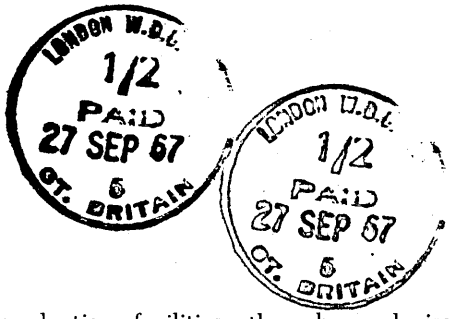
During the survey, information was provided by a number of companies on techniques they had used which were rather unusual.

Company A manufactures capital plant which is custom made, very few end products are identical. As a result of this, full design and manufacturing information is often



not available until part of the job is already built. This makes it difficult to obtain an accurate forecast of forward load on any particular load centre. To alleviate this situation, they define classes of product, characterised by a similar utilisation of resources in each class and each class being represented by a standard machine design. When an order is received, the appropriate corresponding standard machine is identified and the standard details are entered into the computer system as a provisional load to aid forward planning. As finalised sections of the design are received from the design office, instructions are entered into the computer system to delete the appropriate portion of the standard design and substitute the firm design for the order.

In company B a large, and varying, proportion of the work is subcontracted. To allow the most efficient allocation of subcontract work and the best loading of their own



production facilities, they have devised an automatic system for compensating for load fluctuations. Every component used in the company is allocated a code number which represents the ease of obtaining the components outside the organisation. The extreme values of these code numbers represent products which must always be purchased outside, normally proprietary items, and those which must always be made inside. When the extreme limit code numbers have been dealt with during computer processing, work continues to be loaded until the capacity limit is reached—when off-loading of further requirements takes place. The coding system ensures that those items most easily dealt with outside the company are the first to be off-loaded.

Company C operates a computer system giving order processing, stock control and production scheduling for four different factories, only one of which is in the U.K. A 24-hour turnaround is given on order processing with documents being flown in, processed, and the results flown out again.

Company D, which now has its own computer, was operating a service bureau sysem which every month carried out the demand breakdown, netting against stock and preparation of a schedule for the next six monthly periods. Running on an IBM 1401, this system was costing £140 for about 10,000 transactions per month. It is now offered for sale to anybody who would like to use it.

In Company E, order details are entered into the computer using a series of standard forms. From this data the selling price of each order is computed from basic costs and a production schedule is produced. The manufacturing process has been mechanised and instructions to the machine operatives for each job are given in the form of setting instructions for the machine controls. Shipping

PERIOD	METHOD	PROCESSING FREQUENCY	AGE WHEN PUBLISHED	TURNOVER
Pre 1959	Manual Requirement Breakdown	3 months	6 weeks	40%
1959	Service Bureau	3 months	2 weeks	40% - 60%
1961	Punched Card Installation Net Requirements	1 month	2 weeks	60% - 90%
1964	1440 Computer Production Plan Buying Guide	1 week	1½ days	90% - 100%

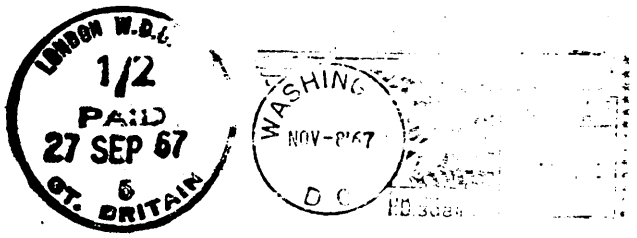
lists are also produced and a printed layout for the site erector showing the physical positioning for each item as it is off-loaded from the lorry.

analysis of benefits

The few companies able to quantify benefits are grouped as follows:

GENERAL BENEFITS	NO.OF COMPANIES
Staff savings	8
Stock reductions	8
Work-in-progress reductions	5
Improved deliveries	4
Increased output	6
Better control	8
No benefit	4
Don't know	6

Generally it was felt that the introduction of computer-aided production control had so much modified the organisation that "before and after" comparisons were difficult to make. It was very difficult to be certain that some changes would not have happened if the computer had not been introduced. In many cases, the companies were operating in a manner which just could not have been conceived with a manual control system, so that comparisons were meaningless. In the few cases where no benefits had appeared, it was clear that they had failed to provide the correct environment for the installation. They



could all see benefits which were going to come when they had straightened out their present troubles.

As would be expected, in medium and large companies the staff savings were substantial. In all cases, it was expressed as an avoidance of further recruitment; in many cases, this would have been virtually impossible anyway, and all of the companies considered it to be a bonus, not the prime reason for the installation of the system. It is, of course, an easily definable benefit clearly tied to the computer and is therefore commonly used in justification exercises. Savings ranging from 50 to 200 people were quoted and in one case 600 additional staff would have been necessary to carry out the work now being done. Even if all the refinements of management information had been removed, 250 extra people would have been needed to keep the system turning over. In one medium-size company an annual figure of £35,000 had been accredited to the computer for staff savings.

Improvements in stock control have appeared repeatedly, generally finished goods and raw materials being quoted. Many companies were hesitant in quoting actual values, particularly where the reductions had been "dramatic" (to quote one company). Reductions in stocks by 10% were definitely obtained, however, even without any sophisticated control procedures. Stocks were said to be better balanced and customer service had certainly been improved.

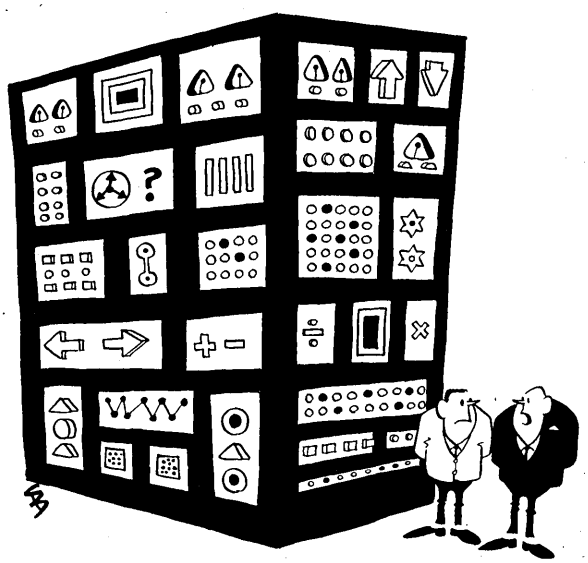
The much tighter control possible is reflected in the reduction of the amount of goods awaiting processing on the shop floor. Jobs are not started until the right time and are carried through to completion as quickly as possible. This change also frequently appears as a reduction in the lead time and a reduction in the variability of lead time. Four companies spoke of reductions of the order of 50% in work-in-progress, generally associated with increases in throughput.

Another natural result of the tighter control is a much better performance in meeting delivery dates. Two companies spoke of improvement of the order of 20% and one company with a very complex range of products with many inter-stage transfers between factories reduced its arrears from 950 order items to 19.

Information was given on increases in output within the existing resources, in some cases several years of expansion being accommodated simply by improved control. Increases of the order of 10% have been quoted but companies entering the optimising phase visualise much more dramatic improvement. One company whose output had gone up by 50% actually got rid of 300 machine tools and another had eliminated all overtime while still expanding the business.

Although the NCC report carries appendices listing 59 companies in the U.K. working on computer-aided production control systems in addition to the 40 surveyed, nowhere does the Marston Excelsior company appear. This firm is a subsidiary of Imperial Metal Industries and, on the very same day that the NCC issued its report, J. P. Sale of Marston presented a paper revealing that since the beginning of 1967 they had been applying resource allocation techniques in a jobbing shop environment. The NCC had only been able to find one company using this approach and even then in a rather less common setting. This highlights the difficulties facing the NCC in acting as a clearing house for computer applications in the U.K.

The success of Marston depends on an estimating program, written in ALGOL, which provides resource requirements at the time the order is placed and so gets around the drawing office bottleneck. Marston work on a bureau basis and the cost of virtually eliminating resource overload has been between ¼ - ½% of the shop's annual turnover. ■



© DATAMATION

"Aren't you sometimes overwhelmed by the sheer logic of it all?"

AUSTRALIAN DP: THE '67 SCENE

everybody's doing it

by DAN KELLY

To give an idea of just how fast computer applications are growing in Australia, it is rumored that since it has been found, the Sydney Opera House is not suitable for opera (after 10 years and $35 million), it is to be converted into Sydney's new data centre. The building and site have many advantages for this application; an obvious one is that most output can be dumped directly in the harbour.

Vietnam, rising costs of the F111 ($10 million each) and beer (up 2 cents a glass), discovery of huge natural gas deposits as well as further discoveries of oil and iron ore deposits, poor showing of Dame Pattie in the America Cup, and the granting of full voting rights to the Aborigines are some of the highlights of 1967.

With the arrival of well over a hundred G.I.'s every two days for rest and recouperation leave from Vietnam, Australia is rapidly becoming as well known to this generation of Americans as it was to the previous one during World War II. One of the first men to arrive was David Miller and here's some glimpses of his first day in Sydney.

His first thought after a hot shower was to phone his folks at home in Jackson, Michigan.

"You know, the call was through within five minutes," he said. "I've been trying to call them from Vietnam, but I could not get a connection."

And then, changed to slacks, shirt and bright yellow cardigan, Millier went for a stroll down Macleay Street seeking a beer.

"I've heard so much about Australian beer that I had to try it," he said. "You can't get a beer like this back home or in Vietnam."

From King's Cross, I took Miller on a tour of Sydney.

We were caught up immediately in the atmosphere of the city.

A burly taxi driver complained about the doors being slammed and then threw his creaking cab between traffic down Macleay Street and the bends of Wylde Street.

At traffic lights in Woolloomooloo a uniformed chauffeur driving a black Bentley was hunched over a radio listening to the first race at Randwick.

"What won?" shouted our cabdriver through the window and was told the sad news.

"I'm still in front," said the driver. "I lost $7 at the races on Monday, but I won $28 on the poker machines the same night."

Miller, who does not follow the horses, listened with amazement.

But in Martin Place among the lunchtime throng of office girls he showed no such disinterest.

"There sure are a lot of beautiful girls," he said. "I've been all over America and I have never seen so many lovely girls."

We walked down Pitt Street. "It's all so busy. I never realised Sydney was as big as this."

At Circular Quay, Miller stood bewildered in the tiled public bar of a hotel.

"I've been told about the Sydney pubs, but I've never seen a bar like this where everyone stands up to drink," he said.

He watched the girls scurrying across the road for ferries. "I can't get over all the beautiful girls," he said.

Another Yank in Australia at the moment is Malcolm Macaulay (former president of Data Display). Since arriving in January to work for a year at the University of New South Wales, he has formulated some quite definite views about computing in Australia.

"Computing is a half-world in Australia. Although consumption is high, manufacturing is nil. On a par with such countries as Canada, Sweden and West Germany in computer installations per capita (40 to 50 installations per million persons), Australia is well ahead of mother

England and neighbour Japan, though still less than one-third that of the U.S. On conservative estimate, Australia has exported more than $100 million to the U.S. and U.K. to date in payment for computers. Most Australian engineers interested in computer design and manufacture have either changed their career plans or gone overseas to find employment. Mathematicians interested in system software development often do likewise.

"As of June 30, 1967 there were 545 digital computers installed here and 132 on order. As far as number of installations are concerned, IBM holds the dominant position with 45% of the market. Surprising to an American, ICT runs second with about 20%. The remaining scant third of the installations are divided between 11 other manufacturers including Control Data, Honeywell and NCR. Univac and RCA are conspicuously absent. In terms of market value Control Data is pushing IBM since they have captured the bulk of the large 'glamour' installations.

"The Australian computing community seems to have a 'colonist's complex:' a strong sense of dependence upon and subservience to overseas masters. I attended the recent IREE Convention in Sydney. The display of equipment was impressive and the technical quality of the papers was good. But very little of the equipment shown was of Australian origin. When I've discussed this observation with Australian engineers, the answer has been 'But we can't afford the expensive research facilities that you Yanks have', or 'There isn't enough capital available in Australia to start such ventures', or 'It is smart to stay behind; let the other blokes do the expensive development, and we will reap the benefits.'

"All these arguments are based on the presumption that wealth governs originality. The truth may very well be that economic resources and intellectual resources are independent phenomena.

"There is no shortage of talent among Australia's engineers and mathematicians but there seems to be a lack of the confidence needed to excel which leads to a lack of innovative industry in the country. Similarly, businessmen appear to be generally unwilling to venture into unfamiliar territory. The speculators and entrepeneurial engineers who made companies like Control Data, Scientific Data Systems and Fabri-Tek in the U.S. have no counterparts in Australia. When they do, look out! Australia's climate, both social and meteorological, is delightful. Once Australians realise that the computer manufacturing industry is independent of closeness to markets and that more brain than capital is needed to develop superior machines, Australia will be a force to reckon with."

Prompted by Mr. Macaulay's words and not being able to find anything written on the subject, I asked Gordon Rose, one of the few engineers in the country actively engaged in computer design, to outline a brief history of Australian computers.

history

"The beginning of computer engineering in Australia was marked by the demonstration of two Australian made machines at the first formal symposium on computers in Sydney in 1951," he said. "One machine was a mechanical differential analyser; the other, a general purpose, delay line storage, digital computer, CSIRAC, one of the earliest computers in the world. Both machines were designed and built within the CSIRO (Commonwealth Scientific and Industrial Research Organisation).

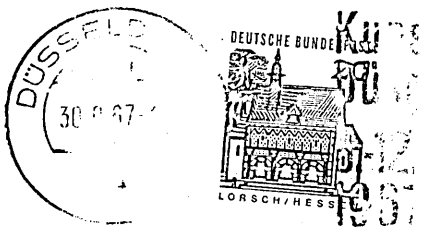
"SILLIAC," an improved version of ILLIAC I, was built by members of the Physics Department at Sydney University in collaboration with Standard Telephones and Cables (Aust.) in 1955. The computer has given superb service for over ten years and is still in operation.

"Solid state design came in the form of a Digital Differential Analyser in 1957. Project ADA was built jointly by CSIRO and the Electrical Engineering Department of the University of Sydney. A general purpose digital machine SNOCOM immediately followed ADA from the same small group in 1959. SNOCOM was installed as the Snowy Mountains Authority computer. Over the period 1959 to 1963, CIRRUS was designed and constructed within the Electrical Engineering Department of the University of Adelaide. The structure had advanced multiprogram features under microprogram control including dual stores—the second held a multiplicity of address modifiers, accumulators and sequence counters. Emphasis was placed on register minimisation, and each machine order left the registers available for immediate program change which was achieved by nominating a different sequence counter. The read-only control store developed had 4,096 words of 36 bits, cycle time 1½ microseconds. Earlier an analogue computer had been built in the same department.

"At WRE (Weapons Research Establishment), DIP, a digital impact predictor, was constructed for service at the Woomera rocket range. WRE personnel had also constructed an analogue computer. ARCTURUS (1965) was constructed in the Electrical Engineering Department of the University of Sydney with special features for teaching logic and computer design.

"For the past two years actual computer construction in Australia has been virtually at a standstill. There are only one or two small groups at all active. On the slips at the moment, is the INTERGRAPHIC computer; it is being designed and constructed within the Department of Electronic Computation, University of New South Wales. INTERGRAPHIC will link a number of general purpose graphical consoles to the University's 360/50. Initially, 13 T.V. terminals with 'raster pens' will be installed but the speed of image generation is such that up to 100 such consoles can be serviced by the system before straining its capacity."

Despite the present difficulties facing computer engineers, application programmers can find any amount of work. Clearly, the outlook is bright for a country the size



of the United States, yet with only 5% of the population. A high standard of living and booming economy is certainly going to mean more computers and more people for Australia.

One last thought. Where else in the world can one live on 40 acres of good farm land for under $10,000, be within 10 miles of the nation's capital and two hours driving of magnificent surfing beaches and snow fields and work on a top computer project?

out and around

The Commonwealth Bureau of Meteorology is to install a large IBM computer complex, costing approximately $4 million, in Melbourne. Equipment will consist of two IBM System/360 Model 65 control processors with all of the

usual peripherals, but including display stations and graphical plotting equipment. During normal operation, one /65 processor will extract and analyse meteorological data on a real-time basis operating day and night. The computer will be linked by a communications system with meteorological data sources and information users throughout Australia and overseas. The second /65 will be available for research and development and generally the centre's non-routine tasks, while providing backup to the first control processor. The computer equipment and communication system is to be installed in two phases over a number of years with the first /65 being installed next year. Ultimately, the centre will play an important role in the World Weather Watch, planned by the World Meteorological Organisation in response to a request by the United Nations General Assembly.

Though only formed in January 1966, membership of the Australian Computer Society now exceeds 2000. Tasmania is the only state not yet amalgamated. The next big events are the first issue of the society's journal due out at the end of the year and the 1969 computer conference in Adelaide. There has been some kind of Australian computer conference every three years (except 1954) since 1951 when Trevor Pearcey invited D.R. Hartree to come out from England and tell the locals what computing and programming were all about. So far the society has made no official pronouncement on plans to set up a national computing authority; however, it is believed many leading members are in favour of such a move.

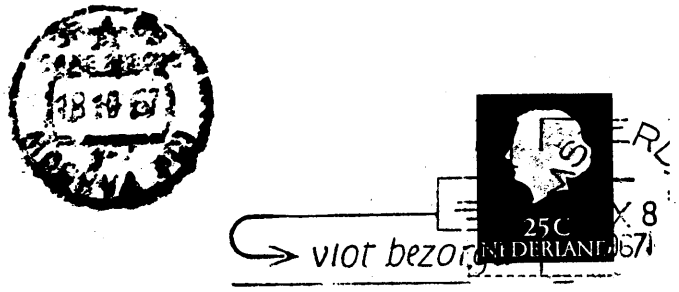
The CSIRO computing story, up to the end of 1964, was told in the March 1965 issue of DATAMATION. Since then two drums, a large disc and six CRT consoles have been brought into operation on the CDC 3600. A major undertaking was the writing, by members of the Division of Computing Research, in collaboration with Control Data Australia, of a completely new, yet SCOPE-compatible, monitor system called DAD (Drums And Display). DAD allows all peripherals to be multiplexed and fully integrates the consoles with the system. Thus the consoles are used (1) as hand calculators—but without the need for tables, (2) as more sophisticated calculators for simple statistical calculations, (3) as devices for preparing and editing programs, thus bypassing the use of punched cards, and (4) general information retrieval and editing units. The DAD system has been operating since mid-1966 and has been adopted by owners of other 3600 computers. The throughput has increased by a factor of about two, thus the unsaturated life of the 3600 has been considerably extended. The three 3200s have been expanded by the addition of a disc unit on each. The associated disc software, whose use is now possible, and other software improvements have again meant a considerable increase in throughput. The Division of Computing Research now has several clearly defined research activities, including the investigation of mathematical models for numerical weather forecasting, picture interpretation, numerical taxonomy and voice input.

universities

The computer group at Sydney University under the able leadership of John Bennett seems to be doing an excellent job at getting their "fruit-salad" of computers (SILLIAC, KDF-9, CDC-1700, PDP-8, 7040, 1401 . . .) all linked up and pulling in the same direction.

On-line computational facilities at the University of Western Australia have resulted in high productivity by both users and its small specialist staff. A DEC PDP-6 was accepted in May 1965 following the saturation of an IBM 1620 installed in 1961.

Research and development in the computing centre stresses hardware and software extensions to the PDP-6. Devices which have been interfaced for real-time data acquisition and control under time-sharing include a rat-race, an automatic diffractometer, an analogue computer, a data retrieval computer (Physiology), and mass spectrometers. A PDP-8 has been interfaced to drive up to 16 mass storage devices in a multi-processing environment. Eventually much of the file manipulation will be transferred to the 8. Discs interfaced through this system (hardware has already been checked out on CDC disc packs) will upgrade the PDP-6 and considerably raise the service available to remote console users. A PDP-8/S with display for perception research in the Department of Psychology has been installed and is to be interfaced to



the 6. A PDP-8 with card reader and line printer is due for delivery to the CSIRO in early 1968. The CSIRO, some four miles off the campus, will run a remote batch over Post Office lines.

Softward development at UWA has been remote-console oriented. A library of interactive programs, developed locally, is permanently available to teletype users for research and teaching purposes. Particularly popular is a conversational interpretative FORTRAN (FORDESK) with editing facilities, which has been in use for some 18 months. An upgraded FORDESK IV, which will be re-entrant, is due for release in the last quarter of '67. Standard peripherals include a display and light pen. Software to make this facility easily accessible to FORTRAN-only programmers has been available since early 1966.

This has resulted in heavy usage of this device by a wide range of research workers, particularly for fast inspection of data. On-line design for structural engineers is available through STRAUD, a version of STRESS with remote console and/or display and light pen options, which has recently been released. Other software being finalized includes AUTOTUTE, a system for presentation and control of non-linear programmed instruction through remote consoles. FORTRAN arithmetic is currently being taught in trials of this system. In conjunction with the Sir Charles Gairdner Hospital, hospital information systems are being studied. Routines for the retrieval and analysis of dead records have been developed, and the programming of a pharmaceutical order, control and enquiry system is nearing completion. The University of Adelaide is running about 800 jobs a shift, and have trained about 1,500 programmers in FORTRAN over the last year. Two shifts, and possibly three shifts may have to be implemented because the 32K memory of the CDC 6400 is not large enough to accommodate full multiprocessing facilities.

On the commercial side apart from the host of companies buying small computers, there is an increasing number of commercial organisations moving into the big time with over $1 million worth of equipment and employing many programmers. One such group is Qantas, Australia's overseas airline, now in possession of approximately $3 million worth of computer equipment (including Qantam—a sophisticated airlines reservation system) and employment figures for computer operations personnel is heading toward the 200 mark. ■

THE APTNESS OF APT

for the u.k.

by H. B. SHARMAN

How suitable are American numerical control techniques for Europe? That was the main question put to the British Ministry of Technology's National Engineering Laboratory near Glasgow when its new NC Division was set up just two years ago. As NEL engineers see it so far, US techniques are acceptable, but only after allowance has been made for the time difference in the NC capital investment programmes in the US and in Europe.

Situated in the heart of Scotland's industrial central belt, NEL is entirely government financed; it has a total staff of 900 working generally in the field of mechanical engineering. The Laboratory's research programme is directed by a steering committee of three top men from industry and two from the Ministry of Technology itself. The NC Division has a staff of about thirty computer programmers, part-programmers and supporting personnel: elsewhere in the Laboratory is a Univac 1108 which was purchased mainly to assist the NC and the Computer-aided Design Divisions.

The Ministry of Technology is the government department sponsoring the machine-tool industry and has a special unit investigating ways in which public funds can be deployed to help this industry modernize more quickly. Already £5 million has been earmarked for assisting the introduction of newly developed machine tools. NEL is intimately concerned with this programme and plans to become the national centre for advice on NC programming. Geographically close to some of the big names in British engineering—Rolls-Royce, Colvilles, John Brown, G. & J. Weir—NEL is in close touch with current trends and market requirements in engineering.

When the NC Division was set up in 1965 APT was considered to be the most comprehensive machine-tool programming language available but proved to be in many ways too sophisticated for current use in British industry where numerically controlled multi-axis machine tools are still a rarity and computers having 64K 36-bit core are in very limited supply.

three constraints

Nevertheless, as APT is internationally well-established, it was decided to use it as a basis for the work at NEL and the following three constraints are incorporated in our work.

(1) APT-type part-programming instructions are used.
(2) APT CLTAPE forms the interface, via the post processor, between the NC language compiler and the machine-tool director.
(3) Compilers are written in ASA FORTRAN IV.

British industry most urgently required a programming language for controlling milling machines having continuous path motion in two axes and line movement along the third axis, and capable of running on computers having a 16K 24-bit word core, of which 4K was reserved for the Executive program. Based on these requirements, plus the original three constraints, the 2CL program was developed under contract by Ferranti Ltd. and the first successful part was machined on 14th June, 1967, using the program. The part-programming language was tabled by the British Standards Institution until the November 1967 ISO Paris meeting where it was considered as an International Standard. The program has the usual straight line, circle and tabcyl geometry but has the additional features of terse alternatives, parallel tabcyls and area clearance. This latter feature enables the part programmer to specify an area bounded by a closed contour, describe the machining conditions to be used for clearing the area; and movements of the cutting tool. The language is at present implemented on the Univac 1108 but NEL will, in addition, be responsible for its being implemented on the EELM KDF9, Elliott's 4100 series and the ICT 1900 series computers, and the processor will be made freely available to all British industry. NEL will also be responsible for maintaining and developing the program and will, from time to time, release updates.

A survey of British manufacturing industry indicated a need for a national point-to-point language, and in line with a policy of wherever possible making internationally

Mr. Sharman is employed in the numerical control division of the National Engineering Laboratory, Glasgow, Scotland. He received his technical education at Loughborough College of Technology, Manchester College of Science and Technology, and Birmingham Univ.

established NC languages freely available to British industry, the Laboratory is currently negotiating with the German "EXAPT Organisation" to purchase outright the UK right for EXAPT1. A version of the EXAPT1 compiler is currently running on the Univac 1108 and part programs executed so far indicate that the language meets the main requirements of British industry and fulfills the three constraints mentioned previously.

Before any computer language may be usefully employed controlling an NC machine tool a computer program (post processor) has to be written which tailor fits the generalized output of the processor (CLTAPE) to the peculiar requirements of the individual machine tool/control system. The Laboratory believes that the machine tool, control system and post processor should *all* be the responsibility of the prime contractor, but as there was little experience in writing APT post processors in Britain, the Laboratory advises on the subject and makes its own post processor experience freely available. At present two members of staff have been seconded from industry for a period of one year in order that they may gain experience in writing post processors.

To date four post processors have been written in the Laboratory for, respectively, Kearney & Trecker milling machine fitted with Ferranti MK4 continuous path control system; Vero turret drill fitted with Ferranti point-to-point Scope control system; D-MAC graph plotter; and IDI display.

The IDI display post processor is perhaps the most interesting as it enables the cut vectors contained on the APT CLTAPE to be displayed on the IDI screen and by using the keyboard the display may be rotated about any axis and selectively magnified by zooming. Once the required view has been obtained a hard copy may be obtained on the 30″ CalComp plotter.

The APT compiler is being examined in considerable detail, primarily in the more sophisticated areas such as GCONIC, TABCYL, POLCON, APTLFT-FMILL, etc., and a large number of test programs have been executed in addition to preparing part programs and machining trial components for British industry. In order to improve the turn round of part programs, especially during the debugging stage, Westrex duplex teletypes are used to input the part programs although, due to the volume of output, the CLTAPE and CONTROL tape listings are obtained from the Univac 1004.

One member of the staff has been seconded from industry for a period of twelve months and a number of other industrial personnel have been seconded for shorter periods to gain part programming experience in the Laboratory.

The Laboratory at present uses a Kearney & Trecker milling machine fitted with Ferranti MK4 control and a Brown & Sharpe drilling machine fitted with a GE Mark Century 120 point-to-point control system. Due to be delivered this year are a Vero turret drill, fitted with Ferranti Scope control, and a Churchill-Redman lathe fitted with a GE Mark Century 100S continuous path control system. Wherever possible the machine-tool control systems are specified to accept ISO 7-bit code set for punched paper tape.

As a temporary measure, until the Laboratory obtains its own multi-axis machine tool, experience in APT multi-axis part programming is being obtained by hiring machine time on the Sundstrand Omnimill OM3 fitted with the GE Mark Century 105C multi-axis control system at IITRI, Chicago.

For the immediate future, work is continuing on the development of a graphical input language for the 2CL program and experience will be obtained on the EXAPT2 processor using the Churchill-Redman lathe. ■

THE BCL PROGRAMMING LANGUAGE

by DAVID HENDRY

BCL is a general-purpose programming language with special reference to data structures, which are in themselves organized into a general system.

The target of a data-structure system is to express the logical structure of problems as clearly as possible. "Define the problem—don't write an algorithm to solve it." In BCL there are two kinds of concepts or objects, active and passive. Active objects are references to things like data structures or data variables which are used as operands. BCL has a coherent central scheme of reference which applies to active or passive objects.

BCL has brought right out into the open the concept of an address in the machine; it isn't coy about it. Every kind of object in a BCL program is capable of being referenced. You can get at the address of the thing, as well as the thing itself. Referencing may be by name, by indirect name, by number, by parameter, by condition and by function generation. This generality of reference abolishes the need for labels, whilst at the same time providing an easy way to use them for those who are only happy with the familiar. References which are invalid because of the context in which they are made, such as

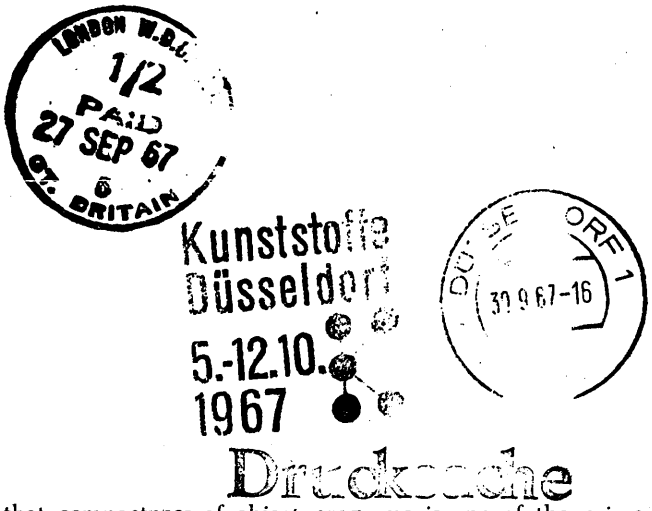
Mr. Hendry is a lecturer at the Institute of Computer Science, London University. Previously he spent four years in commercial programming for NCR and the Atlas Computing Service. His work on BCL is a response of the university to British government and industry requests for assistance in making best use of scarce systems analysis resources.

treating data as program, are detected either at compile time or run time by the BCL system.

The system is implemented on the ICT Atlas computer at the London University Institute of Computer Science. The compiler is written in the BCL language and occupies less than 6K of 48-bit words. A 360 series compiler, for 64K stores, will be in use by the second quarter of 1968.

BCL is a product of the experience gained with the Atlas Commercial Language (ACL). The designers of the language believe that if systems analysis leads to the unambiguous description of data structures these should be processed by the system with the minimum of procedural statements. This enables the programmer to concentrate on creating a steering program. The specific timing of actions in the logical sense provides the basis for the steering program. These logical needs arise from the interaction of commands with data. BCL programs may be said to be data driven.

Conceptually, the language provides merely input, output and value storage commands. To actuate label reference—where this crutch is used— a GO TO command is provided. A full evaluation of the efficiency of compiled programs has yet to take place, but it is already apparent



that compactness of object programs is one of the prime virtues of the system.

The current concern in programs is for a blend of business and scientific types of computing and the introduction of generalised arithmetic expressions as a type of object, combined with a generalised referencing capability, gives BCL, its designers believe, greater power than PL/I in scientific applications. The very limited number of rules to be learnt makes for ease of learning. However, as the strength of BCL lies in its data structure concepts these are outlined below.

data elements

Many data processing languages only allow you to use data variables (items which can be integers or character strings, etc.) in a data structure. In BCL several further facilities are provided.

Character literals. On input, character literals can be used as identification marks or control symbols to specify which of several alternative possible structures is coming in on the input stream.

On output, fixed characters located inside data structures can be output as headings and messages.

In both cases, it is also possible to include new line, new page, and space specifications in the data structure, in the same way as character literals.

Elements previously defined in other structures. It is allowable to write

```
X is (P, Q, R)
Y is (A, P, B)
READ X
PRINT Y
```

which would cause values to be read into P, Q, and R, and then cause the values of A, P (the same P as before), and B to be printed. Unless this is allowed, it is necessary to declare a new variable in the current structure and copy the old one into it. In other words, you can define your output records in terms of input variables and substructures without any need for movement of data.

Names of other structures. BCL extends this basic principle to whole structures previously defined. This simply means that whatever the other structure is, it is included in the structure being defined, at the appropriate point.

```
e.g.  X IS (A, B)          (The structure being defined)
      Y IS (P, Q, X, R)    (The other structure)
  Y now means (P, Q, A, B, R)
```

Commands. Commands can be written as elements of structures, and they can be executed at that point. This saves storing flags which steer the programs and trigger the commands later.

Arithmetic expressions. This facility allows you to define an arithmetic expression as an element in a structure for output. This means that its value is to be printed at that point, and avoids the necessity to calculate it, store it somewhere, and then print it.

Editing specifications. In general, editing operations are concerned only with the input or output of a variable, and not in any way with how it is held internally in the computer, which is of no real consequence to the programmer.

arrangement of elements

Juxtaposition. BCL allows items to be specified as being situated one after the other, either in the store of the machine, or on the input/output medium.

```
X IS (P, Q, R)
```

This means "X is composed of P followed by Q followed by R."

Alternation. Many records, whether to be input or output, have alternative forms. These will be defined in terms of alternative, mutually exclusive, substructures. The existence of a particular one of a set of alternatives is usually dependent on the recognition of certain control symbols in the case of input, or on certain conditions being satisfied for output.

```
X IS (P, Q, EITHER ('*', A, B)
          OR ('/', P)
          OR Z
Y IS (P, Q, EITHER [IF CODE E 1, P, Q]
          OR Z)
```

Repetition. BCL allows data structures to be repeated within another structure, either under the action of a control variable, or a number of times specified by certain minimum and maximum limits.

```
X IS [P, Q, (R, S (I) (I = 1 TO 3)]
```

equivalent to

```
X IS [P, Q, R, S(1), R, S(2), R, S(3)]
```

Data structure parameters. Parameters of structures, like those of subroutines, allow different elements to be slotted into any position in the basic data structure.

```
X (R, T) IS (P, Q, R, S, T, U, V)
```

A later reference to, say, X (L, M), would mean (P, Q, L, S, M, U, V). This facility is particularly useful when several data structures are identical except for slight differences in one or two places. ■

ECONOMICS OF TIME-SHARED COMPUTING SYSTEMS

part two

by WALTER F. BAUER and RICHARD H. HILL

In Part I of this two-part series we examined system design considerations bearing on the economics of time-shared systems. This part discusses hardware and software cost factors and other topics more directly related to the implementation of such systems.

Time-shared systems will undoubtedly cause a greater attention to large scale, centralized computer complexes. Since the physical location of the computer is relatively unimportant, why not locate the equipment centrally and derive the benefits of that centralization? This tendency to centralize plus the requirements for reliability and expandability in time-shared systems will, in turn, generate increasing interest in mutli-computer systems. The system configuration of computer equipment is an important factor in cost-effectiveness.

Even before time-shared systems commanded such a great deal of professional interest, multi- and modular-computer systems were becoming increasingly prevalent and popular. Most of this early interest stemmed from a number of military command and control systems which had important on-line features. Some of these were SAGE, SAC Control System (SACCS), the Air Force Command Post (System 473L) and the Department of Defense Damage Assessment Center (now part of the National Military Command System). A multi-computer philosophy was introduced by the military initially for reliability, but it has important by-products in flexibility, efficiency and economy.

computer configuration aspects

The multi-computer system has become a generic name for one which is modular in concept and design. It allows the interconnection of various modules such as processors, input-output channel handlers, high-speed memory devices and peripheral units in ways which allow the computer to be re-configured both on a millisecond basis and, in the case of adding or deleting modules, on much longer time scales such as weeks or months.

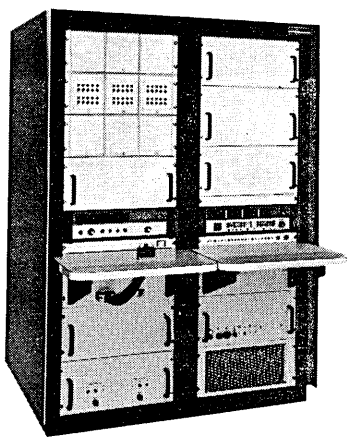
Although there are a number of economic advantages to modular computer systems used in time-shared systems, two salient characteristics are reliability and expandability. It has often been noted that equipment or software failures in a time-shared system can have serious effects on hundreds of people, while a batch system usually has enough buffering and elasticity to admit short-length down time. At the very least, since the users are conditioned to lengthy turnaround times, small extensions cause relatively little grief.

A significant amount of reliability can be achieved in a multi-computer system with only a modest cost for equipment redundancy. Equipment redundancy in the neighborhood of 20-30% can buy the same reliability that 100% equipment redundancy buys in the non-modular systems. If an on-line system is designed for 100 users, and is currently being used at 75% capacity, one of the four processors could be lost without degrading system performance. Alternatively, if it were being used to capacity, and one processor went down, only the lowest priority (25%) of the work would suffer.

Expandability is probably an even more clear-cut characteristic of some of the advantages in time-shared systems. Fig. 1 *(p. 43)* shows the advantage of a modular system in an expansion situation in minimizing costs of excess capacity capability. Processors, more high-speed memory and more input-output channels can be added to accommodate the growing numbers of on-line users. It is true that this imposes some additional design requirements on the software. The executive, for example, must be written in a way that it need not be altered greatly with the addition of the extra modules. However, this should not be an inordinately costly software factor.

It is likely that many time-shared systems will be designed with a separate input-output computer which interfaces between the basic processor system and the

Fairchild has these fond memories of Librascope



Unlimited programmed testing with flexible test sequencing is one reason why. That's the advanced state-of-the-art job called for by the programming unit of Fairchild's new Series 4000M Automatic Integrated Circuit Testing System. Librascope's Series L100 Disc Memory got the call. Each stores 900 test programs—grouped in sequences of 25—and runs up to 60 per second. The same testing line accepts a variety of devices for high-speed processing. A simple keyboard programs the disc—no accessory hardware needed. And an entire sequence is reprogrammed in minutes. Proven reliability (over 600 L100 units in use) stems from conservative, no-compromise design. Yet the L100 is probably the lowest-cost disc memory on the market.

Thanks for the memory order, Fairchild—reputations are made of this. For the brochure detailing the longest line of discs in memory, write: General Precision Systems Inc., Librascope Group, Components Division, 808 Western Avenue, Glendale, California 91201.

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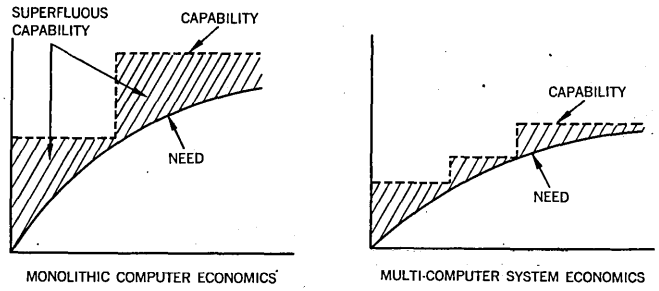
consoles as well as between these two types of equipment and the auxiliary memories. (See Fig. 2.) This concept is the one currently employed for SDC's TSS and MIT's Project MAC, and it is also being utilized in the development of modern message-switching systems. The input-output computer is frequently called a "sequencing" computer or "concentrator." It handles the bits and pieces of communication between the end-use devices and the main computer. It can, for example, accept the character by character input, check for format, syntax and the like, make certain initial decisions on priority of the message and, at the appropriate time, transmit the composite message to the main processor. It is economically advantageous in that a simple computer can be used for this task. Also, simple software can be designed since the executive of the sequencing computer need not interact

Fig. 1



in detail with that of the main processor, and the main processor can be utilized with greater efficiency since it will be interrupted with less frequency.

The concept of the sequencing computer described above is frequently used on communications systems and is referred to as the "local loop" concept. The basic principle here is to use a simple loop for the local traffic, low bandwidth activities, and allow for multiplexing the information to provide high bandwidth transmission to the main processor. It is interesting to observe that the modern computers being developed expressly for time-sharing operations utilize modularity to a very great extent. Examples of this are the GE-645 and the IBM 360/Model 67.

hardware and software costs

For quite a large number of reasons, information on the cost of implementing time-sharing systems is sparse. In particular, these writers have found no references which quantitatively present information on hardware and software costs, especially compared with batch systems. The newness of the field probably is the best explanation of this dearth of literature and analyses. Those sufficiently knowledgable about time-shared systems to make such contributions are deeply engaged in analyzing and designing, where the attention is turned to the technical factors only and the economic implications are given less emphasis. However, the various cost factors in these systems can be identified and discussed, and it is constructive to do so.

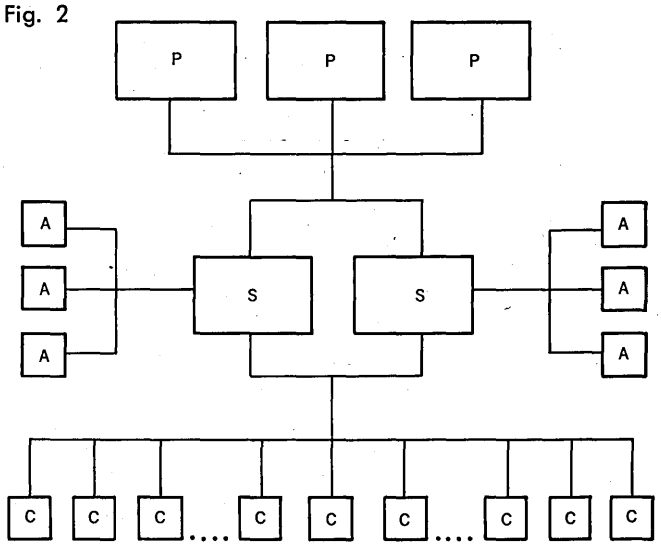
Hardware Costs: Certainly the hardware costs for a system capable of efficient time-shared operation will exceed those of batch processing hardware. Some of the reasons for this increase in cost are:

1. Additional working storage features.
2. Multi-access to and independent operation of working storage.
3. Large internal high-speed memory.
4. Increased storage capacity of auxiliary memories.
5. Hardware speed degradation.

The working storage features necessary for on-line systems result from the needs of the executive to determine the instantaneous status of the computer system when attention is being turned very rapidly from one user to the next. Perhaps the most important feature here is the dynamic relocatability hardware. This is hardware which allows part of a program (frequently referred to as a "segment" or "page") to be read in from auxiliary memory into any portion of the physical working storage. That part of working storage may not be the location from which the program operated before, and since there is a requirement that the programmer (user) need not be concerned with the location of his program each time it is to be executed, the modification of the addresses for relocation must be handled automatically. Therefore, in the interpretation of an address, a table look-up is accomplished by the hardware to determine in which portion of the memory the address is to be found, and then the proper modification to the address is made to determine the effective address. Essentially, therefore, there is an associative process which is carried out—the address of the program must be associated or correlated with the portion of the actual memory in which it is contained; a small associative memory is actually included in the machine which has the automatic dynamic relocation capability.

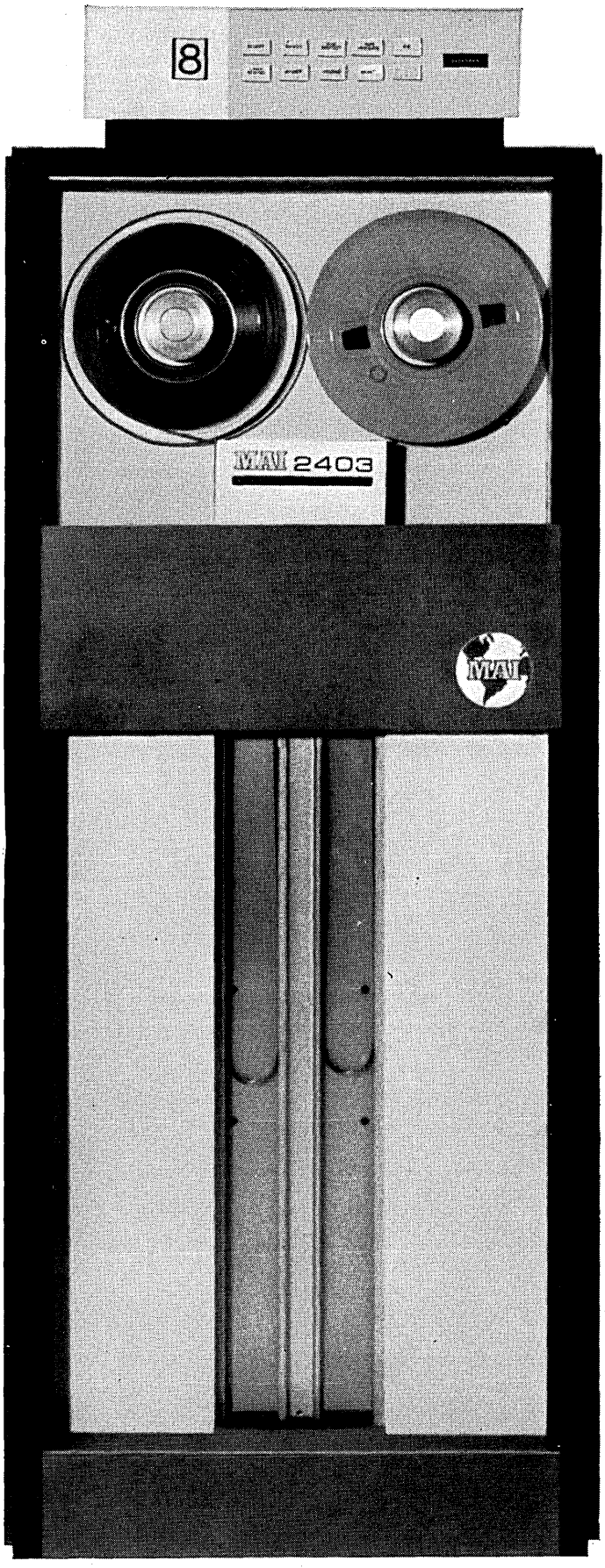
Other working memory features are also deemed desirable. Although it is becoming quite common to have memory protection on computers, some of these features have been extended in the case of time-sharing hardware. For instance, it is common to have a memory protect feature which prohibits writing into any unauthorized memory space. This feature has been extended to the

Fig. 2



prohibition of *reading* from any unauthorized space as well. This affords an extra degree of assurance that the hardware/software combination is doing what it is supposed to do, and also provides extra assurance of privacy.

Still another feature being added to time-sharing systems is one which indicates whether the portion of memory of a portion of the program has been used or whether it has been referred to or changed. Two bits are added to a memory block; one which would indicate whether the block has been referred to, and one which would indicate whether the information in the block has been changed. The uses of this feature are manifold. For example, one could conceivably design an executive which would shift out a portion of the memory if it has not been



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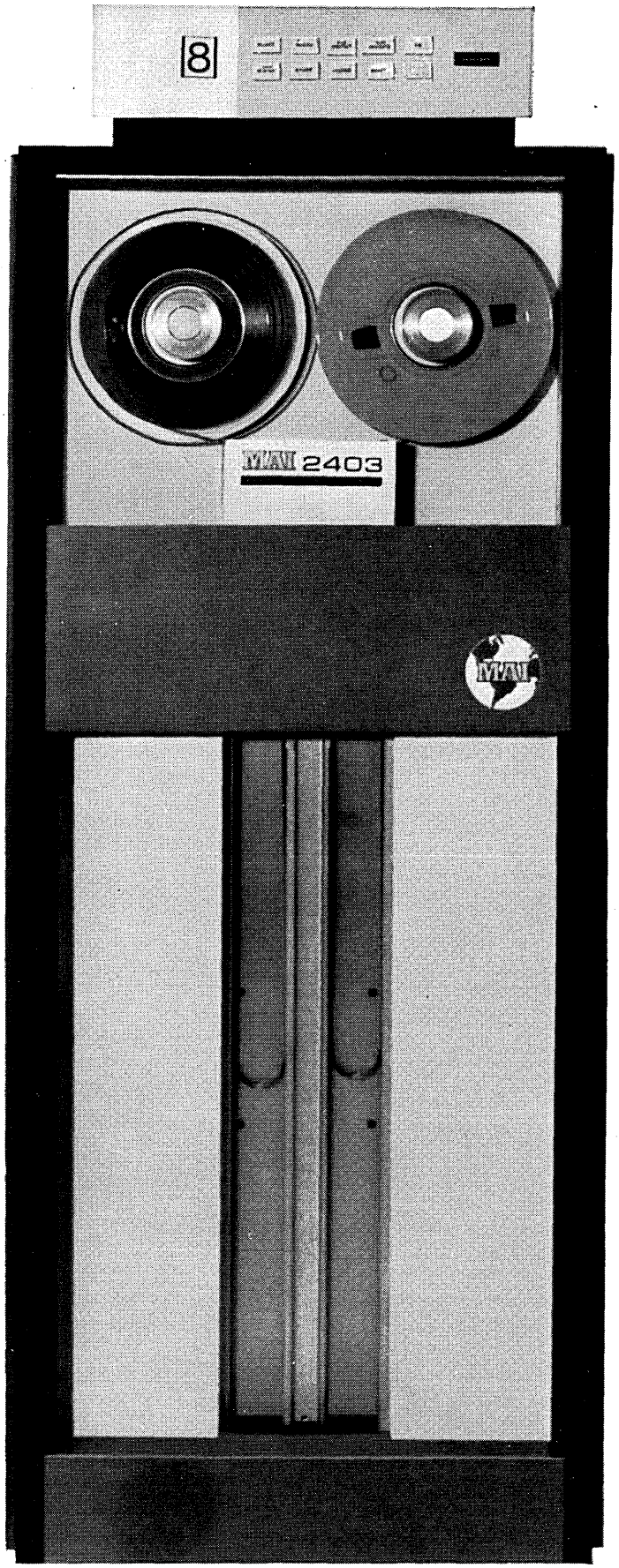

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referred to or changed for a given period of time. The assumption is made that this is not an "active" portion of the program.

In order to reduce the non-productive period when the main processor is awaiting new portions of the program which must be transferred from some auxiliary memory ("swap time"), considerable changes must be made in hardware over conventional systems. In conventional systems, memory accesses for input/output transfer are interleaved with those of the main processor, thereby degrading the performance of the processor. Various memory-sharing schemes have been devised to minimize such degradation. However, in time-sharing systems, it is desirable to provide a sufficient independence of action between the memory devices and the auxiliary memory and input/output devices to allow a large amount of transfer to take place independent of the main frame. This requirement arises because of the much greater amount of swapping between auxiliary memory and working storage in a time-sharing system.

Some systems have used interleaved core banks (odd addresses in one bank, even in the other) to increase program efficiency. Since instructions occupy consecutive cells, one can be fetched while the previous one is being executed. In a time-sharing system, however, the input/output transfers between auxiliary memory and main memory predominate. Memory should be organized into integral banks of consecutive locations, then, so that the program and data for one user can be entered into one bank from auxiliary memory (discs or drums) while another user is executing from another bank. It is clear that the main memory should consist of several banks, rather than only two, each of which can communicate with other devices if it is not connected to the main processor. Choosing the number of such banks and the size of each is a highly complex problem in system design, involving trade-offs among circuit cost and operating efficiency, decisions as to optimum sizes of program modules and the cost of executive program software. It is clear with only a little reflection that four 8,000-word, independently operating core memory units will operate better (but be more costly) in a time-shared system than a 32,000-word memory organized as two 16,000-word units.

Larger high-speed memories are required for a number of reasons. The most obvious reason is that a complex executive resides in working storage and cannot, because of the high frequency of its usage, be kept even part in auxiliary store. The SDC executive for their TSS is 16,000 words in length and does not represent a complex executive as compared with ones currently being planned. In the General Electric 600 series, 8,000 words of high-speed memory are added to the basic core specifically for the resident executive. Still another reason for large amounts of high-speed memory is to increase the probability that the part of the program or data that is required next is on hand in high-speed storage. Ideally, it is desirable to have in the memory all possible parts of all programs that could potentially be activated next; the larger the high-speed core is, the more likely it is that the program part is ready for execution.

the high cost of core

A significant observation about high-speed storage is that it represents the most costly part of the machine. Frequently, storage costs more than the processor. Another significant point is that in comparing batch and time-shared hardware system costs, one must realize that an additional amount of high-speed memory—probably as much as 50% more—is needed; therefore, it is a significant increment in cost.

Those programs which are active but not in core must still be ready on short order to be transferred to high-speed memory and used. There are probably at least three levels in the auxiliary memory hierarchy. First of all, there is the magnetic drum which stores program data that can be transferred in a high rates to main memory. These are programs that are currently active—probably programs of users currently at the console. There should probably be as much as 16,000 words of storage for each console station, which implies on the order of 1,000,000 words of drum storage for a 50-console station system.[1] The next level in the auxiliary memory hierarchy are those programs and data which have been active during the day or week which are likely to be brought to action. They may also represent portions of a program which overflows allotted drum space. Those programs can be stored on random access disc devices. The third level of hierarchy is now frequently considered archival in nature—magnetic tapes. Magnetic tapes will be used as a general backup for providing an additional reservoir of active programs. Disc packs and data bank devices (CRAM, RACE, IBM Data Cell, etc.) fall in an intermediate category between on-line and archival, having characteristics of both.

The last item mentioned above on hardware costs refers to lowering efficiency of the hardware system rather than an increase in the basic cost of the hardware. In the process of interpreting addresses when programs are relocated (that is, in the action of the relocatability hardware), extra time is required beyond the normal operation of the main frame and the memory. The process of associating the address of each executed instruction with one of the various portions of the program, and then modifying its effective address, requires an additional 15-20% of computer time.[2] In other words, the basic memory cycle is slowed down by this amount. This is not incurred by poor programming, but is part of the wired-in characteristics of the computer. Any additional overhead or inefficiency in the machine starts from this point, and is in addition to it. This is a subtle point, frequently not fully appreciated by time-sharing advocates. It is, for all practical purposes, like adding 15-20% rental to a machine and, again, comes in addition to any other total system inefficiencies.

Communications and console costs are likewise important in time-sharing systems. Communications costs are almost always a factor in time-sharing systems. While some consoles may be within cable connection distance of the computer, this is probably impractical for all but the smallest and simplest systems. Communications costs and usage is a far-ranging subject which will not be touched upon here.

The main cost item in peripheral equipment is the user station itself. This may vary from a teletypewriter station costing in the neighborhood of $1,000 to an elaborate console costing in the neighborhood of $150,000. A low-cost terminal is one of the pressing needs of time-sharing technology. Paradoxically, it is increasingly evident that the terminal must have more than simple typewriter capability. The minimum user station is a teletypewriter, but most applications now demand graphic capability (i.e., cathode ray tubes) for a page of information or the equivalent in displays. Thus, attempts to get by with the

[1] These figures apply especially to a large-scale, *general-purpose*, time-shared system.

[2] Some computers are not degraded by these processes. For example, it is probable that no degradation would be incurred in the case of a processor-limited (as opposed to a memory-limited) computer. However, most computers are memory-limited.

limited capabilities of the Touch Tone telephone as a terminal device have not met with success. Note also that costs of buffering the terminal and communicating between it and the central processor are extra.

software costs

The general factor which leads to increased programming and analysis costs in time-shared systems is that of increased system complexity. Some of the factors, in turn, involved with the increased complexity of the system are:

1. The programmer must make allowances for "simultaneous" occurrences. Part of this is a design problem and part is a programming execution problem. It involves building the proper networks to react to the various random occurrences in the computer system which result from human inputs which, in turn, provide a multitude of interrupts to the system operation.
2. There is a basic problem of working storage overlay in such a system since there is a very large amount of programming data swapping between working storage and auxiliary storage. The systems must be properly developed to enable this swapping with a maximum of user efficiency or program execution productivity while, at the same time, giving all users a sufficient number of time slices within a given period of time to allow the system to be responsive. In more recent systems, there are hardware features ("relocatability hardware") which facilitate memory overlay operations. However, the executive must be properly designed to make good use of such hardware features.
3. The memory management problem becomes far more complex since there will be many levels of data storage depending upon the frequency of usage. There will also be communication among the various storage levels and a logic of describing the data which is consistent from the point of view of the many users and consistent from the point of view of the many storage levels.
4. The design of a scheduler which takes into account the various conflicting objectives of the system and its users is a continuing factor. To insure a near-optimum system requires considerable paper analyses and system simulation. Unfortunately, the large number of parameters and the environmental anomalies make a unique solution to the scheduling problem a near impossibility.
5. The development of conversational mode languages and debugging aids is also complicated. These languages break down into two general classes: conversational compilers which are essentially adaptations of existing or off-line compilers; and new utility languages for man-machine communication and command.

Despite all of these apparent increases in software costs, a number of highly respected systems people with experience in both batch and time-shared systems insist that a time-shared system is no more complicated than a sophisticated batch system and, therefore, no more costly. This opinion may or may not hold up under scrutiny; a great deal depends on the system definitions. Certainly IBM will spend more on development of OS/360 than on TSS/360. However, this comparison may not be meaningful for obvious reasons. A time-sharing system designed for restricted usage may well be less costly to implement than a highly general sophisticated batch processor. It seems apparent, however, that time-shared systems are always more complex than batch processors at the same level of generality.

However, the added complexity and costs do not augur

ill for the future of time-shared systems. Remember that much of the design and programming being done for time-shared systems today is new. The professionals are greatly increasing their efficiency to produce systems of this kind.

costing and pricing

Early sections of this report dealt with questions of the relative merits of batch and time-shared systems from economic standpoints. They have dealt also with the relationship of technical features to economic ones. The previous section dealt with costs of hardware and software. This aspect of the economics of time-sharing systems—costing and pricing—is more closely related to business aspects. Costing and pricing refer to how one should account for costs and how charges should be made to customers—these are important aspects to any time-shared system whether it be for commercial usage or to implement in-house capabilities or requirements.

Anyone familiar in detail with the accounting and pricing procedures for large-scale batch systems will have no difficulty with developing accounting and charge policies for time-shared systems. Administrative procedures for the batch systems are relatively straightforward, at least as they have usually been applied. The system equipment costs are well known for the first shift rental and for marginal additional rental on second and third shifts. Usually each job uses the entire system or, at least for simplicity, it is assumed the entire system is used. One simply keeps accounts of the amount of time the job runs on the computer, and charges the person appropriately.

Time-shared systems will be more complex. Though there are differences, the philosophy of accounting and pricing is not radically different for a time-shared system, or shouldn't be. The time-shared system user will use a very powerful computer for shorter periods of time; perhaps accumulations of time slices ranging from 50 to 200 milliseconds. There will be the introduction of the concept of "overhead computing," where the computer system is performing computations—perhaps extensive—in support of all users. Certain sophistications may be introduced in pricing such as charging the customer according to the priority he has been given in servicing the problems in the queues.

As with any kind of accounting procedure, there are two types of cost: overhead and direct. The former are those that are not attributable to the given user, but benefit all users. The latter are those that are directly attributable to the user. Examples of overhead items are: operation of the executive, swapping between auxiliary and working memories, and idle time. Examples of costs that are (or are more likely to be) direct are: productive main frame computation, console time used, and auxiliary or working memory space used.

Although most of the identifiable costs clearly fit into one category or the other, there are a number that could fit in either category, depending upon the accounting philosophy. As with all accounting systems, the question is whether keeping account of small costs and attributing them to specific users is worth the extra cost of the required monitoring and handling. On one hand, it is desirable to give the customer a complete accounting of just what system capability he used, and thereby reduce overhead costs to an absolute minimum. However, cost accounting can be excessive if carried to a very low level of data processing functions.

A third type of cost can be regarded as a "one-time"

cost. Examples of this are the system design and systems programming costs that are done either initially with a system or at periodic intervals as the system is being modified or upgraded. These costs are not usually regarded as overhead and, of course, they are not direct charges to the customer. In general, they are amortized over a given period of time, and the prices charged for the services must, of course, take these amortization rates into account.

customer charges—profit and loss

Normally the basis for charges to the customer is the direct costs described above, appropriately burdened. In the simplest case, the customer is charged according to processor time used, which includes an allowance for a normal amount of overhead costs, such as those described in the previous section. Some specialized systems allow a charge per transaction. Some charge procedures will involve keeping track of time to the nearest millisecond for the main frame and for the peripheral devices, and will charge different rates depending upon which of a half dozen or so priority levels are used.

Some clues are now available as to order-of-magnitude costs of time-shared systems from the user's viewpoint, however. Table 1 lists cost data for ten time-sharing systems commercially available. It is interesting to note that there is a factor of six spread in the per-terminal-hour charge for these systems (from $5 to $30), and even more interesting to note that there are two different pricing philosophies. One involves a per-terminal-hour use fee, usually on a sliding scale according to the number of hours used per month. The other provides a fixed fee per month per terminal which in some cases amounts actually to a minimum charge. In one case not represented in the table (Keydata Corp.) pricing is totally dependent upon facilities used.

The variance in prices and pricing techniques would appear to indicate that more experience is required before cost factors in time-shared systems are well understood.

The unsophisticated buyer should be wary of any costs which relate only to console time. In the first place, he may be deluded into some belief that console time equals processor time. Even if he has no such delusions, he should realize that the amount of processor time he gets for a given period of console time may vary greatly, depending upon a host of conditions such as number of other users, types of other problems in the system, and the like.

The computation of the price for service will, in principle, not vary from the price of any other service or product which, just as in manufacturing, is based on a certain expected usage or sales rate. If, for example, the charges were based on main processor time only, the price would be based on a certain number of hours of usage per day—say, six hours of billable or chargeable main processor usage. All overhead costs would be added in such a way as to make the six hours of billable time a break-even point in the system. If the usage goes below the six-hour level, the overhead rate goes up and the system "loses money." If the system is utilized more than six hours per day, the system "makes a profit."

Once the break-even point is passed in a time-shared system, the operation can, of course, be very profitable. If the break-even point is sufficiently low to allow usage beyond that point without adding equipment, then the profit leverage can be great. However, the profit leverage can be good even if certain peripheral equipments or high-speed memory units have to be added to keep the system from downgrading in the quality of the service as the service amounts are increased. As the quality of the service deteriorates, that is as response times get intolerably large, a processor can be added. The system should be of the multi-computer nature to allow for the efficient addition of such extra capability. Also, the programming system should allow the addition of an extra processor, and if it were designed correctly in the first place, it will be. It is clear that many one-time costs are independent of the number of users. Among these are likely to be physical space, programming system, and most of the computing system. Therefore, as the amount of usage rises, and it can rise almost indefinitely in a well designed centralized system, the profit leverage gets extremely attractive to the entrepreneur or to the organization implementing a system for service in a large company or agency. ■

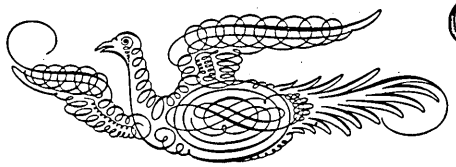
Table I. Commercial Time-Sharing Systems

Organization	Computer	Number of Users	Fixed Fee Per Month Per Terminal	Average Cost Per Terminal Hour	Additional Charge Per Hour Per CPU
Allen-Babcock Computing, Inc.	IBM 360/50	60	$250	None	$240-$480
Applied Logic Corp.	DEC PDP-6	20	None	$ 5.00	$360
Bolt, Beranek & Newman, Inc.	DEC PDP-1	16	None	$12.50	None
CEIR, Inc.	GE 235	30	None	$ 5.00	None
COM-SHARE, Inc.	SDS 940	32	None	$10.00	None
General Electric Co.	GE 235 (New York)	40	$350[1]	$10.00	$180
General Electric Co.	GE 235 (Penn)	—	None	$20-$30	None
Munitype, Inc.	GE 225	50	$150-$350	None	None
IBM-Quiktran[2]	IBM 7044	40	None	$12.00	None
Tymshare Assoc.	SDS 940	60	None	$13.00	None

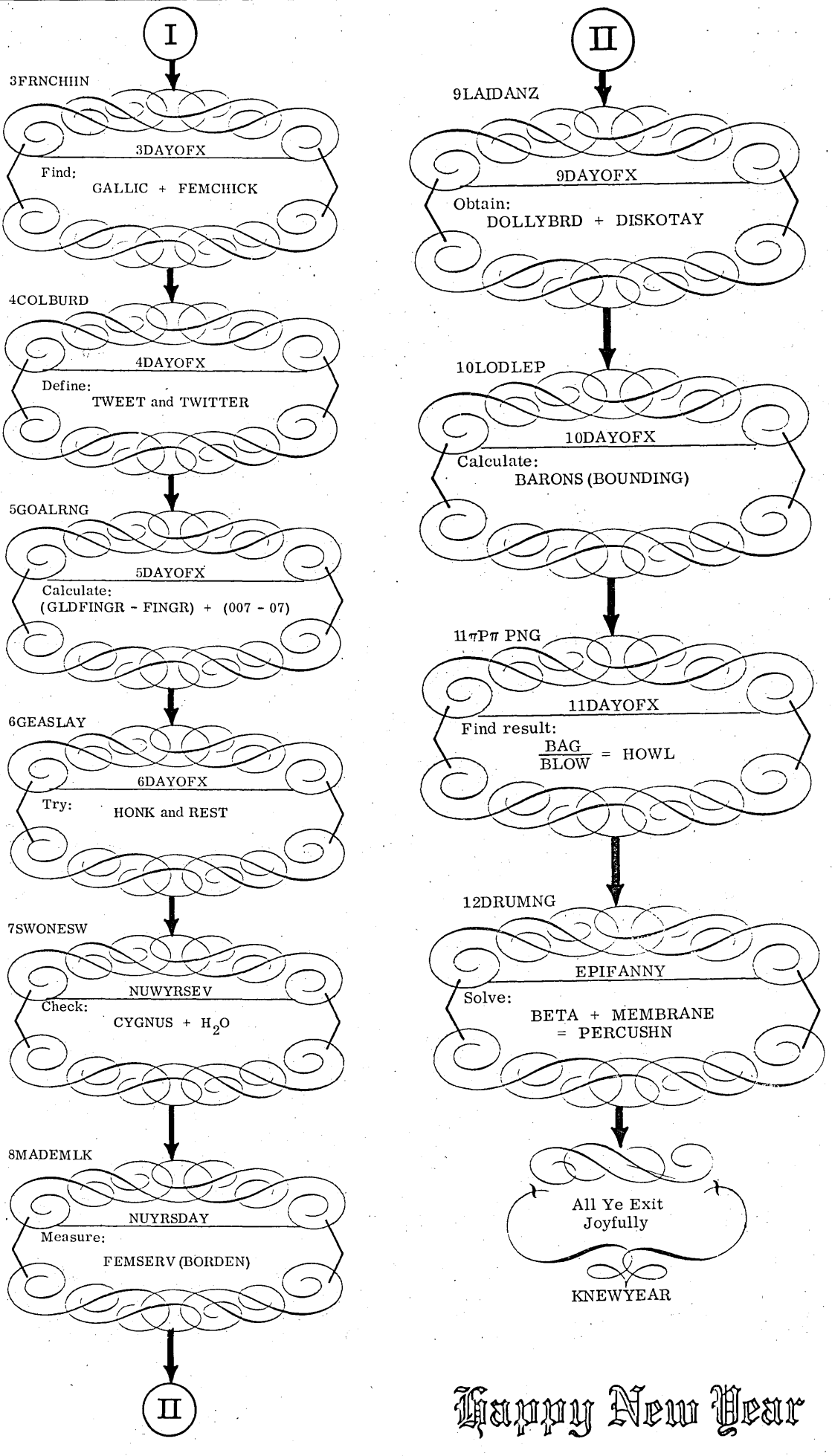
Table adapted from data published by Computer Research Corporation, Newton, Mass.

[1]Includes 25 hours of terminal time and 24 hours of CPU time.
[2]Systems located in New York City and Los Angeles.

Christmas Flowcaral



Merry Christmas



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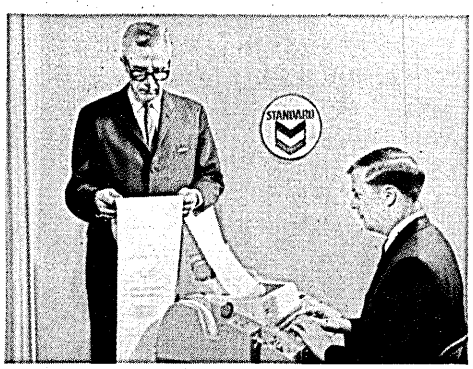
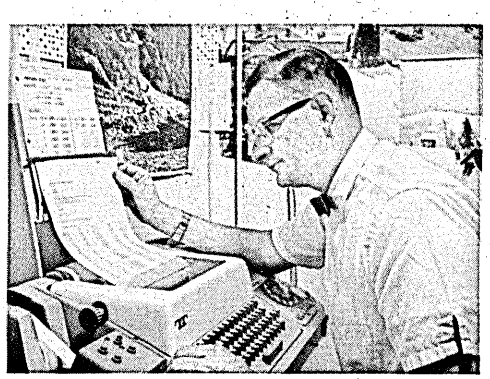


"New insights into problem solutions are now being made as a result of the 'power assists' to the imagination from having a conversation with a computer." **J. E. Walstrom, Consultant-Formation Evaluation, Standard Oil Company of California.**



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CYBERNETICS CONFERENCE

For one and a half days on October 26 and 27, 1967, in the beautiful auditorium at the National Bureau of Standards in Gaithersburg, Maryland, there was a revival of a three-ring circus and variety show with an all-star cast, including three outstanding foreign luminaries (one for each ring), that performed its repertoire before a mixed audience of some 250 of the merely curious and the buffs.

Of course, the First Annual Cybernetics Symposium—with the esoteric, all-embracing (thus little understood) theme: "Purposive Systems — The Edge of Knowledge"—was not billed as a revival even though it was advertised as the twelfth conference on cybernetics.

It was not billed as a three-ring circus; it was described as a conference with three technical sessions: Man as a Purposive System; Machines as Purposive Systems; Men and Machines Together as Purposive Systems. And it was not billed as a *variety* show but as an *interdisciplinary* meeting. Almost all the speakers were indeed famous for their specialties—which they spoke on very well, largely disregarding the obviously contrived titles of their papers. Almost all speakers' products were bottled and uniformly labeled: For Purposive Systems Only. And the show was very good. Highly entertaining, polished performances, little information, which is all one could reasonably ask of a show.

Important and famous people spoke on the nature of our society and the potential role of "cybernetics" in solving our horrendous problems. Dr. Frederic Seitz, president, National Academy of Sciences, noted that from the cave man, to agricultural man, to industrial man, to science-based technological man, each technological success engendered a new series of technical and social problems harder than before. Seitz' principal concern is a parallel of Nero fiddling while Rome burned. He worried about what he called the "death of interest in innovative methods of problem solution. In the U.S., this might happen in ten generations," he said. His hope lies in the "cybernetic revolution" which in one-third of a century, by the evolution of feedback technology, will enable us to do large and complicated tasks efficiently with ever fewer people.

Dr. Emanual Mesthene, who is in charge of the IBM-funded program at Harvard University on the implication of technological change, opened his talk with the admission that he didn't know anything about his paper's published title: "Social Organisms as Purposive Systems." But he did know about the Harvard program and that's what he talked about . . . fortunately. Mesthene said that (1) new technology must lead not only to social change but to new social and individual values; (2) change is so extensive now that it must be considered the essential characteristic of the world; (3) the particular kind of change experienced is never independent of the fact that technology brought it about; therefore, the principal political problem of our day is to systematize and institutionalize the expectation of change.

Dr. Talcott Parsons, a Harvard University sociologist and president of the American Academy of Arts and Sciences, also disavowed the title of his talk: "Facilitating Technological Innovation in Society." Parsons said that complex organizations for education and research, and giving higher education the stewardship of intellectual values, were the two developments in our society that produce and control technological change. He thought it an illuminating feature of this century that U. S. Steel was the dominant company in the first third; General Motors in the second third; and that probably IBM will be in the last third. (Whatever happened to AT&T?)

Dr. Margaret Mead, anthropologist, American Museum of Natural History, and on the Scientific Council of the American Society of Cybernetics, recalled that a decade ago she hoped that the interdisciplinary nature of cybernetics, or feedback, or teleological phenomena would be an influence in settling inter-nation squabbles and inspiring international understanding. She has given up on this idea but now hopes that cybernetics can have significance for interdisciplinary activity as a way of looking at things—or as a language.

She admonished the ASC to ask itself: "What are you founding? Why? How do you keep from getting old? Do you want to die in ten years? What kind of people do you want? What kind don't you want?" Ironic, that at this conference on purposive systems, the sponsoring society is charged with being currently purposeless.

On being asked from the floor to distinguish general systems theory from cybernetics, Dr. Warren McCulloch, MIT, and president of the American Society of Cybernetics, first replied that "general systems is so general as to be vacuous" and then continued with a delightful and erudite exposition on neurophysiology that left this reviewer entertained, but still uninformed on what distinguishes general systems from cybernetics.

the nature of purpose

Dr. David Hawkins, philosopher, Univ. of Colorado, actually spoke on "The Nature of Purpose." And his was the last paper of the last session. Hawkins talked about the distinction made by Hans Storm between a design and an eolithism. An eolith is a piece of junk like a spear, accidentally adapted to a use it suggests. A design is a structure, made out of homogenous parts, for doing an already determined task. In design, the ends can be said to justify the means. In an eolithism, the ends must be formalized to include the means. So that "ends justify means" is an irrelevant phrase in an eolithism. The verb "to purpose," then, is eolithic.

The "Evolution of Purposive Behavior" was the title of the paper by Dr. Alexander Fraser, geneticist, old-time computer modeler, Univ. of Cincinnati. Also commenting that he did not know what his title meant, he wondered whether the ability to define a purpose and to adapt behavior to achieve it characterized a purposive system or whether natural selection sets intrinsic purpose, and the species adapts its behavior to

*The first 10 were the annual Macy conferences from 1944 to 1953; the eleventh, out of which the idea for this meeting grew, was the inaugural meeting of the American Society for Cybernetics held three years ago on October 16, 1964.

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achieve it. He reported that random walk methods for naïve computer genetic models are now exhausted; that he has run models for 50 or 60 genes and that because no one has encouraged him to run 100,000 generations, he can't give an answer to the question: "Given an infinite number of ways to produce an organism, how does evolution decide which way to evolve?" He believes that an odd random event can set a population on a track and that it is likely that evolution blundered along on 50-50 compromises until it arrived at its present superlative machinery.

In a well-done review paper on the history of the discovery of some neurophysiological correlates of behavior, Dr. Ralph Gerard—physiologist and dean of the Graduate School, Univ. of California, Irvine—put in perspective the enormous difficulty of the current unsolved problems of finding the neurophysiological basis of behavior.

J. A. Haddad, IBM Corp. vp for research and development, made some projections on what can be expected in future computer hardware. He also made a pass at saying we'll need software too.

In central processing units and memory, Haddad sees a trend toward associative memories mainly used as indices. An exciting forecast is for control read-only memories to replace the instruction registers and to control the opening and closing of gates in the CPU. Thus, one could "read in" a new computer. Printers won't be much different, and file storage capacity and speed will increase, with prices decreasing somewhat. In the input-output/people area, consoles, student terminals, keyboards, tablets, and voice recognizers will proliferate, predicted Haddad.

Five speakers contributed in one way or another to the polemical storm in which such meetings are invariably held. Dr. Seymour Papert, MIT ("Why Machines Can't Think"), counterattacked with feeling those sceptics, especially among the humanists, who remain unconvinced that machines will play championship chess, or master and translate natural languages, or retrieve relevant information for solving problems or . . . and who liken cyberneticists who make such claims to the alchemists of another day. About "thinking machines," such as chess playing programs, Papert proclaimed that if a machine won't learn, the responsibility is with the teacher, and not with the machine, which the earlier black-

box notions implied. Using Greenblatt's chess playing program—having a B rating—as an example that proves his contention (Papert may be unaware of the old Yiddish proverb, "for example is no proof"), Papert said that Greenblatt made a machine that could be treated as a sentient intelligent being; it prints out what you ask of it so it could be improved, on line.

Another message from Papert was that, in the solution of problems, a person uses not only logic of which he is aware but also a fund of relevant knowledge that he cannot make explicit even to himself. How to program a machine with knowledge it needs but of which the programmer is unaware, is a problem Papert didn't try to solve.

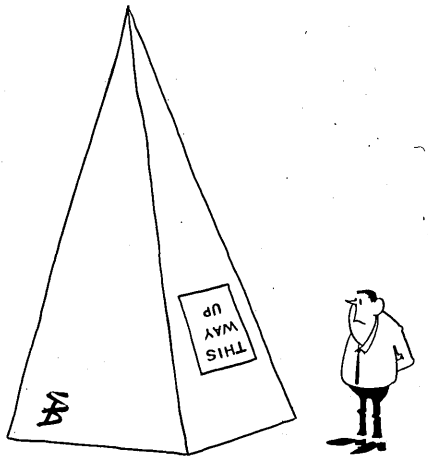
machine intelligence

One of the optimists on the pseudo-issue "Can machines think?" is Dr. Herbert Anschutz, Ministry of Defense, West Germany, whose paper was enticingly labeled: "Prospects for the Development of the Psycho Cybernetics of Intelligent Behavior." He believes that large machines and brains are both instances of large systems for whose operation we do not yet have a theory. He does not believe that when we do have a theory, it will indicate different restrictions on machines and on brains.

In the only talk of the conference about concrete work by the author, Dr. Ivan Sutherland, Harvard Univ., gave a terse, well-organized, and lucid presentation of schemes for making three-dimensional oscilloscope displays for graphic (not natural language) communication between man and machine. Sutherland identified digital and analog tablets, for use in editing text in a machine, as the most exciting development for the possibilities of effective communication between man and machine.

Dr. J. C. R. Licklider, IBM, who has long been in the forefront of the man-machine business, expressed his thoughts on the nature and role of man-machine work. Conventional machines, he said, are used to evaluate formulas . . . to solve already formulated problems. The role of man-machine work should be to improve understanding and to help formulate nebulous ideas. But merely having a typewriter at a console is not enough. With computer graphics and lots of computing power, including an amount of software that will take many years to develop, Licklider is optimistic that machines will be useful to man in the formulation and understanding of ideas, theories, and problems.

Judged by the ferocity of the counterattack on what he said, and on what he didn't say, Dr. Bar-Hillel's mistitled paper "The Future of Man-Machine Languages" was an unexpected bombshell. Bar-Hillel, philosopher, Hebrew Univ., Israel, is a well-known sceptic of cyberneticist's claims. He spoke not about whether machines can think, but mainly about whether machines can master a natural language, and have sufficient knowledge, criteria for relevance, and reasoning ability to indeed engage in intelligent conversation with a human being to the end of helping the human being to formulate and test theories. He said, "Today, it is nothing short of preposterous to think that a computer can master a natural language." He concludes naturally that



computers are unlikely ever to play an active role in theory formation and testing.

In discussing the limits of what can be achieved in the field of intelligent conversation with a computer, he asked by how much our aims must be lowered to make them reasonably achievable. Instead of a natural language, he suggests the possibility of the machine being able to master a language having a restricted syntax and semantics. Thus, topics of conversation would be very limited. This would also limit the extent to which a computer could determine relevancy of appropriate data for use in checking the compatibility of a proposed theory because to do this it is mandatory that the formulation of the data be transferred in accordance with meaning rules that the language may not be able to apply.

In looking at the first four or five moves of two chess games in progress, one between chess masters and one between two computers, one might not be able to tell which is which. Some would consider this to be significant. But Bar-Hillel remarks, "Nothing of any importance follows for the chances of developing an intelligent chess playing program."

rebuttals

The rebuttals to Bar-Hillel included the defense of a faith that was not attacked. It was pointed out that Bar-Hillel was dishonest to argue against an intelligent machine defined as one requiring a mastery of natural language, among other things, and then show that machines do not now have a mastery of natural languages. The accuser said that some animals display intelligence and do not have mastery of a language. Bar-Hillel wasn't there to defend himself against this non-sequitor. Were he there, he would surely have pointed out that intelligent conversation, not intelligent animals, requires mastery of a natural language. Others admonished the audience to listen to Bar-Hillel but to be agnostic of him just as he is agnostic of the believers.

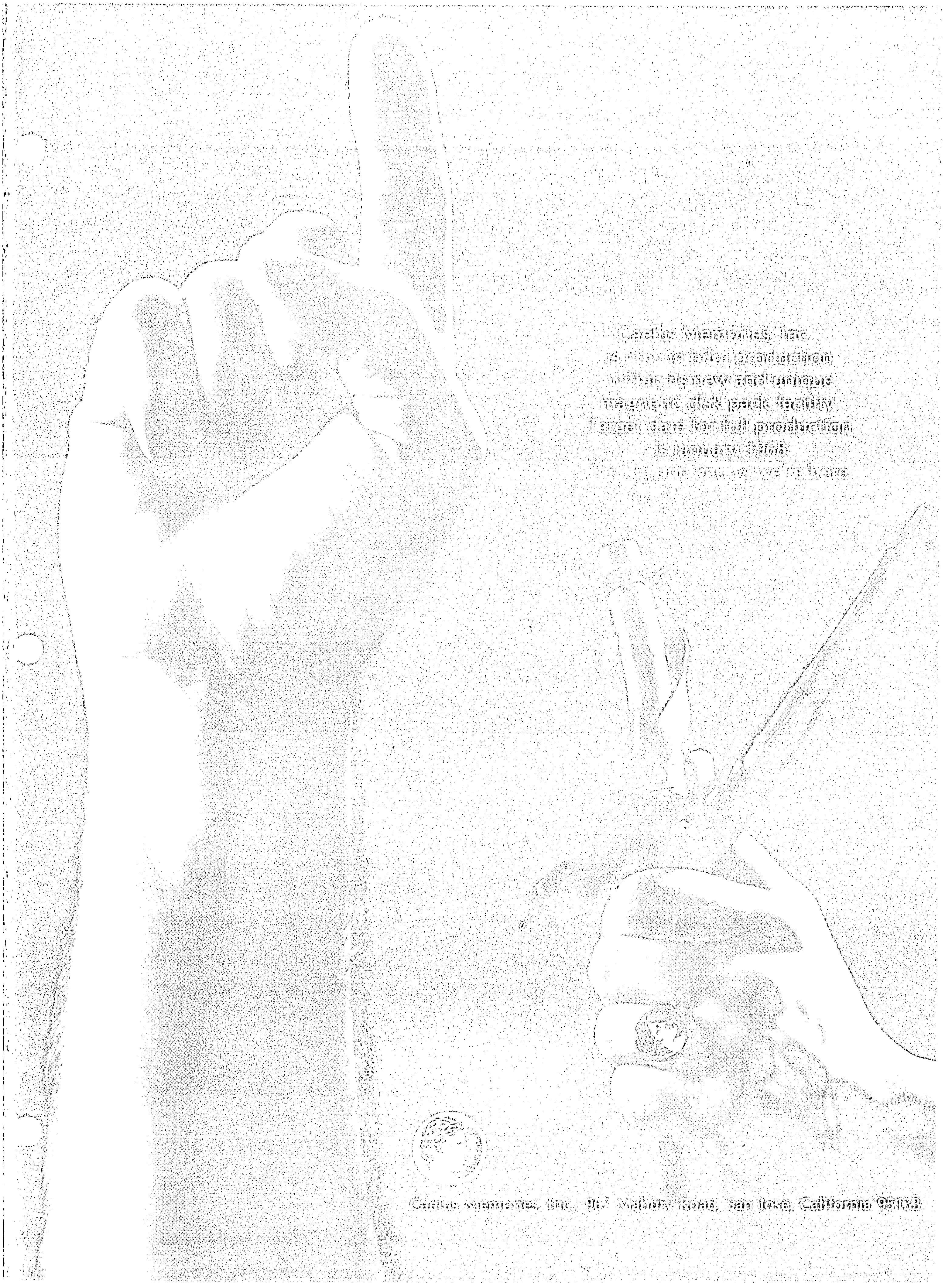
One man told this reviewer in private that Bar-Hillel didn't really qualify to have his opinions because he probably had never written a program nor sat at a computer console.

Dr. Saul Amarel, RCA Princeton Laboratories, reported on the history of computer use in helping people to specify goals and to specify solutions to problems. He discussed conditions for problem solution such as appropriate representations and reformulation and said, in effect, that much work needs to be done before the problem of constructing an artificial intelligence can be solved.

From the USSR came Dr. Nicolas M. Amosov, Deputy, Supreme Soviet; Head Biological Cybernetics Department, Institute of Cybernetics, Kiev, Ukranian SSR. Amosov, a heart surgeon, as well as a fiction and non-fiction writer, spoke on "Models of Information Processing Within Man." He showed slides of block diagrams and accompanying definitions. Labels in the blocks were items like feeling, speech, perception, will, consciousness, creativity. The blocks represented a computer program that "modeled" each such attribute of man. On being asked what experiments he had in mind to validate or invalidate his model, Amosov replied that he had some in mind, but that there was lots of work to do.

A final message of reassurance both to the Congress of the U.S. and the Supreme Soviet of the USSR. You may rest assured that there is at persent no cybernetics gap between the two countries: zero minus zero equals zero.

—Louis Fein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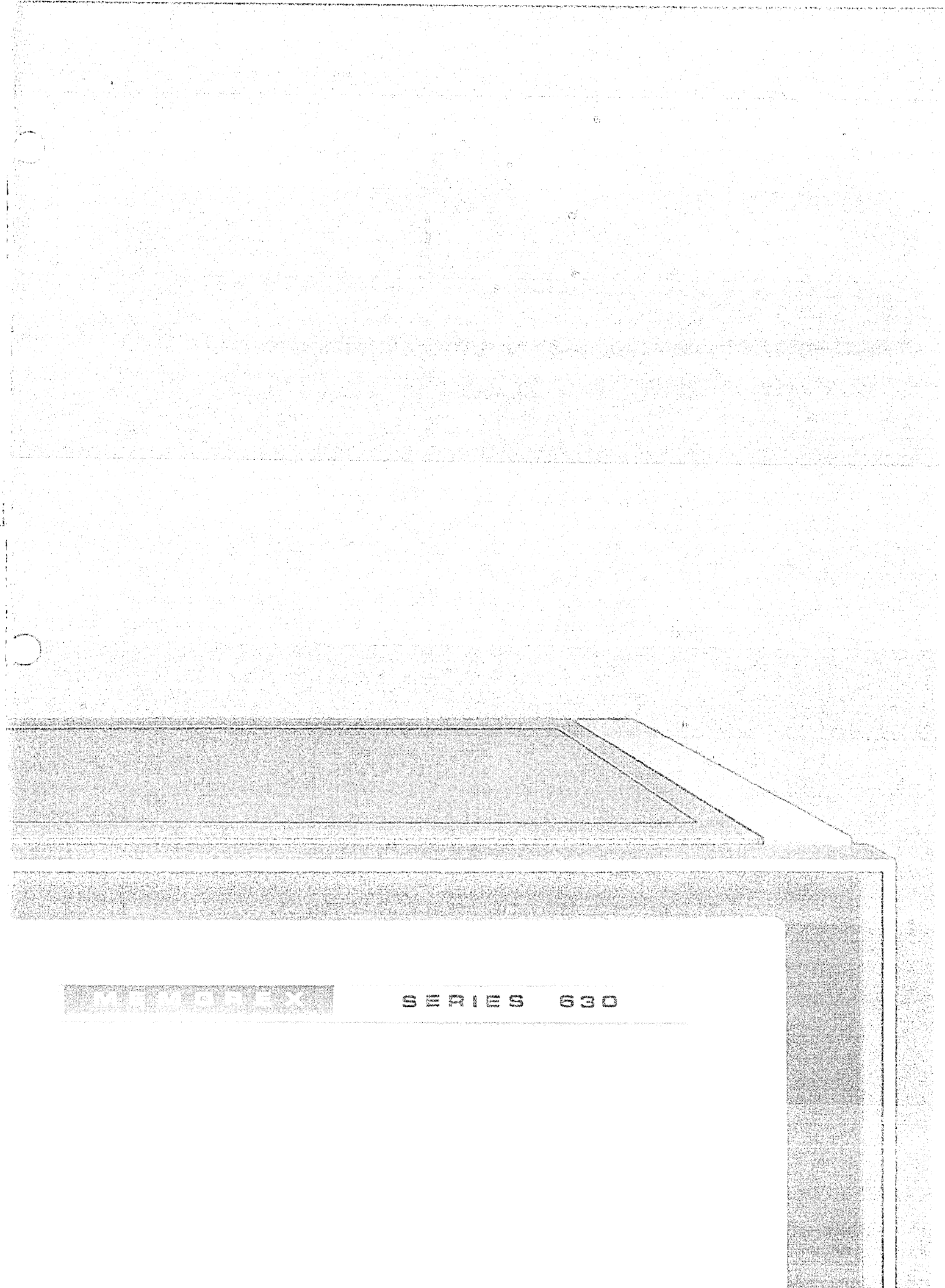
CIRCLE 25 ON READER CARD


MEMOREX
SERIES 630

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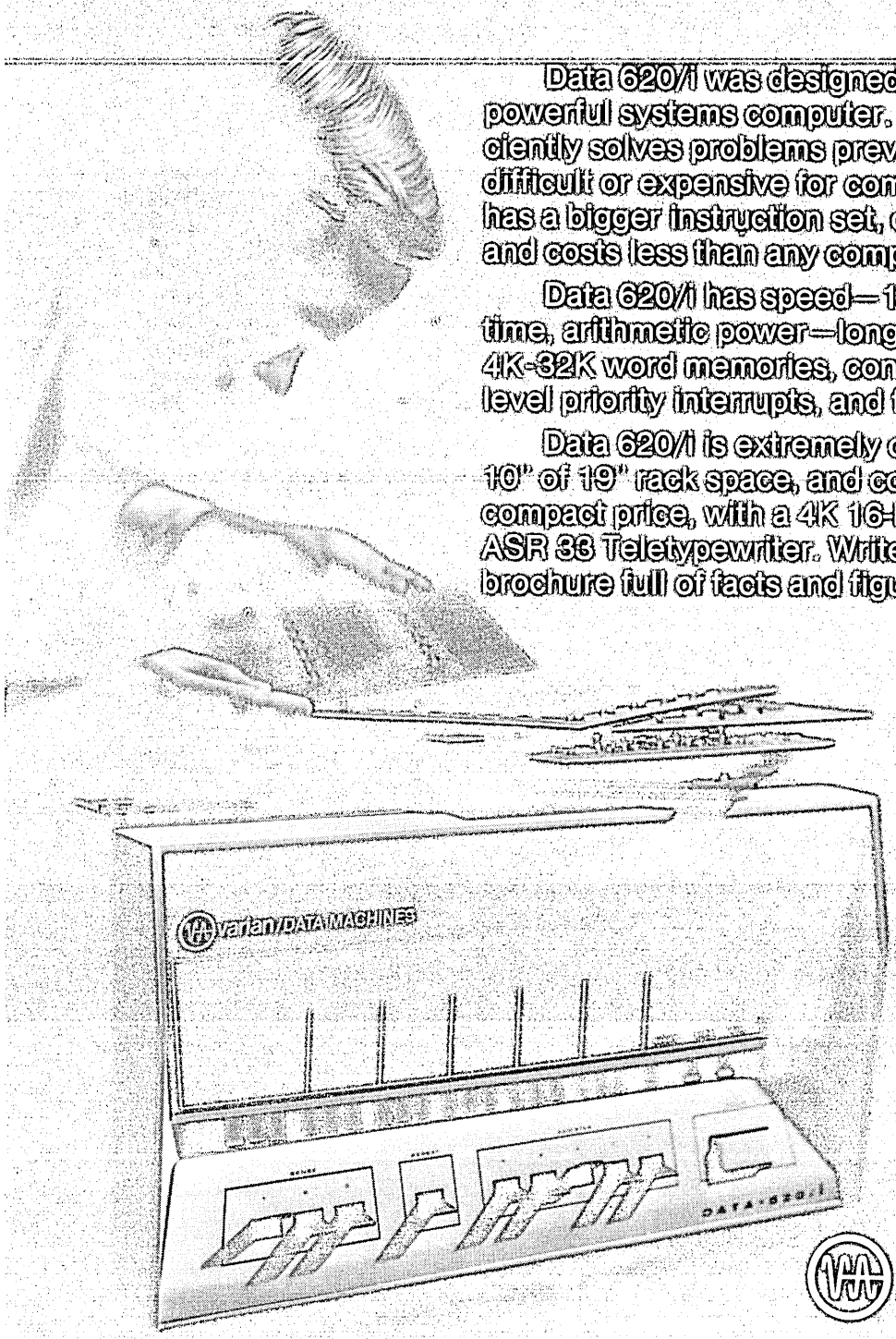

Data 620/i was designed from scratch as a powerful systems computer. That's why it so efficiently solves problems previously considered too difficult or expensive for computer solution. Data 620/i has a bigger instruction set, one-half the components, and costs less than any computer in its class.

Data 620/i has speed—1.8 microseconds cycle time, arithmetic power—long 16 or 18 bit words and 4K-32K word memories, control and I/O facilities, multi-level priority interrupts, and field-proven software.

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CIRCLE 97A ON READER CARD

international meeting . . .

STANDARDIZATION OF PROGRAMMING LANGUAGES

On November 6-10, 1967, a meeting of ISO/TC97/-SC5 was held in Paris. SC5, which stands for Sub-Committee 5, is the group responsible for standardization efforts in the area of common programming languages. It belongs to Technical Committee 97 whose scope is standardization in the area of computers and information processing. Together, they belong to the International Standards Organization of which the United States of America through the U.S. Standards Institute (USASI) is a member.

The procedures for realizing an international standard are long and tedious. First, a member country or some other acceptable body proposes a working paper. This ultimately turns into a draft proposal which may be circulated any number of times until it is finally acceptable. Then the draft proposal is elevated to the status of a draft Recommendation which subsequently becomes a Recommendation. After the passage of a suitable amount of time, it becomes an ISO Standard.

More than a year ago, both FORTRAN and ALGOL were proposed

for elevation to the status of draft Recommendations. While FORTRAN in the meantime has become a USA Standard it was decided to hold up further work on a US ALGOL Standard until ALGOL became an ISO Recommendation. Some further editorial work is required of the FORTRAN draft and through the generosity of the French standardization body, they volunteered to complete the work within the next few months. This means that both ALGOL and FORTRAN will continue their distribution with letter ballots to the TC97 member countries for acceptance as ISO Recommendations.

Concerning COBOL, the US submitted their working paper the first week of June, 1967. On the first day of this meeting, the document was given the status of a draft proposal, primarily because it had passed the four month rule required for the submission and distribution of documents.

During the next three days an *ad hoc* COBOL working group met with representatives from the USA, United Kingdom, Netherlands, Japan, France and Germany. The purpose of these meetings and the *ad hoc* COBOL group was to discuss the US draft proposal and the comments which had been distributed by Japan, France, the United Kingdom, and the European Computer Manufacturers Association. The general consensus was that an ISO COBOL Standard must be a subset of the COBOL Edition 1965, and that furthermore, it would be highly desirable to have the ISO work identical with the USASI proposal. During the three days of meetings, many proposed changes were discussed and an exceptional spirit of international good-will and cooperation was evident. Many proposals that would have made the ISO COBOL a super-set of the USASI COBOL were withdrawn in favor of maintaining compatibility with the USASI work.

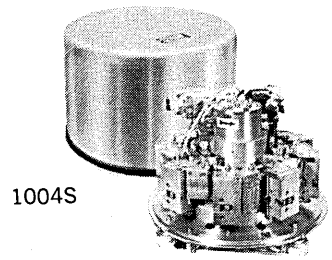
Currently there exists a very few minor differences between the USASI and the ISO COBOL and it is hoped that in the near future the USASI X3.4.4 Committee will be able to resolve these remaining differences. Finally, the eight attending member countries voted unanimously that the USASI COBOL proposal as amended by the work of the *ad hoc* COBOL working group, be approved as the first draft ISO Recommendation for COBOL. In addition, an editing committee was appointed to prepare this document and forward it directly to TC97 with a request that postal confirmation take place directly on the Technical Committee level according to the ISO directives. It was obvious from this meeting that an international COBOL standard based on the USASI work is both desirable and achievable. During this time, Working Group 1 held its first meeting on the standardization of programming languages used for numerical control of machines. The languages that they are considering include ECMA point to point, EXAPT 1, APT, and 2CL.

Sub-Committee 5 also produced and will circulate a revised document concerning criteria to be applied in the standardization of programming languages.

Finally, the scope of Sub-Committee 5 was changed. This change broadened the previous scope which was devoted exclusively to standardization in the area of common programming languages of broad utility. The new scope now states, "The standardization and specification of common programming languages and the characteristics of other software of broad utility, with provision for revision, expansion and strengthening and for the definition and approval of test problems." The Committee adjourned with a feeling of accomplishment and issued a press release to that effect.

—HOWARD BROMBERG

Fact:



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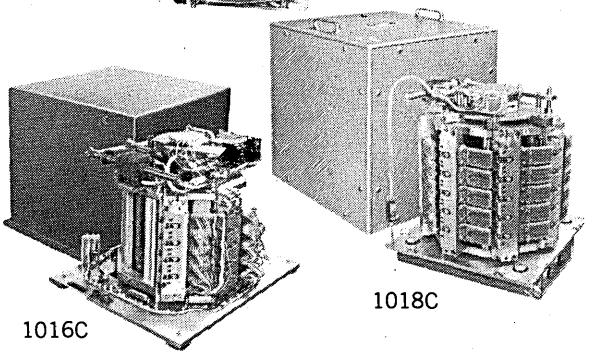

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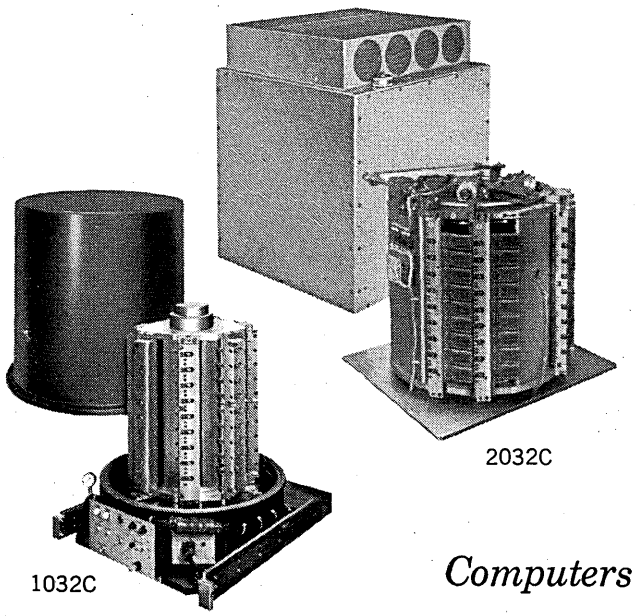

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CIRCLE 51 ON READER CARD

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The shortcut from data to mag tape that bypasses punch cards.

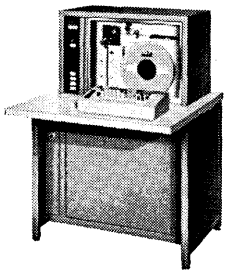
Now you can convert data directly from source documents onto magnetic tape without using punch cards. NCR offers its new family of magnetic tape encoders—NCR 735. This shortcut makes it unnecessary to handle or store punch cards in many applications, saving time, work and space.

NCR 735 operators use a standard input keyboard for encoding data; and each unit both encodes and verifies. The NCR 735 holds data in its memory prior to encoding onto tape. As a result, the operator can easily and quickly correct errors before they get on the tape. There are four modes of operation—entry, verification, search, and error correction.

Specific members of the 735 family allow other kinds of operations: (1) conversion of punch cards to magnetic tape, (2) conversion of punched paper tape to magnetic tape, (3) off-line high-speed print-out, (4) typewriter print-out, (5) linkage with an adding machine to provide total detail listing as data is encoded, and (6) use of a controller to combine data from two machines onto one tape.

To add to the NCR 735's versatility and usefulness, any unit can be equipped with a telephone subset so that data can be transmitted from one 735 to another over voice-grade wires.

For complete information on the NCR 735 family, contact your NCR man or write NCR, Dayton, Ohio 45409.



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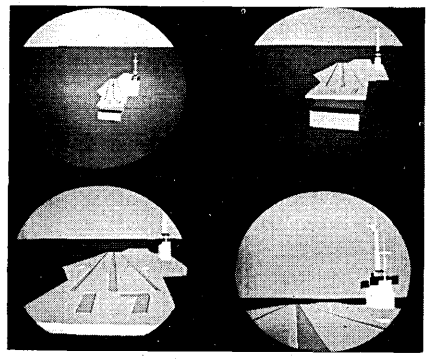
CIRCLE 27 ON READER CARD

news briefs

VISUAL SIMULATION COMPUTED FOR NASA

The GE Electronics Laboratory has developed a visual simulator for NASA's Manned Spacecraft Center in Houston. Based on a general purpose computer and five memories, the system is capable of displaying pictures on a 614-line CRT in up to 1000 shades of color; the pictures are created by the computer from its stored digital information—no cameras, films or drawings are used. Up to three simultaneous views of 40 objects can be simulated; all parameters (object size, shape location, viewing window size, location and attitude) are under software control.

The observer can "walk" around a simulated scene as it appears on the display by manipulating a control



stick. The computer senses the observer's location and uses mathematical laws of perspective to change the displayed scene. In test applications, a street scene, an aircraft carrier, an airport, and a lunar module were simulated on the display. The prime objective of the development of the system was to simulate the conditions a pilot can expect during a flight experience.

In addition to space applications such as a simulated soft landing on the moon, or a rendezvous with another vehicle, developers suggest that the three-dimensional display can also be used in urban planning and architectural training: using the control stick, viewers can walk down streets or enter buildings.

UNIVERSITY STARTS SURVEY OF EDP INSTALLATION COSTS

The first opportunity for U.S. and Canadian computer users to get objective detailed information on costs will be offered by the Univ. of British Columbia as the outcome of a project headed by V. W. Ruskin.

Some 3000 questionnaires have been printed by the university, to be sent to a cross section of North American edp users. The questions are specific enough to uncover the costs of equipment and staff by industry, size of company, type of application, hours of use, etc. The university is also supplying the computer time and programs necessary for detailed analysis of the results.

In spite of the surplus of questionnaires these days, DATAMATION urges readers to cooperate in this unique venture. The information is to be supplied anonymously and the results will be available to all, probably about March next year. With them, an organization should have a clear idea just what other groups about the same size are spending to do the same things.

Those who do not receive questionnaires but wish to contribute should write to V. W. Ruskin, Dept. of Mechanical Engineering, University of British Columbia, Vancouver 8, Canada.

ARMY STORAGE/RETRIEVAL SYSTEM FROM LINK GROUP

A sophisticated on-line microfilm updating service, AMACUS, was scheduled to be delivered Dec. 1 to the Army's Rock Island Arsenal, Rock Island, Ill.; it is expected to become operational early next month. AMACUS was developed and built by General Precision's Link Group.

Within the next several months AMACUS will be married to automatic microfilm storage and retrieval equipment; the result should be a much-improved system for assembling the graphic and alphameric data needed for Army Weapons Command procurements. An ASPR-type bid solicitation covering the storage-retrieval portion of the Rock Island Arsenal system is scheduled to be issued this month.

More efficient assembly of these technical data packages is the objective of a major development project, known as TEDPAS, within the Army Materiel Command. So AMACUS, if it works at Rock Island, probably will be replicated. Competition, notably from IBM, is a possibility, however.

The storage-retrieval equipment to be acquired by the Arsenal is likely to be DARE, a Magnavox system already installed at AMC's missile and electronics commands. DARE, essentially, copies microfilmed data off aperture cards, stores it on keyboard-accessed microfilm chips, and outputs the information onto new aperture cards. Each chip is identified by an optically-recorded binary code.

AMACUS, which stands for Automated Microfilm Aperture Card Updating System, consists of these basic elements: a scanner-recorder, which converts microfilm data into binary code and vice versa; a crt display screen with light pen and control panel; an optical viewer; and an electric typewriter. Aperture cards containing graphics and/or alphameric information are input individually; the contents of each are displayed on the crt screen; the operator makes corrections with the light pen and through the typewriter, using the viewer display for reference; the corrected information is photographed on a new aperture card, automatically processed and ejected.

At Rock Island, a typical update run will take about five minutes per card, according to present plans. Microfilmed drawings with original dimensions of up to 22x34 in. can be accommodated by the system. The scanner-recorder will distinguish microfilmed lines with a minimum width of .003 in. Conversion of each aperture card to binary form requires a maximum storage capacity of 25 million characters.

FRANCE'S PLAN CALCUL SPAWNS BIG MACHINE

Over the next five years the French government hopes to re-establish an indigenous computer industry. To do this, deGaulle's advisers have pulled quite a coup in getting wholesale collaboration within the French electronics business, forcing some shotgun marriages that have left knowing pundits agasp. All this has been done with the aid of a very big carrot: a promised share of the $150 million earmarked for Plan Calcul (France's "Computation Plan").

The initial fruits are about to be seen. The CAE 10.070, first of the new Gallic big computers, is scheduled to hit the market in '68.

The first moves in the Plan were based on CITEC, common subsidiary set up by two big electronics firms, CSF and CGE. Yet another company, CAE, looks after the computer manufacturing end for CITEC. The next move by the government was to set

up a central development and manufacturing unit to meet the needs of Plan Calcul; this was the Compagnie Internationale pour l'Informatique, or CII. In October '66 CITEC moved CAE's activities over to CII.

The CAE firm, of course, has had a cross-licensing agreement with Scientific Data Systems. SDS president Max Palevsky, recently addressing some financial analysts, affirmed the fact that his company is now affiliated with CII in the "design and development of an advanced multiprocessing system.

"These technological developments," Palevsky said, "may lead to improvements which will significantly extend the life of our present Sigma line by providing new equipment that might be called an additional half generation . . ."

This was how things stood until a couple of months ago when deGaulle completed the master stroke in merging Thomson-Houston and CSF. Although such a merger was believed nigh impossible, it finally brought Thomson-Houston's much valued peripheral making subsidiary, Sperac, directly into the national framework for computer development.

What this all adds up to is that France's biggest telecommunications, systems and components houses are all tied in to Plan Calcul. Today, CII looks something like this: managing director and vp is Robert Remillion, president of CITEC; president is Jacques Maillet, president of Intertechnique. CII employs 2,600 people with 40,000 square metres of manufacturing space. And its big job is to see the CAE 10.070 through.

In broad terms the 10.070 is a general purpose system for multiprocessing and time-sharing. It uses a central main memory that can be accessed by six independent processors. The memory is structured in 524,000 octets, or groups of eight-bit bytes. One processor is allocated the central job of program control and arithmetic handling; basic cycle time is 0.7 usec. The individual processors have separate integrated circuit memory blocks with a 0.06 usec access time. And in the central processor the memories serve as general registers for arithmetic and logic operations. The memory block is structured into sets, each with 16 registers; a central processor can have from one to 32 sets. At any one time there is only one set, nominated the active set, linked to the central processor. Each critical program has its own set of registers which becomes active when a particular program is substituted for the program under way.

This technique, claim CAE designers, eliminates redundant operations otherwise needed for safeguarding and restoring the contents of registers.

Paging segments are used for main memory sharing, and there is a dynamic assignment of pages to different programs. This task is handled by a topography device which keeps the main memory's organization up to date in the processor stores. There are 108 wired instructions for the central processor including a stack handling routine.

The 10.070 has 240 input levels, each with a precisely allotted input priority. In-parallel accounting for all of the user's remotely transmitted and received information is effected by means of multiple transfer units. These are capable of simultaneously transferring information between memory and 32 peripheral control units. The total output is 250,000 octets a second. A single multiple transfer unit can organize concurrent operation of one disc unit, two card readers, a card punch, typewriter and two magnetic tape drives. A single transfer unit handles 32 million bps on one of 32 channels. CII offers four-level software with the machine. The first gives self-service operation for modest batch processing configurations. The second offers the combination of batch processing with real-time working. Number three on the list is for a large configuration linking as many scientific, dp and peripheral jobs as possible under control of a monitor. And the fourth is for a big time-shared-with-batch operation in a utility network. FORTRAN IV and PL/I compilers are being written.

Successful development of the CAE 10.070 may well lead to an upgraded model of the SDS Sigma 7, and perhaps other additions to the Sigma line.

BUNKER-RAMO, SCANTLIN ASK FCC TO SUSPEND WU TARIFF

The FCC has been asked to suspend Western Union's proposed SICOM tariff on grounds that it is discriminatory and prejudges the pending computer utility inquiry. Basically identical petitions were submitted by Bunker-Ramo and by Scantlin Electronics, two suppliers of stock market information retrieval services. (For late developments, see Washington Report, p. 95.)

SICOM is a computerized, store-and forward market information service involving shared use of broadband channels. The sharing is what creates the alleged discrimination. B-R's petition contended that the SICOM customer in Los Angeles would pay $280 per month for a service costing $4,597.33 per month under private line tariffs. Western Union itself was quoted to show that SICOM customers would get the equivalent of private line service at far less than private line rates. The petition referred to explanatory material WU filed with the commission when the new tariff was proposed, in which it was explained that "SICOM (Security Industry Communication) Service . . . provides each subscriber with the equivalent of a private wire network . . ."

The B-R petition used the Telequote IV donnybrook of 1965 to dramatize the carriers' control over entry into the telecommunications market. In that case, B-R tried to lease circuits from both AT&T and WU for the use of brokers buying the Telequote IV service. WU refused outright and AT&T imposed allegedly impossible conditions. "The carriers exercise this control (over market entry) even though they may be in error as to whether certain data processing functions are in fact communications activities," B-R argued. "And there is no practical appeal . . . Hence, all competition may be stifled by . . . the carriers. For, as the carriers move into the areas of data processing and communications services, it will be in their self-interest to eliminate as many potential rivals as possible."

SICOM, both petitioners insisted, would project WU into the data processing business not just potentially, but actually. They pointed out that the proposed service includes message retrieval, error checking, message priority queueing and formatting—"data processing functions . . . which have no relationship to communications activities."

SOFT SPOTS APPEAR IN SOFTWARE ORDERS

A survey of the larger software companies has verified current rumors that a slowdown is being felt—although it affects some firms considerably, others hardly at all.

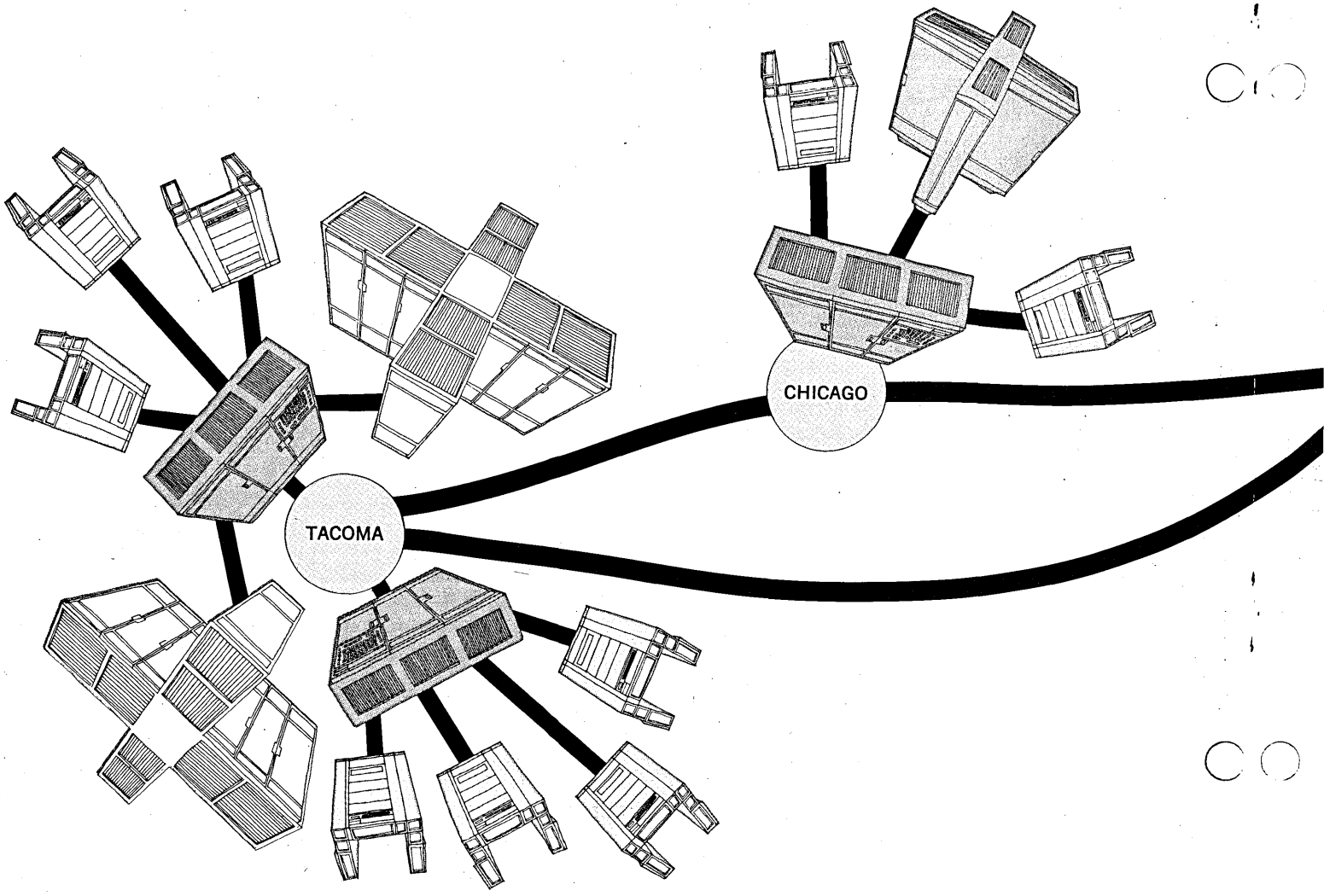
Biggest dent is in government contracts, especially from NASA, but including most of the armed forces and even such recently booming areas as education. (A big exception is the Army . . . apparently feeling no budget pangs.) On the commercial side, several companies say they're busier than ever but a few think the outlook is less rosy. A side complaint from some of the big boys: there's a lot more competition, with all those new little outfits coming in with low bids.

A summary of reasons for the

Weyerhaeuser is growing a management information system.

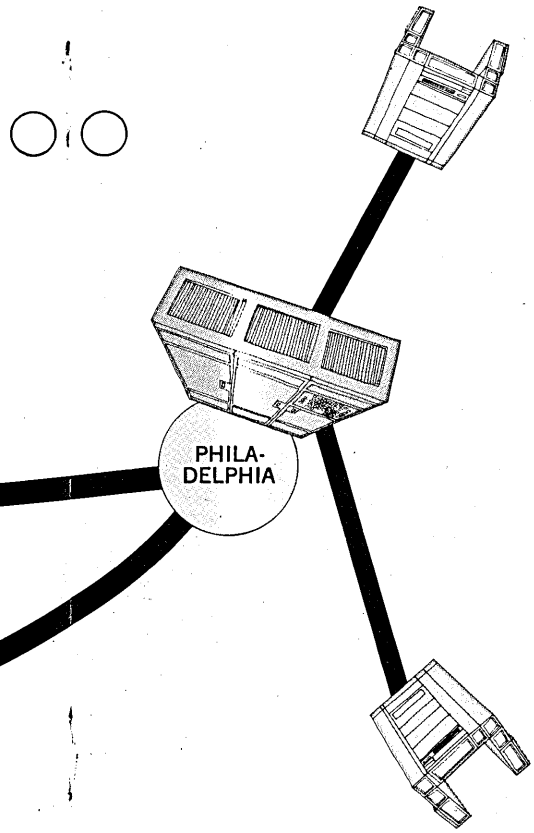
What computers did they choose?

Weyerhaeuser is building a nationwide network of General Electric computers:



Two large-scale GE-635 computers are the heart of the system. Interconnected, they store huge volumes of business data for Weyerhaeuser's forest products headquarters in Tacoma, Washington. The GE-635's will process the data in real time, so they can respond quickly to management inquiries.

Eleven compact GE-115 computers will be stationed in Weyerhaeuser's paper, packaging, lumber, and plywood installations throughout the country. These versatile GE-115's serve as high-speed input/output terminals feeding complex tasks to the GE-635's.



A medium-scale GE-415 is being used in Chicago in development of systems and programs. Because of their compatibility, there will be no major conversion when this work is later transferred to the central GE-635's.

Four General Electric DATANET-30* communication controllers handle the long-distance traffic between computers. They also tie in some 150 Teletype terminals in Weyerhaeuser offices across the United States.

*DATANET, Reg. Trademark of General Electric Co.

But the computers are only part of the story...

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"We are creating a data base — a central file of all important business data. With our interconnected network of computers and Teletypewriters, every manager will have access to this data base. Thus, the computer becomes a flexible and effective management tool and an important adjunct to the manager's thinking process."

Bringing to people like George Weyerhaeuser the useful work of the computer is the purpose of General Electric's Information Systems business. We'd like to help you. Call your General Electric Information Systems Sales Representative. Or write General Electric, Room 912, 2721 North Central Avenue, Phoenix, Arizona 85004. 300-06

GENERAL ELECTRIC

dropoff in activity:

The continuing battles in Washington between Congress and the Administration over budget cuts vs. a tax increase. The effect of this on lower echelons seems to be delays in reaching decisions on proposals.

The market is changing. In 1965-66, the bulk of business was in massive conversion jobs. Now the emphasis is on new systems design—which takes fewer but more experienced and talented people.

The major manufacturers are at the stage in their business cycle where they are consolidating software—that produced outside as well as inside. Until some new machines come along, they need less help.

One of the companies that sees no signs of a slowdown is Mellonics Litton, which reports they have never been busier. (They have added 200 people in the last year for a total of 300.) And they say that so far any drop in other companies sure hasn't reached the stage where recruiting is any easier.

COMPUTER USE WIDENS IN MARKETING APPLICATIONS

Although the application of computers to marketing and advertising planning and decisions is relatively new, major companies are now at the operational stage in several areas. A discussion of their progress was presented by A. Edward Miller, president of Alfred Politz Research, at a workshop meeting on advertising financial management of the Association of National Advertisers.

Politz sent out questionnaires to selected members of the ANA, an organization of industrial and commercial companies—not advertising agencies. The questions were simple, asking the respondent if his company had ever tried any of some 20 applications in advertising and marketing. If so, he was also asked if it was experimental or operational and if it was being handled inside or outside the company.

Answers were received from 56 companies, ranging from medium size to very large.

Sales analysis proved to be one of the most popular areas. Of the 56 companies responding, only four had not tried to apply computers in this area. And 75.9% said they have such programs operational—plus three companies buying this service outside.

In sales forecasting, 20% of the firms haven't tried it but over half have operational systems and another 21.4% are experimenting with it. About one in seven companies had reached the point of using market simulation models to evaluate the effects of changing conditions on their product lines.

Another area asked about was media selection and evaluation. Here, less than half the companies had either experimented or developed operational applications. Of the minority who took advantage of these techniques, most used outside services—presumably their advertising agencies.

About four out of ten companies have applications for advertising measurement—where the money is spent. In advertising expenditure studies, however—how much to spend, allocation by region, product, etc.—very little has been done. Only about one company in five was using or experimenting with computer-aided decisions. In accounting and control of expenditures, however, more than half were active. Other, hazier areas—such as advertising effectiveness and marketing/advertising planning—show a fairly small number with programs under way.

As a final statistic, although there are few who can agree on just what a management information system is, over half the companies say that they have one in operation.

TWO MORE COMMERCIAL TIME-SHARERS OPEN DOORS

Two new time-sharing firms start operations this month—Rapidata Inc. of New York using a GE 420, and Computer Network Corp., Washington D.C., using a Burroughs 5500. Both report officers, many from GE, with several years of time-sharing experience.

Rapidata, headed by Stewart Gold, ex-dp manager and time-sharing user at International Flavors and Fragrances, is backed by Wien, Lane, Klein & Malkin, a real estate firm whose properties include the Empire State Building. Computer Network, headed by Frank Trumbower, ex-GE'er, has just raised up to $450K through a public offering along with over $97K from such backers as Comress and ex-Univac marketing vp L. E. Johnson.

The 14-man Rapidata will specialize in large computation jobs, such as regression analysis and linear programming. The 420, which now has one CDC-made 23-megacharacter disc (three more can be added), will handle 30 users simultaneously. The firm hopes to put 60 on at the same time by spring. Cost will be 5¢/second for cpu time, $11/hour for terminal time, plus mod 33 or 35 terminal and line costs. Another 420 will be installed in New York in the spring, and two more may go into New Jersey during the summer. Rapidata is also testing other developing time-sharing systems for graphics and other applications. Direct competition for the firm in the metropolitan area include GE (265), IBM (Quiktran), CEIR (remote GE-265 in D.C.), Realtime Systems (B-5500), Data Network (940 and 360/40), and soon to come, ComShare.

Computer Network, according to its prospectus, will get one B5500 this month and a second next summer. Remote batch and scientific applications are among those offered.

IBM SEES SIGNS OF PL/I REACHING MATURITY

Tests of the PL/I (F) version 3, released last month, showed gains in compilation speed in commercial applications of up to 60% over earlier versions, according to IBM. Job execution speeds were twice as fast on the average, although some programs were run four times as fast.

"The gains in PL/I performance indicate that this new language is well on the road to maturity," said John E. Guth, Jr., director of systems marketing for IBM's Data Processing Div. He reaffirmed IBM's position that the language "will become the primary language for today's and tomorrow's highly diversified computer installation."

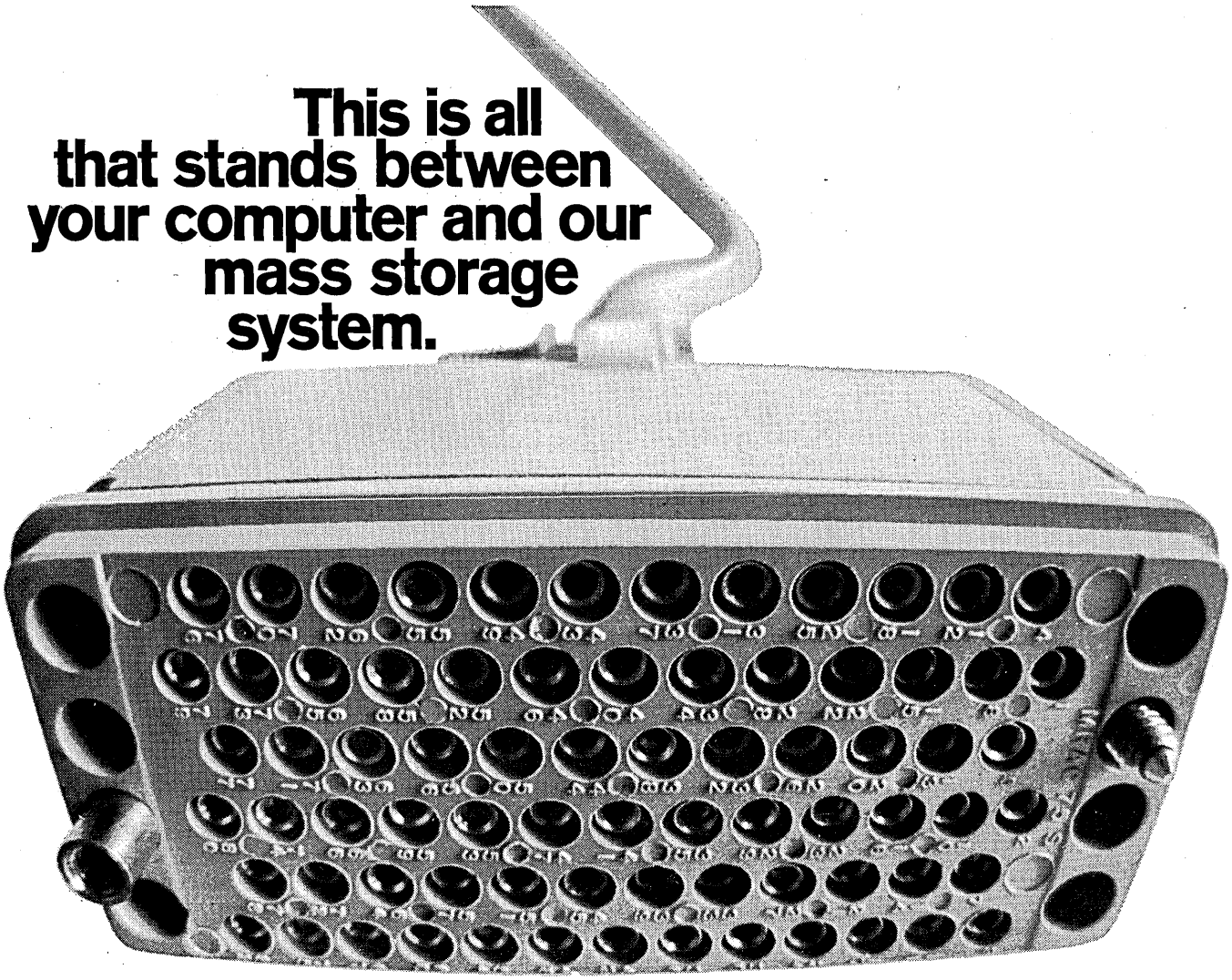
At a SHARE meeting this August, after a long period of silence on PL/I, IBM informed the user group that it was throwing full development support behind PL/I and would not make any non-standard extensions to COBOL and FORTRAN. (A later comment from IBM indicated that all the non-standard features FORTRAN and COBOL users wanted incorporated were not lost forever, but would be considered.)

At this meeting, PL/I (F) compilation performance was said to be roughly equivalent to FORTRAN G while significantly faster than FORTRAN H option II. But the object code performance was considerably slower (1.5-4 times) than either FORTRAN. This PL/I version was slightly faster in compilation than COBOL F, but slower than COBOL in object code performance (.76 as efficient). The measurements were taken on a model 40.

MICROFILM SYSTEM SCANS, CONVERTS, AND TRANSMITS

The latest wrinkle in microfilmed data automation is about to emerge from a developmental cocoon at the Army Material Command. It consists of a system that automatically scans "micrographic" information—statistical

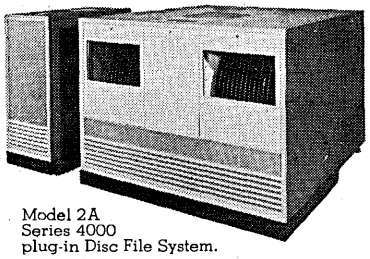
This is all that stands between your computer and our mass storage system.



One lowly plug turns the Bryant XLO-1000 Controller into a universal memory system—for any computer, new or already in use. Simple? Even more so, when you add a comprehensive software package that includes handler and maintenance routines.

The auxiliary system is fast and economical too. Designed to operate in several different modes—serial and parallel—it features word transfer rates from 50 microseconds to 900 nanoseconds per word. To and from two computer central processors.

And up to eight data storage devices can be operated from one Controller. You can improve your memory—as your needs grow—from 8 million to 5 billion characters.



Model 2A
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Simplicity, economy, speed and flexibility. All funnelled through a plug. It's enough to make a "Bryant Believer" out of anybody. Give us a chance. Write Ex-Cell-O Corp., Bryant Computer Products, 850 Ladd Rd., Walled Lake, Michigan 48088.

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CIRCLE 31 ON READER CARD

charts, curves, and related graphics—then converts and transmits this data via Telpak or Autovon lines.

A prototype installation is being set up at AMC's missile command in Huntsville, Ala., next door to the Marshall Space Flight Center; the center developed much of the software. Transmissions to AMC hq in Washington are scheduled to begin in about six months. The basic equipment used in the developmental configuration consists of a Stromberg Carlson 4020 crt plotter, a microfilm scanner and a facsimile machine made by Alden Electronics, Westboro, Mass., and Viscomat (Kodak) film processing equipment.

The system will deliver charts, graphs, and similar pictorial summaries of AMC field activity to headquarters within a day after the end of each reporting period, reports Tom Doran, leader of the task force that developed the new system. Manual methods require about two months, he adds.

The input to AMC's new micrographic system is mag tape from which a series of data points are calculated. The data points reflect AMC supply activity—e.g., number of supply orders, classified by product or bookkeeping category, which were received, processed, and/or filled during a particular period. The data points are derived from a preceding routine which the task force has been running on an SC 4400.

The data points control operation of the SC 4020 plotter; they guide an electron beam across the face of the plotter's crt and this image is automatically captured on microfilm. After processing, the film is optically scanned and transmitted to AMC hq by the fax machine.

A different plotter program is usually required for each type of graphic output, reports Doran. But all the software is available and can be read in and out quickly.

When the new system goes operational, it will be married to another one which involves conversion of alphanumeric data into microfilm records. The latter application has been undergoing tests since last July at three of AMC's National Inventory Control Points, each equipped with an SC 4400 plus peripheral microfilm processing equipment.

Among other applications, each NICP is recording supply catalog changes on microfilm and sending this film to the using installations in the field. The data is recorded on film at a speed of 15,000 lines per minute; each line has a maximum of 13 characters. Before, the catalog revisions were produced on line printers. It is estimated that at just two of the three facilities, the switch to microfilm will save well over 7,000 hours of computer time annually. Getting the information to the user quicker is producing additional benefits of the same magnitude.

ARMY MOVES TO CUT PROPOSAL TIME, COSTS

A basic change in dp equipment selection and evaluation procedures, capable of telescoping the time frame by as much as 50% and reducing costs by a like order of magnitude, is being studied by the Army.

Lengthy system specs and vendor proposals would be eliminated, ultimately. The former would be replaced by an RFP containing a brief description of a needed system, a detailed description of a representative benchmark test, and a list of software and other support requirements. The vendor would propose a particular equipment configuration and operating system, and report the processing time for each run required by the application. Vendors could get benchmarks changed, but these modifications would be strictly controlled. The winning bid would be selected on the basis of a benchmark test of each entry. Actual workloads or representative samples would be used, rather than simulator programs, to minimize possible disagreements with bidders.

Army information specialists have prepared an initial version of the new procedure, which is now being reviewed at command levels. Several vendors have said they're interested in the idea, and a pilot test is likely to get under way next year.

An abbreviated RFP, covering augmentation of a 360/65 scientific system at Picatinny Arsenal in Dover, N.J., should be issued within the next few months. Bidders will respond with abbreviated proposals, and their offerings will be subjected to benchmark tests employing a representative sample of the workload. This particular acquisition may be readvertised and ultimately selected in the conventional way, but officials expect the pilot test of abbreviated selection to lead to a procedure that can be used on its own.

Abbreviated selection would be applied initially only to selected scientific systems which replicate or augment existing installations. But even this limited use would encompass "a large number" of dp equipment acquisitions, says a knowledgeable source.

DOCTORS' PANEL CONSIDERS FUTURE APPLICATION NEEDS

"Computers in Medicine" was the theme of Clinic Day at Providence Hospital, Detroit, covering the use of computers in emergency care of the critically ill, in radiotherapy, and in EKG analysis. It was generally agreed that computers are going to be a most important tool in all phases of medicine, with emphasis on the future. Aside from the areas of hospital administration and laboratory automation, there is still a great deal of work to be done in defining problems well enough for computerization.

Most of the discussion was devoted to the interpretation of EKG's, with the leadoff by Dr. C. A. Caceres, chief, Heart Disease Control Program, HEW, describing his work with EKG's received from cooperating hospitals. He hopefully mentioned a future when physicians would be able to find and treat warning signs in a patient and thus ward off heart attacks and the need for hospitalization. A panel of Providence physicians noted that often a single EKG was not sufficient to give a true picture of a patient's condition; comparison of variously timed EKG's may be necessary. Someone suggested that in the future adaptive pattern recognition may become sufficiently audio-oriented to recognize heart sounds and directly interpret and diagnose them, thus replacing EKGs.

Dr. Max H. Weil, director of the Shock Research Unit at the University of Southern California, noted the need for more instrumentation to carry forward the research work to practical application. This will require much interdisciplinary cooperation.

Dr. William S. Spencer, Texas Institute for Rehabilitation and Research, Texas Medical Center, Houston, said that applications are growing and advancing rapidly, although he expects parallel operations to be necessary for 10 to 15 years. Extensive patient information handling by computer must be reliable; breakdowns could be catastrophic. Today's methods are still insufficient to handle large arrays of test medical information, and solving some of the problems will take many hard steps. He said that it is often surprising to note the overall picture of a patient's care from computerized handling, which is not apparent from fragmentized information. And from this, Dr. Spencer feels that the largest element of quality control in the future is what the computer shows is being done in patient care.

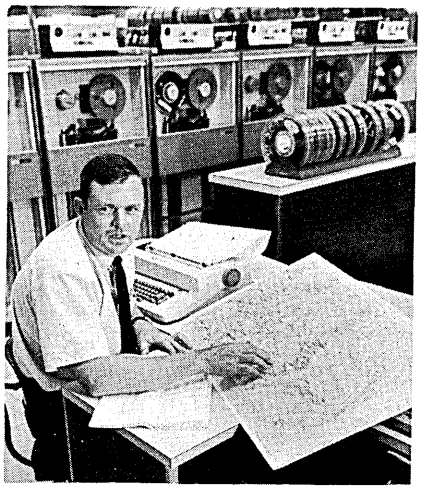
"In radiotherapy," said Dr. Harold Perry, director of the Radiation Ther-

apy Center, Sinai Hospital, Detroit, "the computer is helpful in calculating the distribution of gamma rays from implanted material, and for calculations in beam therapy."

ENVIRONMENTAL CONTROL: THREE NEW PROJECTS

To better control and benefit from water resources, a Stanford Univ. professor of civil engineering, Dr. Norman Crawford, has written a program in PL/I: Stanford Watershed Model V. When run on the local 360/67, this program can describe—and forecast—the behavior of any river system in the world.

Watershed Model V is a translation of the hydrological (rainfall) cycle; ultimately, Dr. Crawford hopes it will solve such problems as proper distribution of water during a shortage,



regulation of water flow, flood warnings and control recommendations. The system is capable of measuring the runoff from rain or snow into a river's headwaters, and can calculate the effects of a flood wave at any point in the stream.

Developed under a grant from the National Science Foundation, the system may eventually have time-sharing capabilities, allowing officials at remote places (dams, hydroelectric plants, irrigation systems) to converse with the central computer via teletypewriters and CRT displays.

An 1130 computing system is already forecasting river flow and flood warnings to the low areas along the Ohio River. Observations made at rain and river gauges along the basin and tributaries are telephoned at regular intervals to district offices of the Weather Bureau's River Forecast Center in Cincinnati.

In addition to these, another project discussed at a recent conference at the Watson Research Center in Yorktown Heights, N.Y., was an air pollution measurement and prediction program stored in a 360/40 at the Travelers Research Center in Hartford, Conn.

The program, a mathematical model which can analyze data from many types of emission sources and generate street-level pollution readings, was described by Dr. Glen R. Hilst, director of Travelers' environmental sciences department. From information obtained from the system (developed under a grant from the Connecticut Research Commission), the center can prepare a map of the state showing pollutant concentrations, including the amounts of sulphur dioxide, carbon monoxide, nitrogen compounds and soot in the air. Wind dispersion patterns can also be determined. The model is used to test methods of pollution control before action is recommended.

POST OFFICE DISCUSSES AUTOMATION PLANS

Dr. Edward M. Reilly, the Post Office Department's R&D director, dumped a big mailbag full of plans for improved optical scanner and other sophisticated dp equipment in front of a recent "Briefing for Industry;" his audience consisted of about 500 technical representatives of potential suppliers.

"In FY 1970," Reilly said, "we are planning the advanced development of a second generation optical reader for printed characters" (a follow-on to the Philco-Ford equipment now being installed in several cities). In FY 1971, he said, a second generation script reader, capable of accepting hand-written ZIP code numerals, will be developed, plus a non-electronic optical reader. "We are hopeful that the field of holography may offer promise of accomplishing this rather complex recognition function with an almost wholly optical device," Reilly explained.

In FY 1970, the department plans advanced development of source-coding equipment which would be used by large mailers to place machine-readable address information on individual letters. Optical readers capable of driving such equipment are also planned; they would be placed at the point where mail is first received in a post office, and make it possible to perform subsequent processing operations completely automatically with devices linked to code readers.

Other projects: an improved presorter, able to cull optically-scannable mail from the general mail stream, thereby increasing scanner throughput; an orientation module for optical scanners that would enable them to accommodate varying address locations; a computer-controlled sack sorter; and a system for marking all postal vehicles so that the vehicle numbers could be entered automatically into a computer-controlled dispatch system.

Reilly said all of these projects would begin, or be significantly advanced, during FY 1969-70.

POD also has big plans for inputting data via speech recognition equipment instead of manually-operated keyboards. A numeric speech translator has been developed already. It "may be considered as a useful module for replacing the manual keyboard now used in sorting parcel post," Reilly explained, but he emphasized that its numeric capabilities are limited. "In FY 1969, we are hoping to support the technology of advanced speech recognition units for more general use in all kinds of mail handling equipment. In 1970, we are planning to begin advanced development of an alpha-numeric speech recognition unit, one capable of taking all of the normal kinds of input from a mailing label or address, freeing the operator from the keyboard. By this means, we hope to eliminate some of the errors which are always caused by humans using keyboards."

No pricetag was attached to these ambitious plans, and in view of the budget squeeze financing may be a problem. But Congress seems receptive; the Post Office Department's last R&D budget, one of the largest in the agency's history, was approved on the Hill without a penny being subtracted. If a pending postal rate increase is okayed, and Postmaster General Lawrence O'Brien succeeds in getting his department converted into a government-owned corporation, like TVA, the money problem will diminish further.

O'Brien, who shared with platform with Reilly, asked the nation's R&D community to come up with additional ideas for improving postal operations. An "Industry Guide for the Preparation and Submission of Unsolicited Proposals" was distributed. Proposers were told their ideas could lead to sole source procurements only when the subject matter "merits . . . support, (when) the substance thereof is not available . . . without restriction from another source, or . . . competition is otherwise precluded."

ADAPSO, QUIET ON TOLLS, ASKS FREE COMPETITION

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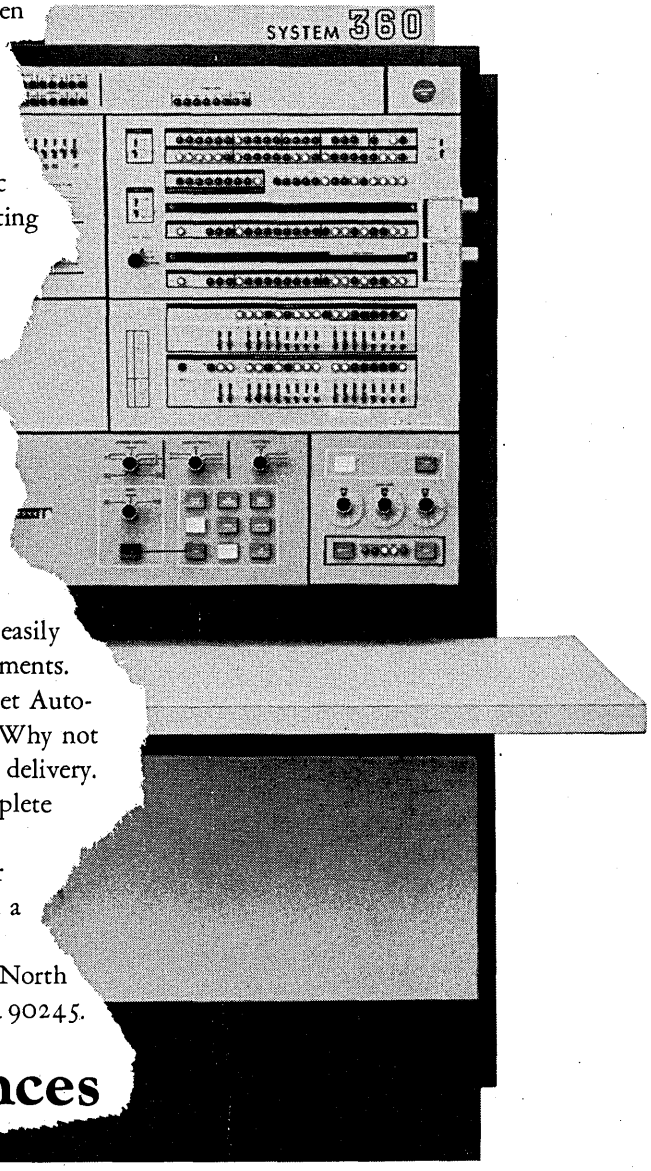


Computer Sciences Corporation

CIRCLE 39 ON READER CARD

dp/communications industry that the Association of Data Processing Service Organizations will recommend to the FCC in the inquiry beginning in February. Otherwise, the organization feels, free competition should be maintained in the industry.

Much to the chagrin of some time-sharing firms in ADAPSO, the proposal calling for elimination of message toll charges in data communications was deleted from the recommendations. The board of directors felt this was not in the immediate interests of the organization. Many small member firms, not using communications in their services, believe the competition from on-line service bureaus will increase quickly enough without providing the added incentive of reduced communications costs. One observer feels this issue could give rise to a schism in the organization.

Other recommendations ADAPSO will make are: service centers should be allowed to switch messages when this is not the main function but incidental to the dp service involved; users should be able to use non-common carrier attachments (meeting standards) on both private and dial-up lines; a digital data transmission network with data-conditioned line quality at low cost is needed; additional tariffs providing for a wider range of data transmission speeds should be offered; because of tariff disparities from state to state, FCC should establish uniform equipment and line standards and charges and recommend their adoption to the state utilities commissions; standard and reasonable charges for the cancellation of channel services should be established. ADAPSO is preparing economic data to support these recommendations.

ASTROLOGICAL INSTALLATION NOW READY TO DIRECT LIVES

"If single, marriage will be delayed from . . ." This incomplete sentence in our computer-produced 10,000-word horoscope caused us to wonder if this was a symbolic omission or a printing error only a computer would have been insensitive enough to make.

Time Pattern Research Institute, in cooperation with service bureau Tabulating and Business Services, recently demonstrated to the press its new system for producing 20-page horoscopes in less than a minute. To the 5,000,000 believers in the U.S. (40 million said to be "interested"), the reports on character and personality and a 12-month forecast, are offered at $15, versus $5-500 and up to 60 hours for manual production.

In the data base of the system, an IBM 360/40, are 18 million characters in phrases (all the different combinations of text relating to character, health, finance, romance, etc.). The system contains tables of positions of the sun, moon, and planets for the last 80 years. Taking the individual's exact time and place of birth, it determines the positions and relationships (what "house" and "sign") of these bodies at birth and over the next 12 months. The location is correlated with the equator as well as the celestial bodies.

Though there is a basic agreement among astrologers on the calculations and on which relationships between the celestial bodies are important in casting a chart, the interpretation of these factors varies. Time Pattern's system contains the theories of Katina Theodossiou, said to be among the foremost astrologers. TBS' most difficult task was in formatting her interpretations, especially since any change in combinations of "conditions" can affect the analysis. Though some contradictions must still be worked out, the machine is now said to be programmed to produce up to two billion different reports.

According to Miss Theodossiou, computerizing these data and theories means that "limitless numbers of studies can now be made . . . on the incidence of correlate astronomical configurations as it relates to psychological problems such as alcoholism, drug addiction, suicidism, autism, etc. Similarly explorative studies can now be made in other directions such as ratios of intelligence, superior intellectual and artistic endowments."

(In the meantime, my horoscope, accurate in many ways, leaves me wondering if I really could be a big-game hunter.)

NEW FIRM WILL LEASE SOFTWARE PROCESSORS

Information Systems Leasing Corp. has been established in Glenside, Pa., by software pioneer Mary K. Hawes, most recently manager of information systems at Univac where she was responsible for the IMRADS, information management system.

The company will develop, lease, and maintain major applications-oriented information system processors. They will be designed for third-generation and later computers, but will include subsystems that can be used by current tape-oriented installations. Support services, such as training and updating, will also be supplied by ISL.

Two characteristics of this type of software make leasing advisable, Mrs. Hawes said. These are that software becomes obsolescent faster than hardware and that applications software is undergoing modifications more or less constantly because of changes in both the hardware and the applications area itself.

EMPLOYEES ACCUSED OF ILLEGAL COMPUTER USE

The Chicago Board of Education has accused five employees of its data processing bureau of using the Board's flat-rate, leased scanner for non-Board work. The five, who have since resigned, allegedly were operating their own dp firm, which dealt with reputable firms in the city. Among those who left was bureau director James A. Quinn.

The state's attorney office is currently investigating. The investigators emphasize that so far they have no proof, that they are trying to find out the facts.

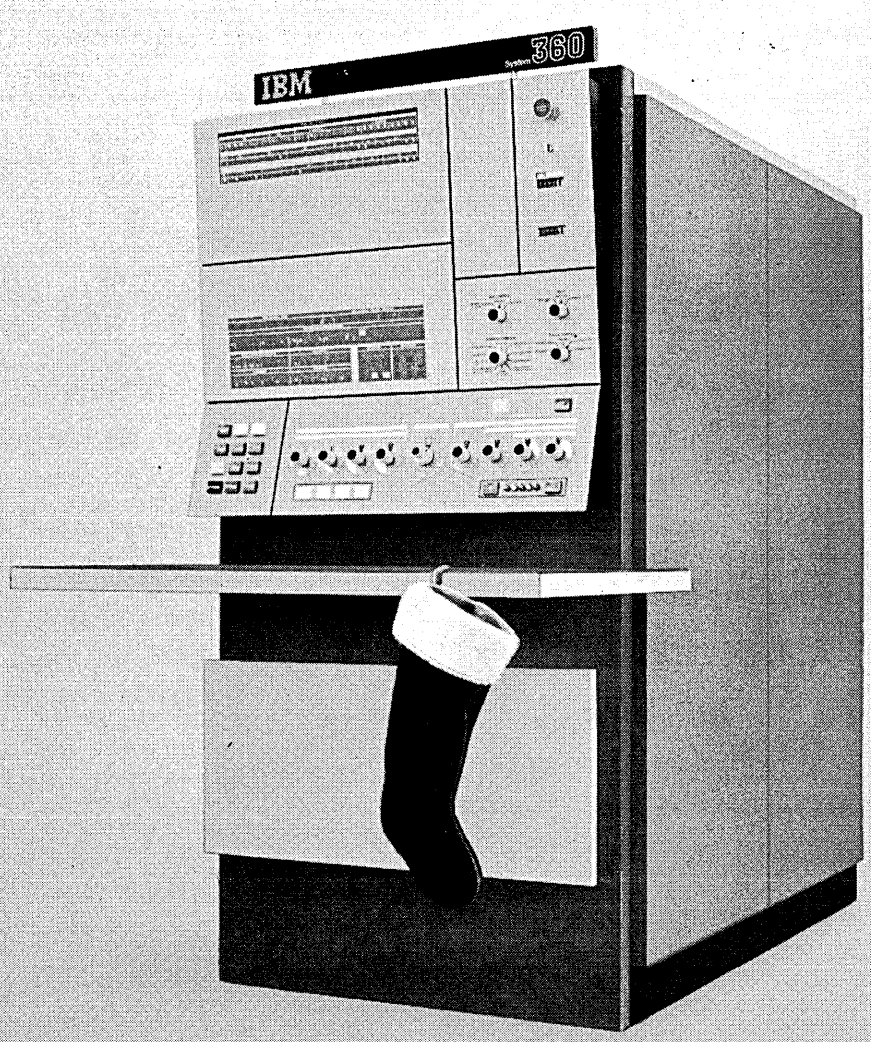
And the facts that cause them the most trouble are the dp equipment details. Matters involving computer usage, and especially any unauthorized uses, are so new that there are few precedents to guide lawyers as to whether something like this could be considered criminal. Questions to be answered, in addition to the veracity of the accusation, are: Does the use of an unmetered scanner—paid for but not in use—by those authorized to use it for the Board but who use it for non-Board business, constitute a crime? Did the employees collect money that was not passed on to the Board?

The Board was the recent target of a critical report by Booz, Allen and Hamilton Inc., which said that the dp bureau was overequipped and underutilized (see Nov., p. 94) The report cited a second document reader, no longer there, that was so underfed its cost per hour of utilization was $303, instead of the optimum $45.

NEW COMMAND/CONTROL ORDERS WILL COME TO $150 MILLION

The Joint Chiefs of Staff will buy about $150 million worth of command and control adp equipment during a five-year period beginning in fiscal '69. Specs are about 80% completed. They are scheduled to be finished next March, and JCS hopes to have an RFP on the street by July 1, '68. AF/ESQ, Hansom Field, Mass., will evaluate bids.

The application encompasses the world-wide military command and control system, which operates from approximately 35 major locations around the globe. Present gear ranges from 1401's up to Philco 2000's. The



This Christmas, don't forget your computer.

How do you think it feels, humming quietly in the next room while everyone else exchanges gifts at the office party?

Sad, no?

But you can change all that—make your computer feel like one of the gang—by getting it something personal.

To help you choose the right gift, we here at Tab Products have come up with a gift catalog: 122 pages filled with more than 700 accessory items for computer and data processing rooms; gifts like DataGard cases and collars, tape storage cabinets, tape transfer trucks, and practically everything ever made for EDP.

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Some tapes are. That is, certain of their properties are made "too good." Often at the expense of other, equally important characteristics.

Outstanding tape durability can be gained at the expense of increased head wear; remarkable coating adhesion could mask inherent internal weakness (and result in premature breakdown); "high-powered" magnetic properties may cause the tape to be electrically incompatible with your computer system.

Because magnetic tape properties are frequently interdependent, often conflicting, we make no boasts of specific superiorities for our new Audev K-68 computer tape.

Instead, we deliver a premium tape in which all the critical characteristics have been *balanced* to provide a high initial quality that will not deteriorate with storage or hard use.

What do we mean by balance? Read on.

It's a dirty shame what some "clean" tapes do to your heads.

To begin with, we know what happens when balance is lacking. There is, for example, one computer tape on the market that is excellent in its freedom from dropouts. It makes a remarkable "first-pass" impression. Yet, an imbalance in key properties makes this tape more than 40 times more abrasive than Audev K-68.

One of those key properties is friction, both static and dynamic. And one way to reduce friction is by lubricating the surface of the tape. But this "trick" solution is short-lived and tends to distort start/stop performance.

In Audev K-68, we attacked the problem differently. Carefully combining binder ingredients, processing and surface treatment for proper static and dynamic frictional balance, we've produced a wear-resistant surface that will not break down on high-speed transports.

But, you might ask, couldn't a really hard binder accomplish pretty much the same result? We say...

Don't get stuck by the "sticky tape" test.

Take one of those tough tapes and torture it. No amount of pulling, scratching or stripping off with pressure-sensitive tape will cause the surface to flake or shed oxide.

But this, too, may be an imbalance. What you may not see is a stiffness and brittleness which could make the edges particularly vulnerable to damage.

Audev K-68's balanced cohesive properties prevent coating failure. The binder is hard enough to prevent self-generated dirt caused by abrasion, yet tough enough to keep the edges from deteriorating.

At the same time, K-68's smooth, non-sticky coating provides few anchoring possibilities for ambient dirt or oxide redeposit. And its low resistivity virtually eliminates electrostatic pull on floating dust.

Balance also affects a tape's electrical characteristics.

We do our bit for today's high densities.

The higher bit densities of today's computer systems make demands that previously acceptable tapes can no longer meet. Use of a marginal tape in such circumstances often results in a gradual deterioration of quality. Dropouts increase; costly computer time is lost.

Audev K-68 takes these new, stringent conditions into consideration. Its magnetic properties, coating thickness and surface smoothness are balanced for total compatibility with all computer systems and for equal performance at densities from 556 bpi to 3200 fci and beyond.

How? A balanced interplay between low loss magnetics, precise

coating thickness and surface smoothness reduces pulse crowding, peak shift and dropout sensitivity without changing output or write current requirements.

K-68's balance also contributes to its environmental stability.

Keep cool. K-68 can take the heat.

Some tapes are as perishable as ripe tomatoes. They react poorly to temperature extremes in storage or transit; they "bruise" easily when moved from transport to transport.

Not Audev K-68. Base and coating properties have been balanced to provide uniform dimensional behavior. Cupping, curling and edge ripples caused by differential expansion or contraction of coating and base have been virtually eliminated.

Nor is Audev K-68 prone to skew-produced, time-displacement errors. Precision slitting, together with the scientifically designed Audev reel—and the low moment-of-inertia of the tape/reel combination—provide smooth tape motion on any transport.

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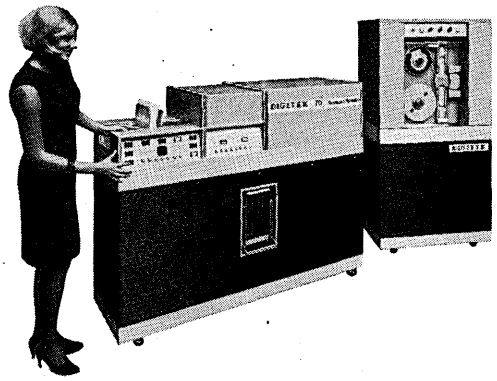
Are you trying to hire keypunch operators when you should be talking to us?



It could be the most profitable conversation you have had all year. Keypunching can be eliminated because there is a better, faster, more accurate and economical way to feed your computer: Digitek 70 optical scanning system.

This versatile system reads 2500 pencil marked (original) documents per hour and transfers information directly to magnetic tape. The Digitek 70 not only saves labor, time and space, it also reduces errors, speeds the movement of data and raises the efficiency of the computer.

Keypunching can account for as much as 35% of the total cost of your computer operation and up to 90% of time delays. It is a profit drain worth far more than a close look and the suggested short conversation with us.

Write for information on this and other Optical Scanning systems that read a variety of hand- or machine-printed source documents.

OPTICAL SCANNING CORPORATION

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CIRCLE 34 ON READER CARD

forthcoming procurement will include an equally broad range of equipment sizes. It will be installed in "a majority of the 35 centers," says a Pentagon source.

All of the hardware to be acquired will be off-the-shelf, he adds. An integrated adp system is a major goal, so one contractor probably will win the whole melon. However, subcontracting may be necessary. Although the present configuration is largely IBM gear, the colossus from Armonk will not have any special advantage in bidding on the new equipment. DOD reportedly has gone to extra expense in writing the specs to assure an equal opportunity for all bidders.

The winner undoubtedly will be in a position to reap additional business, since at least a few follow-on procurements are likely. These will cover functions related to the main application which require developmental effort. A space surveillance system was mentioned as one such follow-on.

The specs will leave operating and executive systems up to the bidder, but in each case he will have to meet minimum performance specifications. Each bidder also will have to furnish COBOL and FORTRAN compilers, although the programming language has not yet been determined. A benchmark test, based on a representative sample of the actual workload, will be run on each bidder's equipment configuration and will determine the winner.

DOD WILL ASK BIDS FOR MILITARY TRAVEL SERVICE

DOD plans to invite bids next summer on a sophisticated computer network which will make travel reservations for military personnel and control movement of their personal effects. The system will consist essentially of a large cpu—on the order of a 360/50 or /60—with multiprogramming and multiprocessing capability, up to 500 remote terminals, and up to 5 billion characters of random access storage. Approximately 200 terminals will have CRT's plus TTY's, while the remainder will have TTY's alone.

Army's Military Traffic Management and Terminal Service, which has DOD-wide responsibilities, will operate the new complex. Specs being written now are scheduled to be ready in March. Hopefully, the network will become operational in mid-1970.

The passenger travel reservation system, known as PASTRAM, will require MTMTS to interface with the seat inventory files of all major domestic airlines. Separate communication links with each airline are a possibility, by MTMTS is more likely to use a computerized interline switchboard which is expected to be installed in Chicago next year. This switchboard, a Univac 494, is designed primarily for travel agents. It will give them immediate access to several airlines' reservation systems. Reuben H. Donnelley Corp., which will operate the switchboard, and Air Transport Assn. members, who will put up part of the cost, are currently working out the details. The system is known as DOARS (Donnelley Official Airline Reservation System).

PASTRAM also encompasses automatic fare calculation. MTMTS expects to buy the software commercially. One likely candidate is a program written by tariff expert Jay Schuler, now being used by Braniff. United Airlines is hard at work on another, while a third is being developed by Donnelley for use with DOARS.

The dp system to be advertised next summer will implement the final phase of both PASTRAM and the personal property management operation, known as WHIST. When PASTRAM is fully operational, it will encompass all military passenger travel movements by commercial air and land carriers within the continental U.S. Army command. The workload will total about 2.6 million transactions per month. Among the system's more sophisticated applications will be the modeling of proposed changes in military travel regulations. WHIST will generate about 728,000 additional transactions per month.

PHOTO-DIGITAL SYSTEM DELIVERED TO LAWRENCE

The Atomic Energy Commission has installed a photo-digital information storage system at the Univ. of California Lawrence Radiation Laboratory in Livermore, Calif. The system was built for $1 million by IBM.

Over one trillion bits of information are stored in the system; data is recorded by electron beams on 1.3" x 2.7" photographic film chips. Five million bits can be packed on a single chip. The chips are positioned in a vacuum chamber for recording, and the information is written during sweeps of the beam across the chip surface. Recorded chips are stored in plastic cells, 32 chips to a cell.

The average time required to access a cell from the storage file and position the request chip for reading is under three seconds. The Livermore system, however, has two readers, and access time can be reduced to milliseconds by overlapping operations. The instantaneous read rate is 2½ megabits per second. The reader is a flying spot scanner.

The photo-digital system operates under the control of an IBM 1800 data acquisition and control system with 16K core memory and a 2 usec cycle time.

A second system is scheduled for installation at the Lawrence Radiation Laboratory in Berkeley, Calif. Somewhat smaller in capacity, this $850K system will store masses of data used to track and identify atomic particles.

IBM BUILDS 4 PI FOR LTV AVIONICS

While the industry awaits the award of the $100 million Air Force Phase II computer contract, IBM is busy working on a $168.5 million award from LTV Aerospace Corp. The Navy and Air Force will use IBM-developed navigation and weapons delivery systems in more than 1,200 A-7 aircraft. The systems, part of a total avionics system LTV is contracted to build, will each contain a small model (TC-2) of the militarized computer, System/4 Pi. This version is a 75-pound unit with 65K (8-bit) bytes.

The on-board system will have the 4 Pi linked to sensing elements from which it will gather information on terrain, height, speed over ground, changes in movement, etc., and process it for display to the pilot on his instrument panel and a "head-up" display directly overhead.

IBM is also developing 4 Pi-based avionics systems for the F-111 aircraft, the EA-6B plane being built by Grummann, and three other unannounced aircraft or space projects.

HONEYWELL SETS UP OWN EDP LEASING SUBSIDIARY

Honeywell, which discontinued its policy of outside sale-leaseback in September because it had provided the capital required, has now established its own finance subsidiary, Honeywell Finance Inc. HFI will be supported by an initial $60-million line of bank credit, to be used to purchase all or part of lease contracts

All time winner, move over- the new PDP-8/I computer is here

The integrated circuit PDP-8/I is a brand new computer, but behind it are the two most successful small computers ever built. Over 1,000 PDP-8 systems are already installed — an all time high for real-time, on-line small general purpose machines. Nearly 1,000 PDP-8/S computers are installed — all sold and delivered within the last 15 months. Built into instrumentation. On-line in process control.

So, PDP-8/I starts with a history and goes on from there. It has all the features of the PDP-8 plus a new ease of interfacing, expanded software and new options. It is more compact. PDP-8/I has a faster multiply-divide option (multiply 6.0, divide 6.5 microseconds). Its standard 1.5 microsecond 4K core memory expands to 32K (first extra 4K plugs into the basic configuration without further interfacing). PDP-8/I comes as a stand-alone console or mounted in a standard 19-inch rack. The processor is prewired so that it will accommodate a high-speed paper tape reader and punch, a 100 card-per-minute reader, an incremental plotter, and a scope display also without further interface.

And software. The same proven software that runs the PDP-8, drives the PDP-8/I. Auto-indexing. MACRO. FORTRAN. On-line editing and debugging. But that is not all. New systems software is available which takes full advantage of 32K or more of DECdisk or DECtape memory. Thousands of the most active computer users in the world exchange PDP-8 programs and techniques.

Peripherals that go with the PDP-8 and PDP-8/S go with the PDP-8/I. Hundreds of logic-compatible modules make interfacing easy. Peripherals are field-installed by an applications engineering and field service group second to none.

And the crusher. PDP-8/I sells for $12,800 including Teletype. Quantity discounts reduce that price. Deliveries in the spring. PDP-8 and PDP-8/S available now. Write for brochure. We'll throw in our new Small Computer Handbook free.

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and installment sale receivables of the EDP Division. Unlike sale-leaseback, which contributed to the firm's earning picture (for example, 12¢ per share in third quarter '66), the new financing method will have little or no effect on earnings, said James H. Binger, board chairman. The domestic computer operations have reached a point of profitability without the sale-leaseback technique, he added.

The finance subsidiary will correct two disadvantages of sale-leaseback. Using as assets a portion of the "forward committed" rental revenues of the edp systems, HFI can borrow capital economically while at the same time Honeywell can retain ownership (relinquished before) of the equipment borrowed against. There will not be the slight reduction of ultimate total revenues that the previous policy necessitated. It is preferable, too, to have the banking function in a separate company.

Sale-leaseback became vital to Honeywell after it had moved from three to five-year (maximum) contracts in November 1965. While long-term leases provided assurance of an ultimate profitable return on investment, "it did not give us the current working capital we needed to produce leased systems," said Binger. Once a major portion of the leases were being written for five-year periods (75% are now long-term with total 90% on rent), Honeywell was able to sell computers to outside financial organizations. This helped the firm raise $60 million.

Honeywell now has 2,000 computers installed; Computer Control Division installations and orders and EDP Division backlog account for 1,000 more.

Control Data Corp is also reported to be considering formation of a finance subsidiary.

BRINKLEY OFFERS PLAN FOR ON-LINE VOTING

"In every house or apartment or other dwelling place in this country, install a new device, somewhat as we have installed telephones. It would have two buttons, one labled 'yes' and one labeled 'no.' Or 1, 2, 3 - or some sort of label. Connect them all together by wire across the country into a series of electronic data processors."

Sound like the checkless society? No, it's an idea for return to the Athenian form of popular democracy. Speaking to a luncheon audience at the recent Business Equipment Exposition in New York, David Brinkley, tv news commentator, offered the thought that modern technology makes possible a popular vote on any issue. All news media would inform the public on the issue, and ". . . on the prescribed day, the voters push the buttons in their homes and vote yes or no. The computers record their votes, count them instantly, and the result is known in a few seconds . . ." The votes could be used as a decision or as a gauge to popular feeling, he said.

Taking the idea further than simply a national referendum, the machines could be used on a local or county or state basis for issues, elections, or just opinions. The breakdowns on public preferences could be done in the kind of detail never available before—by block, neighborhood, economic, social or sociological classification. Business organizations, churches, unions or other groups would also use the system.

The question is, he said, do we want it? It seemed to Brinkley that controls could be built into the system to insure that only qualified voters pushed the buttons. But still, "Do we want it?"

"How often would we vote in what we thought was the national interest and how often in our own personal interest?" he asked, relative to such issues as open housing, Viet Nam, the foreign aid program, welfare.

"If we object to putting political power directly into the hands of the American public, why do we object? Is it because a minority of us like to use the present system of government to manipulate public policies our way? Is it because we are afraid the public might not vote the way we would like . . . I rather doubt, somehow, this computer voting system will appear any time soon. But the interesting thing is that it could . . . We call ourselves a democracy. But in fact are we? And in fact, do we want to be?"

DETROIT COMPUTERMAKERS START MOVE TO SUBURBIA

Detroit's EDP circle has gone suburban.

Familiar names such as Control Data, GE, Monroe, RCA, SDS, IBM, plus Dura, Mohawk Data Systems, SCM and 3M are rapidly appearing on new office buildings on the city's northwest fringe, mostly in Southfield. A dozen years ago this quiet countryside became the home of Northland (billed as the world's largest shopping center) around which commercial buildings soon were erected, spreading out in increasing numbers along the main arteries.

Burroughs, however, is committed to its midtown position with the revamping of its estate into the $8 million World Headquarters (some say the company sold its suburban land and opted for the old site because big B's prexy lives in the opposite direction in Grosse Pointe).

NCR is outgrowing its fairly new building midtown. Here, plans seem to be to say put, but growth is soon going to force part of the operation to move.

IBM retains its main Detroit operations in old EDP circle, but has suburban offices also. And Honeywell is still downtown.

Univac rented its five-story midtown building to Wayne State University's Applied Management Training Center a couple months ago and moved to Southfield. The building is still being completed around the company operations—but the power supply has finally come in to allow the 9200 to be hooked up. This building also houses Rem-Rand office machines.

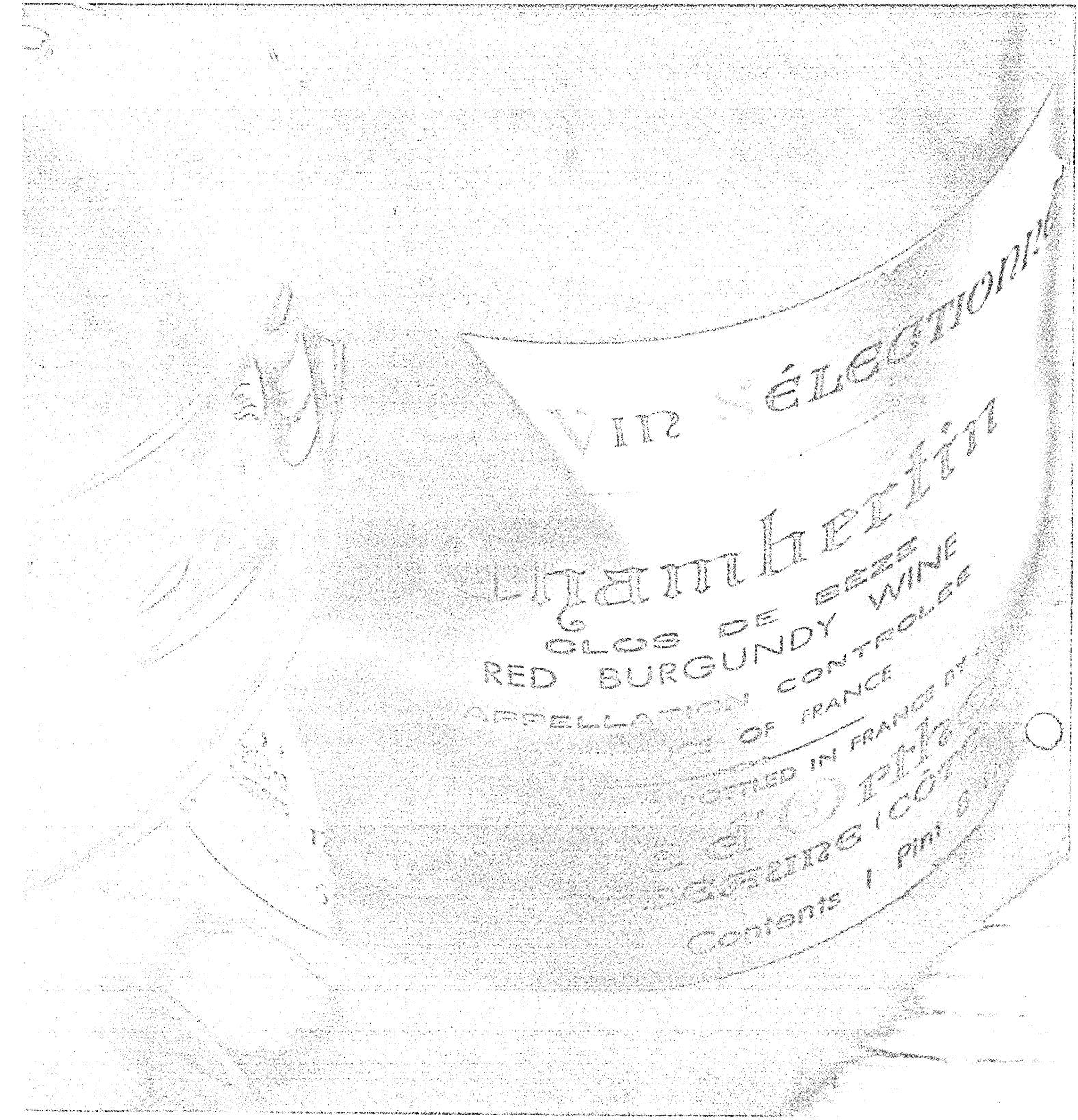
Unfinished building problems also plagued CDC, a near neighbor of Univac, in the recent move. The seventh CDI, scheduled for early November opening, had to wait a couple of weeks (manager William D. Miller was expediting procedures from an office loaned by neighbor Ampex). CDC sales and Data Center will share the same building, a cozy arrangement which gives CDI students easy access for hands-on use of the center's 3300.

The movement to suburbia appears based on a number of factors: following customers; easier transportation via expressways; easing recruitment (especially heavily-suburban salespeople); parking spaces for personnel and customers (each building has its own off-street parking area); and the need for additional space.

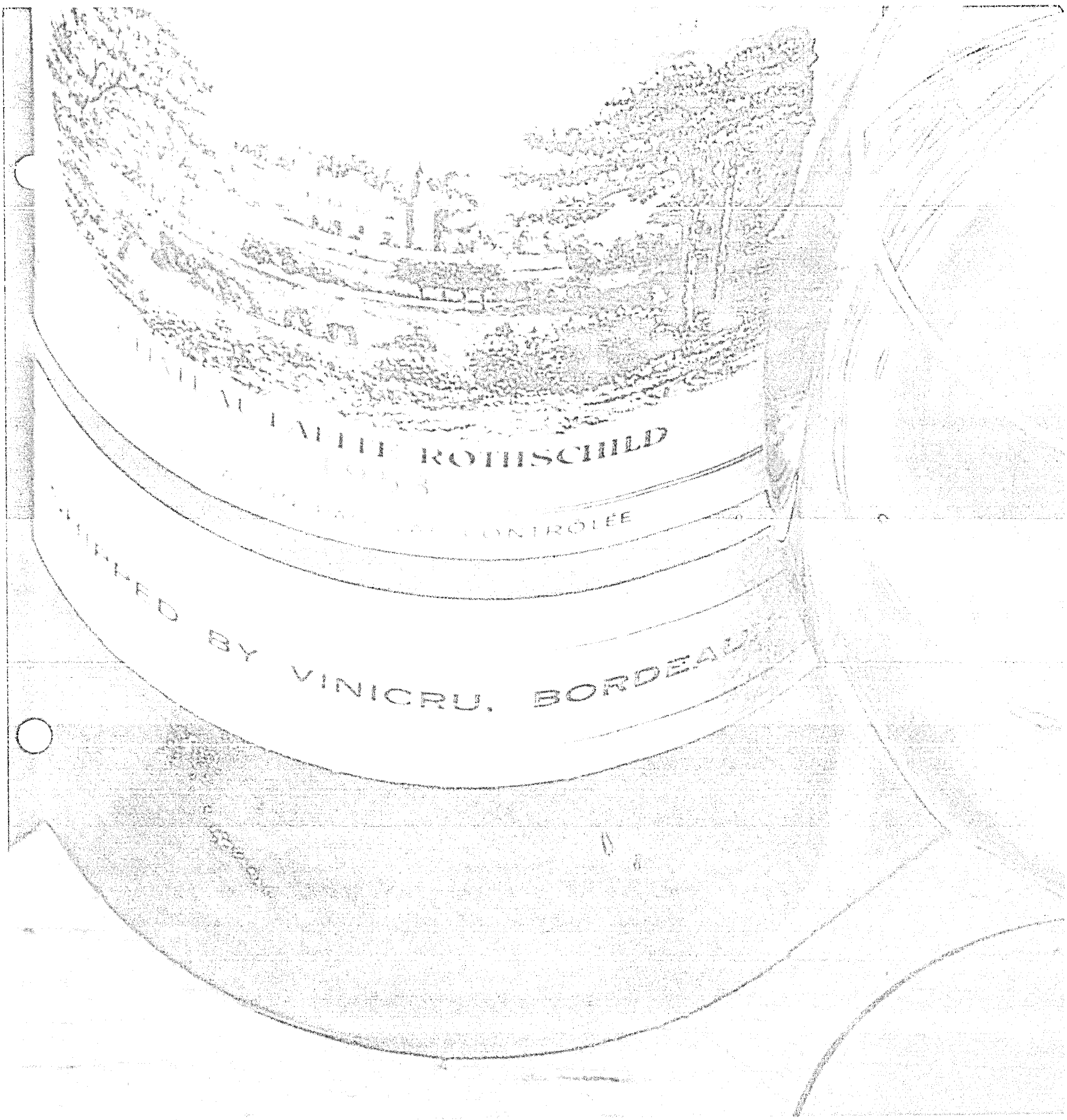
Further attesting to the edp move outward are signs on yet vacant land announcing sites for future homes of software companies and support supply firms.

NEW SERVICE MATCHES STUDENTS TO SCHOLARSHIPS

Over $30 million in college scholarships, grants, and loans went unclaimed last year, primarily because qualified students didn't know about them. And until now there has been no central source of information on the $500 million in financial aid available to students yearly. North American Educational Computer Servies, Inc., plans to change this. The company, headed by 24-year-old David Christmann III, has spent the last two years recording for computer input every known scholarship and now has a data bank of 700,000 such



THE TWO GREAT DISC PACKS



LIKE THE TWO GREAT WINES, ARE NOT IDENTICAL.

Savor a Château Lafite-Rothschild, at least ten years old, and you experience a great Bordeaux.

Sip a Chambertin-Clos de Bèze of the same vintage and you [illegible]

[illegible]

[illegible]

We could be [illegible] the two great disc packs [illegible] we make and the one made by a computer [illegible] Both come from companies with our [illegible] magnetic media technology — the same companies, in fact, that make the two great computer tapes. Both disc packs are the results of rigid quality control and fastidious manufacturing. [illegible]

[illegible]

MEMOREX

Blast it with sand and blast it with water at hurricane force.

Bump it along in a railroad humping test. And then make it float in 18 inches of water.

What a way to treat a sensitive piece of equipment like a computer. But when it's for the Marines, that's what you do.

That's what UNIVAC® did to its CP-808, heart of the Marine Corps AN/TYA-20 Computer Compatibility Group.

And it passed every test the very first time.

The Marines have ordered six of them for their Marine Tactical Data System to improve command and control capability.

This means front line duty. And there's only one way for a 7 x 7 x 12 foot unit to get there. By helicopter.

Somewhere in Vietnam these ruggedized computers are already at work.

They provide command information to surface-to-air missile units and to interceptor aircraft.

That's important business. But it's only one of the vital tasks UNIVAC systems are doing for the military.

In civilian life it's the same story. UNIVAC in industry. In government. In science and education. In all parts of the world.

UNIVAC

Univac is saving a lot of people a lot of time.

SPERRY RAND

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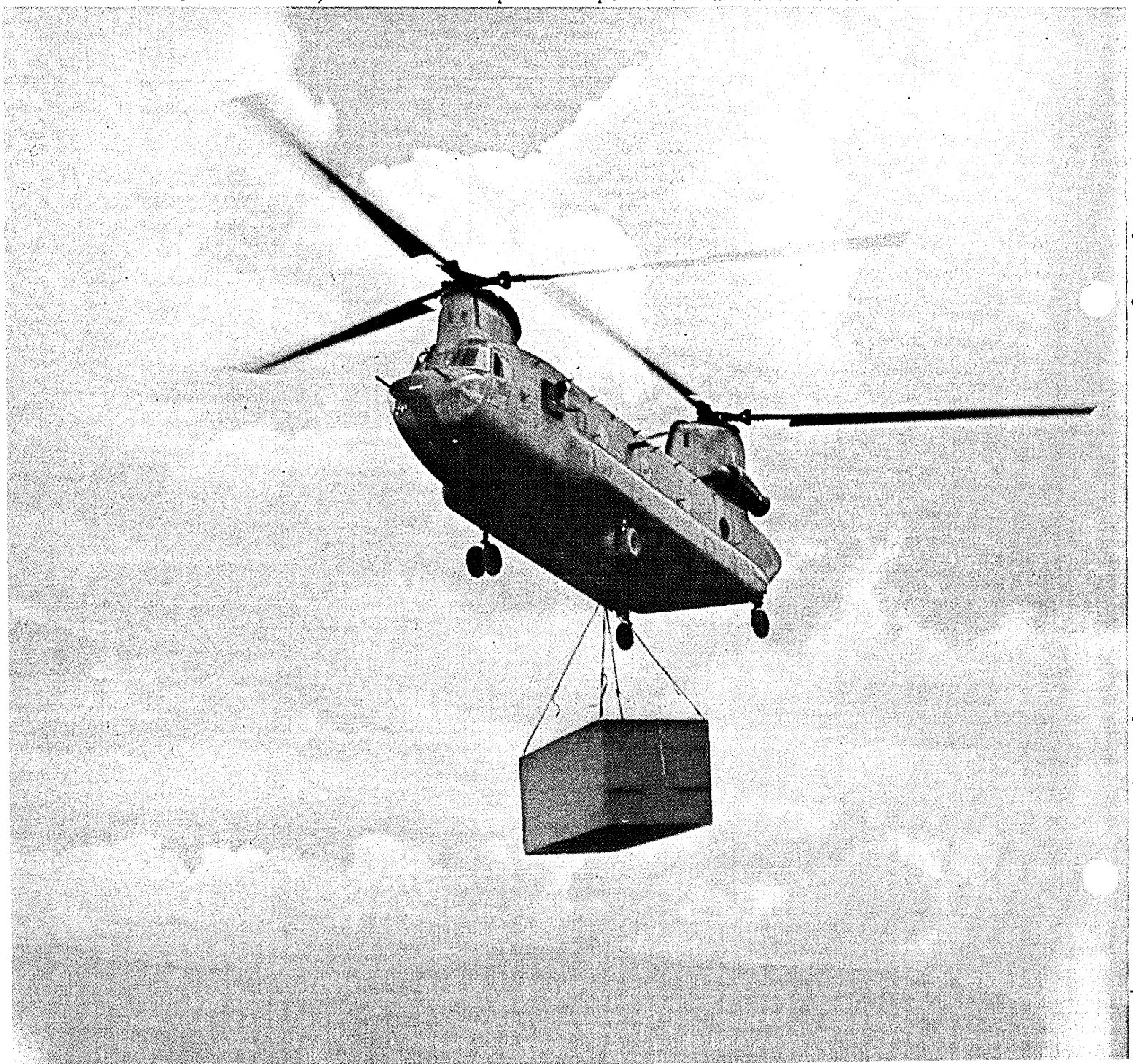
Every once in a while we get carried away.

Give it the old shake, rattle and roll. Drop all 4800 pounds of it and watch it bounce.



items. For $15, a student can be matched with the scholarships for which he is qualified.

Christmann, a non-computerite who developed the idea while a scholarship-seeking student, now has a staff of 30 researchers and an undisclosed number of financial backers. Mandate Systems is contracted to set up forms, build the data base, and program the system, a 512K-byte IBM 360/65 with 2311 disc drives. This month the firm should begin generating the scholarship lists, which will consist of generally available funds and more restricted offerings a particular student qualifies for because of such factors as organization affiliation (student and/or parents), academic major (even ice cream technology) veteran status, home or college location, etc.

The reasons scholarships go unused are many. Some grants are not highly publicized and others are too restricted. (One observer complains that some grants left in trust aren't publicized because of the interest that accrues by letting the funds lie idle.) Pomona College in California has a grant for a descendent of Huguenots in America in the 18th century. The Martha A. DeMerritt Scholarship Fund in Portsmouth N.H. offers money to a resident of the area who will certify that he or she does not use "indecent language, strong drink, or tobacco in any form." And Limeston College in South Carolina offers a grant to a "modest young lady" from Cherokee County.

NORTHWEST AIRLINES CHOOSES UNIVAC AGAIN

Univac has snagged another airlines contract. Northwest Airlines will upgrade their dual 490's to 494's under a $12 million hardware order and a separate $2 million turnkey contract for conversion and applications programming. The system, to be fully installed by 1970, calls for a total $25 million outlay, including communications, facility expansion, and maintenance.

New applications will include flight schedule display, freight control, and passenger name records which will be input via 830-plus CRT agent sets located at 45 offices in 29 cities. Numeric reservations, inventory, message switching, flight planning, revenue accounting, payroll, and other programs will be converted from the 490's.

New hardware will include two 98K-word 494's, 21 drums with a total 350-million-character capacity, two 1004's, five communications subsystems handling 20 full-duplex 2400-bps lines and 100 teletype lines, and 15 tape drives. In addition to CRT's at remote locations, there will be 54

25 cps page-writers. Several hundred teletypes are now installed. In addition to the usual technical support for system software, Univac is providing a 30-man team for the separate applications and conversion contract.

SMALL MACHINE SIMULATOR FROM SMALL SOFTWARE HOUSE

Another small software house moving quickly into proprietary programs is United Computing Corp. of Redondo Beach, Calif. They're about to announce a package that will allow the users of any SDS 900 series machines to simulate them on the Sigma 5 or 7.

United got started with maximum modesty in 1964—one man working on a $3000 contract—but by the end of fiscal '64 had grossed $12,200 with a net of $3K. Next year all three co-founders were working there: president John Wright and vp George Brajnikoff from North American Aviation, vp Ted Shepherd from L.A. City Schools.

Since then the company has followed what seems to be the standard software biz growth curve, doubling the gross every year. In fiscal '67 they took in $206K for a $20K net; Shepherd estimates the current year will bring $400K with a consequent doubling of the staff, now at 16. Shepherd also thinks they may "triple the net and quadruple the problems."

BOOMING BURROUGHS SPLITS PASADENA COMPUTER OPERATION

Prosperous Burroughs Corp., suffering from a space shortage at the Pasadena plant where the main frames, disc files, and tape drives are built, is dividing the operation and putting up a new facility in the nether reaches of the San Fernando Valley.

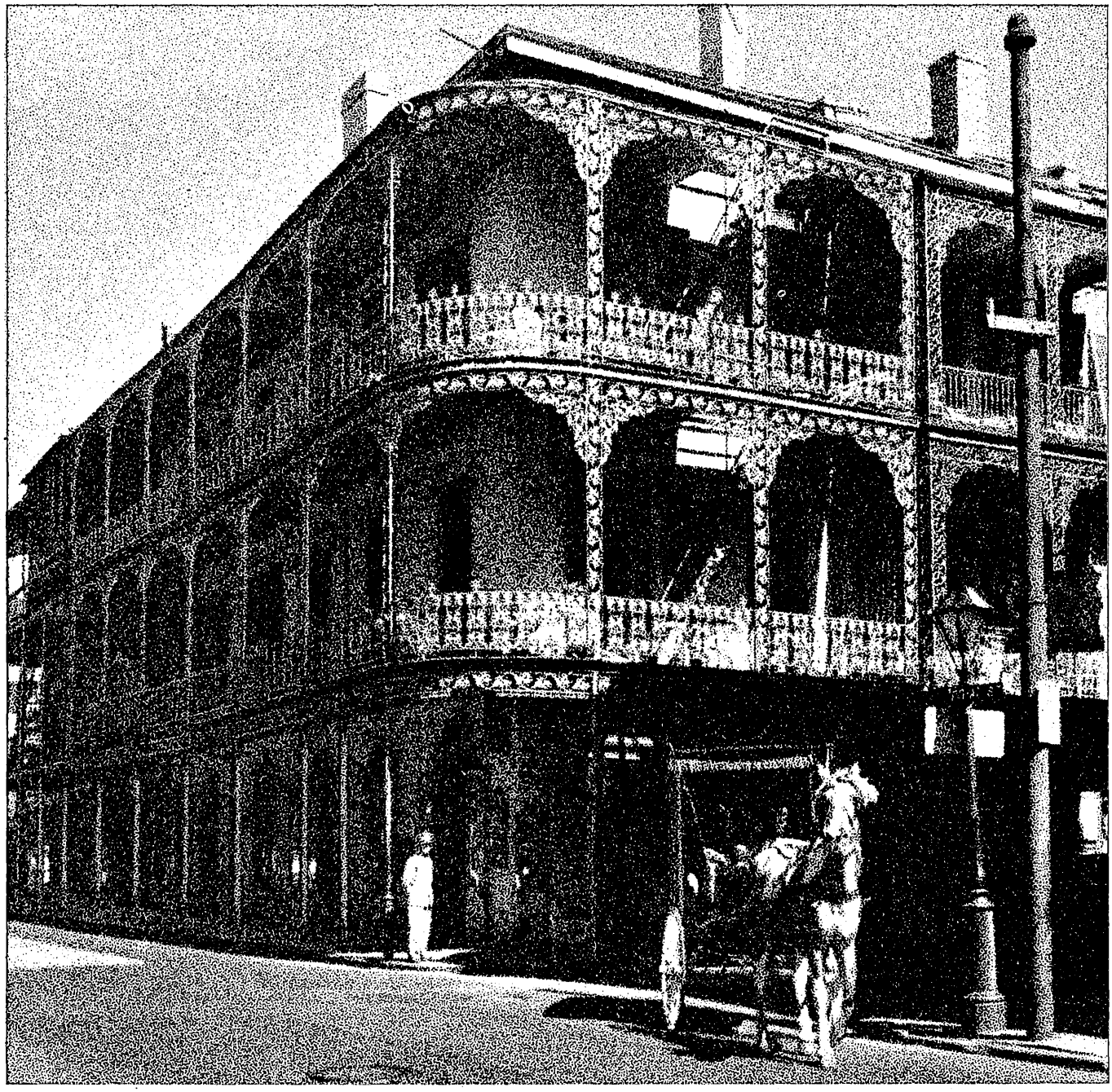
The Pasadena organization, now filling the plant and spilling over into rented buildings, will concentrate on cpu production. The new site will have discs, tape units, and other miscellany—and is to be the largest employer at a place called Westlake Village, a recent development best noted for massive housing tracts. The 30 acres acquired out there will have a building the size of the Pasadena plant to start; plans call for doubling it later. It's supposed to be finished in June next year, with staff transfers starting in July, may employ 2000—about the number now at work in Pasadena, where they will be hiring to maintain about the same level.

● A two-day symposium on the interface of computer science and statistics is planned for January 25-26 at the International Hotel in Los Angeles. Twenty papers will be presented in eight sessions; the symposium is sponsored jointly by the Univ. of Calif. at Los Angeles, and the American Statistical Assn., ACM, Statistical Program Evaluation Committee, and the American Documentation Institute. The $20 fee includes two lunches. Further information can be obtained from Business Administration Extension Seminars, Room 2381, CBA, Univ. of Calif., Los Angeles 90024.

● The Association for Educational Data Systems (AEDS) has announced the fifth annual Computer Programming Contest for students in grades 7-12. A project may be submitted by an individual or by a team; deadline for entries in April 8, 1968. The winner of the contest will receive a $150 savings bond and a trip to the AEDS convention in Fort Worth, Texas. More information and entry blanks can be obtained by writing to AEDS Programming Contest, Computer Instruction NETWORK, 607 Chemeketa N.E., Salem, Oregon. 97301.

● The U.S. Air Force has reassigned some 500 data systems design personnel, currently working in such areas as supply, base maintenance, offices of the Auditor General and Surgeon General, and others, and placed them under the newly-formed Air Force Data Systems Design Center. Under Colonel Vernon R. Turner, the center will be located at Bolling AFB, near Washington, and in Suitland, Md. The new agency will report directly to the Office of the Air Force Chief of Staff.

● The National Bureau of Standards is sponsoring a survey of services that provides for the exchange of com-



DYNAMIC MEMORY LOCATION *NEW ORLEANS, LOUISIANA*

New Orleans has a way of evoking memories. About 25 miles up the river, where Creole gentlemen once passed in Mississippi steamboats, now stands Little Gypsy, the world's first fully automated steam generation plant. □ Control Data's Mod. 46 computer made it a reality in 1961. Digital Development Corporation's 512 track Model 10100 drum memory was there then and hasn't been down for a moment since. As the Little Gypsy plant grew, a CDC 636 was added with a 1024 track DDC Model 12750 drum. □ Today this advanced computer system provides scanning, logging, monitoring operations and closed-loop control from startup to shutdown. □ Background processing has streamlined operations management decisions with timely performance/efficiency calculations. As Little Gypsy moves toward future expansion, other DDC high performance rotating memories are ready for this and other advanced applications. □ If demonstrated reliability in rotating memories is important to you, contact Digital Development Corporation, a subsidiary of Xebec Corporation, 5575 Kearny Villa Road, San Diego, California 92123, Phone (714) 278-9920.

DIGITAL DEVELOPMENT CORPORATION

CIRCLE 38 ON READER CARD

puter programs and documentation. In its first phase, the survey will interview organizations such as user groups, government agencies, nonprofit groups and private corporations. The Standards Bureau hopes to determine the general nature of the services offered, the number and types of programs involved, and the extent to which program catalogs exist. A roster of program exchange organizations will be published at the end of the survey; any organization wishing to be listed in this roster should contact the Technical Information Exchange, B250-Instr. Center for Computer Sciences and Technology, National Bureau of Standards, Washington, D.C. 20234.

● In a reverse of the usual situation, a British service bureau, the J. Short Computer Centre, recently sent a company partner, Valentine Reader, throughout the U.S. in an effort to create enough prospective business to enable the company to establish an office in the U.S. linked by Telex to the London Centre. Already serving U.K. branches and subsidiaries of American firms, the Centre offers systems analysis, programming, personnel training and temporary help.

● U.S. attendees to IFIP Congress '68 in Edinburgh, Scotland August 5-10 are urged to register and reserve rooms immediately. The U.S. committee is holding a block of rooms which will be assigned on first-come basis for registrations received through the end of January. Too, advance registration, until April 30, will cost $40; registration at the Congress will be $50. Refunds on rooms and registration will be made until April 30.

● The American Institute of Physics (AIP) is evaluating the Universal Decimal Classification system (UDC), a system used in Europe for document storage. Subject matter for the evaluation will be bibliographic reference data for nuclear science research reports; AIP, using this data, will determine the effectiveness of the UDC system under conditions where scientists have direct access to the data through a display console linked to a computer. Software for the study is being developed by Xerox's Information Systems Div. Later, Xerox will supply AIP researchers with a terminal and computer time.

● The Garden State Credit Bureau, Clifton, N.J., has contracted ITT Data Services to design and operate a computerized system called ACIS (Advanced Credit Information System). The system will provide data storage, up-dating and inquiry response information service to the 1,400 members of the credit bureau, which maintains current records on over three million people. The system, which will be located at ITT's computer center in Paramus, N.J., will be connected to the credit bureaus via Teletype terminals. Credit bureau officials have stated that access to the system will be limited to authorized individuals, and the system will automatically make note of each query and its nature.

● A Postal Address Analysis system has been developed by Prof. E. N. Ferentzy of the Dept. of Computer Science, Univ. of Toronto, Canada. The system accepts machine-readable postal addresses in unspecified format and 1) identifies address components by province, county, city, street, house number, etc.; 2) corrects keypunch and spelling errors; 3) recognizes alternate names and abbreviations; and 4) validates address components by referencing master files. The system reportedly allows the specifications of a whole family of postal address analysers in a syntax-oriented language, Meta-PL/I, developed by Ferentzy. The Meta-PL/I specs of any particular address analyser are then automatically translated into a running PL/I program. The length of a particular address analyser is about 350 PL/I statements, Ferentzy says. The system has run on both a 360/50 and 65.

● An agreement for the acquisition of Voiceprint Laboratories by Farrington Manufacturing Co. marks the entry of the optical scanning equipment concern into voice identification. Farrington's Optical Character Readers are being used in banks, and one purpose of the acquisition is to add voice identification techniques that may be suitable for later direct communication between depositors and a bank's computer, according to Farrington president Norville E. White. Voiceprint founder Dr. Lawrence G. Kersta will continue as president of the subsidiary.

● The 1968 Winter Convention on Aerospace and Electronic Systems WINCON will be held Feb. 13-15 at the International Hotel, Los Angeles. Co-sponsors are the Aerospace and Electronic Systems Group and the Los Angeles Council of the Institute of Electrical and Electronics Engineers. Chairman is S. F. Eyestone, president of the Autonetics division of North American Rockwell Corp.

● Machine Control Co., 6-month-old division of Microwave Development Laboratories, is providing computer-based systems for machine tool control. MCC offers a gp computer—now the PDP-8S although other machines will be used—machine-language programs for tool control, MCC-manufactured interfaces or directors, tape reader, and the analog motor controls and servo devices. A major feature is that the configuration is adapted for feedback on workpiece dimensions or cutter parameters to control machine tool speed. Two systems have been ordered from the Bedford, Mass., group: one to operate eight milling machines and another for full contouring control. Bedford Assoc. Inc. is providing software and consulting.

shortlines . . .

An information retrieval system which will store a mixture of microimages of different sizes and formats and provide remote viewing capability will be developed and marketed cooperatively by Sanders Associates, Inc. and Diebold, Inc. The Sanders/Diebold 500 system will be in prototype early 1968. Because Sanders is in SEC registration, no further data is available . . . The National Cash Register Co. has opened its 25th data processing center in its new Reno (Nev.) marketing building. The center will be equipped with an NCR 315 system . . . The COBOL Language Subcommittee of CODASYL has recently formed a task group to investigate the asynchronous processing capabilities of COBOL. Individuals wishing to participate in this activity should contact Mr. Robert F. Betscha, IBM, Dept. 610, 1271 Avenue of the Americas, New York City 10020 . . . The 1968 ACM National Conference & Exposition, to be held in Las Vegas, August 27-29, has issued a call for papers. Deadline is March 1, five copies of completed drafts and abstracts of 100-150 words should be sent to Marvin W. Ehlers, Program Committee Chairman, Ehlers Maremont & Co., Inc., 57 W. Grand Avenue, Chicago, Ill. 60610 . . . Univac has found a buyer for its four punched-card manufacturing plants. Their acquisition by Data Documents Inc., Omaha, Nebraska, being negotiated as this is written, would mean a 50% increase in the production capability of DDI. And their addition would bring to 13 the number of manufacturing facilities of Data Documents, which also makes continuous business forms and pressure sensitive labels. DDI, in its fiscal year just ended, had sales of over $9 million.

Piquant though small

Our exclusive DRUM FILE: It stores up to 65,536 10-bit bytes or 131,072 numeric characters at a transfer rate of 35 K bytes/sec. with a sorting rate of 50 numeric characters times 2,000 in 3 minutes.

FACOM 230-10 speaks COBOL ALGOL and FORTRAN.

FACOM 230-10 accepts all input data regardless of code.

Concurrent Operation: Peripheral hardware—FACOM WRITER. High Speed Tape Reader, High Speed Tape Punch and Line Printer—as well as recurrent processes work concurrently.

Small Size: The basic system stands on 35.5 sq. ft.

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Communications and Electronics

Marunouchi, Tokyo, Japan

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CIRCLE 32 ON READER CARD

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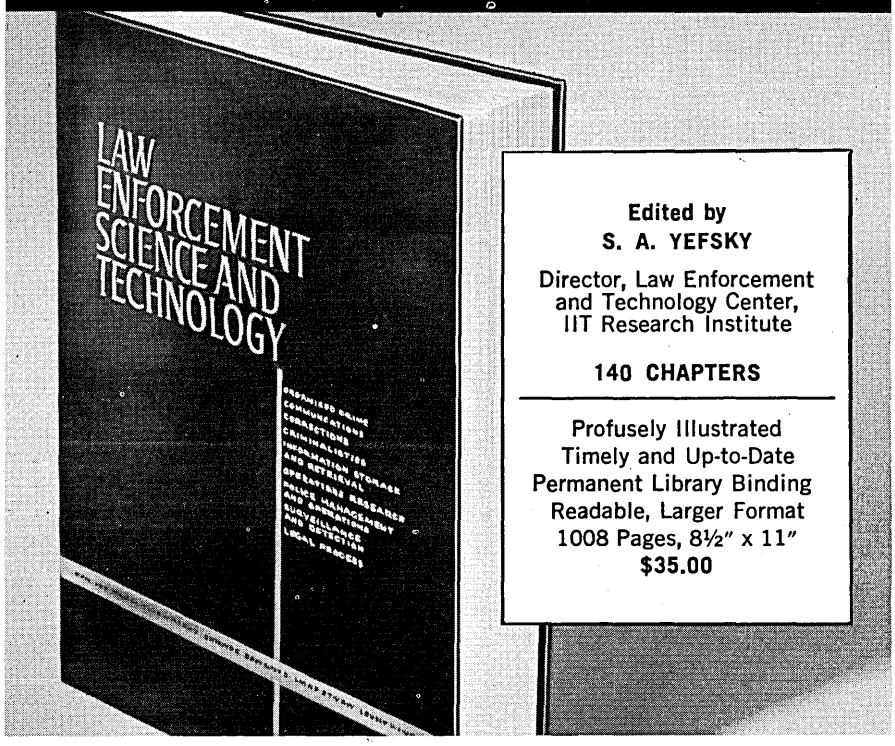
This major, comprehensive work from Thompson reports on all the significant research and development programs reflecting the state-of-the-art of criminal justice within all related disciplines. Written by the world's foremost experts in their respective fields, contents include:

AN INDISPENSABLE REFERENCE TOOL FOR ALL CONCERNED WITH LAW ENFORCEMENT!

The Basic Material for the Newest Developments



Edited by
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Director, Law Enforcement and Technology Center, IIT Research Institute

140 CHAPTERS

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ORGANIZED CRIME

Legal, social, administrative, political, economic, and other aspects. Philosophy of crime prevention re: urban planning and redevelopment; legislative action at federal and local level; law enforcement, education, welfare. Special report by President's Commission on Law Enforcement on potentials of science and technology in criminal justice.

COMMUNICATIONS

Frequency allocations in law enforcement for more efficient transmission techniques and spectrum utilization. Future requirements in data transmission to patrol operations. Because of communications loss when patrol officer leaves his vehicle, two separate solutions to providing personal communications are described: satellite station repeater approach; vehicle repeater approach.

CORRECTIONS

Impact of information systems on problem of offenders. Nearly half of convicted offenders repeat within two years after release. Basic objectives: punishments and new research in rehabilitation, retraining, prison management.

CRIMINALISTICS

Newly-developed techniques in blood analysis, shooting distance determination, individualization of materials. Great promise held for advanced analytical techniques now being perfected.

INFORMATION STORAGE & RETRIEVAL

Programs for national, state-wide, area-wide, local information systems. Methods for classification and identification of fingerprints; papers on patter recognition, laser optics, holography, etc. Ultimate development of fingerprint classification a most significant breakthrough by searching several hundred million sets of fingerprints to identify one latent print. Present system requires ten prints.

OPERATION RESEARCH

Treatment on variety of applications to criminal justice problems, such as crime prediction, administration of courts.

POLICE MANAGEMENT & OPERATIONS

Patrol, investigation, arrest, training research. Police-community interrelationships, demonstrations and riot control; weaponry. Applications of information systems to resource allocation and crime prediction.

SURVEILLANCE AND DETECTION

Commercial and industrial security, intrusion systems, in light of military technological developments; commercial systems having only progressed to doppler ultrasonics. New detection methods: infrared, seismics, range-gate radar, magnetometer, inage, pressure, etc., heretofore unreported. Central control of police vehicles by radar, transponder techniques.

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CIRCLE 46 ON READER CARD

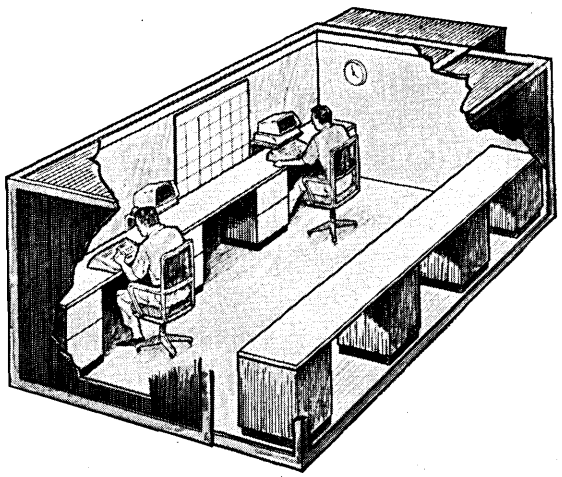
DISPLAYS FOR COMMAND AND CONTROL

Bunker-Ramo is developing command and control systems. The object is to achieve the maximum "command visibility"; that is, to give the commander the clearest picture, in real time, of the diverse information flow involved in the command situation.

For use at high command echelons, the BR-90 (AN/FYQ-37 and -45) Visual Analysis Console, with its easily changed, stored program control; combined with superimposed photographic and electronic displays, presents source data for real-time analysis. BR-90s are operational at SAC and are being implemented in the worldwide Air Force Integrated Command and Control System.

For use at lower echelons, low-cost, light weight display systems specifically designed for mobile, tactical environments are soon to be available.

Hardware at all levels is backed up by an integrated support program that ranges from the analysis of systems objectives to complete field support of the installed operational system.



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CIRCLE 40 ON READER CARD

washington report

MONEY PROBLEMS GETTING WORSE

Federal adp programs are being dropped, deferred, and stretched out in wholesale quantities because of the budget squeeze. One bureau chief expects a mass exodus of government adp experts next spring. They're embittered partly by inadequate appropriations, but even more by the necessity of haggling with BOB for what money Congress has already provided. A typical case: an agency with funds for 12 new jobs has been told to fill only three.

Many agencies are even reluctant to launch projects that don't require direct expenditure; they fear hidden, indirect costs. GSA's plan to set up inter-agency service centers is among those hung up as a result.

REVIEW COMMISSION PLANS GAINING MORE SUPPORT

HR12510, Cong. Chet Hollifield's bill establishing a commission to study government procurement activity, has been reported by the House GovOps committee; probably it will be passed by the full House early next year and sent to the Senate. There, HR12510 may be married to S2430, which contemplates a similar commission.

Beneath this activity is a complex struggle which could materially affect the amount of adp support services contracted out by Uncle Sam, and put federal adp policy in new hands.

The policy change was reflected in Comptroller General Elmer Staats' comment to the Brooks committee last summer favoring "establishment of a high-level commission at the Presidential level ... to consider the over-all implications of adp use in government."

The battle over in-house vs. "out-house" contracts essentially is a struggle over BOB Circular A-76, and civil service laws requiring agencies to fill certain jobs with government employees. In the past year, GAO and the Civil Service Commission have criticized NASA for ignoring the circular and the laws.

GAO EVALUATING MERITS OF SYSTEM TYPES

GAO has undertaken a "major" study of adp utilization concepts which should be completed next summer, says a knowledgeable source. Basic aim is to give federal users and policymakers guidelines for deciding when a service bureau, time-shared network, or free-standing dp system will optimize efficiency. Significantly, in view of the Congressional ferment regarding procurement policy, GAO's study will include an evaluation of BOB Circular A-76.

CHANGED PROCEDURE MEANS FASTER CARTERPHONE DECISION

Final decisions in the MCI and Carterphone cases are possible by next April. FCC commissioners have decided to review the hearing examiner's decision in each case, instead of deferring to a review board. This move telescopes the proceedings substantially and underlines the growing importance FCC attaches to telecommunications policy. Commission action was anticipated in the SICOM case soon after this column goes to press. WU has voluntarily agreed to suspend its new tariff until Dec. 1. (See News Briefs for more details.)

CAPITOL BRIEFS

A Litton-RCA-Stanford Research team has won the contract definition phase of the TACFIRE competition, beating teams headed by IBM and Burroughs ... LBJ proposed a "network of knowledge" when he signed the public broadcasting bill last month; his advisers have "begun to explore the possibilities" of such a network.

Anything the SEL 810A can do,

the new SEL 810B can do twice as fast.

Over 50 SEL 810A, 16-bit computers have been supplied for data acquisition and control. Now meet the SEL 810B, with twice the speed of the A. Yet only about 20% more in price. Same great features: all integrated circuits, 2 levels of priority interrupt, memory expandable to 32K, I/O typewriter, high-speed hardware multiply and divide, and real-time I/O structure. And the software package of the 810B has been proven in the A.

Fixed point execution times of the B are: add/subtract—1.58 microseconds; multiply—4.74 microseconds; divide—6.32 microseconds; cycle time—790 nanoseconds. If you don't need the speed of the SEL 810B, buy the A. For either, call or write: Systems Engineering Laboratories, 6901 West Sunrise Blvd., Fort Lauderdale, Fla. 33310. Area Code 305 587-2900.

Systems Engineering Laboratories

CIRCLE 41 ON READER CARD

world report

U.K. DOCTORS TO BE TERMINAL USERS

Computing has come of age in the Irish Free State with the formation of the Irish Computer Society. At inauguration day, members had a run down of developments in time-sharing and multi-access operations from Harry Baeker, Computer and Automation Centre, Imperial College, London. He gave first details of experiments by Britain's Royal College of General Practitioners to test out a system for bringing terminals into the family doctor's consulting room. With a State-run health service for the nation, there seems strong possibilities for an early start to time-sharing for the general practitioner.

BURROUGHS GAINS IN U.K. MARKET

As forecast in Datamation last month, Burroughs has clinched another multiple B8500 order in the British banks with a sale to National Provincial Bank worth more than $30 million. The bank is an IBM user. This follows a coup earlier in the year in wresting Barclays bank from the grip of IBM with a similar size order. By year-end, Burroughs' order backlog in the U.K. should total $120 million, putting it in third place in the British market behind IBM and ICT, which share a total of $500 million in orders.

Although Burroughs has lucrative manufacturing facilities for accounting machines in Scotland, a local electronics and telecommunications group (Plessey) is named as possible partner for the production of B8500 units in the U.K. With a computer commitment in military and communications message switching, Plessey has no foothold in the dp market for main frames. But it dominates the data transmission field and has the largest slice of the market for modem equipment for off-line data transmission. Banks are the biggest single market in data transmission for the company, and Plessey has been named as systems coordinator by National Provincial for a planned network which will bring several hundred branch offices on-line throughout the U.K.

THE DEVALUED POUND: AN EARLY APPRAISAL

Some rapid reappraisals are taking place in Europe now that Britain has devalued the pound sterling from an exchange rate of $2.80 = £1 to $2.40 = £1. Devaluation last month had big consequences for the computer industry at large.

In basic terms it now costs 14% more to import machinery into the U.K. But it costs proportionately less for U.K.-based machine makers to sell their goods in other markets. As a result, corporations such as Honeywell (which makes main frames in Scotland) can stay competitive with local companies such as ICT and English Electric-Elliott Automation. And they should get the advantage of lower prices on the Continent which they supply from the U.K. factory. Although IBM has a small plant in Scotland, it loses out because it imports most of its equipment into Britain from key production units in France and Germany. Other corporations such as Univac, Control

(Continued on page 99)

Our half-price model

I-41 Shuttle printer by Bull General Electric

Most medium speed line printers are really "cost-reduced," high speed printers. They're expensive.

But the I-41 shuttle printer by Bull General Electric was designed specifically to operate at 200 lpm. And it costs only about half as much as most "cost-reduced" printers. OEM quantity prices start under $3,000.

The price tag is low because there are fewer components. Only one hammer for every four print positions. Fewer operating parts mean greater reliability, sharply reduced maintenance.

The I-41 is available now with 80, 120 or 136 columns, and 64 character set.

Quality and technological know-how are built into every Bull General Electric product. Mail the attached coupon for full information on the I-41 and our complete line of Card Readers, Card Punches, Card Sorters, Keypunches and Verifiers.

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CIRCLE 42 ON READER CARD

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☐ Please send full information on the I-41.

☐ I'd like information on your entire line of data processing equipment.

☐ Have a sales representative call immediately.

BULL

GENERAL ELECTRIC

Data, and Burroughs are badly placed since their computer activity in Europe is essentially marketing. National Cash has a manufacturing agreement with Elliott to produce for Europe. There is also a big NCR accounting machine plant in Scotland for world sales outside the United States. Burroughs also has an accounting machine base in Scotland to serve world markets, including some product ranges back to the U.S. But recent multi-million dollar signings in London for CDC 6600's, Univac 1108's and B8500's will be affected by the devalued pound, since these are all U.S. made.

The measures that have been taken to secure Britain's ailing economy (brought about by imports outstripping exports) are expected to pre-empt early decisions among managements that have been meditating on their next steps for expansion into Europe. Instability of the U.K. economy has been the delaying factor in many of these. And it has made the U.K. a dubious location for what would otherwise have been an eminently suitable base to attack Europe.

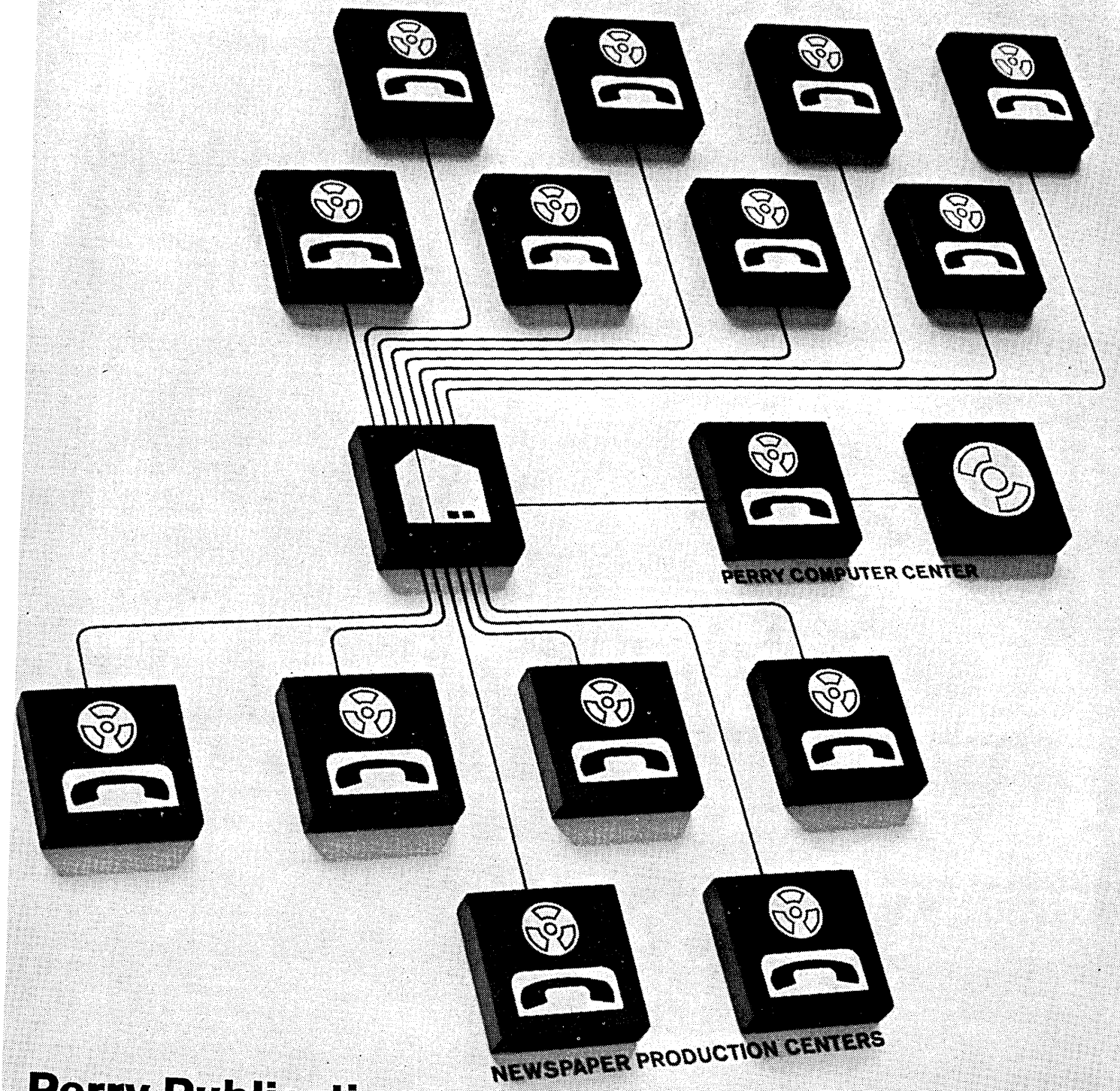
Devaluation has wiped out 14% of investments by foreign corporations in capital plant in the U.K. But with other European countries flourishing, and so unlikely to be economically disturbed by the British government measures, Britain looks as if it may now be the best investment location to springboard fresh programmes for world markets. Candidates for production extension into Europe include Univac, NCR — which is in need of new facilities since its manufacturing licensee Elliott Automation has tied up with a competitor in merging with English Electric — and further expansion from IBM if the model 10 is as near to the market place as industry sources believe. Burroughs is also on the list since it has decided to push at least part of its banking systems equipment into local manufacture.

FRENCH FIRM TO OPEN LONDON 6600 BUREAU

Metra International, Europe's biggest consultancy headquartered in Paris, is setting up a CDC 6600 operation in London. This supplements a 6600 installation in France, where one division, Societe d'Informatique Appliquee, lays claim to being the biggest systems and software house in Europe. In the London operation, Metra is linking with consulting engineers Freeman, Fox, Wilbur Smith & Partners. Metra is taking over the 6600 initially destined for an independent Freeman, Fox scheme. An early '68 start is slated for the new Metra service.

BITS & PIECES

IBM has developed a new classroom computer at its Hursley Research Labs in the U.K. The machine was designed for a school mathematics scheme to revamp math education in all grades through the university level. A desk-top machine with an aerial connection that will plug into a domestic television set, the machine got its debut at the Institute of Mathematics. The prototype unit had pushbutton keyboard input ... Negotiations are in progress with Czechoslovakia for a Western company to set up manufacturing of small to medium-scale dp systems. Bull-GE and ICT are the contenders with the odds strongly stacked in favour of the former. DeGaulle is ready to look favourably on Franco-Czech trade deals in general if it goes through.



Perry Publications is making headlines with this system

The system was designed so Perry's 26 daily Florida newpapers could use one computer center in West Palm Beach.

Every day the Perry papers send their display advertising and editorial matter to the center to be prepared for typesetting machines.

Since speed is essential, Perry set up 14 transmitting-receiving centers where newspaper copy is put on paper tape. The tapes are sent via Type 2 Dataspeed*Service (at 1050 words per minute) to West Palm Beach.

At the center, tapes are read into the computers at 1000 characters per second, using photoelectric readers. The computers have a 50,000 word dictionary programmed into them, so that copy can be prepared in newspaper column widths and words hyphenated, where necessary.

The output of the computer is a new tape which is returned by Dataspeed service and fed directly into typesetting machines.

If moving information in a hurry will help you make more efficient use of your computer installation, talk with our Communications Consultant. He'll help you plan a system to beat any deadline.

Dataspeed Service
Bell System Central Office
Computer

BELL SYSTEM AT&T and Associated Companies

*Service mark of the Bell System

new products

communications interface

The CC-30 communications station, a remote processing and display link, can be interfaced to IBM computers via channel adapters (the 1130 uses the CC-7011; 360 computers use the 7012). The adapters attach to the storage access channel of the cpu. Using the adapters, a user can connect one or more CC-30 stations in several ways: A station can be connected directly parallel to the adapter at the computer site. In this mode, up to 125,000 cps can be transferred between the cpu and the station. Also, a serial interface can be attached to the adapters, which will permit any Dataset to be used. Or, in a third method, a multiplexer can be attached to the station, permitting the addition of up to 32 communication lines (either hard wire or telephone lines). COMPUTER COMMUNICATIONS INC., Inglewood, Calif. For information:

CIRCLE 124 ON READER CARD

rpg listing aid

An RPG Listing Aid for the 360/20, providing a formatted listing of source programs with headings that identify all fields, facilitates debugging new programs before compilation. It also provides a more readable program listing for backup or library purposes, and generates duplicate listings for program changes. Multiple source programs may be listed at one time. This Listing Aid is available *free*. COMPUTER RESULTS CORP., West Springfield, Mass. For information:

CIRCLE 125 ON READER CARD

digital computer upgraded

The 8400 mod II features a fetch ahead instruction execution technique which accounts for an average 25% reduction in execution time over the 8400 in each of its three operating modes: 32-bit floating and fixed point, 16-bit and 8-bit byte modes. The base register provides for automatic relocation of programs in blocks of 256 words under monitor control. Relocation is performed on each address prior to transmission to memory by adding an 8-bit base value to the most significant bits in the address. The mod II has an 8-65K-word (32-bit) memory range and 1 usec cycle time. ELECTRONIC ASSOCIATES INC., West Long Branch, N.J. For information:

CIRCLE 126 ON READER CARD

remote terminal

The COPE .45 terminal consists of a 10-cps Teletype unit, an Anelex 1250-lpm printer and a 1500-cpm Uptime card reader. It operates in a full duplex mode over voice-grade phone lines, and features a 4K PDP-8 communications controller with a 4800-bps interface for on-line batch processing. All I/O executive programs for operation of the terminal with a Univac 1107/1108 computer are available from the manufacturer. UNIVERSITY COMPUTING CO., Dallas, Texas. For information:

CIRCLE 127 ON READER CARD

typesetter

The 902 phototypesetter holds nine type font matrix plates instead of the three the 901 holds. Like the 901, it runs at 500-800 cps and offers a graphics capability for automatic composing of pictures and drawings into columns of word matter. Eleven 901's have been delivered, one with graphics capability, PHOTON INC., Wilmington, Mass. For information:

CIRCLE 128 ON READER CARD

conversion system

POLYTRAN (POLYTRANslation analysis and programming) is a conversion system for use with such languages as FORTRAN, PL/I, ALGOL and COBOL; it is currently being used with an IBM 360, but can be operated with any system. POLYTRAN has three basic parts: a method of analysis and documentation of language and system

PRODUCT OF THE MONTH

The 2760A is an optical mark reader that reads pencil marks and/or punches made on standard tab cards—into any data system compatible with Dataphone. Errors in pencilled entries can be erased, and preprinted marking boxes will accept 39 characters of alphanumerics on each card. Part of any card can be prepunched, eliminating the need for repetitive human entries.

Reading rate and output format are compatible with standard data sets. Standard rate is 105 cps; 10 cps is optional. Transmissions match the requirements of receiving terminals that accept the Bell 202C or 103A gear.

The reader reportedly operates in temperatures from 0 to 55°C, and has been constructed for use in such places as construction sites, machine shops, and weather stations. The unit measures 12¾ x 20 x 7 inches. HEWLETT PACKARD, Palo Alto, Calif. For information:

CIRCLE 129 ON READER CARD

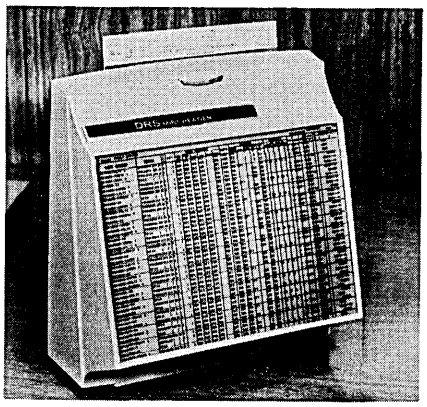
new products

compatibilities (POLYSCAN); a specialized programming language for implementation and maintenance of language translators (POLYSYN); and a set of supporting subroutines (POLYGO). URS CORP., San Francisco, Calif. For information:

CIRCLE 130 ON READER CARD

microfilm reader

The DRS Mini-Reader is portable, and fits in a 9″ x 9″ x 7″ case weighing 2½ lbs. The unit is capable of reading aperture cards, micro-



jackets and microfiche; it has a plastic screen with a variety of magnifications. A dichroic reflector suppresses infrared rays and controls film temperature. DATA REPRODUCTION SYSTEMS, Inglewood, Calif. For information:

CIRCLE 131 ON READER CARD

communications buffers

The 608 E-1000 series of keyboard communications buffers can be used for any memory requirement with asynchronous input or output character rates of up to 500 KHz, or synchronous rates up to 4 MHz. Basic system has a 4,096 (8-bit) storage which can be expanded to 128K. All timing and control functions are included. DIGITAL DEVICES INC., Syosset, N.Y. For information:

CIRCLE 132 ON READER CARD

accounting system

The E6000 electronic accounting system consists of a cpu with an internally programmed 400 (12-digit) word core memory, a console, automatic ledger reader, punched card reader, line printer and card punch. The control console has alphanumeric input, random access to all words, automatic forms handling, reverse entry control and operator/system communications. Magnetic ink striped ledger cards provide hard copy records; each ledger holds up to 260 positions of information and allows account updating and data distribution in a single operation. In addition to the printer, the E6000 can use either punched card or paper tape output. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 133 ON READER CARD

incremental recorder

The 1400/360 incremental mag tape recorder records on 9-track IBM-compatible tapes at a density of 800 bpi, at speeds of 0-500 bytes per second asynchronously. Inputs are compatible with current sinking logic, with true levels up to +12 volts. KENNEDY CO., Altadena, California. For information:

CIRCLE 134 ON READER CARD

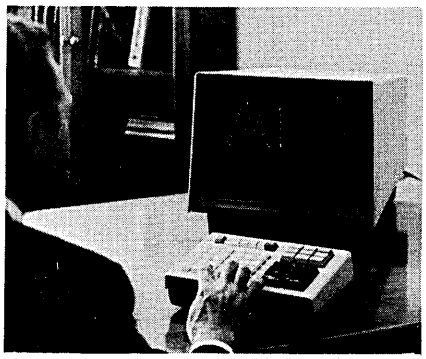
military memory

The SEMS 7, a ground-based military core memory system, meets all specs for shock, vibration, humidity, temperature range, etc. The 7 comes with four maximum storage capacities: 4,096 80-bit words; 8,192 40-bit words; 4,096 40-bit words; and 8,192 20-bit words. Cycle time is 2 usec with an access time of 600 nsec for the 4K versions; and 700 nsec for the 8K versions. Clear/write and read/restore are standard modes. ELECTRONIC MEMORIES INC., Hawthorne, Calif. For information:

CIRCLE 135 ON READER CARD

financial display

A crt console, Telequote 70, conforms to the growing stock market need for one terminal to display all the quotations and information services available. The console has two 6-inch



screens so that two kinds of data may be shown at one time. These could include the New York and American Stock Exchange tickers, Bunker Ramo's stock quotation service, any financial newswires or investment advisories, transmission of a transaction, and in the future, management infor-

What are RCA computers doing down on the farm?

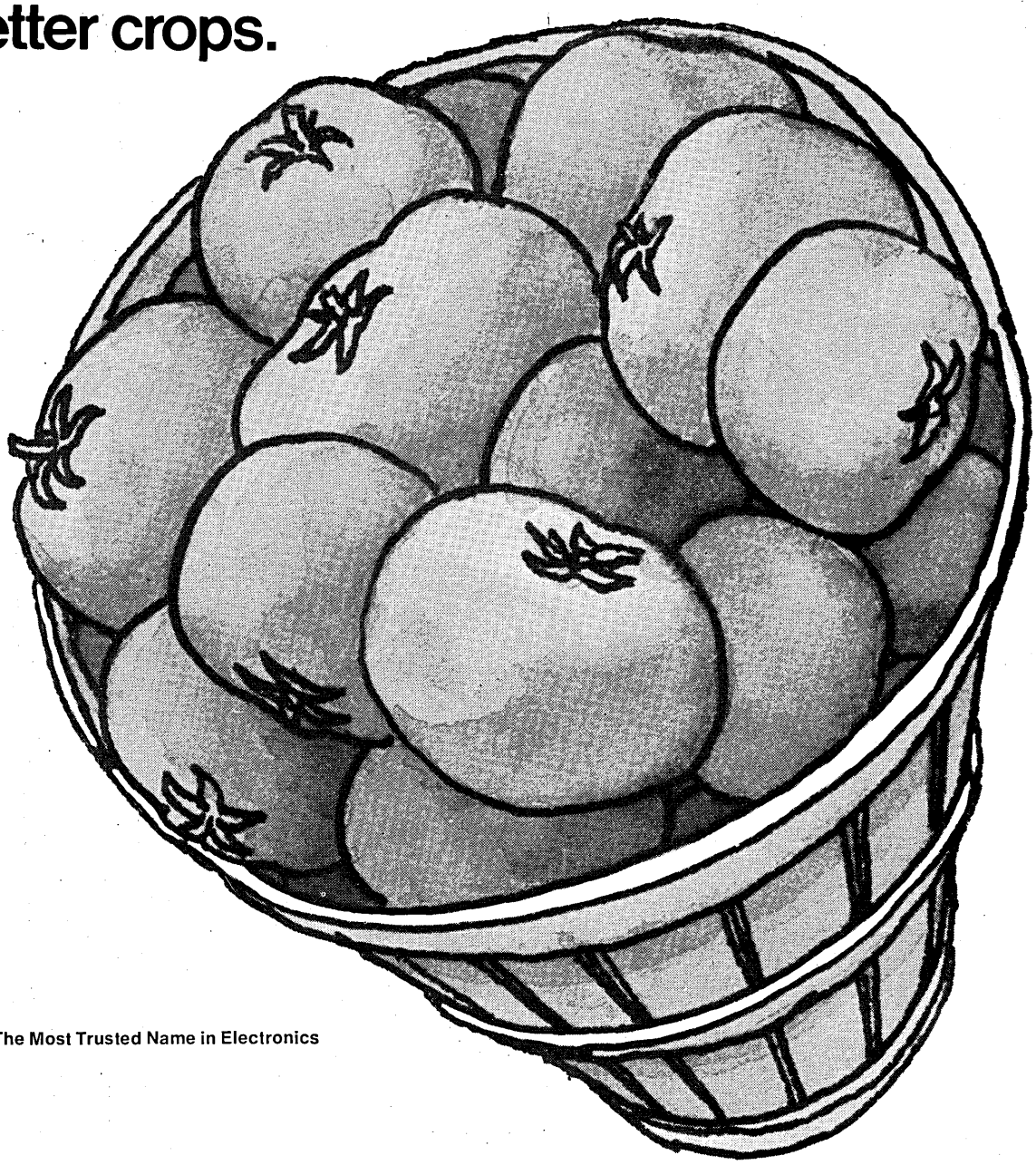
RCA computers at the H.J. Heinz Company are telling contract growers in 10 states exactly what nutrients their soil needs to grow specific vegetables. Correlating a soil analysis, history of fertilization, crop rotation, and desired crop goals, the computer prints out recommendations in a matter of seconds. The results are bigger yields for the grower and more uniform and nutritious produce for H.J. Heinz products.

Companies like H.J. Heinz choose Spectra 70 because of its impressive cost-performance ratio, because of its broad compatibility with other systems and because RCA's highly trained technical advisors give the kind of service that gets the most out of an EDP installation.

For the full story about why H.J. Heinz and other major companies are choosing Spectra 70, call your nearest RCA EDP office or telephone us at (609) 424-2385. RCA Electronic Data Processing, Camden, N.J. 08101.

RCA SPECTRA 70

Helping H.J. Heinz growers produce bigger and better crops.



RCA The Most Trusted Name in Electronics

CIRCLE 44 ON READER CARD

Like to save the cost of all those little holes?

You can with a Control Data Optical Reader

INSTEAD OF DEPENDING ON LITTLE HOLES PUNCHED IN A CARD, OUR 915 CHARACTER RECOGNITION SYSTEM SEES LIKE YOU DO ... RECOGNIZES THE SAME TYPEFACE YOU ARE READING HERE.

The 915 is by far the most economical data conversion technique today. It does away with all intermediate processing and key punching. Reads the language you read—usually right from the source document.

Any electric typewriter you equip with this font can prepare input for your computer. And typists are much easier to come by than key punch operators.

The 915 reads alphabet characters A to Z; numeric characters 0 through 9; standard punctuation; and special symbols for programmed functions. It takes documents 4 to 12 inches wide, 2½ to 14 inches long, plus continuous fanfold sheets.

Ask for a demonstration. Or write for application reports telling about 915 users in your area.

CONTROL DATA
CORPORATION

8100 34th AVE. SOUTH, MINNEAPOLIS, MINNESOTA 55440

mation system data, such as customer and stock reports in graphs or text. Generally the system will have one keyboard to change and control the data on one crt, the other display being used for only one continuous service, such as the NYSE ticker. A second keyboard to allow operation by two persons is optional. One control unit will handle a combination of desk units and other B-R displays. The console is operationally compatible with Telequote III. BUNKER RAMO CORP., Stamford, Conn. For information:

CIRCLE 136 ON READER CARD

format control buffer

The 1051 format control buffer can convert analog or digital data to 9-track NRZI computer format; the unit can be tailored to accept input from analog multiplexers, A/D converters, time code generators or tape search and control units. The buffer can use either fixed or variable sampling rates and binary or BCD codes. Writing speeds up to 100K cps are offered; output mag tape is compatible with IBM 360 or RCA Spectra 70 computers. ELECTRONIC ENGINEERING CO. OF CALIFORNIA, Santa Ana, Calif. For information:

CIRCLE 137 ON READER CARD

terminal with peripherals

The 200 User Terminal has a basic configuration consisting of a card reader, printer and keyboard/display. It can be used on dialed or leased lines, as a remote batch-loader or a respond terminal. Buffered peripherals make the unit compatible with Teletype respond terminals; optional peripherals are 80-column or 136-column printers. The card reader operates at 100 cpm; printer has speeds of 300 lpm. The terminal can be used with either 2400 or 4800 bps line. The unit and its associated software will be available in May '68. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 138 ON READER CARD

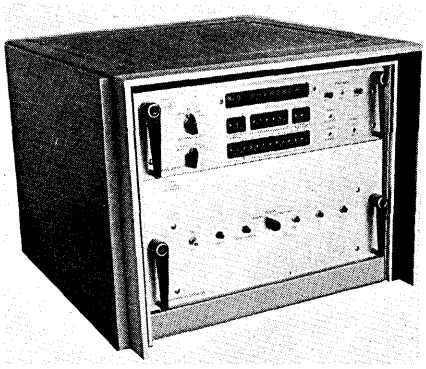
data handling program

The Master Control Data Handling program is designed to automate input data preparation for flight control computer programs. A FORTRAN IV program coded for the IBM 7094 computer, it can presently store any number of sets of data for up to 1,000 variables. It is used with coupler subprograms to generate input to analysis programs; the coupler calculates all parameters needed for use in the analysis program, punches card decks in correct input format (or writes a tape), and prints a summary of all data values used, calculated parameters and data document sources. COSMIC COMPUTER CENTER, Univ. of Georgia, Athens, Ga. For information:

CIRCLE 139 ON READER CARD

data acquisition system

The GLS data acquisition system will sample data from up to 100 analog sources, convert them to digital form, and record on IBM-compatible mag tape. The system has 12 internally commanded sampling rates of 10 to 2,000 samples per second, and asynchronous sampling of DC to 200 samples from external command. Resolution is optional at 6, 8 or 10 bits. Optional accessories include time code generator, record number counter, multiplexer, and additional plug-in differential or single-ended gate cards for increased channel capacity. SYSTEX CORP., Richardson, Tex. For information:



CIRCLE 140 ON READER CARD

large mass memory

The RM mass core memory is available in sizes of 5, 10 or 20 million bits, with an access time of 1.5 usec and a cycle time of 2.7 usec. The 20 million-bit-memory is priced under three cents per bit, and is composed is four 5 million-bit modules. This construction permits four-way interleaved operation that achieves an effective cycle time of 675 nsec. The 22-mil lithium cores in the RM are strung in a 2½D two-wire configuration. The memory's data store consists of 262,144 (72-bit) words arranged as four magnetic core stacks of over 65K words each. The RM can accommodate many word lengths in the 36- to 72-bit range. Drive and sense circuitry, timing, control and general logic are contained on printed circuit card assemblies. The memory's oper-

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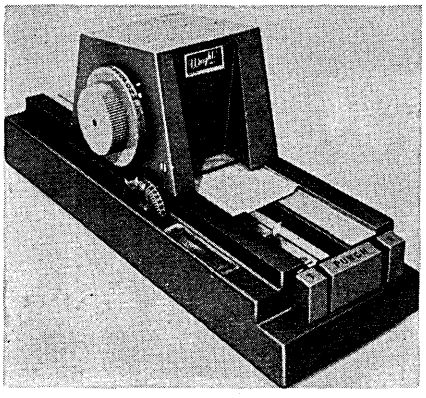
CIRCLE 47 ON READER CARD

ating modes are clear/write; read/restore; and read/modify/write. AMPEX CORP., Redwood City, Calif. For information:

CIRCLE 141 ON READER CARD

printing punch

The model 2629 portable alphanumeric printing punch punches and interprets up to 47 COBOL characters



on a tabulating card. Unit includes a space key for single column spacing and six adjustable tab stops. WRIGHT LINE, DIV. OF BARRY WRIGHT CORP., Worcester, Mass. For information:

CIRCLE 142 ON READER CARD

I/O testing software

OLTEP (On-Line Test Executive Program) is a monitor program that controls test routines for individual I/O units without interrupting normal operation. It can determine the condition of the units, aid in making adjustments, exercise a malfunctioning device to determine the cause of the breakdown, and verify a repair action prior to switching the device on-line. With OS/360, it requires 18K bytes of core; with TOS and DOS, it requires 10K storage. Now available to OS and DOS users; it will be ready for TOS users early in '68. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 143 ON READER CARD

small-scale computer

The 405 computer system, low end of GE's 400 family, has an 8K word memory (no other size available), and an access time of 2 usec. Programs written for the 405 are compatible with the larger systems, as is the peripheral equipment; however, the compatibility does not work in reverse order: not all peripherals on the larger systems are available for the 405. Software for the little one includes COBOL, FORTRAN IV, SORT/MERGE generator and MACRO assembly language processors; SIMCON, CPM, resource allocation, MATH PAC, linear programming and generalized payroll applications packages. Purchase price of a typical configuration ($196K) includes all the standard peripherals; the 405 rents for $5,120/mo. The system can be delivered within four months after receipt of order; first deliveries are scheduled for February '68. GENERAL ELECTRIC INFORMATION SYSTEMS MARKETING DIV., Phoenix, Ariz. For information:

CIRCLE 144 ON READER CARD

tape reader

The R150A perforated tape reader operates at a speed of 150 cps, and features a read head that senses a hole or no-hole condition from the bottom of the tape. Bidirectional and asynchronous, the unit reads 5-, 6-, 7- or 8-level paper, paper-plastic laminated or plastic-foil tape. TALLY CORP., Seattle, Wash. For information:

CIRCLE 145 ON READER CARD

piggyback memories

A series of three coincident current, random access magnetic core memories are available to OEM; the models differ only in capacity: the CM-5 has a capacity of 512 (9-bit) characters; CM-10, 1,024; and the CM-40, 4,096. Cycle time is 2 usec. The basic units are supplied with address and data output leads. Built-in address registers and externally modifiable data registers are options. COMPAT CORP., Hicksville, N.Y. For information:

CIRCLE 146 ON READER CARD

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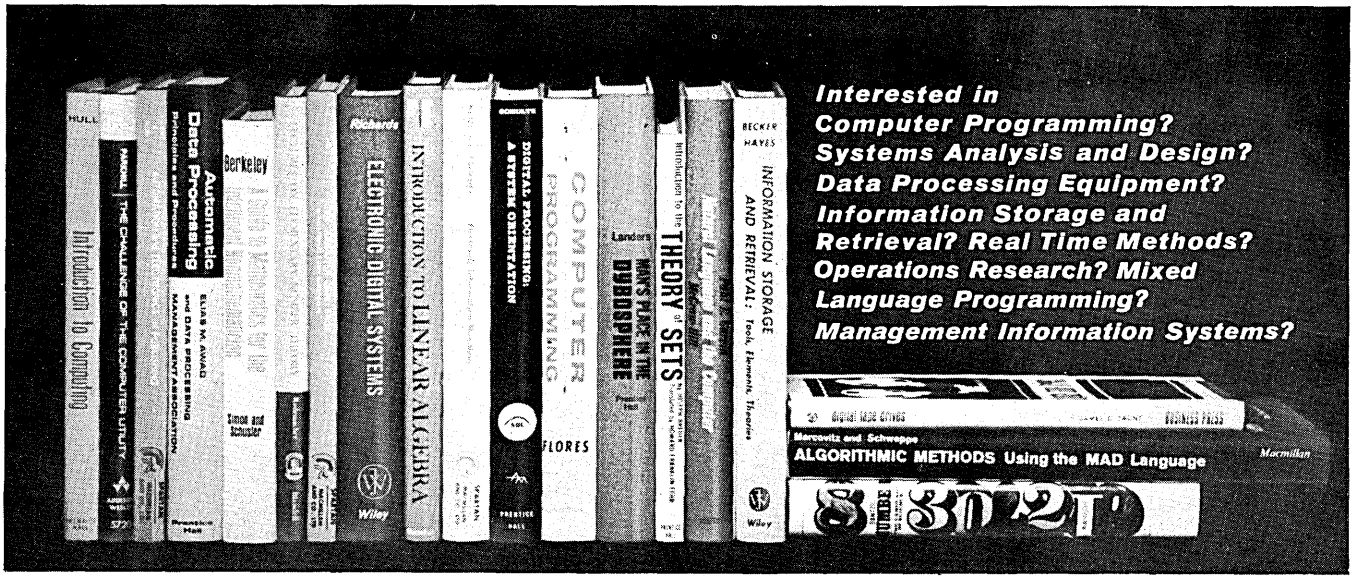

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new literature

DATA COMMUNICATIONS SYSTEM: Illustrated brochure describes model M1000 general-purpose data communications system capable of operating independently as a message switching system or of doing the communications management for a dp information system. Design approach and economic considerations for such a system are defined. M1000 system is a package of hardware and software installed on a turn-key basis designed to move messages to and from remote devices, including teletypewriters, video displays and magnetic tape terminals, and will route and queue transactions and inquiries between these terminals and computers. MARSHALL COMMUNICATIONS DIV. OF MARSHALL INDUSTRIES, Santa Ana, Calif. For copy:

CIRCLE 150 ON READER CARD

REMOTE USE OF COMPUTERS: Final report of study, divided into three phases: 1) Survey of more than 200 computer installations using central processor capability through remote terminals; 2) In-depth study of four computer systems selected from those surveyed; 3) Analysis of data and information collected on remote computer systems, with emphasis on time-shared systems. Current state-of-the-art is presented with recommendations for areas where further work needs to be done and where standardization is needed or desirable. 108 pages. PB-175 666. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Md. 22151.

ANALOG HANDBOOK: 140-page book on general-purpose analog computers and software. The book covers the basic fundamentals of computer operation and illustrates the solution of elementary problems; provides a detailed description of the operating controls and computer logic of the SD 10/20 and 40/80 series computers; and develops sophisticated programming techniques and applications on a progressive basis. Suitable for use by researchers and engineers, as well as students. Cost: $5, non-educational institutions; $4, educational institutions; $3, orders of 10 or more by educational institutions. SYSTRON DONNER CORP., 888 Galindo St., Concord, Calif. 94520.

AMPLIFIER MODULE: Applications data, detailed specifications, characteristic curves and operating information on model 770-440 circuit module, are in 12-page brochure. Module employs dynamic bridge principle and features common mode feed-back technique. Designed specifically for use in low level data acquisition and instrumentation systems. REDCOR CORP., Canoga Park, Calif. For copy:

CIRCLE 151 ON READER CARD

INTEGRATED CIRCUITS: 28-page brochure describes the company's 930 series DTL integrated circuits: flip-flops, gate expanders, multiple gates, dual buffers, AC binary circuits, and monostable multivibrators. Tabulated electrical characteristics, plus logic diagrams and circuit schematics are presented for the various units. Test circuits and wave-forms are also given. RAYTHEON CO., Lexington, Mass. For copy:

CIRCLE 152 ON READER CARD

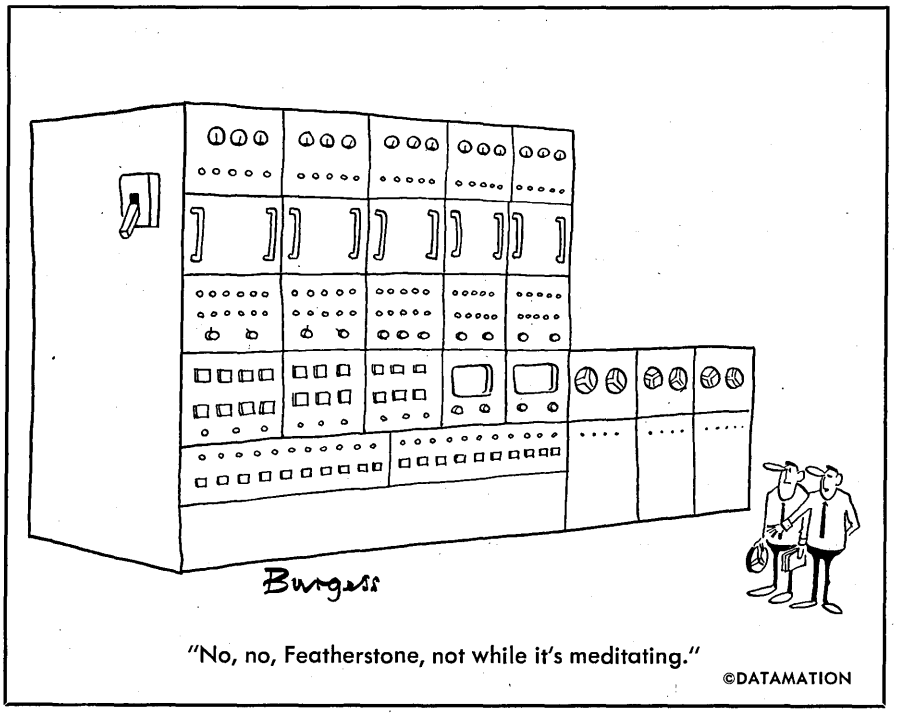
DRUM MEMORIES: 12-page technical brochure contains complete basic specifications of the company's drum memory products and includes details of design factors (mechanical, magnetic and electronic), specifications for five standard drums, and standard logic modules for drum memories. VERMONT RESEARCH CORP., North Springfield, Vt. For copy:

CIRCLE 153 ON READER CARD

DATA GENERATOR: Technical bulletin on model 201 data generator offering 16-bit word lengths, variable baseline offset to ±10V, 1-10V NRZ data outputs, and clock rates to 10MHz. Methods for obtaining variable parameter RZ pulse outputs, extended program outputs and multiple parallel channels are described and information is given regarding pulse generators which may be used as clock source. DATAPULSE, INC., Culver City, Calif. For copy:

CIRCLE 154 ON READER CARD

MEDICAL CYBERNETICS: 227-page report, an introduction to medical cybernetics recently translated from Russian, considers general questions of biocybernetics, cybernetics of cellular and subcellular structures, cybernetics of physiological systems, problems of neurocybernetics, and the pecularities of "man-machine" systems. Other topics include the application of cybernetic methods in diagnostics, cybernetic aspects of medical electronics, problems of biological control, and the main trends in the development of bionics. N67-33159;



"No, no, Featherstone, not while it's meditating."

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new literature

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CAREER ADVANCEMENT: Catalog on correspondence school offering engineering graduate level courses enabling engineers to update themselves in the fields of control systems, digital computers and circuits. Licensed by New York State Dept. of Education. EDUCATION FOR CAREER ADVANCEMENT, Mineola, N.Y. For copy:

CIRCLE 155 ON READER CARD

INTERACTIVE SYSTEMS: 16-page booklet, intended for reading by general management, describes how on-line analysis can be used as a basis for management decision-making. INTERACTIVE SYSTEMS, INC., Boston, Mass. For copy:

CIRCLE 156 ON READER CARD

FANFOLD FORMS: Brochure shows new uses for fanfold forms, types of constructions available, use in high-speed printers, various features available. MOORE BUSINESS FORMS, Niagara Falls, N.Y. For copy:

CIRCLE 157 ON READER CARD

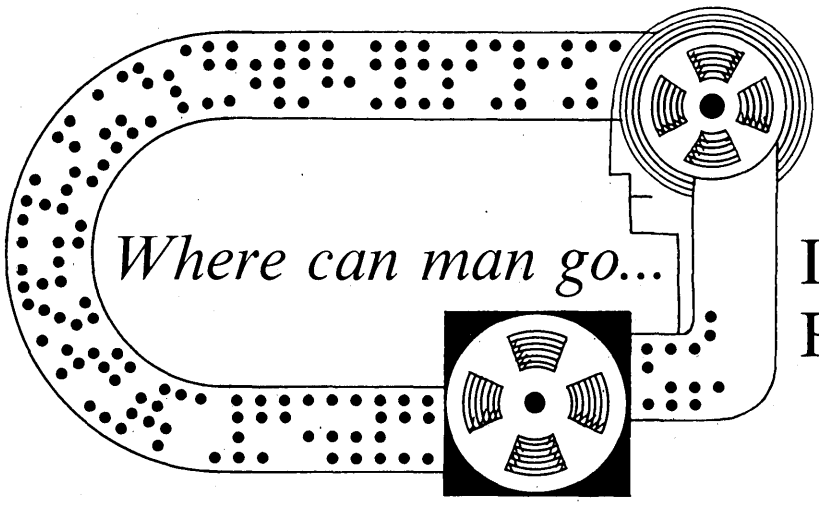
AUTOMATED LITERATURE PROCESSING: Summary of the development and characteristics of the first generation of the ALPHA-1 system currently used by the Library Branch of the Redstone Scientific Information Center, Alabama. 508 pages. AD-658 081. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

DISC PACK: Four-page brochure on Mark I disc pack, an assembly of six discs providing ten recording surfaces and enclosed in a heavy-duty dust proof container, mechanically and operationally compatible with most existing disc drives. MEMOREX CORP., Santa Clara, Calif. For copy:

CIRCLE 158 ON READER CARD

TAPE TRANSPORT UNIT: Eight-page brochure describes single-capstan tape transport unit designed to accommodate all tape motion in the company's magnetic tape systems. Unit is designed to lengthen tape life and reduce information dropouts: all guides are air bearings; oxide surface contacts only the read/write head and tape cleaner. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For copy:

CIRCLE 159 ON READER CARD



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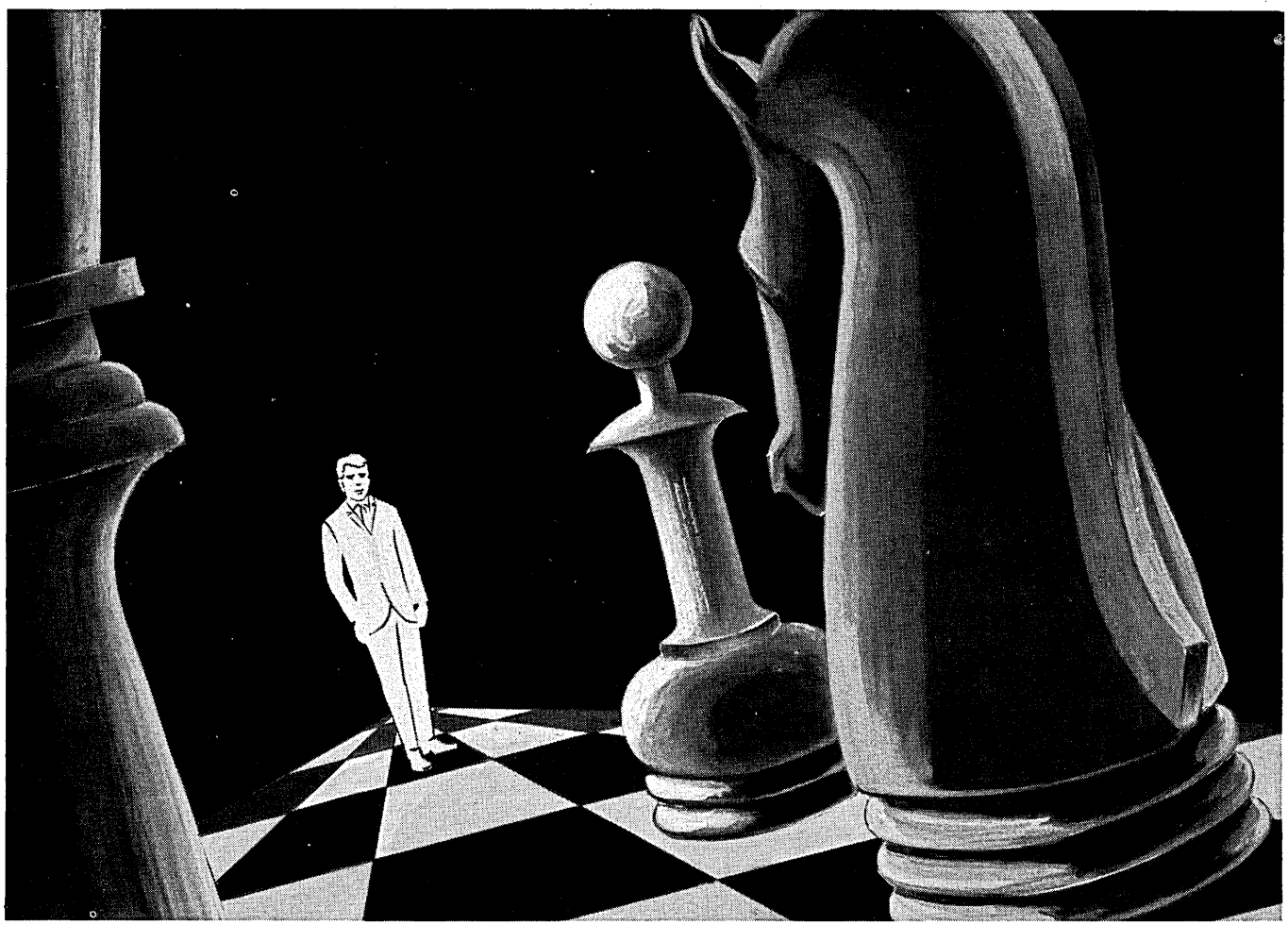

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books

***An Analysis of Time-Shared Computer Systems*, by Allan L. Scherr, Introduction by Herbert M. Teager, M.I.T. Research Monograph No. 36, Cambridge, Mass. (M.I.T. Press), 1967. $5.**

"An Analysis of Time-Shared Computer Systems" turns out to be a simulation of CTSS. This MIT time-shared system on the IBM 7094 is one of the pioneering efforts of the time-sharing world. Scherr's analysis is thorough and comprehensive, although the principle conclusion, as stated by the author, does not relate to qualities of time-sharing systems. Rather, Scherr states: "Perhaps the most important result of the research in this report is that time-shared systems and their users can be successfully modeled." He then defends this seemingly self-evident conclusion by claiming that it was not a foregone conclusion at the time the study began. Perhaps in his mind this was true.

The most interesting feature of the book, to the generalist, is the thought-provoking introduction by Professor Teager. His somewhat pessimistic view of time-sharing, written in December 1965, seems even more justified today. In particular, this paragraph warrants repetition:

> In other instances, however, some organizations are rushing into [time-sharing] on a basis of prestige, manufacturer's pressure and fashionable catchwords, rather than on a considered analysis. One object of this introduction was to indicate that a completely general purpose, regional "public utility" form of computing facility with longhaul communication lines attached to unlimited numbers of consoles is neither a completely obvious nor the best solution to all computation problems; there are alternatives that are potentially as good or better.

Teager sees a somewhat limited future for time-shared systems, as the paragraph quoted above suggests, at least within the foreseeable future. He ends by suggesting that proponents of time-shared systems need to know much more about their users than is presently understood. This refreshing

books

point of view—a novelty 18 months ago—deserves greater exposure.

RICHARD H. HILL

book briefs

(For further information on the books listed below, please write directly to the publishing company.)

***Computers in Higher Education*, by John W. Hamblen. Southern Regional Education Board, Atlanta, Ga. Approx. 300 pp. No price given.**

A soft-bound report on the use of computers in colleges and universities, and the expenditures, sources of funds and utilization for research and instruction 1964-65, with projections for 1968-69, based on a survey conducted under a contract from the National Science Foundation. The introduction stresses the need for such data; the report gives listings and discussions of various institutions, with recommendations for further study, their distribution of computers, and dp degree programs. The report concludes with summaries of financial data.

***Digital Logic and Computer Operations*, by Robert C. Baron and Albert T. Piccirilli. McGraw-Hill Book Co., New York, N.Y. 1967. $13.50.**

The book is a general introduction to the computer field written for people with mathematical training. The authors describe the fundamental design concepts: the binary number system, computer logic, coding, flip-flops and registers. The final chapter is a brief review of programming. Also included are discussions of time-sharing, peripheral devices and integrated circuits.

***Careers in Computer Programming*, by Leo Barnett and Lou Ellen Davis. Henry Z. Walck, Inc., New York, N.Y. 1967. 117 pp. $3.75.**

The book is a study of career opportunities for programmers and systems analysts, and gives information on how to prepare for and obtain these jobs. Written on a high-school level, the book, in attempting to show the breadth of the field, also gives brief descriptions of several current systems, and a short history of edp. Suggestions for further reading are included.

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We have openings now for experienced programmers, analysts, and communication engineers in our offices in the Washington, D.C. area; San Francisco; Killeen, Texas; Sierra Vista, Arizona; Kansas City, Missouri; Petersburg, Virginia; and Karlsruhe, Germany. In your letter let us know which of these locations interests you.

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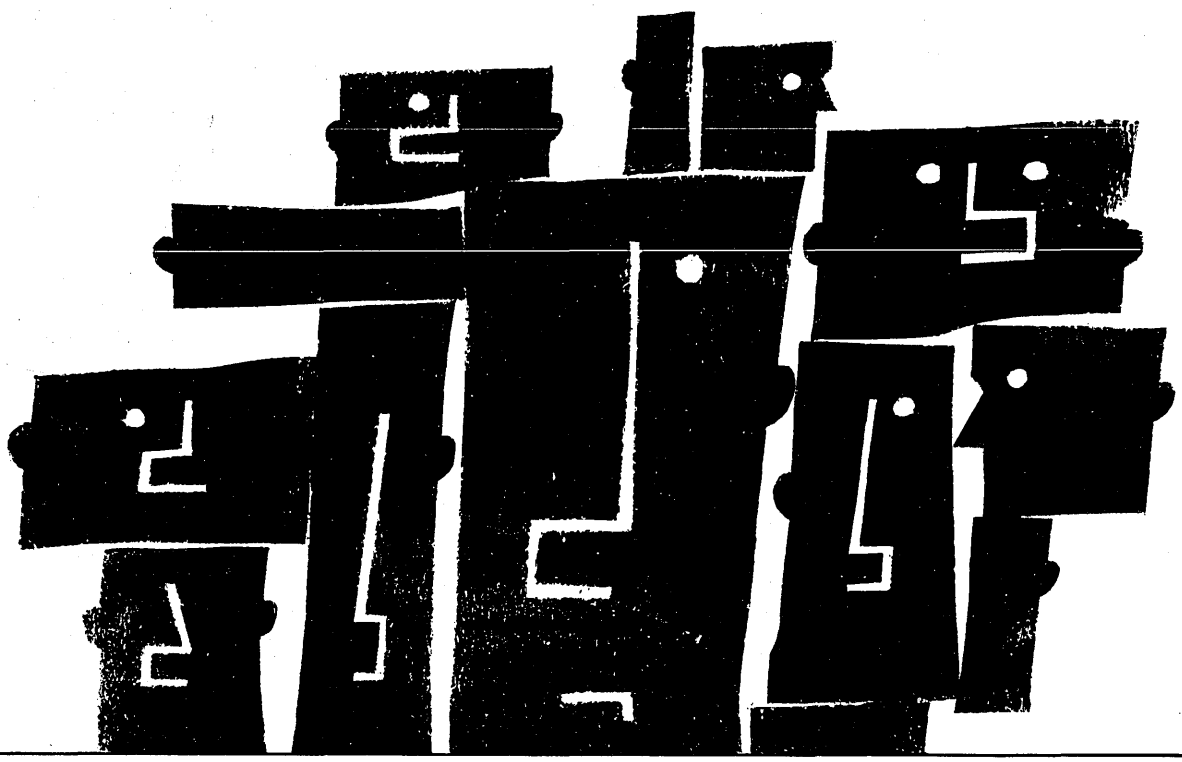

The Medinet change came shortly before a massive GE reorganization, which sees the former Information Systems Division elevated to one of 10 groups containing four divisions: New Equipment, Louis E. Wengert; Information Services, Jerome T. Coe; International Info Systems, Arthur E. Peltosalo; and Advanced Development & Resources Planning, John W. Haanstra, former IBM Federal Systems president. J. Stanford Smith moves up as group executive of the new organization. Medinet, along with the highly profitable time-sharing service bureau activity, reports to Coe. Dr. Louis T. Rader remains in the Industrial Group.

ONCE-FLOUNDERING DPI NEARS RECOVERY

Facing such competition as IBM, CDC and Friden, an outfit called Data Pathing Inc. was formed early in '64 in Palo Alto, Calif., to make data collection-transmission systems. Two years later, a Solar receiver-processor and input terminals had been developed but no installation was announced. Now, in the 15 months since Robert C. Stender left CDC to take over at DPI, seven systems have been delivered and are in various stages, one completed. The rest, with from 36 to over 200 floor terminals, are phasing in gradually, placing departments on-line one at a time. These systems reportedly have valuations from $0.5 to $2 million. Founded by LeRoy Score, now a board member, DPI had 70 people when Stender took over and made broad management changes. Stender has modified the Solar processor, built up the staff to 220, and is adding more in the assembly department. More than enough financing reportedly exists to support the growth.

RUMORS AND RAW RANDOM DATA

Contrary to last month's Look Ahead statement, the 1130 can handle tapes; there are tape 1130's installed. ... Control Data's acquisition of CEIR has won approval of the shareholders, with 267,000 shares of CDC common being traded for 6.35 times that many of CEIR. The company will be operated as a wholly owned subsidiary. ... We hear that a preliminary recommendation at RCA calls for the order of 200 Varian Data Machine computers for use throughout the corporation. ... Dave Ferguson, president of L.A. software house Programmatics, decided since hardware manufacturers give away software, he'd give away hardware. So he offered at his FJCC booth the Programmatics/16, a hex-digital conversion slide rule. Over 10,000 people accepted the pocket computer. ... Ex-Univac and Fabri-Tek men Ward Grimsrud and Wayne Savick have formed Magnetic Memories Inc. in Santa Rosa, Calif., to make core stacks. The firm is headed by Don Benner, who also holds majority interest in Midwest Circuits. ... Datacraft Corp., Ft. Lauderdale, Fla., which announced a 1 usec, 2D core memory recently, is a spinoff from SEL. Headed by Edward Kozial, the 6-month-old firm already has a $500K backlog in memories and other unannounced proprietary products. ... Datamation's editorial offices have moved to 94 South Los Robles Ave., Pasadena, Calif. 91101. Telephone: (213) 681-8586.

When General Electric asks people to join its computer business 90% accept*

(*BASED ON STAFFING RECORDS FOR 1966)

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Computer Equipment Department

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A COMPLETE WORLD-WIDE SYSTEMS EXPERIENCE. General Electric systems are installed or on order in Argentina, Belgium, Denmark, Finland, Germany, Greece, Holland, Mexico, Norway, Portugal, Sweden, Switzerland. GE systems have been counting the house, processing the revenues, checking the parking lots, tracking city wide room reservations at Montreal's Expo '67; they are checking the viewing habits of Japanese TV audiences; provide for centralized accounting for a 2400 grocery/60 supermarket chain in France. Domestically, GE systems are operating in universities and R&D centers as well as in the aerospace, banking, communications, distribution, manufacturing, transportation, and utility industries. *And systems design responsibility for the foregoing resides at Phoenix.*

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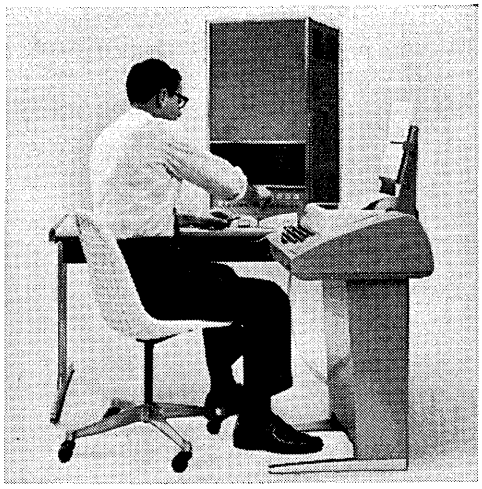

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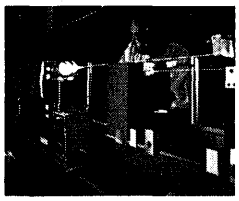

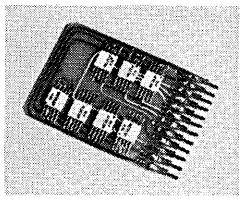

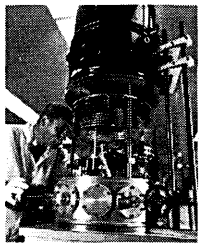

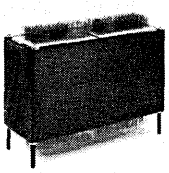

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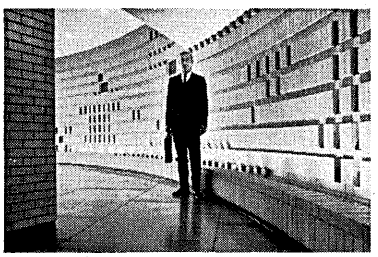

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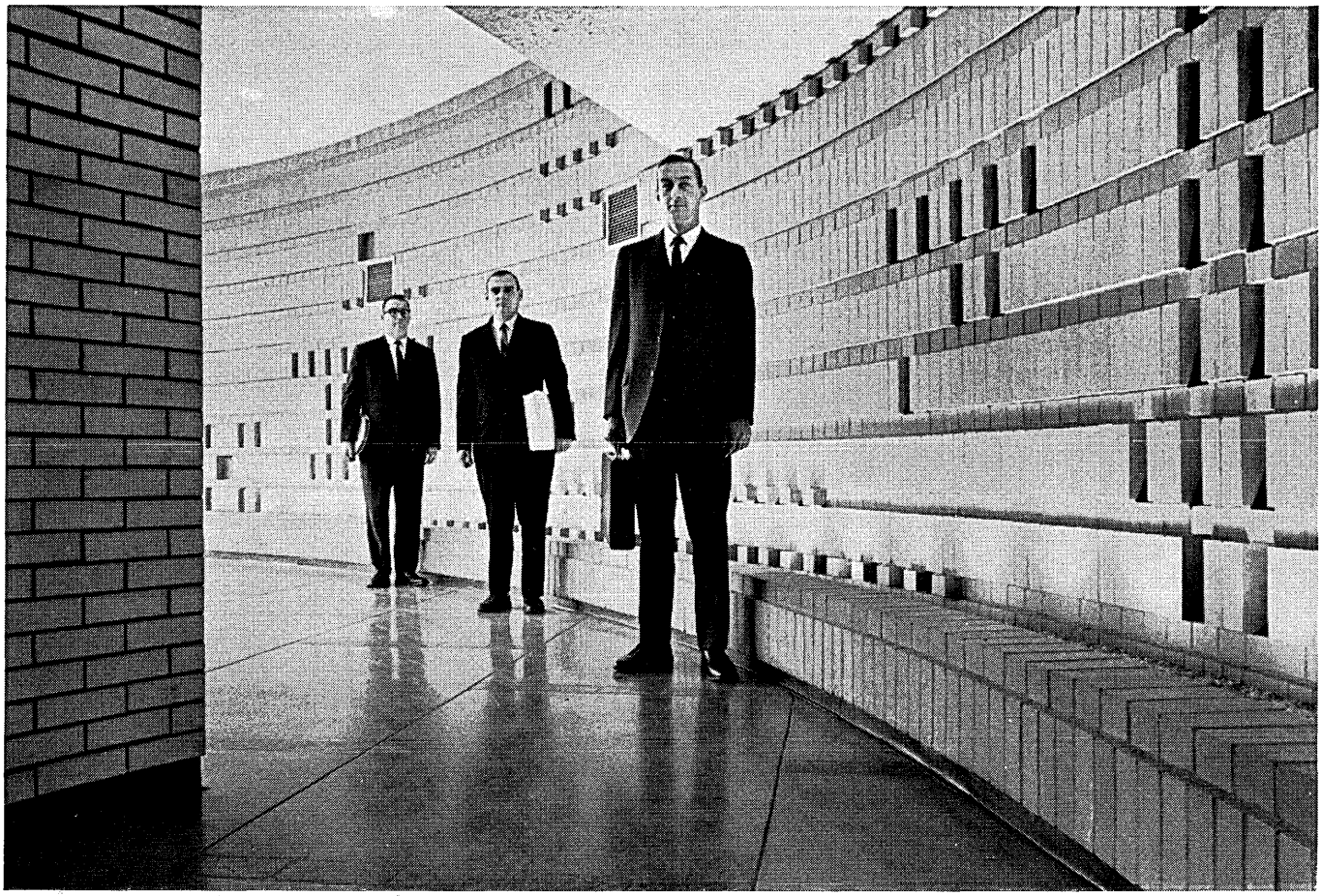

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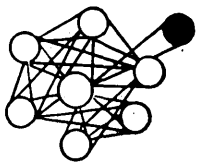

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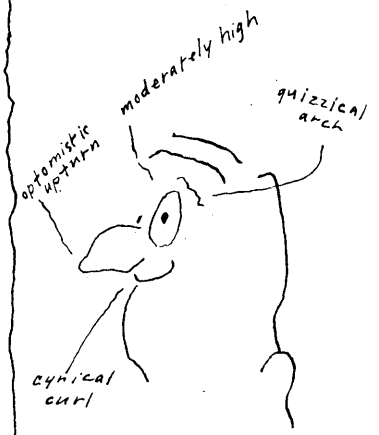


The guy we're looking for was born between 1934 and 1943. He's spent the rest of his life wondering why, and wondering about all sorts of cosmic things as well. Between musings, he graduated with an E.E. or M.E. degree, probably has a Master's Degree tagged on, and by now has been recognized by his peers for some major (or minor) achievement in computer-related diggings around—man-versus-machine, etc. If you are this guy and have digital experience in engineering, production, marketing or management, contact John Link, Personnel Director, Electronic Memories, Inc., 12621 Chadron Ave., Hawthorne, California 90250. (213) 772-5201.

people

■ Wayne Aamoth has joined Programming Services, Inc., Tarzana, Calif., as vice president of plans and programs, a new position. Formerly he was aerospace industries manager for Univac.

■ F. G. Rodgers has been named president of IBM's Data Processing Div. Succeeding him as vp of the division and western region manager is C. E. McKittrick, Jr., who will direct the company's dp marketing activities in 17 western states. Rodgers replaces G. B. Beitzel, who is now assistant group executive, Data Processing Group.

■ Dr. Lee D. Cady, Jr., has joined the professional staff of Planning Research Corp., where he will direct expansion of the corporation's capabilities in the field of hospital automation. Most recently he was head of the department of biomathematics at the Univ. of Texas at Houston.

■ Robert A. Mallet has been appointed president of Information and Communication Applications, new Rockville, Md., company specializing in the analysis, design and implementation of communication and computer systems. He was formerly a director with Informatics, Bethesda.

■ Perry J. Davis has been appointed director of systems and data processing for Pepsi-Cola. He had been manager of the company's Management Information Center.

■ Earl W. Whittle has been appointed manager of the Chemical Abstracts Service data processing operations department. CAS, a division of the American Chemical Society, is the largest information system in the world serving a single discipline.

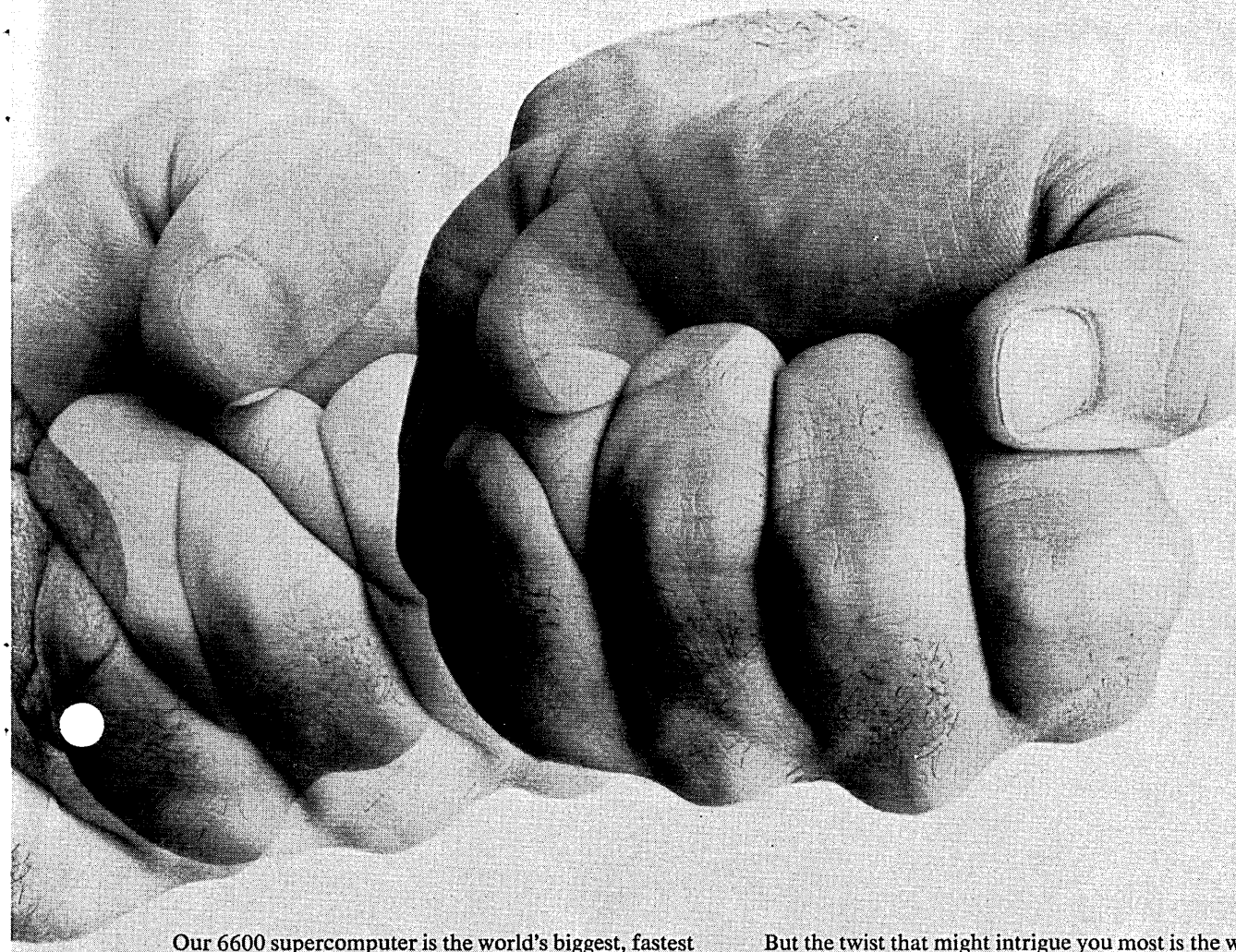
■ Ascher Opler has joined IBM, Yorktown Heights, N. Y., as consultant to Dr. Arthur G. Anderson, director of research.

■ John R. Hillegass has resigned from Auerbach computer reference services to start his own consulting operation in Willow Grove, Pa.

■ Andrew S. Huson, formerly president of Benson-Lehner Corp., has been named manager of Raytheon Computer Operation, Santa Ana, Calif. He replaces Joseph Ricca, who's starting his own business.

As of now, we've got the supercomputer market by the tail.

Now here's the twist.



Our 6600 supercomputer is the world's biggest, fastest and most powerful. And it's fully operational. No computer going (or even coming) can touch it. Just as nothing has ever approached the market potential for it.

This alone might be reason enough for you to seriously consider a career with Control Data. As it happens there are a number of other, possibly even more important things to consider.

Like our tremendous diversification and growth in peripheral and terminal equipment.

Like our increasing penetration into medium size computers and into the microminiaturized special purpose computer field. (A couple of random examples might be the contracts we have for fire control computers for the F-111 aircraft and the Poseidon submarine.)

And then, there's the work being done here in analog-digital hybrids and advanced software development.

But the twist that might intrigue you most is the way we go about getting the job done.

For one thing, ours is a decentralized organization. While other companies may talk about decisions being made at the lowest possible level, we do it. It's one of the reasons we've accomplished so much in such a short span of years. It's also one of the reasons Control Data people move so fast professionally. Another thing. Age has nothing to do with it. Whether you're 23 or 53, talent comes first. Always.

But, that's only the beginning of a long list of reasons other than the supercomputer that Control Data might be the place you've been looking for. Let us tell you about them. Send for more information or drop a copy of your resume to Thomas Linklater, Dept. D-12, Control Data Corporation, 8100 34 Ave., S., Minneapolis, Minn. 55440. An equal opportunity employer.

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Computer Specialists

Bellcomm—systems engineering contractor for NASA's Office of Manned Space Flight—can use creative help in these interesting areas:

- Analyzing data processing requirements of advanced missions being studied.
- Determining functional requirements for future generations of spaceborne computers.
- Studying optimal computer organization for reliability (hardware and software).
- Defining computer systems for supporting launch and flight operations of future multiple missions.
- Developing management procedures for controlling computer resources.
- Defining a ground network for distribution of data transmitted from space.

If you feel you are qualified, send your résumé in confidence to Mr. N. W. Smusyn, Personnel Director, Bellcomm, Inc., Room 1523-E, 1100 17th Street, N.W., Washington, D.C. 20036. Bellcomm is an equal opportunity employer.

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Anatomy of a Scientific Programmer

He thinks big... about developing the programs for the world's largest hybrid computer system soon to be installed at Lockheed-Georgia. To be operational in 1968, this system will apply extremely advanced development and simulation techniques to the world's largest airplane —the giant C-5A, and to other exciting projects.

He knows the finest equipment when he sees it. That's why he likes working with all of Lockheed-Georgia's equipment, which includes a CDC 6400 digital and four CI 5000 analog computers.

He will grasp immediate opportunity in Lockheed-Georgia's newly-created hybrid computer department.

On the other hand, he might be more interested in Lockheed-Georgia's digital computer equipment, which includes: CDC 3400, 6400; IBM 360, 7094; Univac 1108, 418.

He will be aware of flexibility, one of the big advantages of Lockheed-Georgia's new hybrid equipment. This system, the world's largest, can solve several problems simultaneously.

He wants to get in NOW in the early years of the new age of airfreight. That's why he comes to Lockheed-Georgia, where he can use his skills to program computers that will be designing airlifters for the military services and airfreighters of the f[illegible]. A future that will see airfreight ton-miles jump from 5.4 billion in 1965 to 55 billion by 1980.

Lockheed-Georgia has many openings for programmers who have designs on the future. Here's your chance to work with the largest, most advanced hybrid computer system in the world, and other sophisticated equipment... while working on the largest airplane in the world— the long range C-5A program.

For more information about how you can become a part of the dawning age of airfreight and airlift at Lockheed-Georgia, mail your resume to: Charles E. Storm, Professional Placement Manager, Lockheed-Georgia Company, 834 West Peachtree Street, Atlanta, Georgia 30308. Department ACM-12. Lockheed is an equal opportunity employer.

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CIRCLE 330 ON READER CARD

the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

PROGRAM PATENTS— YEA OR NAY

A previous article in The Forum implies that programmers are shirking their professional responsibilities by not opposing Section 106 of the proposed patent legislation. As an unbiased observer, with no private axe to grind, I cannot convince myself that program patents are in the best interests of the computing fraternity.

There are three forms of protection currently available to the programmer.

A program with relatively limited demand may be leased to its users. The lease agreement, a legal contract, can include a clause restraining the user from further distribution of the program; if the user violates this agreement, the programmer has a legal recourse.

If the program is of wide interest, copyright may provide adequate protection, since the selling price for the program can be set low enough to discourage extensive borrowing. The only real protection from the copyright is the ability to prevent mass distribution of the program by a "competitor." Improved technology may make copyright protection more effective, through the development of cheap, non-copyable forms of program distribution.

If the program owner is a service bureau, the ultimate in protection is obtained by requiring the potential user to run the program on the owner's facilities. This has the added advantage of building up service bureau billings. The individual programmer may find it desirable to lease his program to a service bureau on a royalty basis; this assures a monetary return with a minimum of promotional effort.

There is a real problem in the patentability of computer programs. The fundamental principle of the patent law is that ideas must be reduced to practice to be patentable. In the pre-computer era, this meant that ideas were not patentable, but machines were. A computer program is an entity somewhere between an idea and a machine. A technique in numerical analysis is considered by the academic community to be in the public domain. Should the programming of such a technique be patentable? Is it relevant whether the programming is done by the originator of the technique or by someone else? Does the programming require inspiration, perspiration, neither, or both?

One argument for the patentability of computer programs is the fact that a general-purpose computer under program control becomes a special-purpose computer, a machine which may be patentable per se. How valid is this argument?

One further aspect of patent protection requires elaboration. There are damages which may be collected from those who infringe upon a patent, knowingly or not. This could create chaos in an industry where most programmers seemingly operate in a vacuum. A manufacturer of electric generators may reasonably be expected to make himself aware of patents owned by the competition. Should a programmer be required to do likewise? What would be the effect upon the industry if routines such as integer-floating point conversion were covered by a patent? Is another form of protection required?

I recommend that all readers make up their minds what position they should take on this issue, and communicate their position to their Senators and Representatives in Congress.

—HARRY A. CLAMPETT, JR.

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"SUPER-IMPROVED-NOW-THREE-TIMES-BETTER-THAN-EVER-BEFORE"?

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Core, plane or stack problems?

Take 'em to the experts. (Us.)

Core? Construction? Format? Hostile environment? Whatever your problem, we've probably seen—and solved—it before. If not, Ferroxcube experts will always find the shortest path to the right answer. For instance—

Application: Core memory stack for real-time display system in ship-board fire control computer.

Problem: Hostile thermal environment, critically limited space restrictions.

Solution: Single-area, double matted printed-circuit board construction; bus-wire bridging to allow air-flow cooling of 30-mil wide temperature range cores.

Application: Core memory stack for navigational guidance computer in commercial avionics system.

Problem: Mil-reliability at commercial prices; NDRO operation; volume reproducibility.

Solution: Single-area, single-matted plane, plastic laminated terminal frame construction; bootstrap patterns with 30-mil cores on extremely tight centers.

Application: Low cost core memory stack for state-of-the-art commercial-computer main memory.

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Solution: 2½D organization; planar construction to offer lowest cost and convenient access; 20-mil cores; stack mounted diode modules.

Application: Core memory stack for guidance computer in missile-borne avionics package.

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Want more information? Write for Bulletins 6005 & 6006.

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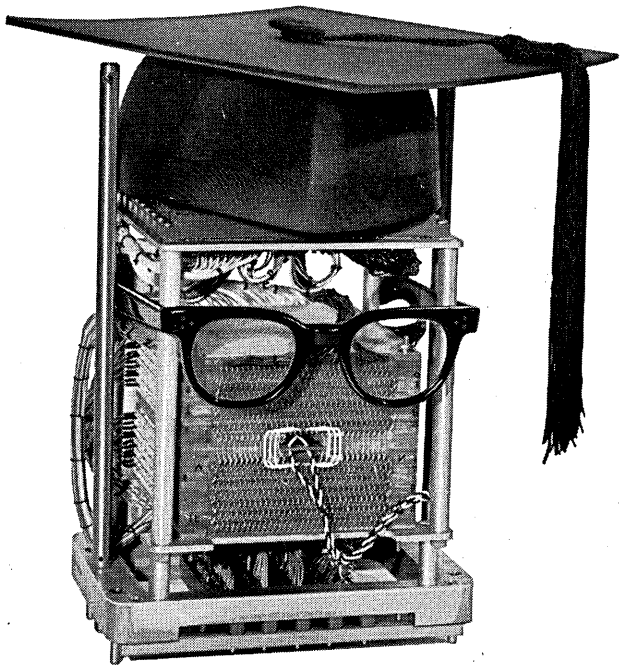

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