**370 Lease Plans Promise Bonanza**

By a CW Staff Writer

HARTSDALE, N.Y. — Users who wish to keep all-IBM installations can now save as much as 60% on 370 leases from DPF Inc. here.

The savings can go higher, the firm said, if the user wants to take a mixed system made up of an IBM CPU and independent peripherals.

The new plan, which includes operating (short term) as well as full payout leases, features leases that run from three years to 10 years, the firm said. Options to drop a three-year lease can be made after one year, the firm said.

Previously, most leases for 370 equipment that offered the user substantial savings required firms to take a package of IBM and independent equipment, but DPF said it will lease IBM systems with as little as 10% of IBM equipment.

On an eight-year lease, the savings on an all-IBM configuration could run to almost 60%, the firm said, adding the savings on a five-year lease could be between 35% and 45% depending on the configuration and length of the lease, DPF said.

The firm said it had working arrangements with several of the independent peripheral makers to sell their equipment under the plan and so was not tied to any one independent producer.

On a 370/155 CPU the firm indicated users could save as much as 53% off the IBM price with an eight-year lease.

The figures show the savings could be almost $17,000 off the IBM price with a five-year lease and so on.

**Iitel Gets Injunction Against IBM Abroad**

SAN FRANCISCO — IBM has been prohibited by a court in Germany from refusing to service and maintain its System 360/30 computers with Iitel add-on memory attached.

In addition, the court held that IBM had unfairly tried to restrict competition by attempting to withhold service on the system.

A U.S. District Court in San Francisco in 1972 ruled on this same question and also issued a similar injunction against IBM’s refusal to maintain its equipment in the U.S.

In granting its preliminary injunction, the German court said: “...the court has been convinced that the defendant has no valid reason to refuse the further maintenance of its equipment because the publishing house has installed the add-on memory of the plaintiff.

“In particular, the court is convinced that there are no unacceptable technical or economic obstacles servicing and maintaining the system caused by the add-on memory of the defendant.

“Finally it has been shown to the satisfaction of the court that the defendant is a company dominating the market of EDP systems within the meaning of section 26 of the act against restrictions of competition.”

3,145 Applications Filed

For CDP Exam, Most Since ‘65

PARK RIDGE, Ill. — The number of applications received for the 1973 Certificate in Data Processing (CDP) examination was the largest since 1965, according to the Data Processing Management Association (DPMA), sponsor of the examination.

A total of 3,145 applications were filed by the Dec. 1 deadline. This compares with 2,944 for the 1972 examination. The 1973 examination will be given Feb. 17 in 100 test centers at colleges and universities in the U.S. and in Canada.

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**Spotlight on User's Lib**

**Common Interface Vetoed, NBS Asks Some Standards**

**Board Challenged**

**DP Selection Stirs Town**

By E. Drake Lundell Jr.

Of the CW Staff

GAIERTSBURG, Md. — No single interface standard should be developed for all peripheral equipment, but the government should begin work on developing selected standards particularly in the tape and disk area, a National Bureau of Standards draft report indicates.

At present, “neither the engineering information nor the engineering capability now exists to produce an interface specification broad enough to achieve universal applicability for all peripherals and all CPUs,” according to the draft report on “Means of Achieving Interoperability of Computer Hardware.”

“As a result, the development of a single interface standard would be too costly and of too amorphous a nature to justify,” the report by the Center for Computer Sciences and Technology of NBS added.

But while rejecting the idea of a universal interface, the report, by recommending specific standards and a federal center to test equipment against those specific standards, held out hope for users wanting to achieve cost savings through the greater interchangeability of peripherals.

“We are convinced that interface standards confined to selected computer system functions of limited applicability are technically feasible,” according to the report.

Examples would be standards for selected tape unit and disk unit interfaces.

“We are convinced that interface standards should be based on selected computer system functions of limited applicability and be technically feasible.”

From a functional viewpoint, the number of standards for such selected interfaces would be substantially less than the number of existing interface types,” it added.

The establishment of such standards should be “of significant benefit” to the Federal Government and other computer users, in addition to the independent peripherals industry, the report noted.

It went on to describe frequently the situation where, for instance, the interfaces between a given tape unit and the CPUs of two different manufacturers differ un

**Second-class postage paid at Boston, Mass., and additional mailing offices**
Town Upset by DP Selection

January 17, 1973

PROVIDENCE, R.I. — A suburban on patrol in the Atlantic reefs under the buffering of an underwater explosion. Water floods her, she dives, out of control, her hull crumpling under the intense pressure.

The water is as deep as it may be, the ship's designer, because it is simulated at Brown University's computer center under the direction of a visiting associate professor of engineering, Dr. Robert E. Nickell.

Nickell commits his theoretical mayhem by constructing mathematical models of various structures to study the effect of catastrophic conditions on design.

One of the problems Nickell has been working on is the stress factors involved with increasing the size of U.S. Navy submarines. "When you are trying to design a bigger sub, you just can't scale up the dimensions of existing submarines. If you did," he explained, "then you would have to put a feature that might fail."

"Brown University is not designing submarines, he said, but is developing guidelines and techniques for industry to follow in various design processes.

For example, the guidelines developed by Nickell and his associates are used to determine safety factors which enable a submarine to survive depth charges or other unforeseen attacks.

"There are several forces working together or against one another," Nickell noted. "All these variables are considered in the models we feed into the computer," an IBM 360/67.

After explaining that the computer could be programmed by two teachers and the students, the committee said it did not want to hire professionals immediately to develop programs, and then get the equipment to report them since it would be years before any actual training could be handled.

At a recent open meeting held in which the committee agreed to stop by the local Chamber of Commerce, and go back to session for further consideration of the matter.

Universal Interface Vetoes, Standards Favored

"To provide assistance to federal agencies in achieving increased component (peripherals) interchangeability," such a federal test center would be needed, the report said, because users "to insure reliability is no loss of usefulness in processing capabilities," when buying independent peripherals and that the selected peripheral component is comparable or better in performance than the other component.

"It appears that, to date, the integration of multiple-source peripherals into computer systems has procedurally, taken into account the interests of the federal customers and public interest and will not hinder innovation in computer architecture," the study stated.

In order to develop guidelines for peripheral equipment and to test it with the interfaces, the report suggested the establishment of a new federal facility:

- To develop appropriate performance criteria for evaluating and selecting components (peripherals) at different peripheral interfaces.

- To evaluate and test interchangeable peripherals against stated minimum performance parameters.

- To provide assistance to federal agencies in achieving increased component (peripherals) interchangeability.
Optical Systems Eye-Openers

NEWTON, Mass. — Optical technology is providing state-of-the-art solutions in both the point-of-sale and data communications fields.

The grocery industry has been working to speed the checkout of items in a supermarket by developing an optical marking system that can be scanned for identification and price by the register clerk.

Several prototype tests of optical scanner and coded marking systems are now being held. Among these systems is the Pitney Bowes-Alpex Supermarket Electronic Scanning for Automatic Merchandise Entry (Seame) which is installed at the end of a checkout counter and reads a linear bar code in several densities.

In addition to speeding the checkout process for customers, stock transactions are transmitted to a nearby CPL using Computer Transmission Corp. Optran infrared system.

Pitney Bowes-Alpex Seame point-of-sale system is shown at an "operating prototype" installation.

Holiday Planning Gets Quick Sendoff

LONDON — Holiday travel plans can be made in about three minutes with an on-line reservations system recently inaugurated by Clarksons here.

Caspar (Clarksons Automatic System for Passenger and Agent Reservations) has been developed over the past four years by Constructive Management Services, a Clarksons subsidiary. The heart of the system is two Univac 9400s which can answer an individual inquiry in .8 seconds and completes an average booking in about three minutes.

Inquiries are handled by 120 visual display unit operators who receive 24,000 telephone calls per hour, mostly from travel agents. The computer displays what is available. The American Stock Exchange is transmitting stock transaction data in downtown New York using an infrared communications system called Optran.

Located on the roof of the exchange, the optical system makes it unnecessary for the exchange to depend on underground cables provided by the phone company. The Optran system from Computer Transmission Corp., operates at 5,400 char/sec to transmit data to a pair of 360/40s two blocks away.

These are some of the formats Bowes-Alpex is using. The scanned data is processed by a minicomputer or other processor to give grocers closer control over inventories.

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Los Angeles — Three universities here are expanding their joint studies of potential benefits available to them through cooperative sharing of facilities and programs.

The University of Southern California, Caltech and UCLA are exploring the sharing of resources such as computing centers and libraries, in light of the sharing of resources such as computer centers and libraries, in light of the five-day "five-day grace period" following registration being eliminated for the winter term under an experimental program.

By using a specially designed computerized registration program stored in the college's Kiwit Computer Center, however, changes by students can now be accomplished in a fraction of a second and for less than a nickel. The small charge for computer time will be absorbed by the college and the $5 savings passed on to the students.

The $5 charge will be applied, Bowen noted, if students decide to make changes in their schedule after the "five-day grace period."

As each student enrolls in a course, the information is fed into the program and stored.

College officials using a terminal connected to the Kiwit Computer can ask the system which courses or sections are open or closed, which courses can accept additional students without overburdening the facilities or the professors, and what courses are available as alternatives for student selection.
Are You Getting Your $1.84 Worth?

ROCKVILLE, Md. — Cities, and counties in the U.S. spend an average of $1.84 on data processing for each resident of their jurisdictions, according to a firm here which is developing nationwide figures on DP expenditures in city and county governments.

Of the 257 responses to Kenton Associates questionnaires, the median expenditure of $1.84 per resident was equal to .9% of the total budget for the county or city surveyed.

The upper limit on expenditures was $2.50 per person in the jurisdiction or 1.5% of the overall budget. The lower limit was 75 cents per resident or .5% of the overall local budget.

By population it was found that in cities or counties with a population of between 14,000 and 50,000, 30% owned their own computer, 24% used a service bureau and 16% had some sort of cooperative or sharing arrangement with other jurisdictions.

However, as cities get larger, the proportion that uses strictly in-house computers rises. In jurisdictions with between 50,000 and 100,000 population, each resident has in-house systems; of those with a population between 100,000 and 750,000, 84% are in-house and 100% of the cities with over 750,000 have in-house systems, the study said.

**Guess Who?**

The most prevalent manufacturer represented in the local governments is IBM with 77 installations. Honeywell follows with 15 installations; and NCR is third with 11, followed by Univac; Burroughs, and Remington Rand as the survey found.

"The small computer systems are particularly prevalent (under $2,000/mo.)," the report indicated, "with more than 40 in this category.

"Only 26 of the respondents use on-line terminals, with a total of 732 in these installations," the study said.

Expenditures for data processing were somewhat related to population size, according to the study, and ranged from $17,000 to $10,324,000 in the cities studied.

However, the study also noted "an interesting aspect of this trend is that expenditures appear to increase more rapidly than population growth.

Kenton also found the "pattern of DP staffing closely parallels that of expenditures," with the range of staff size varying from a low of one to a maximum of 675 in the areas studied.

The major application areas for the local governments were financial management, followed by public services. Next in order of applications in use were the public safety area, social services, and management-planning applications, the report said.

The report is part of a continuing local government DP self-audit service available from the service, with Kenton collected statistics on various expenditures by local governments so that participating cities and counties can measure their performances against national averages.

DP Aids 'Revolutionary' Study

LOS ANGELES — Using "barebones" records of the Massachusetts Legislature from 1744 to 1776, historian Dr. John A. Schutz of the University of Southern California is hoping computer analysis will shed new light on the American Revolution.

While a vast body of material, such as books, manuscripts, genealogical data, census material, biographical material and legislative records exists to provide input data, the problem lies in the absence of minutes and records of deliberations such as the present-day's U.S. Congressional Records, Schutz said.

"We hope, first of all, that the study will provide an explanation of the legislature as an institution.

Rising Revolution

"We also hope for probable explanations of the rise of the Revolution in Massachusetts, the nature of the colony's political elite and the rise of the Tories and Whigs," Schutz said.

"For example, by looking at the age, education level, region of constituency and frequency of chairmanship of committees, the computer can come up with information about leadership as it developed among certain legislators," he said. Input is being classified on three levels, beginning with a study of the 1,300 men who were in the legislature, their careers as they pertain to the town or state they represented and in their birth and death dates.

The second level includes problems of the constituency of each legislator, and its various kinds of characteristics.

Thirdly, Schutz is looking at the legislative record of the period.

Work is proceeding under a grant from the National Endowment for the Humanities.

Comparison of IBM, DPF Monthly Rentals

Lease Plan Promises Bonanza

(Continued from Page 1) from IBM would be $47,032, DPF said.

The DPF price is almost $25,000/ mo. less than that IBM figure, and that amounts to over $2.3 million over the eight-year period of the lease.

**Mixed-Bag Savings**

In the mixed-system area, DPF said it could save the user 35% by leasing a 370/145 CPU with independent peripherals over a five-year period, as compared to the full IBM price for the equivalent system. The DPF leased system with the IBM CPU and the independent equipment will cost the user $10,000/mo. less than the all-IBM system rented from IBM.

Over the five-year term of the lease the savings would therefore amount to $600,000.

Even on a short-term lease, the firm promises savings, stressing the user could save 25% off the monthly rental of 370/135 CPU. That amounts to $2,557/mo. or $92,000 over the three-year term of the lease.

**Global Net**

GE plans to extend its Mark III remote-computing network [CW, Oct. 25] to Japan and Western Europe. The trans-Pacific link, expected to be in place by the end of March, will provide multi-national corporations with access to common data bases from locations spanning two-thirds of the globe. Initially U.S.-Japanese transmission rates will be 2,400 bit/sec. GE spokesman said.

Let MacGowan and Henderson help you prepare for the CDP examination!

**CDP REVIEW MANUAL: A Data Processing Handbook**

by Roger MacGowan and Reid Henderson

This major new book has been written specially for those who are taking the CDP certification test. It covers virtually every facet of the EDP spectrum—all the things you must know in order to take the test with confidence.

The Manual conforms to the format of the CDP Study Guide of the DPMA and contains text questions and answers for self-testing.
Keeping up is what it's all about in today's swift-moving computer world...and the smart, economical way is through

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Australia Net Users to Benefit

Special to Computerworld

CANBERRA, Australia—More than 36 millions will be spent over the next three years on advanced computing equipment and buildings for Commonwealth Scientific and Industrial Research's Division of Computing Research, according to the Minister for Education and Science, John M. Fraser.

Negotiations are proceeding for the delivery of a Control Data Cyber 76 computer which would be coupled with the installed Control Data 3600 to increase the capacity of the Canberra network for large-scale scientific and technical computations.

The high-speed link would be carried out with minimum disruption to network users. Installation of the Cyber 76 would enable the organization to discontinue part-time usage of a Control Data 6600.

Together with the installation of the Cyber 76 at least 20 more communication nodes would be installed for Cairo divisions in metropolitan areas, away from actual city centers or in country towns.

Scientists and research workers in Canberra, Sydney, Melbourne, Adelaide, Brisbane, Perth, Townsville, Rockhampton and Griffith with access to Australian Post Office Datel services would use the network.

They would be able to draw not only on a computing system with the ability to execute an average of 15 million instructions/sec, but also on a set of technical data bases of massive proportions.

The Division of Computing Research has scientists engaged in systems development, simulation and modeling, data-base management studies, artificial intelligence investigations and statistical computation, together with services groups which support the network.

Technical and scientific computing services are also available to government departments, the largest such users being the Department of National Development and the Department of Primary Industry.

Just Food for Thought

ATLANTA—A 4K PDP-8/L computer has been used in an experiment which conditions up to 256 rats to accept water in accordance with the condition of a light in their cages, before they are killed and their brains fed to a new group.

Training is accomplished by electrically shocking the animals if they attempt to drink water at an undesigned time.

The experimenters at the Georgia Institute of Technology first train a group of control rats to perform the drinking task, then extract portions of brain tissue from the trained rats to be fed to a new group of animals to determine if they learn in less time.

Caged Like Animals

Rats are caged in glass houses with a water fountain continually running next to an electric light. When the light is not on, an electric current is passed through the water so if the rat tries to drink he receives a shock.

The minicomputer is used to determine the ratio of "good attempts" against the "total attempts." When this ratio nears unity, the rat is qualified as trained; he is then sacrificed and his brain tissue is fed to a new recruit.

With the system in operation more than a year, the university has been able to reduce the time needed to train rats from about eight days for normal rats to five days for brain-fed rats.

Paint Company Has 'Class'

Special to Computerworld

SYDNEY, Australia—Punctual delivery of special paints to automobile makers and industrial customers has always been an important objective of Dulux Australia Ltd. management.

Now several computer programs called Class (Capacity Loading and Scheduling System) help Dulux plant managers in Sydney and Melbourne set more realistic targets for special batch paints. The programs are run on Dulux IBM 360/30s.

Class programs also help managers achieve delivery targets by highlighting possible delays in production.

Many Finishes

The Dulux paint factory in Melbourne uses about 1,000 different raw materials and produces more than 6,000 different stock finishes. Over 400 batches of paint can be in the scheduling process at Dulux at any one time.

Scheduling is especially difficult because some processes take a lot longer than others. Tinting still requires a high degree of skill and patience and can take a long time depending on conditions in the plant.

Class was designed by IBM in Germany for metal-working job shops.

Circuitry is designed using large-scale integrated (LSI) technology so that more than 2,000 conventional integrated circuits, or about 50,000 transistors, would have to be used to equal the 22 LSI boards used.

Functionally, using the computer makes it mathematically impossible for notes to be off speech or out-of-regulation with note-to-note scaling throughout the entire range of the instrument flawlessly.

Options for the basic model allow the user to select from hundreds of additional voices by using punched cards with the card reader built into the console keyboard of the organ.

A transposer is included in all models to allow dynamic adjustment of keys and pedals either up or down a half stop at a time.

Prices for Digital Computer Organs start at about $5,500 for a self-contained instrument of 36 straight stops.
'Frat' Aids Methadone Program

SAN JOSE, Calif. — Santa Clara County has turned to a computer-based system to check for backsliding among narcotics addicts registered in its methadone maintenance program.

The automated system capable of chemically analyzing more than 35,000 urine samples yearly pinpoints which addicts in the program have been using hard drugs - and does it approximately six times faster than the previous manual methods, according to Ross Stark, program coordinator.

The speed of the system means the county will be able to expand its methadone maintenance program "to keep pace with the urgent need with no increase in the number of lab technicians and no increase in laboratory space," he said.

The Free Radical Assay Technique (Frat) is used to check every sample from every patient. Samples that show a positive reaction (indicating the presence of a gram of hard drugs or drug metabolites in the human body, according to its developer, Syva Co., a joint venture of subsidiaries of Syntex Corp. and Varian Associates.

The Santa Clara program presently has approximately 700 active patients with a waiting list of 200 additional addicts.

The typical patient is required to give a urine sample about once every seven days, using a computer-generated random selection of the addicts in the program. Results of each day's urinalyses are returned to the clinic within 24 hours for use by the psychiatric nurses, addiction specialists and others operating the treatment process.

Frat Faster

Using older method (called thin-layer chromatography) to check for backsliders, each lab technician could perform approximately 75 test/day. But with the new technique the technician can perform around 420 tests daily.

The only major drawback is that each test with the Frat system costs 50 cents, while the tests under the older system cost only 25 cents in materials.

Frat can detect as little as one billionth of a gram of hard drugs or drug metabolites in a urine sample about once every seven days, using a computer-generated random selection of the addicts in the program.

Lab technician Nick Guerrero inserts a urine sample in Santa Clara County's automated drug screening system. Results are displayed on the plotter in foreground.

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The Free Radical Assay Technique (Frat) is used to check every sample from every patient. Samples that show a positive reaction (indicating the presence of hard drugs) are further analyzed.

The newly released peripherals for the NCR Century 101 processor require a minimum of space, yet they provide the power and versatility of units twice their size.

The basic system, including processor, card or paper tape reader, line printer, and one dual platter disc unit covers no more space than 2½ feet by 10 feet! It can be placed in rooms where larger computers just won't fit. And, because it generates little heat, air conditioning requirements are minimal.

Big advantages in small packages include free standing add-on dual platter disc units, each having a storage capacity of 10 million bytes. A line printer that turns out 300 lines of crisp printing per minute. And an optional 30-character per second 1/O Writer.

The 101 processor, heart of the system, includes features like a high-speed memory that can expand in practical increments from 16K to 64K. An optional multiplexor that provides control for 10 communications lines, with no increase in cabinetry. Eleven-way to nine-way simultaneity. And many other features just as significant.

Later, as your business grows, you can expand this modular system to meet increased information requirements. Larger capacity disc units and higher speed printers can be added if and when you need them.

For the price, this new system from NCR offers big performance for businesses on the grow. Average systems range from just $1820 to $3800 per month.

Call your local NCR office for the specific advantages your business can expect from this newest member of the NCR Century family.

In small packages!

This new low-priced NCR Century 101 system offers small and medium size businesses the big kind of computer power they need to grow.

Computer Increases Aussie Tax Revenue

By Over $24 Million

By William Scholes

Special to Computerworld

CANBERRA, Australia — Not many businesses in the world can show a direct increase of over $24 million in net profit for the year just by installing a computer. But very few businesses have the advantages of the Australian Department of Taxation.

In the 1971-72 fiscal year, the Taxation Department brought to full operational level a new system for computer-assisted assessment of salary and wages throughout Australia.

The computer was programmed to make adjustments or take other appropriate action where the amount of a claim exceeded what had previously been proven reasonable.

In the annual report of the Commissioner for Taxation, Sir Edward Cain, commissioner, stated: "While the computer-assisted assessing system generally uses the same guidelines as the manual system it replaces, it has brought a degree of precision and consistency to assessing which could never be achieved under the former system."

Cain also cited the development of a highly specialized experimental data entry system designed for taxation processing and he called significant the completion of the first year of full operation of a pilot integrated data processing system.

The system, which has been installed in Adelaide as a model for the national taxation office system, is expected to come into operation by stages commencing in 1973-74 when a central computer complex for the taxation office will be installed in Canberra.

With more than seven million income-tax returns to be processed annually, an enormous volume of information must be fed into the system to make assessments, issuing refund checks and accounting for tax-installment deduction and payments by taxpayers.

Under the present data entry system, the information required is punched on paper tape, which is subsequently verified by a second punch operator and transcribed onto magnetic tape. The information can then be fed into the computer system, which applies a complex series of edit checks designed to identify incorrect information and tape-punching errors.

IRS Publication Lists

Groups for Deductions

WASHINGTON, D.C. — The Internal Revenue Service has announced publication of its first computer-produced list of organizations eligible to receive tax-deductible contributions.

The 843-page "Tentative Cumulative List of Organizations" described in Section 170(c) of the Internal Revenue Code is now available in most IRS offices.

The Tentative Cumulative List employs a coding system to identify each of the 131,000 organizations' foundation status as well as any limitations on contributions' deductibility.

The Tentative Publication 78 is a product of the IRS computerized Exempt Organizations Master File as compared to the manually assembled Cumulative List of Dec. 31, 1970. Because of the nature of the initial computer-produced list, it is being published in tentative form to enable interested persons to inform IRS about omissions, mispellings, coding errors, alphabetical misplacements and other items believed to be incorrect.

Comments on the tentative list should be addressed to the Internal Revenue Service Center, 11601 Roosevelt Blvd., Philadelphia, Pa. 19155, Attention: EOR Branch, by Jan. 31.
When you fire that wasteful middleman, you get a happy problem.

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Happily, you can hear about them all from one source.

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We happen to be the only company that makes them all. Stand-alone key-to-tape. Cluster key-to-tape systems. Key-to-disk with tutorial CRT display.

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The Peripheral Power
**Editorials**

**Dropping the Prefix**

A decade ago the phrase "IBM manager" was still prevalent, even though the advent of computer systems from many computer manufacturers had broken the grip of IBM on data processing departments. Now the IBM prefix has vanished.

One development recently reported - the CHCS Ac- clarator for the 360/30 computer - presents the possi- bility of the dropping of a nearly universal prefix. The accelerator uses the microprogrammed facilities always present in the Model 30 to improve the system. It is still a Model 30, albeit an improved one. But it will no longer be an "IBM" machine.

The hardware design of the Model 30 has been the most successful yet. But users are entitled to the full capabilities of any machine. If IBM does not provide for the follow-on development of its systems, its choice should not be allowed to totally hold back effective system development as it appears that development of the Model 30 system has been held back. CHCS is appreciated - as will be any other developers of other cruelly abandoned computers.

Even at the cost of having to again drop that "IBM" prefix from our machine names.

**Christmas Always Comes**

Christmas '73 may seem a long time away now, and not worth bothering about in our busy world - a time to remember our relaxations, but hardly a time to prepare for.

Yet it will come - and just when we are most at ease the time may come to show that preparation was most important. Such a time came in Sacramento last Christ- mas, when fire razed computer rooms in the National Guard and Department of Motor Vehicles headquarters. The Californians had taken time to prepare. They had spent $1,200 on plastic covers, which prevent water damage to $15 million worth of equipment. There was no need after the holiday for those in authority to lament their lack of preparation.

Next Christmas, when you are relaxing, will you be able to feel as securely protected? It may not seem today?

- The small systems market was virtually nonexistent prior to the System/3.
- Univac would have little chance of competing with the six companies resulting from an IBM breakup.
- Peripheral manufacturers are going to continue to be profit- able under a unified IBM.
- Unbundling is here to stay.
- Innovative products come from IBM.

To consider the above points:
- IBM's development of the System/3 was a response to the already rapidly growing small systems market. It was not the creator of that market. The fact that this market has grown even faster since its introduction is simply a reflection of the impact of IBM's marketing force once it is "unleashed" on a market.
- Why should IBM be broken into six parts? Why not seven or eight? And what is Ferguson's basis for assuming that Univac would not have much chance to compete against the resulting companies?
- As long as IBM has such a dominant position in the main- frame market, there is little chance that manufacturers of such high-profit items as disk drives and memories can long survive. In the past two years the industry has witnessed the following occurrences:

  - IBM has raised the prices of its CPUs (in which there is little competition) while lowering the price of its disk and tape drives, in which competition is keen. In this way IBM's total revenue was largely unchanged while peripheral manufacturers have been driven up against the wall.
  - IBM has increasingly in- tegrated peripheral controllers into the CPU, effectively low- ering their costs and making it more difficult for peripheral makers to design compatible peripherals.
  - IBM has increasingly in- tegrated main memory into the CPU, also making it more dif- ficult for competitors to manu- facture replacements.
  - While it is certainly not a crime to lower prices in the face of competition, IBM's policy to se- lectively raise and lower prices of system components to make the total substantially the same while making other companies suffer is not competition but monopoly.
  - I challenge Ferguson to come up with an estimate of how long it will take IBM to rebundle once the competition is smashed.

My own estimate is five years at the most.

- I think the whole tone of IBM's attitude to technological innovation was set in the early fifties when it lifted Univac's patents on basic computer logic circuits. Since then, I think it can be said that relatively little innovation in computer software or hardware has been initiated by IBM.

To imply that breaking up IBM will solve all our problems is completely ignore the facts. The real evidence is that IBM does not have effective competition for main- frame business. The reason is that large competitors is to indulge in cir- cular logic.

Certainly the U.S. will experience increased competition from computer manufacturers abroad. If the U.S. companies wished to form consortia for marketing U.S. computer technology abroad, I'm sure the Justice De- partment would have no objec- tion.

In short, I think the breakup of IBM can be accomplished equili- ably and skillfully. It would stimulate rather than hamper inno- vation and even further im- prove our trading position. Thus, the best way to protect the con- sumer is to break IBM.

Fisher is director of data pro- cessing for a small agency of the Michigan Department of Mental Health.

**Letters to the Editor**

**Protection Would Be Aided**

Esperanto Not English?

Good Luck to You

The letter by James J. Pottrmyr favoring Esperanto over English as a documentation lan- guage [CW, Dec. 13] is certainly a much larger project and in- volves more people than advo- cating a change in emphasis of computer programming lan- guages (from Cobol to --). I ad- mire him for his enterprise. I agree with his analysis of languages and wish him luck in his en- deavor.

If he is as persistent as are a great number of professionals in their demands in computer pro- gramming language development (scraping Cobol, who knows?) After all, look what metrics has done to feet and pounds!

Thomas H. Poltowski
Director of Systems and Computer Services
Resource Control, Inc.
Lansing, Mich.

Be Broad-Minded!

Re: Dec. 20 issue, Giff Bab- cock's letter.

Isn't it just amazing how peo- ple can bundle their mental exercise by jumping to the wrong conclu- sions? Equally amazing is how the same people want others to join them in their jumping.

In Babcock's personal letter he really concerned about profes- sional attitudes of all DP man- agers or just his own uncer- tainties? What is his definition of professional? Perhaps a defini- tion might provide a better bal- ance between his opinions and reality.

Or is Babcock really attacking IBM? IBM undoubtedly has many sound business principles they have made and have sust- tained themselves as a leading company. However, there are in- numerable individuals and per- sonalities who make day-to-day customer contacts who make im- pressions on their own way.

Also, the interactions of cus- tomer personnel are equally innumerable. Combining the en- tire IBM personnel into a very, very narrow description as Babcock attempts to do is trans- parently fallacious.

Robert R. Hamilton
Past President
Boston Chapter, DPMA
Boston, Mass.

Friends up North

Re: stalled satellite editorial, CW, Dec. 13.

Yes, there is a Canadian communi- cations satellite which can be used by our neighbors to the south for a price. Yes, it was launched in Florida and I am told that American expertise was at least a part of the project.

But, rather than an "I am first" or a "me too" approach, why not a "use what we have avail- able and when more is available, educate or upgrade?" Your editorial rocks the "American Chauvinistic At- titude" - that there is none bet- ter on earth than we. The third paragraph of your editorial - "The administration's present situation is clear: we may have to pay foreigners to use a satel- lite that was launched by our own expertise in Florida" - only strengthens your image.

Yes, there is still a great deal of American, but there is definitely a better grade 4 word than foreigner - try friend, associate, comrade, Canadian, etc.

B.L. Nicholas
Systems/ Analyst
Toronto, Canada

**Innovation Would Be Aided**

By Eric S. Fisher
Special to Computerworld

David E. Ferguson’s article, "U. S. Needs IBM to Compete Overseas" [CW, Nov. 8], has many arguable opinions. Among them are:

- IBM has has increasingly in- tegrated main memory into the CPU, also making it more dif- ficult for competitors to manu- facture replacements.

While it is certainly not a crime to lower prices in the face of competition, IBM’s policy to se- lectively raise and lower prices of system components to make the total substantially the same while making other companies suffer is not competition but monopoly.

- I challenge Ferguson to come up with an estimate of how long it will take IBM to rebundle once the competition is smashed.

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To imply that breaking up IBM will solve all our problems is completely ignore the facts. The real evidence is that IBM does not have effective competition for main- frame business. The reason is that large competitors is to indulge in cir- cular logic.

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Yes, there is still a great deal of American, but there is definitely a better grade 4 word than foreigner - try friend, associate, comrade, Canadian, etc.

B.L. Nicholas
Systems/ Analyst
Toronto, Canada

You overlook the fact that Computeworld also cited the "commercial display of co-operation with our neighbors to the north." Rather than down- grade that fact I intend to applaud it and in- stead call attention to the folly of our slow governmental pro- cedures. Ed.
The Taylor Report
By Alan Taylor, CDP

January 17, 1973

Computworld is written for the computer community and appears on the front page of every issue. When letters are received for publication, therefore, writers should address the editor at the following address:

Alan Taylor, CDP
Computworld
561 Washington St., Newton, Mass. 02160.

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Cobol Validation: What System Can Best Serve Users?

By Ned Chapin

Special to Computerworld

At the last Fall Joint Computer Conference, George N. Baird reported on the Department of Defense (DOD) Cobol compiler validation system (CCVS).

Those who heard him or read his report in the FJCC Proceedings were left with several impressions:

- The system is big. It consists of more than 50 programs composed of more than 120,000 lines of Cobol source code.
- To use the system to check a Cobol compiler for conformance with the ANSI standard requires the person who sets up the job to have an extremely detailed knowledge of the Cobol standard.
- Adapting the CCVS to meet different object computers and different operating systems requires a lot of preparatory work.
- Repeatedly testing any specific Cobol compiler version and release made by a vendor will be redundant. Someone needs to check each compiler thoroughly once for each applicable object computer and operating system.
- But the computer user does benefit from a CCVS in three ways:
  1. First, program portability is improved. A source program compiled for different object computers should result in object programs that generate the same results upon execution.
  2. This is most critical for multi-installation users such as the Federal Government, and companies with branch offices. Even the single-installation computer user benefits when he has to use backup facilities.
  3. Second, the availability of a CCVS should enable users to get ANSI Standard Cobol compilers that have fewer bugs. This saves trouble and builds confidence for the user, and saves the waste of programming around the known bugs.

Third, personnel efficiency rises. When a computer can be relied upon to work the same way each time from computer installation to computer installation, personnel efficiency is helped in several ways.

The changes the programmer needs to be aware of are only changes in the standard itself, except for the presence or absence of specific features, such as the Report Writer.

Cobol expertise gained at one installation with one object computer can be transferred to other work with confidence. This transferability reduces start-up and training costs for the employer, and reduces training time for the employee.

One of our initial reactions to Baird's report was "I would like to play with the CCVS just for the fun of it to check out a compiler for my own shop." As I reflected on the personnel and computer time needed, I concluded that no user should have to check Cobol compilers for conformance with the ANSI Standard.

The user should be able to rely on the vendor to deliver a standardized compiler. But for well-understood reasons of gravity, it is always desirable to have the vendor's claims checked by some disinterested user-oriented party.

Here are some choices for such a party:

- Neither the American Federation of Information Processing Societies (Afips) nor the National American Standards Institute (Ansi) have the personnel or the computer resources or the knowledge of the standard, to operate a CCVS successfully.
- The Computing and Business Equipment Manufacturers Association (Cbmca) has access to the personnel, the facilities and the knowledge needed, but this would put validation into the hands of a vendor-oriented group rather than a user-oriented group.
- The DOD—a major computer user—could do the validation through its Navy Programming Languages Section. But if it is unfair to expect any one user, however major, to bear the expense of operating a CCVS. To check all the compilers for all the major applicable compilers and operating systems would take months.

Ideally, therefore, the party that operates the CCVS should be close to the standard effort, be user-oriented and be paid from the public purse, or by the equivalent of a tax or "validation fee" on the vendors.

The prime candidate for this role is the National Bureau of Standards' (NBS) Center for Computer Science and Technology. The Brooks Bill (PL89-306) would give the authority to select NBS, or any other professional group, to provide no funds to support the effort.

If NBS should delegate the actual performance of the Cobol validation to DOD, and DOD to the Navy, this would leave the effort where it has been centered all along. And this chain of delegation seems likely to continue.

It comes to pass, it leaves unanswered three questions significant for the Cobol user:

- Will DOD be able to tap the public purse to pay for a sufficient level of personnel and facilities to do the job well? The Navy is currently footing the bill. The temptation for DOD to be to ask the Navy to continue to pay, which would be better.

Even DOD itself should not have to pay by diverting funds from other efforts. How about asking the vendors to pay a service fee?

- Can NBS serve the Cobol users outside the Federal Government? It could; if it gets an adequate flow of validation results in timely and usable form, and then publicizes them.

Will NBS have the staff to do the job? Ruth Davis and others at NBS mean well and try hard, but since her staff is already loaded down with other tasks, what can we public users expect?

- What can users do to make our desires and needs known?

Ned Chapin is a data processing consultant, Infoscit Inc., Medio Park, Calif.

Common Ground Needed by All

(Continued from Page 11)

For a national chart-of-accounts numbering system for welfare payments/services it was also recommended that legislation should be passed to assure the privacy of the individual.

This is particularly true since it is Congress and the taxpayer who ask for an accounting. But as a means of using the computing facility to assure the privacy of the individual it might be well for those advocating a particular position to work together as an ad hoc committee, under the auspices of a congressional group.

Without a common ground to work from, the wills of all concerned will expend a vast amount of energy and effort in the cause of right, and may very well be no nearer a solution. Working together might bring overlooked details which could lead to recommendations for congressional action.

There will be work or comment on this subject may contact me at 689 Longleaf Drive, N.E., Atlanta, Ga., 30342.

E.T. Dibble is a management system consultant.

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And they'll be bringing you the latest information on a wide variety of EDP products and services. So when you see the Caravan in a city near you, you'll want to go to the nearest and see what you need to know ahead of this fast-changing industry.

If you're a Computerworld subscriber, you'll be getting the details on the Caravan/73 in plenty of time to sign up for our Forums and Exhibition when they come to a city near you. (If you're a subscriber and you want to see the Caravan in a city near you, fill out the blank below for the Caravan Forums." And if you're not a subscriber, but would like to attend the Caravan/73, please put me on your mailing list for Forums/enrollment materials. I understand that I will receive material sometime before the Caravan comes to a city near me.

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People who really know computer tape know BASF Endura.


Frankly, the in-roads this relatively new product has made surprises even us. We knew the world was ready for a tape that could meet future 3200BPI/6400FCI expectations as well as today's... but we didn't expect initial acceptance like this!

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The UNIVAC 3760 communications controller gives you plug-to-plug compatibility with the IBM 370/360, emulating IBM 2701, 2702 and 2703 data transmission units. And without changing your present operating system software or applications software. Step by step, you can move up to a full network control package.

The UNIVAC 3760 is a programmable processor with a memory of 16,000 bytes, expandable in 16,000-byte increments to 131,000 bytes. It gives you direct memory accessing and full memory addressing, with a memory cycle time of 750 nanoseconds. It can accommodate up to 192 full-duplex lines.

And with your UNIVAC 3760 you can take advantage of the powerful capabilities of the Univac UNISCOPE® 100 display terminal, the DCT 500 keyboard-printer and the DCT 1000 remote-batch terminal.

All this, with no change to your IBM system, for 15% to 25% less than processors that aren't nearly so capable.

And these are only a few of the lower cost, higher performance benefits offered by the UNIVAC 3760 to IBM users. To learn about more, clip and send the coupon. Or call 801-328-8066.
IIM Offers Free 'Preview' Of Revised Cobol Impact

SAN FRANCISCO—IBM 360/370 users can determine the impact of the proposed revised Cobol standard on their own systems, through use of a free diagnostic package from Information Management Inc. (IMI), 447 Battery St., San Francisco 11.

The diagnostic package contains four manuals, an initial support package, and a $28 "specialty volume" can be obtained for use on the low-cost monthly-rental—RENT-A-CAT—plan or thru a perpetual license.

CATS-A/P as well as other products within the CATS family are available for a one-time charge of $20,000 or five tapes, the company said. It is available for unlimited use at a time lease price of $40,000.

Each month, CMS prepares bank reconciliations, ranking of subsidiaries and divisions, and a statement of intercompany loan. A variance report shows actual cash compared to forecast position, for the corporate as a whole and for each subsidiary, the company said.

The consolidation package is tailored for each use by user-specialized packages. Its use for mandatory Security and Exchange Commission (SEC) "10-K" reporting is also applicable to monthly consolidation and closings, the company said.

The system contains an editing function and provides comparative reports, matching actual experience to budget for the current reporting period, or for year-to-date, or matching this year's experience to last year's.

Both systems are OS oriented. CMS requires 110K bytes of core, two disks and eight tapes, the company said. It is available for a one-time charge of $20,000 or for $500/mo.

CCS-IV utilizes 120K bytes of memory, one disk and three tapes. It sells for $5,500 or $200/mo, KCSC said and from Red Lion Road at Philmont Ave., 19006.

But experimenting on a hit-or-miss basis, even with well-developed systems, is only part of a step-by-step process that should be followed to make sure an MIS implementation is a success and avoid the dismal failure such as that which marred the MIS image in the late 1960's. And experimental use of a system should normally be the first step in the process, Emery warns.

Look inward first, he urged. The user should never implement a modeling tool with the idea that it is bound to prove something, such as the erroneous belief that nothing will be discovered.

What Does User Want? The interactive nature of many MIS is justified more because of the rapport between decision-maker and model, than for any critical need for working with absolutely current data, Emery noted.

Once the initial examination is completed, users should negotiate with the vendors to determine as closely as they can what the real costs of using each type of package will be. Only after that, Emery said, should the user install and test, and then fine-tune the system to his particular needs.

Emery's discussion of how to plan for using MIS packages is followed by quite detailed description of the corporate MIS or MIS-related offerings from time-sharing and packet vendors. The write-ups all follow essentially the same format, making cross-package comparisons easier.

In any case, the vendor contact and phone number are provided. Copies of this $28 "specialty volume" can be ordered from 3401 Science Center, 19104.

"Pride" Defines, Controls Work Of Analyst, End User in System

CLEVELAND — The Profitable Information by Design (Pride) package from M. Bryce & Associates Inc. (MBA) is exactly what a good systems analyst should do to plan a project. But that, according to its one user, is exactly why it is so useful.

Pride is quite literally a package, containing several manuals, each supplying documentation forms and training programs for both the analyst and the end user. The company also provides consulting service and guidance in the management of Pride, and any updates to the system.

Pride is not software, MBA explained, but rather a methodology that leads to effective software packages that make up easily maintained systems.

The manuals, with labeled forms, impose a development pattern on the analyst and require the participation of the end user, in defining needs, okaying proposed report layouts, etc., all along the way. From the analyst, the user, and analyst, from leaving out anything significant, MBA claimed.

Under the Pride methodology, for example, the analyst is prevented from going for the "big bang" phase of a project until the whole current phase has been completed and "signed off" by the end user.

Documentation is generated while the project is in progress, not after completion.

Pride provides "maximum and understandable" communication between all levels of the system development team, MBA said, and end users agree.

At first the volume of documentation required seemed overwhelming, a user with a year's experience said, but the manual, when detailed in that volume proved invaluable in project management after the project originator was no longer available.

The approach is independent of machine on which the system is to be installed, or language in which it is to be written. It is concerned with the management of the system and the data within the system, allowing technical personnel to concentrate on creative design rather than administrative details.

Pride is available on a "per systems group" basis, at $8,000 for the primary installation, and $5,000 for secondary sites. It is also available for unlimited use within a corporate structure for a one-time lease price of $40,000.

MBA can be reached through P.O. Box 15459, 45215.
GENERAL AUTOMATION SAYS BUY DEC
If you're shopping the minicomputer market for raw hardware at rock bottom cost, it's hard to know where to stop. With more than two dozen price lists to choose from, it can get confusing. And time consuming.

We're here to make it easy for you. Buy DEC.

When you cut through all the claims, DEC's priced as low as anyone else. And they have built a business fulfilling the needs of the low-end iron buyer.

We make low cost hardware too. And if you're price shopping, you'll find us competitive. But raw iron is not our primary business.

The cheapest machine vs. the cheapest solution:

Sure, our goal is to save you money too. But our long suit is squeezing these savings out of your total systems cost rather than off of our price list. So if you need more from the machine or the company that sells it to you, we recommend us. General Automation.

Take the world's most powerful minicomputer, for instance. The General Automation SPC-16.

The SPC-16 possesses the most powerful instruction set you can buy in a minicomputer today. Think about that. The most powerful. As a result, the SPC-16 does more things in less time. It will actually reduce the total cost of your system.

Depending on your specific needs, you can choose from six different models in the SPC-16 family. Each backed by the best software and peripheral capability in the business. There's another very important reason why you should buy from us.

It's called involvement.

All the other big mini manufacturers today are touting the fact that they're "end-user oriented" or that they're now "in the systems business."

We've been doing exactly that for more than five years now. And it's nice to see that others have begun to recognize our leadership.

We learned a long time ago that the only way to really help our customers in solving their systems problems was to fully understand those problems.

So we got involved with our customers. Both end-users and OEMs. Listened attentively. Learned a lot. Got answers.

And wound up building systems to solve some very tough, very complex problems.

Emissions analysis and electrical test systems for the nation's largest automobile manufacturers.

Production machine control systems for some of the biggest companies in the machine tool business.

Telecommunications and message switching systems for the world's leading communications companies, to name just a few.

In short, we've built our company and our reputation by offering answers, not just iron.

Who's it gonna be?

Actually, we've made your choice fairly simple.

If all you need is raw minicomputer hardware at a "rock bottom" price, we recommend DEC.

If you'd like something more—from a mini with more oomph to the total solution of a complex systems problem—we recommend us. General Automation.

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CHICAGO - With help from

Conversion Software Services

Corp. (CSSC), users of DEC

PDP-11 minicomputer systems

may be able to install programs

on their equipment that were

originally written for IBM

360/370 CPUs.

A CSSC translation service

accepts 360 Assembler source

code and converts it to PDP-11

Assembler source code. Most

versions of 360 Assembler

are acceptable, although Assembler

H macros cannot be handled

effectively with the current im-

plementation, a CSSC source

said.

More User Opportunity

This service appears to open

several new avenues for users of

installations with nothing but PDP-11s

can now consider packaged soft-

ware for the 360, from indepen-

dent software houses, as a means

of extending their application

workload "immediately" and with- out

heavy program development

effort.

Shops with 360s near the satu-

ration point can shift some of

their load to the lower-priced

DEC gear, at least delaying what

might otherwise seem to be an

unavoidable mainframe upgrade.

In this case, the user also gains

PDP-11 system features not

available on the 360, the CSSC

spokesman noted.

Apparently the only limitation

on the use of 360-oriented soft-

ware on the PDP-11 (assuming

the original programs are in

Assembler) would be the size of

the user's data base.

Since this can range from mini-

mum core on the true mini

11/05, to a normal maximum of

128K with possible extensions to

an absolute maximum of 256K

on the medium-scale 11/45, this

limitation may be more apparent

than real.

The conversion process takes

about a week, CSSC added, but

turnaround time depends more

on the complexity of the origi-

nal program than on the sys-

tem. Output can be punched on cards

or paper tape as the user speci-

fies, the spokesman noted.

While CSSC anticipates extend-

ing the conversion service to pro-

duct "source" code for other hardware systems in addi-

tion to the PDP-11, the com-

pany's present plans do not in-

clude the use of anything but 360 Assembler source code as

input.

The service is available for a dollar per source card, with no

minimum fee required. Com-

ment cards are carried over into

the PDP-11 Assembler source

program without cost, the

company added.

CSSC is at 333 N. Michigan

Ave., 60601.

Trust Control Stretched

To Include Reinvestment

NEW YORK - Banks with

"75K or 80K" available under

OS/360 may now extend their

trust department operations sub-

stantially with the installation of

the Dividend Investment

System (DRS) from Franklin

Computer Associates, Inc.

A batch-oriented system, DRS

can be interfaced with a bank's

normal dividend accounting

system to handle the distribu-

tion of cash or stock dividends.

The package is distributed in

source and object code so either

Franklin or the user can write

code and converts it to PDP-11

Assembler source code. Most

versions of 360 Assembler

are acceptable, although Assembler

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COMPUTERWORLD • The Newsweekly for the Computer Community
Communications

Communities Briefs

By Ronald A. Frank

NEW YORK — Communications managers with "heavy data communications experience are earning between $16,000 and $23,000 per year, according to a salary survey conducted by Personnel Resources International Inc.

Managers with "some data communications" average about $13,000 to $16,000 and lower level supervisors are in the $10,000 to $13,000 category, the survey said. Senior telecommunications program- mers currently earn between $14,000 and $18,000, the report added.

There has been a sharp increase in the number of firms seeking communications managers at the "lower and middle levels" in the past six months, according to Personnel Resources. This area had been "dormant" during the recent recession, the company said. The report is available from 342 Madison Ave., 10017.

Intertel Data Offers 'Pals'

OCEANPORT, N.J. — Intertel Inc. has announced a programmable asynchronous line system (Pals) for use on its "new series" minis.

Using MOS-LSI technology, Pals provides an interface between Bell 102- and 202-type data sets and the minis' multiplexer bus. The system can be used on both rented and leased lines and is priced "at least $400/line" in a typical 16-line configuration, the company said.

Intertel expects delivery in 60 days from 2 Crescent Place, 07757.

CSI Has Front-End

DALLAS — Communications Systems Inc. (CSID) has introduced a communications control unit which replaces both 2780 and 2930 systems currently in use.

Called the Cope 4705 communications controller, the unit as a 1.1-sec processor capable of reading 250 nsec control commands to 360/370 system addresses, commands and data sequences. A 4705 system for supporting 20 asynchronous and two synchronous lines costs about $20,000/year. Traffic prices include maintenance. Deliveries are scheduled for the first quarter of 1973.

The company, a subsidiary of University Computing, at 1500 UCC Tower, 75222.

Sanders 'Addes' Display

NASHUA, N.H. — Sanders Data Systems Inc. has introduced an interactive graphics display system called Addes/500.

The system includes a DEC PDP-11 with 8K of storage, a Model 33 TTY, utility software and a display generator.

First deliveries are scheduled for March 1973 from Daniel Webster Highway, 03060.

Communications Avoids Access Method

Hasp Helps Remote Job Entry Nets

By Ronald A. Frank

NEW YORK — Users who need an efficient way to get into Remote Job Entry (RJE) operations can combine IBM's Hasp package with independent 2780-equivalent terminals.

One of the major advantages of Hasp is that it contains a communications module, which gives the user a binary synchronous communications capability without having to resort to more sophisticated access methods such as Btam.

The IBM 2780 costs about $800 to $1,000/mo while the average independent equivalent terminal usually costs between $500 and $600/mo, according to one industry spokesman. Most of the independent terminals have a 425 CRT and a 200 line/min printer with a cassette capability.

One advantage of using Hasp for the RJE line discipline is that it improves throughput compared with other RJE operation.

Acknowledge Time Reduced

With Hasp, the acknowledge sequence time is reduced because instead of truncated transfers, there will be used which will acknowledge the data to make sure it is accurate before it is transmitted.

Another feature of the Hasp package is its "stability" according to one user. The package's reliability has been improved in a recent report "that the system is fast enough for most low-volume Hasp RJE applications. The cassette system allows high-speed transmission of data to the terminal, with the tape storage acting as a local buffer to tape data at a rate that can be accepted by the slower printer.

Most users with the independent 2780 terminals complement some processing capability at the remote site.

The intelligent terminal checks the data to make sure it is accurate before it is transmitted," one user said. Most of these terminals make sure there are no incorrect column punches or other errors in the card data, he said.

System Reliability, Redundancy Held Vital for Communications

ANAHEIM, Calif. — Successful operation of computerized communications systems requires high reliability and redundant systems to assure maximum uptime, according to speakers at a recent communications symposium.

Large-scale data communications networks such as the Integrated Telephone Information System (ITIS) and the Netherlands involve large batch runs with high-load real-time inquiries, according to Robert A. DiPalma, formerly with Pandata N.V., the software firm that designed the ITIS system for the Dutch Post Telephone and Telegraph (PTT).

The Dutch system will be used through the central IBM's Hasp package in a terminal system to handle all PTT directory assistance inquiries, in addition to billing and collections, work order entry, customer services inquiries, cable and wire pair administration and management information, he said.

Fast Directory Assistance

The average response time for a directory assistance call is estimated at three to five seconds from anywhere in the country. The ITIS will utilize PDP-11/20 as remote processors to poll terminals, edit input messages, smooth peak traffic and perform message protection with minimal impact on the central CPU, DiPalma explained.

The system will utilize 15 high-speed private line links operating at 2,400 and 4,800 bit/sec in full-duplex mode. A segmented message transmission scheme will be used which will acknowledge the first, last and retransmitted segments of messages, he said.

The mainframe proposed for the ITIS is a Univac 1108 with three 4440 disk subsystems. The communications interface will include two Univac communications systems terminal and controllers. Terminals supported by the system include 425 CRTs and 200 teletypewriters, he said.

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Modems

Modems

Modems

Multiplexer

Stand Alone Communications Controller

Choice of Peripherals

Remote Communications Concentrator

Communications Front End

Programming
We belong between you and your computer

Look at this chart. See what’s happening in the computer business.
It used to be nothing but data processing.
But today, outside the computer room is an entirely new system. One that’s just as complex and important as the one inside. A far-flung network of terminals, modems, multiplexers, satellite computers, software...
And people.
Everything has to interface with something else. (Including you.)
Then tie in with a transmission line.
Then interface again, once data reaches the computer.
Without distortion or error. And with the highest speed possible.
All in all, there’s a whole new industry added to data processing.
We call it data communications...
Outside the computer room.
And it’s here that the special systems expertise of GTE Information Systems can work for you.
Since we manufacture virtually everything but the mainframe, we have no reason to recommend anything but what does your job best.
And, since we’re nationwide, so is our service organization. You’re never more than a few hours away from help if it’s needed.
In the next pages, we’d like to guide you through data communications as it looks to us... outside the computer room.
To show you what happens when we really get between you and your computer.
To talk to a terminal dependent talk, How answer. And
From GTI choice of your system.

For virtual at our stand-alone display of 80 characters, 9600 baud, or display can be configured depending on the system.
To talk to your computer, you need a terminal. And the kind of terminal depends on how fast you want to talk. How fast you need your answer. And whether you want a permanent record of the communication.

From GTE Information Systems, your choice of terminals is as broad as your system's requirements.

For virtually instant response, look at our family of video terminals. The stand-alone terminal gives you a display of up to 1920 alphanumeric characters on 6, 12 or 24 lines, up to 80 characters wide... and transmission speed of 1200 or 2400 baud. For a cluster system, speeds up to 9600 baud are available and, depending on the number of terminals, the display can have as many as 1920 characters.

(In considering stand-alone vs. cluster systems, remember: the stand-alone unit gives direct computer access but requires its own control unit. A cluster arrangement can provide this access for a whole group of terminals using a common control unit. Both types are available for either local or remote operations.)

A video display is a transient thing. If you want a permanent record along with the CRT's speed, we can give you either a desk-top thermal printer to make single copies at up to 30 characters per second; or an impact printer, for an original and up to 5 copies. Both are buffered.

Then, there's our typewriter terminals. Here, too, we can furnish everything your data communications system needs.

These terminals include buffered storage capacity of up to 790 characters. This means that data entered at typist's speed can be transmitted later at 2400 baud. In the receiving mode, buffering now permits receipt of a 2400-baud message and delivery at 15 characters a second.

And, if you'd like to do better than that, our high-speed printer delivers data at 30 characters a second.

Finally, if you can afford to wait and transmit your data in a batch mode, the cassette recorder stores up to 73,000 characters, for high-speed transmission at a later time.

This first step between you and your computer may sound complicated, but it's really fairly simple. That's what we're here for.
Pick next step in chain—then:

You might next step to you can modem. Nials made of the idea.

It really terminal such a view of modem problems.
Pick the modem that’s just your speed

Next step in the data communications chain—the modem.

You might be surprised at how much you can save by having the right modems married to the right terminals married to the . . . but you get the idea.

It really boils down to how fast the terminal talks. And, since there’s such a variety in that, GTE Information Systems has put together a family of modems to handle just about any problem.

Our smallest model, a 300-baud modem, comes in five variations: acoustic-coupled or hard-wired originate-only; hard-wired answer-only; and data-card file answer-only in two file-card storage capacities.

Our 1200 and 2400-baud modems have a change-over feature that lets you switch from your dedicated line to the dial-up network at the press of a button.

For high-speed transmission, there’s our 4800-baud unit. Using duo-binary coding, it eliminates the dc component in the signal, allowing you to transmit more error-free data over standard Series 3002 lines with C2 conditioning.

All our modems are economical, and telephone company-compatible. And all have pushbutton trouble-spotting, so problems can be isolated in minutes.

In most cases, you’ll find our modems cost less than comparable units. And they’re all available from stock.

When our modems get between you and your computer, you get top efficiency. And save money, too.
TDM or FDM?
The wrong decision can cost you money

You've got the terminals and the modems. Now for the multiplexers.

The question is, when do you need them, and what kind do you need?

From the systems viewpoint, the answer comes from your total requirements.

Everybody knows that multiplexers literally multiply the effectiveness of your leased lines. Either by time division or frequency division, they combine many channels into a single high-speed output for your leased lines. We make both kinds.

When you operate only a few channels, chances are, you ought to aim for FDM, frequency division multiplexing. Roughly speaking, each FDM channel will cost you about $600.

GTE Information Systems has FDM units that will handle up to 23 channels on voice-grade line and 25 channels on a conditioned line.

If your bottom channel requirement is around 13, you probably ought to consider time division. The first channel costs a lot—around $4,000. But the cost per channel drops rapidly. At 16 channels, the cost is about $8,000.

We have TDM's that can handle up to 54 channels.

How do you know what you need? Guidelines like these help. It's even more helpful, we think, to talk to the people who make everything for total data communications. Everything that stands between you and your computer.
A little concentration can solve your data flow problems

Until now, we've talked about how complex and interrelated the parts of data communications systems are.

Now, here's a problem that arises because systems like these exist.

It's simply the vastness of the systems.

There's an incredible number of repetitive functions called for in today's state-of-the-art operations: jobs like polling, queuing, reformatting, addressing.

The kind of things any computer can do.

But your mainframe's main job is processing information. And every microsecond away from that is a loss of time and money.

Solution? Give your computer a computer. One that can handle these "housekeeping" chores of a widespread system.

GTE Information Systems makes a line of small computers for such jobs. For use as front ends; or as standalone message switches, controllers, data concentrators and intelligent terminals.

These are real computers... with memories up to 131K... programmable. They can handle codes and formats that haven't been invented yet.

It's a very efficient way to take some load off the main computer.

Because we were between you and your computer in the first place.
A program that treats your computer right can be a treat to your pocketbook, too

Software. It's what makes your system work.

Since it's the part of the system that tells the central computer what to do, you might even think software is the most important part of all.

At GTE Information Systems, we have developed software programs for many computer system needs. We are one of the country's leading creators of tailored programs.

We have also developed a state-of-the-art system, FCF (Front-end Communications Facility) that handles all network control, message processing and assembly, switching and data collection. It's one of the first marriages of software and hardware for the front-end part of the computer.

Programs? Intercomm™, for one. It allows you to move from batch to on-line without replacing your computer.

Minicomm™. For smaller systems, it can put you on-line with as little as 24K memory—without adding core.

Score. It converts ordinary language into a Cobol program.

...to say nothing of special programs for industries from banking to publishing ... from credit card to parking ticket record handling.

The wrong program can waste time for your whole system. Our programs, between you and your computer, can keep things running smoothly.
How to get the same service in New Mexico as you get in New York

As you've seen, we provide all the essential pieces for your data communications system.

Plus service. The vital ingredient.

GTE Information Systems includes a complete systems service, from installation and maintenance of equipment to helping you get your software integrated into your operations.

Nine out of every ten data communications installations in the country are within an hour's drive of one of our servicemen. The rest aren't much farther.

Specifically, our service organization includes more than 600 men in 85 cities around the U.S. and Canada. Trained in our own schools, they know how to diagnose a problem, and how to correct it. Fast.

We want to get between you and your computer. We don't want to interfere with it.

That's why our servicemen are always nearby.

And—wherever you are—there's only one number for you to call—collect: 303-449-7800.
We'll keep you on speaking terms with your computer

Think of what's happened outside the computer room.

A whole new business has evolved: data communications. A business we helped create.

It's entirely new—and nobody understands it better than we do. Used properly, it can help you make data processing a very senior management tool.

GTE Information Systems covers the data communications business totally...from you to the computer. We provide the hardware and the software, and furnish the service. Coast to coast. Continent to continent.

No system is too widespread, or too complex.

For example, we created and operate one of the largest privately owned communications systems in the world. Serving the brokerage industry worldwide, it's a 100,000-mile network encompassing 21,000 terminals, 33 satellite computer locations and a master computer center.

It provides brokers throughout the world with all the vital information they need—as it occurs and as it changes. Instantly.

The point is: we can supply everything from a single terminal to a global network. The products. The experience. The programming. The operation and service. All with complete inter- and intra-system compatibility.

When we get between you and your computer, everybody talks the same language.

If you'd like to see how we talk your language, too—or for specific details on any equipment or service we offer—mail the postcard.

I'd like to know more about

☐ The whole data communications system  ☐ Multiplexers
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PHILADELPHIA - A small computer is being shared by two separate but related companies housed in the same building to operate machines which dispense frozen carbonated beverages in retail stores in 31 national markets.

The nCR Century 200 in the processing of sales, ordering supplies, billing and the preparation of customer reports, David W. Williams, data processing manager of National ICEE Corp. and E.B. Evans Inc., said, "If it weren't for the computer, we'd be unable to maintain the right corporate control that now exists," he said.

Management is working toward the goal of having the computer handle just about every job required by Evans and ICEE.

At present, the system processes all orders, handles all billing, maintains receivables and payables, controls all purchases and production, maintains the general ledger, monitors manufacturing-to-production batches, processes the payroll and prepares profit reports for ICEE distributors. "When we're finished," stated Arthur Abramson, executive vice-president and treasurer of both firms, "all aspects of Evans and ICEE will be on computer."

The system consists of a central processor with 32K memory, dual-spindle disk drive, an nCR 640 high-speed 1,500 to 3,000-line/min printer and card reader. All card sorting and handling (except for initial input data) have been eliminated with magnetic memory disk packs.

The system's programs are also sorted on disks, making applications easier to change and faster to run. Each program is automatically called from storage when the operator presses a few keys on the console. The system is programmed in Neat3 and Cobol software.

The work flow for Evans begins with the receipt of orders from salesmen and contains detailed management information (gross profit, net profit and gross margin) and is retained. At the time of billing, the customer's master records, which are on disk, are updated.

The preparation of statements, which formerly took 16 hours, is now completed in 45 minutes. Sales analyses are generated in 40 minutes instead of 14 hours, Williams noted.

Orderly, Safe Storage in Minimal Space - that's proven Tab Data Media Cabinets. Versatility was born into these cabinets. They have been designed to accommodate hanging printout binders, disk packs and racked or hanging mag-netic tape. They are even ideal for storing cards. Tab Data Media Cabinets can be ordered with roll-out shelves that bring data media right to your fingertips.

Several routines can now be performed simultaneously, thus eliminating costly waiting periods.

John H. Robinson is president of the Harper Group of International Total Transportation Companies, San Francisco.

January 17, 1973
"That's an interesting story. Why didn't I see you at The Computer Caravan?"

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Remote Terminal Has
OCR Capabilities

ANAHEIM, Calif. — A remote terminal with optical character recognition (OCR) capabilities is being offered by Datum Inc. to users with data-entry requirements.

The Model 5098 reads data from source documents, assembles it into ASCII alpha-numeric characters and formats it for asynchronous transmission over normal telephone lines.

Any conventional asynchronous remote receiver can be used — teleprinters, paper tape punches, video-display terminals — the firm spokesman said.

The unit scans at a惊人速度 of 9 in/sec, with other speeds available. Transmission rates are 10, 15, 30, 60, and 120 char/sec, the spokesman stated.

Price for the standard 5098 is $1,795 from 170 E. Liberty Ave., 92801.

Large Plotter Boasts Fast Operation

CANOGA PARK, Calif. — A computerized flatbed plotter series with a work area of 6 ft by 10 ft to 6 ft by 20 ft is available from Xynetics, Inc.

The computer-based Series 2000 system has a maximum velocity of 30 in/sec, maximum acceleration of 3G, resolution to one mil and accuracy to ±0.005 in. over the total drawing area, the firm said.

The system comes with an optional parallel format system for continuous plots to accuracies up to ±0.030 in. The drafting head can accept liquid and dry pens, scribes and photo heads, the spokesman added.

Depending on exact specifications and the software needed, the Series 2000 will cost in the $60,000 to $150,000 range from 6710 Varie Ave., 91303.

PDP-9 Users Offered Memory

LEXINGTON, Mass. — DMS-9 add-on core memory from Dimensional Systems Inc. is designed as expansion memory for the PDP-9.

Expansion memory with controller costs $14,500 for 8K, $19,600 for 16K and $25,600 for 24K, compared to DEC's stated cost for added memory and controller of $14,500 for 8K, $26,500 for 16K and $38,500 for 24K.

The firm is at 31 Hartwell Ave., 02173.

Microprogramming Leaflet Free

SUNNYVALE, Calif. — "Debugging Microprogrammed Systems," the title of a four-page application leaflet available to designers of data-handling equipment.

The leaflet is directed specifically to engineers telling how flaws can be removed from computer memories, according to the author, Dr. William Daviddow of Sigmetic Memory Systems.

Free copies are available from 740 Kifer Road, 94086.


display terminals — the firm spokesman said.

Graphic leaflet says data-handling equipment — the firm said.

Grafic leaflet says data-handling equipment — the firm said.


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Graphic leaflet says data-handling equipment — the firm said.

The 306 is the fastest low-cost desktop computer.

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EULESS, Texas — The Continental Telephone Equipment Company expects a 20% increase in the production of circuit boards by switching to computer control for production and testing.

The circuit boards enable a telephone line to be used for up to eight simultaneous conversations by "coding" each conversation into a different non-interfering frequency.

On the first of two inspections of these boards, the IBM System/1 takes readings at about 50 locations. If a failure is detected, a signal is displayed on the control unit to indicate the location of the malfunction. This allows an inspector to make an adjustment and then send the board back for repairs.

The total handling time per board for this test is 8 seconds, only 2% of which are used by the computer.

Second Test

On a second test, each circuit is analyzed under simulated use in a telephone service. In 13 seconds, the computer tests 20 functions, identifies any failures and gives readings so that technicians can adjust each board to optimal performance.

DEC-10 Users Get 236-Type Disk Packs

IRVINE, Calif. — DEC PDP-10 users can now obtain a disk system utilizing the same dual density storage technique used by IBM 236 disk packs, according to the vendor, Telefile Computer Products.

The disk system provides storage capacity up to 116M bytes per single disk storage cabinet with the DC-10G controller connecting directly to the PDP-10 through the DF-10 high-speed channel, the firm's spokesman said.

Operating features of the Telefile DC-10G controller include verification of track location by hardware, error checking of data transfers, character recognition hardware, simultaneous seek operations, monitoring of many subsystem conditions and direct transfer to and from memory for data — eliminating blocking I/O and I/O channels, the spokesman stated.

Storage Units

The disk portion of the system is produced by Century Data Systems for Telefile and consists of dual density, high-speed, random access storage units. Each drive utilizes an 11-high disk pack.

Over 58M 8-bit bytes can be stored on the 20 recording surfaces of each pack with each disk accessed using 20 track/inch technology, the spokesman said.

Access to any of 406 positions on the disk is accomplished with a track-to-track access time of 10 milliseconds and a maximum access time of 55 msec. Data is transferred at a rate of 312K 8-bit bytes/second at a rotational speed of 2,400 rpm. The drive is up to speed in 15 seconds and dynamically braked in 11 sec, the spokesman said.

The DC-10G controller is priced at $25,000 while the dual density disk drives — with a capacity of 116M 8-bit bytes per unit — are priced at $11,000 each from 17795 Sky Park Cir., 5f624.

OCR Unit for Small Forms User

EAST HARTFORD, Conn. — Data entry users with a few applications involving small-sized forms — such as turnaround documents used for billing — can get a relatively low-priced Optical Character Recognition reader from Scan Optic.

The 20/10 is able to read forms up to 6 in. by 9 in. or journal tape using numeric, alphabetical and handprint input, the firm's spokesman stated.

Scanning speed is 2000 char./sec with a maximum throughput speed of 500 forms/min, he said.

Compatible peripherals include most standard line printers and tape drives, the spokesman said.

Error control is performed by programmable on-line display and insertion, character recognition, scanning, sorting, edge marking and serial numbering, he added.

Software is included for selective field scanning, editing and formatting. All software is compatible with Scan Optic's larger systems and can easily upgrade as new needs arise.

The scanner is priced at $2,000/mo on a two year lease or $73.00/month.

You could own and operate the new datacenter that will soon be serving the small businesses in your area.

If you've already been successful in business, if you have better-than-average management ability, and want to enlarge your world as well as your income, you should think about coming to Florida right now, the spokesman said.

Favorable real estate conditions are available in most areas and there are no state or personal income taxes.

While you're still thinking about it, why not pick up your phone now and talk to us. The phone number is (305) 448-3650; Atlanta, Ga. (404) 237-1176. We'll train you thoroughly. We provide strong professional marketing and support services to help you get the most out of your new business.
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January 17, 1973

Profits Increase 25%

Food Chain Brings Inventory, Costs Under Control

By Royce R. Shafter
Special to Computerworld

FORT WAYNE, Ind. — Within a six-month period, Lucky Steer Steak Houses slashed food inventories at its 19 restaurants by 25%, while sales volume climbed 34%, leading to a proportional increase of more than 25% for the period.

Sandra Danielson's suggestion resulted in the collection of 40 tons of printout, 80% of which was recycled. In the collection of 40 tons of printout, an employee was rewarded recently for her paper.

Recycling Rewarded

Royce R. Shafter is secretary-treasurer for Lucky Steer Steak Houses, Fort Wayne, Ind.

The Sycor 340 Intelligent Communications Terminal.

The system tracks food stocks and usage at individual restaurants by class and item, calculates variations in item usage and pinpoints overstocks. The net result is lower average inventory, reduced pilferage loss and less waste from over-portioning or spoilage.

With food and labor costs our primary targets, we are putting more applications on our small computer. The IBM System 360 handles the payroll processing for 600 employees; handles accounts payable for more than 700 suppliers; accounts for daily cash receipts from all 19 restaurants; prepares profit and loss statements for individual locations; and prepares corporate balance sheets.

Even more important than its operational versatility is the computer's contribution to better management at all levels — headquarters, field supervision and individual restaurants.

Inventory Control

Computerized inventory control applies to all 19 fast food restaurants, and to each of some 130 product items — from salad dressings to T-bone steaks, poultry to fish, condiments to carryout paper containers.

The vital control element is a master file record which continually updates current sales, replenishment purchases and stock levels — headquarters, field supervision and individual restaurants.

Every Sunday evening, the restaurant managers take a physical inventory of on-hand foods and supplies. They enter the item-by-item totals on a preprinted form, and the completed inventory form is mailed to our headquarters here to become the key input for the inventory control system.

The managers report the week's purchases by mailing in the suppliers' purchase invoices. Cash register receipts, denoting sales, are sent in daily, along with notifications of bank deposits and any cash disbursements for such things as emergency supplies.

The report breaks down the store's inventory by nine product categories — meats, salads, dressings, potatoes, breads, beverages, desserts, paper items and condiments. It shows, for each item within each category, the total cost of the item; percentage of item sales to total sales; broken and whole case inventory; purchase quantity; usage for the current week and the four week average; dollar variation between current and average; and the number of days' supply of the item on hand.

Category totals are also provided and a final summary section showing the manager's total sales for the week, total inventory value, total food cost and average usage.

This report gives managers all the information they need to gear inventories to usage patterns, react to overstock or short supply situations, and pinpoint the problem areas where excessive variations in

Recycling Rewarded

BOULDER, Colo. — A U.S. Department of Commerce Boulder Laboratories employee was rewarded recently for her suggestion to recycle computer printout paper.

Sandra Danielson's suggestion resulted in the collection of 40 tons of printout, 80% of which was recycled.
"If we get a low-cost duplicator, there won't be any film users left," is the way one observer explained the situation. There are also potential problems with the films used with COM. Most current systems use diazo-type films which require ammonia salts for processing. The ammonia has to be vented somewhere near the COM facility and often there are unpleasant results.

One COM expert said he would not be surprised to see the U.S. Government clamp down on the ammonia fumes entering the air. If this happens, the use of vesicular films which are processed with heat may be the answer. Up to now, the vesicular films have been more expensive than the more popular diazo kind.

Archival Qualities

While many COM users are only interested in immediate usage of their film, some also look at the archival qualities. This refers to the ability of the filmed output to retain its legibility after years of storage. There are no fixed standards on archival properties, but some vendors claim their film will still be readable after "hundreds of years."

While service calls on COM systems are becoming more infrequent as system reliability increases, this is still a sensitive area for most users, especially those with on-line COMs.

"These users don't have paper anymore for their major output requirements. They have to meet their schedules and when business records have to get out, they need service," Martin said.

Many users with on-line systems look on the COM as a CPU peripheral and expect it to be cared for with the same dispatch. One problem in this area is that the vendor is film-oriented, rather than CPU oriented. For the users this can often be translated into 24-hour delays on a service call.

NCR recently agreed to have its field force maintain Quantor equipment. If other vendors recognize that the COM user needs computer-type attention and maintenance, users' hesitancy about support may be greatly decreased.

In conjunction with the computer image attached to COM, one firm actually compares its devices with other peripherals. "Except for audio response, the CPU tells the user it is only what the terminal output," according to Dave Davison, president of Zytion Inc., which operates COM service in Boulder, Colo.

A major factor in enhancing the original benefits of COM which offers higher speed output and low storage and distribution costs is the recent development of microfilm-based "terminals" which allow "real-enough time" access to very large data bases at a fraction of on-line costs, Davison said.

As an example, a microfilm terminal using microfiche produced directly from a COM recorder can provide the equivalent in data storage capacity of 45-2316-type disk files. This unit which leases for $350/mo, provides five-second retrieval to any item in the data base and can be operated under computer control, he said.

"Automatic retrieval devices like this coupled with on-line COMs can enhance the use of on-line systems by reducing data storage and transmission costs through the use of COM 'optical read only memory,'" according to one COM consultant.

Bulgarians Testing Computerized Farms

NOVI KRICHIM, Bulgaria — Use of computers in agriculture is being tested here on the 31,000-acre Lenin Agricultural Industrial Complex, as part of an effort to concentrate production of goods and reduce the manpower needed on the farms.

About 170 complexes, averaging 54,000 acres each, have been started during the last few years, and plans call for agriculture to become specialized, with, for example, 16 of the complexes concentrating on broiler production, while 43 others specialize in raising pigs.

Several of the complexes are reportedly being supplied with small computers to aid in operations management. Field radios and closed-circuit TVs have been installed in 24 of the complexes to facilitate assignments of men and machines.

CAI Assists Teachers in Identifying Disabilities

HOUSTON, Texas — Since last November, 400 Houston School District teachers and administrators have been taking advantage of a three-month computer-assisted instruction course designed to assist them in identifying learning disabilities in children.

A 40-foot van from Pennsylvania State University houses $650,000 worth of tutoring equipment, including 15 individual teaching stations. Each station is a computer terminal which projects written and illustrated information about child behavior upon two viewing screens.

The teacher-student interacts with the computer, using a keyboard and a pen-like pointer. A listening device completes each station.

Dr. J. Don Boney, chief instructional officer, attributes two values to the course: "It will sensitize teachers to the characteristics of children with learning and language disabilities, so it will let administrators see the educational possibilities in computer technology.
Japan Relaxes Imports

TOKYO - The Ministry of International Trade and Industry has published a revised schedule of export control categories, with 10 lesser categories dropped from the original list.

Included in the revision are 51 types of equipment and a total of 505 models, compared with 332 models within 39 categories on the original list.

The list, which is designed as a guide for customs officials, is not comprehensive, but any firm wishing to export equipment into Japan will have to prove to the officials that its equipment falls within the guidelines, according to the Ministry of Commerce, which released the guidelines.

IBM Rebuffed on Stock

SYDNEY, Australia - IBM has been rebuffed in an attempt to list its shares on the Australian stock exchanges. Current Reserve Bank restrictions will not allow the firm to list its stock here, according to Derek J. Docherty, controller for IBM Australia.

However, if the restrictions were altered, Docherty said, IBM would "welcome the opportunity" to have its stock listed on the exchange.

Supershorts

Data General Corp. has delivered its first 4,000th System/360 computer to a customer in California, marking the beginning of a program financed by DPF of Marshall's Data Systems Division.

Robert D. Klages, legal counsel to the marketing and operations department of Uni-vac, has been named chairman of the Computer and Business Equipment Manufacturers Association Trade Committee.

Shipments of intelligent communications terminals from Sycon exceed a rate of 100 units per week, and are estimated to reach this level by the end of the year, the firm said.

Informatics Inc. Mark IV File Management System has been granted a patent by the U.S. Patent Office. It is believed to be one of the first British patents issued for a document-oriented software system developed by a U.S. firm.

Interdata has signed a three-year OEM Purchase Agreement with Servo Corp. of America. Servo will order, under terms of agreement, involve 13 New Series Model 30 communications processors.

IBM Faces Busy Court Calendar, Telex Trial Set for April 10

TULSA, Okla. - Telex has won the race to become first firm presently using IBM to have its cases heard in court. The Telex vs. IBM case will go to trial April 16 here under the direction of Judge A. Sherman Christensen, U.S. district judge from Salt Lake City, Utah.

The other pending private case against the industry leader, the suit filed by Control Data Corp. over four years ago, will go to court Nov. 5 under Judge Philip Neville in Minneapolis.

Meanwhile, no date has been set for the biggest suit of them all, the government's case against IBM. But the government has filed an appeal to an appeals court ruling that would keep 1,200 IBM documents out of the case.

The Telex suit against IBM sticks specifically to the issue of the independent peripherals producers, unlike the Control Data suit, which covers IBM's actions across the board in the computer industry.

The suit claims that IBM monopolizes the interstate and foreign computer market, including the peripherals segment of that market, and that IBM priced certain 360 and 370 equipment in order to eliminate Telex from competition in the peripherals market.

The suit asks the court to enjoin IBM from engaging in those practices that would eliminate Telex as a competitor in the peripherals market.

The alleged practices include the extended-lease plans on some 360 and 370 peripherals and the IBM practice on the 370 of integrating peripheral controllers into the mainframe of the computer system.

In addition, Telex wants the court to restructure IBM in order to permit increased competition in the computer business.

In the other recent antitrust action, the Justice Department appealed a ruling of a court of appeals that barred the Justice Department from using documents that IBM claimed were privileged and that set up a special judge to review the contested documents in the case to see if they really were privileged.

Justice said it wanted to present "facts and figures" which were looked at by the appeals court in its initial ruling.

In addition to the 1,200 documents that IBM has already identified as privileged, the Justice Department said IBM now might try to claim that an additional 90,000 documents were privileged, which could bog down the case for a long time.

Nearly Half of Booths

For NCC Booked:Apis

NEW YORK - Almost 50% of the booths available for the 1973 National Computer Conference and Exposition scheduled for June 4-8 at the Coliseum here have been booked, the American Federation of Information Processing Societies (Apis) has announced.

During the recent Fall Joint approximately 70 organizations reserved more than 320 booths, the NCC sponsor announced, accounting for 46% of the planned capacity of the show.

The 70 firms and 320 booths reserved represent approximately 80% of the 408 booths taken for the Fall Joint, the organization said, indicating sales were off to "an extraordinarily fast start." The organization predicted the turnout for the New York show would top 30,000.

Computer Industry

To Promote Competition

NBS Seeks Release of Interface 'Specs'

By E. Drake Lundell Jr.

The government is trying to prod the computer industry into releasing interface specifications.

The National Bureau of Standards estimates that such specifications would result in earlier and more healthy competition for computer equipment.

"The key to achievement of inter-competition for computer components is the availability of manufacturers' specifications describing the interface between his equipment units within a computer system," the report noted.

"The disclosure of these specifications in itself, with no accompanying interface standards, is sufficient to permit competition among component (e.g. peripheral) manufacturers.

"Furthermore," the study added, "any disclosure of realistic interface standards is absolutely dependent upon the availability of manufacturers' interface specifications."

A Bit Reluctant

The study said there was a reluctance on the part of the mainframe makers to disclose such standards "because of the obvious resultant increase in competition to their own products."

The result has been that "each CPU manufacturer has developed concurrently his interface designs and definitions and has in some cases kept their specifications secret for his own competitive advantage."

This in turn results in "a proliferation" of different interface specifications that limit the marketability of computer peripheral equipment, the study charged.

But even though manufacturers have not done so in the past, the study said, "the disclosure of specifications is feasible for equipment manufacturers. Further, disclosure is essential at time of first delivery, and is feasible at first offering of equipment using the interface, if proper marketplace behavior is being followed."

Such disclosure upon product announcement "does not preclude later changes to an interface definition by the disclosing manufacturer," the report stated, adding that "such disclosure in no way places responsibility on the releasing manufacturer for subsequent rigid adherence to the specification in question."

"Peripheral manufacturers have shown the capability of sufficiently rapid response to minor evolutionary changes in specifications to maintain their competitive advantage."

"Changes in interface specifications would simply necessitate accompanying changes in released interface specification documentation," the study said.

This early release of specifications would result in earlier and more healthy competition in the peripheral market. Further, the report said, "it would benefit the CPU competitors of the dominant company that customers would have a wider selection of peripherals and Thus their CPUs or computer systems would be more attractive."

At the same time, the report noted, "the growth of IBM to a dominant position in the CPU marketplace has made its interface specifications of particular value to the peripheral industry because of the large number of potential customers for peripherals that can be interconnected to IBM CPUs."

"Because of IBM's dominance in the marketplace," the NBS said the IBM interface specifications have become the present de facto standards in the marketplace.

"This has resulted in additional choices of peripherals for the federal customer using IBM CPUs and has provided for more competition in the peripheral market."

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IRVINE, Calif. — Microdata Corp.'s 1600/60 Communications Processor combines dual CPU hardware with communications handling firmware. When combined with Microdata's full line of communications interfaces and software packages, the processor allows complete programmable communications systems to be assembled, the firm said.

Each of the 1600/60's independent CPUs contains a computer, is dedicated to system program control memory. systems to be assembled, the programmable communications combines with Microdata's full firm said.

faces and software packages, the line of communications inter-

tions Processor combines dual CPUs hardware with communica-

processor allows complete pro-

Corp.'s 1600/60 Communications

One CPU, a general-purpose computer, is dedicated to system control, control of peripheral devices and message processing. The second CPU, the Communications Operating Module (COM-60), services up to 256 synchronous and/or asynchronous communications channels

New OEM Products

sending full or half-duplex with throughput up to 40,000 char/sec. Price for a typical system with 64 asynchronous modern interfaces (103 or 202), 32K bytes of

core memory and cabinets, is $29,000 from 17481 Red Hill Ave., 92705.

Drum Plotter Makes Scene

ARVADA, Colo. — The 8000 series of high speed drum plots-
ters, which can create graphic images in ball point pen, liquid ink or wash emulsions has been announced by Auto-Trol Corp.

Available in 14 in., 30 in. and 36 in. versions with plotter step sizes of .005 in., .010 in., .1mm and .2mm, the systems are available in ca- or of-line configura-
tions with interfaces and mag or paper tape units. Prices range

from $6,000 to $13,000.

Other New Products

The PR2000, a self-contained system for high-speed measure-

ment and display of machine tool positioning, is available from Sperre Vickers Umac Division, Burlington, Vt.

The RL-2CW discrete, solid-state LED lamp with a metal

collar and 3 in. leads from Litro-
nix, Cupertino, Calif., mounts in a 3/16 in. hole and is inserted from the front. The price is $1.70 in quantities of 100 through 999.

Cambridge Thermionic Corp. (Cambion) offers a family of random access memory cards that directly interface with standard Cambion DTL (780) and TTL (783) logic cards. Memory capacity ranges from 256 to 65,536 words by 8 bit to 4K words by 1 bit.

The PC-mounting Series 780 Synchro Data Modules from North Atlantic Industries, Inc., Plainview, N. Y., provide a typical per-channel conversion cost of $650 at the 14-bit level of resolution.

A new series of data scanners capable of sampling outputs from as many as 1,000 sensors has been developed by Consolidated Controls Corp., Bethel, Conn.

A printed circuit card enclosure is available with card spacing, connector mounting centers, overall rack size and other key dimensions to specific user requirements from Vero Electronics, Hauppauge, N. Y.

A new series of sub-modular DC power supplies from Power-
tec, Inc., Chatsworth, Calif., provides a "building block" concept which combines the benefits of multiple-output design and single output modularity, the firm said. Prices run from $15 to $40 in lots of 100.

A breadboard for using dual-in-line components for inter-
facing I/O devices with Digital Equipment Corp. computers is available from Douglas Electronics, Inc., San Leandro, Calif.

A family of four LED numeric displays from Litronix, Cupertino, Calif., utilizes a "bubble top" integrated lens construc-
tion similar to that developed for smaller handheld calculator displays. This allows minimum use of Gallium Arsenide Phos-
phide material, which is then magnified to the specified digit height.

Microdata 1600/60

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Industry Said to Agree on Problems; Seeks Methods to Restrict IBM's Power

SAN FRANCISCO — The computer industry is capable of preventing the antitrust suit against IBM, but it's up to the executives to work out the details, the executives agreed with one another about what the industry should ask for," McGurk said.

"The big problem is how to restrict IBM's power. And they take this industry outlook," he added.

McGurk has been touring the country speaking with executives of various computer industry firms to try to hammer out a proposal to submit to the Justice Department, giving the unified industry outlook on what relief can be expected from the antitrust action against IBM.

"I'm amazed at how almost uniform the outlook is about what is desirable. You might not think they will agree. But our experience is that they do," he told the analysts.

Regarding either the breakup of IBM or some form of government regulation over the firm, he said: "We have to ensure...that it be done sensibly, with input from the entire industry. That's because any solution will affect not only the parties to the suit but everyone."

McGurk pointed out that IBM's market dominance had the effect of driving up capital for other firms in the business and that this has a greater adverse effect on the industry than does IBM's ability to increase its customers base.

The breakup of IBM as proposed by the Justice Department might not have an adverse effect on IBM stockholders, he said, noting that a similar breakup increased the market value of Standard Oil in 1972.

At present, the CIA is attempting to set up a unified industry position on an early relief proposal to be submitted to Justice. This would cover what the industry would like to see the Justice Department ask for in a preliminary injunction.

The injunction would be in effect while the full antitrust case is being tried.

Foreign Orders & Installations

The Netherlands Social Fund for the Building Industry has ordered a Univac 1106 with 86 terminals for the administration of benefits for workers in the Dutch building industry.

Digital Equipment Corp. has delivered a dual-processor Decsystem-1055 to Plessey Telecommunications in Liverpool, England, for software development, testing and exchange interface integration prior to installation at the telephone exchange in London. When operational in late 1974 the system will handle international accounting and traffic analysis for up to 144,000 call/hr.

The South African Coal, Oil and Gas Corp. has ordered a Univac 1106 for use in linear programming, production statistics, inventory, accounting, costing and scheduled maintenance.

Two West German health organizations have ordered 65 Datapoint 2200 intelligent terminals from Datapoint Corp. through its distributor, Gier Electronics GmbH. The firm will use the systems to collect claims information for citizens eligible for benefits under the national health insurance program.

Charles Early & Marriott (Witney) Ltd., a blanket manufacturer founded in 1669, has ordered a Univac 9100 for payroll, invoicing and order control applications.

The Nationwide Building Society, a large British mortgage loan institution, has ordered a Univac 1110 system to provide for a terminal network as well as on-line inquiry of members' accounts.

Kay and Co. and British Mail Order Corp. plan to install up to 1,000 Plessey Co., Ltd. CRT data terminals in on-line systems to expedite processing of customer orders. Bunker Ramo provides the terminals to Plessey under an OEM agreement.

General Motors, Osaka, Brazil, stock exchange has installed additional T-Scan Ltd. terminals to handle market-sense cards.

The Union Bank of Switzerland, Zurich, has ordered 45 Datapoint 2200 intelligent terminals from Datapoint Corp.'s Swiss distributor, TRW International SA/TRW Communications. The terminals will be used to establish a central information file.

Recognition Equipment Corp. has shipped the Postal Address Reader-Indexer System (Paris) for installation in France.

Removal of Trade Barriers Sought

WASHINGTON, D.C. — Both domestic and foreign impediments to sales of U.S.-made computers overseas should be eliminated, according to a special advisory committee established by the Department of Commerce.

"This industry neither seeks, nor needs, active federal government assistance by means of subsides, protective trade barriers, or the like," the ad hoc group said in a recent report.

"We do require the lessening, and eventual removal, of unrealistic and unnecessary domestic and foreign restrictions on the industry's export capabilities," the group added.

The report was published by the National Export Expansion Council's Industry Advisory Committee on Office Machines and Computers.

The report noted that during the decade of the 1960s U.S. exports of office machines and computers increased eightfold from $208 million to $1.6 billion.

But, the report noted, the annual rate of increase in exports of computers and related equipment as well as office machines fell from 43.7% in 1970 to 2% in 1971, a sign of possible trouble ahead.

The major U.S. barriers against trade currently consist of restrictions on the type of computer systems that can be sold to Eastern European and other Communist-bloc countries.

The committee was established by the council to provide industry advice to Secretary of Commerce Peter G. Peterson on how best to increase exports.

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Seeks Methods to Restrict IBM's Power
Comparative Cost Analysis Assures Efficient System

By Joseph L. Kish Jr.  
Special to Computerworld

Approximately 10 years ago, following the development of low-cost reader-printers, conventional rotary camera-microfilm was touted as the panacea for all record-keeping problems. Merely reduce the hard-copy records and forms to 16mm microfilm and—voilà!—the files become more manageable, require less space and become virtually tamper-proof.

Many companies fell for this sales pitch and found—to their frustration and sorrow—that microfilm was far from a panacea. Indeed, while it is true that, in the correct application, microfilm can dramatically slash record-keeping and retrieval costs, it is equally true that its indiscriminate use will impede retrieval and make costs soar.

New Pitch

Today these same companies are being wooed with a new line—convert your bulky computer printouts to an easy-to-work-with, space-saving microfilm format via a process known as computer output microfilm, and save money and increase operating efficiency in the process.

And again, as I have observed among a wide range of organizations, indiscriminate use is often made of this new process. What is needed is a hard look at COM—its costs, limitations and advantages.

Many organizations fall in their eagerness to simplify the problems inherent in retaining bulky computer printout.

COM as Alternative

Put in its proper perspective, COM is merely another way of preparing and distributing computer printout. It provides an alternative to two older methods—hard copy continuous forms and camera-produced microfilm.

The EDI manager contemplating the use of COM should conduct a comparative cost analysis between these various alternative methods to assure that COM will actually be the less expensive, most efficient alternative.

The following format facilitates this cost comparison.

<table>
<thead>
<tr>
<th>Cost Factor</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Forms (number of forms)</td>
<td>$XXXXX</td>
</tr>
<tr>
<td>1. Average run x cost per thousand forms</td>
<td>$XXXXX</td>
</tr>
</tbody>
</table>

2. Printing (average production time for report under study x hourly computer printer operating costs)...

3. Forms handling (bursting, etc.) costs (forms handling time required x hourly forms handling operating costs)...

4. Binding, boxing, etc. (number of binders, boxes, etc. x cost per binder, box, etc.)...

5. Office storage (cubic feet of space required x current space costs x retention period for the record under study)...

6. Transportation to storage (cubic feet of records x cost of transporting to storage)...

7. Inactive storage (cubic feet of records involved x annual cost of inactive storage x retention period for the record under study)...

8. Destruction (cubic feet of records involved x cost of destruction per cubic foot)...

9. Other costs...

B. Comparative or Continuous Forms Microfilming

Cost Factor                                          Cost


2. Cost of the microfilm (number of pages to be filmed + pages per 100 ft of film)...

3. Labor involved (number of pages to be filmed x rated hourly output for the camera involved x hourly labor rate, including fringe benefits)...

4. Costs of chemicals used in processing...

5. Cost of producing and destroying the hard copy used for filming (the same costs involved in Section A, but to be incurred with respect to forms, printing, forms handling, destruction, etc.)...

6. Other costs...

a. Mailing:...

b. Hard copy prints from microfilm:...

c. Cost of duplicate microfilm:...

d. Film processing:...

e. Etc.

Total Costs...

C. COM Generated Microfilm Costs

1. Via a COM Service Bureau Cost Factor Cost


b. Equipment...

2. COM-film preparation...

3. Other costs...

Note: This will be a flat figure that will be a cost allocated by the service bureau.

3. Film Processing (total number of microfilm rolls to be processed + rated hourly speed of film processor involved x labor cost per hour, including fringe benefits).

Note: If a commercial processing laboratory is used obtain the figure by multiplying the number of rolls involved by the processing cost per roll...

4. Disk/tape conversion (hours required for this conversion x average hourly conversion costs)...

5. Other Costs...

a. Mailing:...

b. Preparation of duplicate microfilm:...

c. Preparation of hard copy prints:...

d. Etc.

Total Costs...

Once the relative costs of preparing and distributing the computer-generated data by the aforementioned alternatives have been determined, the EDI manager can then proceed with his systems analysis to assure that each alternative will facilitate, rather than impede retrieval.

Joseph L. Kish Jr. is chairman of Iron Mountain Information Management, Inc. of New York City. He is author of "Microfilm in Business," published by Ronald Press, and teaches courses in microfilm systems at New York University.

Credit Card Firms Nominee VP  
To Assure Quality of Data

REDONDO BEACH, Calif.—TRW Credit Data has appointed a full vice-president to direct its consumer relations and quality assurance, and increased the department’s staff.

"This function of quality assurance includes continuous inspection of our computer system to find new ways of increasing our efficiency in processing credit data, "Edward S. Brennan, vice-president and general manager of TRW Credit Data, said.

Larry L. Jensen was named to the new position."We are taking specific steps to ensure that the information we receive is accurate, and we have introduced new procedures for investigating and verifying information when it is disputed by the consumer," Brennan added.
Survey Finds Buying Influence At DPMA Rises

PARK RIDGE, Ill. — The level of buying influences of attendees at the 1972 Data Processing Management Association (DPMA) exposition was up about 7% over the year-earlier show, according to an audience survey.

The survey, prepared by Exhibit Surveys and released by the DPMA, also showed that buying plans of the visitors were up 10% over the buying plans shown in the 1971 exhibition and crossed all areas, including computer systems, data processing accessories, peripheral equipment and computer-related services.

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<th>360 Peripherals</th>
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</thead>
<tbody>
<tr>
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<tr>
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<td>WRITE: Manager of resale equipment</td>
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</tbody>
</table>

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 Stocks Generally Consistent, But a Few Stand Out

NEWTON, Mass. — While the stock trading index for the year shows a general consistency in the values of the stocks in each of the sectors, a closer examination reveals there were some killings to be made in the market, and also some gains to be had.

The mainframe sector began the year on the CW stock index at about 87 and finished at 111, having hit 120 during the spring and summer. Prices of mainframe stocks generally started out near the high point of their range for 1971, although NCR and General Automation began 1972 nearer the low point of 1971.

Burroughs was one of the mainframe stock darlings of the year, going from about 154 at the beginning of January, climbing steadily to 163 at the end of March, hitting 182 in June and 223 at the end of September. It finished the year at 213.75.

IBM began at 341, hit a whopping 426 during the year and closed at 399, also a tidy gain. Honeywell, while it had a fling up at 148.5 at the end of June and reached 170 during the year, finished at 134.25, only 3 points above where it began.

In the mini sector, General Automation soared from 13.5 in January to close at 47, while DEC began at 76.25 and ended the year at 91.25. Data General was another mover, going from 39 to 111.25 and reached 115 during the year.

The software index showed a spread of almost 30 points. It peaked in early March, and then began a gradual slide. Several companies began at the lower end of the range established the previous year, and tumbled even further throughout the year. A notable exception was National CSS, which began at 8.75 and climbed to 27+.


On the brighter side, Automatic Data Processing began at the high end of the 1971 scale and kept climbing, from 73.25 to 90+.

On-Line Systems started the year at 10.25 and finished at 24+.

The field had a number of firms with substantial declines, notably Ampex, from 14.75 to 6; Calcomp, 19.5 to 10.75; and Mohawk Data Sciences, 22.25 and ending at 11+.

The leasing sector lost some ground in 1972, beginning its composite index about 42 and ending just under 40.

Boothe Computer went from just over 14 to 2+; DFJ from 9.75 to 5.5; DCL Inc. from 8 to 2.5.

A couple of firms with strong diversified bases, such as Dearborn-Storm and U.S. Leasing, managed to ride out the year with less fluctuation. Dearborn-Storm began and ended at 20 while U.S. Leasing ranged from 36.75 to 31.

The supplies and accessory sector showed a span of about 15 points during the year, but finished the year at about 82, six points higher than it began.

The CW composite index of all sectors reflected the relatively flat year on the stock market, beginning at about 53 and ending about 59, with a range throughout the year of 20 points.

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1348 K Street, NW

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Washington, D.C. 20005

Telephone: (202) 296-4662
### Computer Stocks Trading Index

#### Computer Systems - Software & EBP

<table>
<thead>
<tr>
<th>Company</th>
<th>Revenue 1972</th>
<th>Earnings 1972</th>
</tr>
</thead>
<tbody>
<tr>
<td>REYNOLDS &amp; REYNOLDS</td>
<td>$37,700</td>
<td>$3,760</td>
</tr>
<tr>
<td>QO GRAPHIC CONTROLS</td>
<td>$12,000</td>
<td>$1,200</td>
</tr>
<tr>
<td>N GRAHAM MAGNETICS</td>
<td>$13,000</td>
<td>$1,300</td>
</tr>
<tr>
<td>N NASHUA CORP</td>
<td>$10,979,000</td>
<td>$8,062,700</td>
</tr>
<tr>
<td>O STANDARD REGISTER</td>
<td>$9,200</td>
<td>$9,200</td>
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</table>

#### Earnings Reports

<table>
<thead>
<tr>
<th>Company</th>
<th>Revenue 1972 (in $)</th>
<th>Earnings 1972 (in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REYNOLDS &amp; REYNOLDS</td>
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<tr>
<td>N STANDARD REGISTER</td>
<td>$9,200</td>
<td>$9,200</td>
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</table>

### Computer Stocks Trading Summary

<table>
<thead>
<tr>
<th>Stock Symbol</th>
<th>Opening Price</th>
<th>Previous Day's Close</th>
<th>Highest Price</th>
<th>Lowest Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>$91 1/4</td>
<td>$90 3/8</td>
<td>$91 1/8</td>
<td>$90 1/2</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>$54 7/8</td>
<td>$54 3/4</td>
<td>$55 1/2</td>
<td>$53 5/8</td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>$12 1/2</td>
<td>$12 1/8</td>
<td>$12 3/8</td>
<td>$11 7/8</td>
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<tr>
<td>General Electric</td>
<td>$30 7/8</td>
<td>$30 5/8</td>
<td>$31 1/2</td>
<td>$29 3/4</td>
</tr>
<tr>
<td>Motorola</td>
<td>$16 7/8</td>
<td>$16 5/8</td>
<td>$17 1/2</td>
<td>$15 3/4</td>
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</table>

#### Closing Prices December 31, 1972

<table>
<thead>
<tr>
<th>Stock Symbol</th>
<th>Closing Price</th>
<th>Highest Price</th>
<th>Lowest Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>$91 1/4</td>
<td>$91 1/8</td>
<td>$90 1/2</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>$54 7/8</td>
<td>$55 1/2</td>
<td>$53 5/8</td>
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<tr>
<td>Texas Instruments</td>
<td>$12 1/2</td>
<td>$12 3/8</td>
<td>$11 7/8</td>
</tr>
<tr>
<td>General Electric</td>
<td>$30 7/8</td>
<td>$31 1/2</td>
<td>$29 3/4</td>
</tr>
<tr>
<td>Motorola</td>
<td>$16 7/8</td>
<td>$17 1/2</td>
<td>$15 3/4</td>
</tr>
</tbody>
</table>

#### Trading Volume December 31, 1972

<table>
<thead>
<tr>
<th>Stock Symbol</th>
<th>Volume</th>
<th>Average Daily Volume</th>
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<tbody>
<tr>
<td>IBM</td>
<td>1,000,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>700,000</td>
<td>70,000</td>
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<tr>
<td>Texas Instruments</td>
<td>500,000</td>
<td>50,000</td>
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<tr>
<td>General Electric</td>
<td>400,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Motorola</td>
<td>300,000</td>
<td>30,000</td>
</tr>
</tbody>
</table>

#### Price Changes

<table>
<thead>
<tr>
<th>Stock Symbol</th>
<th>Price Change</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>$1 1/4</td>
<td>1.3%</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>$1 7/8</td>
<td>1.5%</td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>$1 1/4</td>
<td>0.8%</td>
</tr>
<tr>
<td>General Electric</td>
<td>$3 1/8</td>
<td>1.0%</td>
</tr>
<tr>
<td>Motorola</td>
<td>$0 7/8</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

#### Market Capitalization

<table>
<thead>
<tr>
<th>Stock Symbol</th>
<th>Market Capitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>$910,000,000</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>$540,000,000</td>
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<td>General Electric</td>
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<tr>
<td>Motorola</td>
<td>$160,000,000</td>
</tr>
</tbody>
</table>

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**Note:** All statistics are approximate and subject to change. Data is as of the last trading day of December 31, 1972.
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