digital newsletter

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Electronic Paging System at Bell Canada

A new electronic telephone paging system, built around a Digital Equipment of Canada, Ltd. PDP-8/I computer, has been developed and put into service by Bell Canada of Montreal, Quebec.

The paging service allows people in London, Ontario, and Windsor, Ontario, to contact persons within a five-mile radius of the local transmitter provided they are carrying small receivers. The receivers are a little longer than a pack of cigarettes.

To reach the owner of a receiver, the caller dials the access code plus the seven digit number of the paging unit he wishes to reach. The call is directed to the switching equipment in the telephone company office, where it is processed by the computer. The data processor validates the number, notifies the caller by means of a tone signal that he has dialed a correct number which has been accepted, and converts the incoming pulses to tones for transmission.

The caller then hangs up, and the call is forwarded to a register which is "read" at two-minute intervals. All calls held in the register are forwarded to the appropriate transmitters, which transmit the signal in the form of a tone to the correct paging unit. The party who receives the tone on his unit then calls a predetermined location to receive his message.

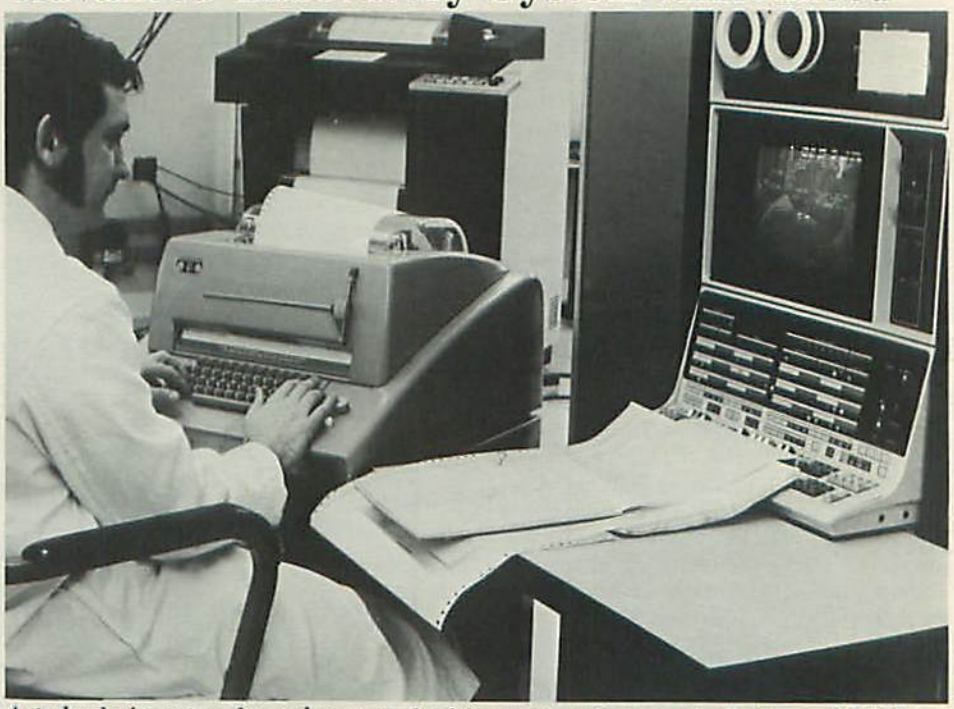
Programming for the paging system was developed for Bell Canada by Omicron Data Systems of Montreal.

The system has initially gone into service in London and Windsor, Ontario. Bell's director of engineering design, J.D. Fahey, called the system "a project of considerable significance – a Canadian development that has made us leaders in this developing area of telecommunications."

Bell Canada has patent applications on the system in 17 countries, according to Mr. Fahey, who says telecommunications experts from a number of countries have visited his installation to study it.

Bell Canada sees further developments in the future. One possibility is a one-way voice service. A voice recorder could be added to the central equipment, which would allow the caller to record a brief message that could be transmitted to the paging unit along with the tone signal.

Advanced Laboratory System Announced



A technologist enters doctors' requests for laboratory analyses on the Teletype of DEC's new CLINICAL LAB-12 advanced clinical laboratory computer system. The system monitors and processes data from laboratory instruments, which analyze blood, urine, and other body fluids.

DEC recently announced the advanced version of its PDP-12 based system for clinical laboratory automation – the CLINICAL LAB-12. The price of the computerized system is $109,000.

The new laboratory system consists of a PDP-12 computer with 8,192 words of core memory, built-in CRT display, analog-to-digital converter, a .5 million word disk, a high-speed line printer, four Teletypes, a real-time clock, and an accoustical coupler (telephone link) to the computer.

Designed to monitor and process data from laboratory instruments (which analyze blood, urine and other body fluids) and to automate data collection from these instruments, the system stores a summary file of patient test data. This data is used to produce a number of reports useful to the hospital medical staff – such as summary reports for all patients on a ward, end of day reports, and inquiry reports. In addition, the computer produces billing summaries for each patient to greatly reduce the accounting tasks resulting from normal laboratory operation.

In a typical test processing sequence, a requisition and sample are forwarded to the laboratory in the usual manner. An accession number is immediately assigned to the test sample as it arrives in the laboratory. The patient's hospital number, sample accession number and list of tests ordered on that sample are entered into the computer by Teletype.

On request, the computer generates a worksheet list of all sample accession numbers on which a particular test is to be performed. The technologist makes use of this computer-generated list to set up a test run. The computer then collects and processes the test data directly from the laboratory instrumentation – putting this information into the patient's file once its accuracy has been verified.

When the tests are completed, a summary report of all test results on each patient is typed automatically on the line printer. The material is also stored on disk. From the information stored on the disk, the computer can generate patient summary, ward, or billing reports. Easy-to-use programs aid the technologist at each step in the process.

(Continued on page 3)

CRM, INC. Introduces Optical Page Reader

A low-cost versatile optical page reader, with a throughput rate of 500-700 words per minute and advanced editing capabilities, has been announced by Melvin J. Fennell, president of CRM, Inc., of Cambridge, Mass. It is designed for typesetting applications and other operations where data is prepared for inputting to a computer and is capable of performing the work of 12-15 teletypesetter or keypunch operators per work shift.

It accepts a predetermined font of English or foreign language text, which is typed on paper 8-1/2 by 11 inches or longer. It recognizes individual characters such as upper and lower case letters, numerals, punctuation, spaces, and special symbols. This recognized text is then coverted into such forms as unjustified punched paper tape, magnetic tape, or electrical signals for transmission to other machines or displays.

The CRM reader replaces the slower, more expensive manual punching or keying of input material. "This product is designed to break the input bottleneck by increasing the speed by which material is prepared for transfer and conversion," notes the CRM president. It also scans material with an average of less than 3 errors per 10,000 characters.

A low cost optical page reader (extreme left) with a throughput rate of 500-700 words per minute and advanced editing capabilities is demonstrated with a popular typesetting configuration by Melvin J. Fennell, president of CRM, Inc., Cambridge, Mass.

The CRM reader incorporates advanced editing capabilities. "A thorough study revealed that virtually all editorial corrections consist of simple deletions, replacement of words or phrases, and insertions of blocks of text. The optical reader is designed so that deletion marks can be either typed or written on the text by hand. Corrected words or blocks of material are typed on immediately succeeding lines or separate pages," he added.

Price of the basic device is $89,000 f.o.b. Cambridge. Leases are available at approximately $2,000 per month. The above prices include installation and a 90-day warranty. Additional maintenance is obtained on a contract or per-call basis.

Options available include a 9-channel magnetic tape output, error display, high-speed paper tape reader, and a high-speed 6-level teletypesetter reader.

Other options currently under development include additional software to increase font capabilities and the incorporation of the new product with DEC's PDP-8/L based typesetting system.

Deliveries will begin this summer. Delivery schedules are 4-6 months after receipt of an order.

For information on CRM's optical page reader, contact CRM, Inc., 103 Erie St., Cambridge, Mass. 02139. Telephone (617) 491-6842.

A new 32-page softcover pamphlet entitled FOCAL®describes DEC's easy-to-learn conversational language for a variety of engineering applications.

FOCAL explains in simplified terms how the PDP-8/L and PDP-8/I small computers are programmed to solve such problems as square roots, sinusoidals expressions, and series evaluation.

For a free copy of DEC's FOCAL handbook, please check customer service box # 8.

PDP-9 Used in Patient Monitoring

Until recently, researchers in computer-based patient monitoring have concentrated their efforts on "critical" patients. But, here at **Northwestern University Medical School** in Chicago, a system is under development for monitoring all types of postoperative patients, including those recovering from routine surgical procedures.

"As a surgeon, I have seen patients recovering from surgery become critical too often," reports Dr. F. John Lewis, who heads the research team. "A routine method must be developed to monitor the vital signs of all postoperative patients and alert medical personnel when those signs suddenly change.

The system monitors heartbeat, respiration, blood pressure, and temperature, and is also used to make calculations on blood gas data fed to the computer manually by medical technicians.

The system works through a series of transducers (contacts), placed on the surface of the body. The research team is avoiding the use of invasive transducers so that the system remains simple and easy to handle.

A single transducer is used in the monitoring of a patient's heartbeat. The information gathered from the computer is shown on a display resembling a television screen. The display shows the time and the reading and flags abnormal readings. For instance, the screen may display the legend "PAC 1/50". This would indicate one premature auricular contraction occuring within a particular 50 heartbeats. According to Dr. Lewis, the system has proven reliable in detecting arrythmias (heartbeat irregularities) up to 95 per cent of the time.

The same electrodes used in monitoring heartbeats are used in measuring the rate of respiration. Time intervals between breaths are stored in the computer until 20 have been obtained. Then the average is displayed on the screen and stored with other data.

Blood pressure is monitored using a cuff which is automatically inflated. Both a pressure measuring electrode and a microphone are used to measure the blood pressure. Other means are being developed using an arterial catheter, which tends to be more accurate, according to Dr. Lewis.

Temperature is measured through the use of a thermistor inserted into the external ear canal. The signal from the thermistor's amplifier is sampled once each second and stored with the other information.

Blood gas determinations are made by a technician and the material is fed to the computer for calculations via Teletype.

In the system's current state of development only single patients are being monitored, according to Dr. Lewis, but the computer will monitor as many as five patients.

DEC Delivers PDP-11

First deliveries of DEC's newest small computer, the PDP-11, have been made ahead of the schedule set when the machine was introduced last January.

Andrew Knowles, product line manager, said an earlier-than-planned move of the computer into production has enabled delivery schedules to be modified. "Not only are we able to deliver twice as many PDP-11's initially," Knowles said, "but also we are able to offer earlier deliveries of larger systems."

The PDP-11/20 is the first of a new family of 16-bit general-purpose computers and dedicated controllers. It features a unique architecture based on a single, high-speed, asynchronous UNIBUS™; multiple general-purpose registers; a powerful instruction set with over 400 hardwired instructions; and memory expandafamily will be supported with a host of peripherals and software to be announced soon.

For more information on DEC's PDP-11, please check customer service box # 7.

500th DEC Computer in U.K.

Reading, Berks. – With the delivery of a PDP-10 to Manchester University, Digital Equipment Co. Limited now has 500 of its PDP-designated computers installed throughout the United Kingdom.

The system, a PDP-10/50 with six DECtapes, will be used for computer aided design on two interactive displays; to control 3 analog computers; and for general time-sharing and computation facilities for the University's Control Systems Center.

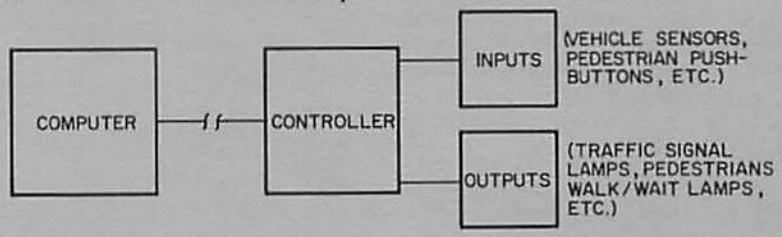
For more information on DEC's PDP-10, please check customer service box # 6.

Via specially erected scaffolding, and with a professional ease that amazes the man-in-the-street, removal men deliver Manchester University's new DEC PDP-10 computer through a second-floor window.

Little Jack's Corner

A CONTROLLER FOR COMPUTER-DIRECTED TRAFFIC LIGHT SYSTEM

SITUATION: The technology of the traffic light has not changed appreciably over the years. They are controlled, primarily, by electromechanical devices programmed on a fixed time sequence, and operable manually when necessary. In many instances, particularly in rapidly expanding areas, such a passive approach to traffic control is not responsive to the requirements. Recently, a number of urban planners have undertaken studies which have and will lead to computerized real-time traffic control.



PROBLEM: In order to take full advantage of computer technology some form of intermediary control device is necessary which can continually sense traffic conditions, report them to the computer, interpret computer commands, and control the light signals. As marked shifts in the traffic conditions occur regularly, but not usually for sustained periods, the device should also have the characteristics of a stand-alone (off-line) controller.

PROPOSED SOLUTION: A controller, composed of M and K Series logic modules and featuring a computer interface was designed for installation at individual intersection. The units can be "programmed" for a fixed signal sequence to be in effect most of the time. Traffic volume, speed and density data are assembled in a buffer by the controller from sensors such as pedestrian push buttons, and optical devices at the intersection. The data is transmitted to the computer which, in turn, calculates the optimum signal sequence. If there is a marked shift in the traffic condition, the computer will generate new operating sequences. In most cases, the computer will generate an off-line or "idle" command which allows the controller to continue its pre-programmed sequence. Manual operation of the controller is possible with the unit.

OTHER APPLICATIONS: This type of control device can be applied to a variety of tasks in which variations in volume will have an effect on a later phase of a process. Some include baggage handling, pedestrian traffic in public places, and manufacturing lines in which units are handled in lots of fixed or varying numbers.

If you would like information on how you can receive free design assistance for your control requirement, contact a Control Products Group specialist at the local DEC office, or mark inquiry box # 3.

See you next month!

Jack Courtemanche

Advanced Laboratory System *(Continued from page 1)*

Programs also provide for the automatic printout of various types of reports, the adding of information to previously generated reports, or of results from non-automated instruments, and transfer of patient data from active files to long-term magnetic tape storage.

In announcing the PDP-12 version of the advanced system, Ray Lindsay, product manager for CLINICAL LAB-12 systems said, "The system performs the technologist's most time consuming job – that of monitoring and recording test data. It provides the hospital with a highly efficient method for updating its medical staff with the laboratory data necessary for effective patient care.

The first advanced clinical laboratory system has been installed.

For more information on DEC's CLINICAL LAB-12, please check customer service box #5.

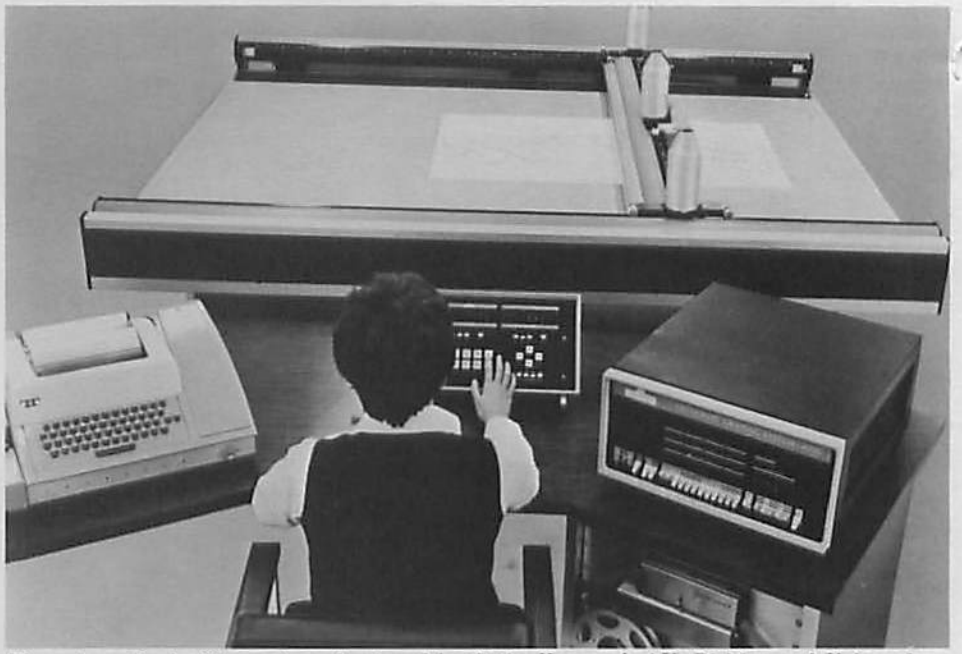
AIL's Newest Automatic Drafting System

Cutler-Hammer's AIL Division demonstrated its newest automatic drafting system at the 1970 IEEE International Convention.

This automatic drafting system represents the joint efforts of **Universal Drafting Machine Corporation**, Cleveland, Ohio, and AIL, a division of Cutler-Hammer, Deer Park, New York.

The system, called Orthomat Graphic System 4000, provides geometrical integrity of line – curved or linear. It meets all requirements for speed, accuracy, power, and broad versatility. The system was designed to deliver cost effectiveness in performing day-to-day precise engineering drawing tasks.

With this new drawing center, a technician can rapidly and accurately produce a wide range of common engineering drawings such as perspectives, orthographics, schematics, diagrams, layouts, statistical charts, and N/C tape verification.



The automatic drafting system, developed by Cutler-Hammer's AIL Division and Universal Drafting Machine Corporation, as seen at the New York Coliseum during the IEEE International Convention.

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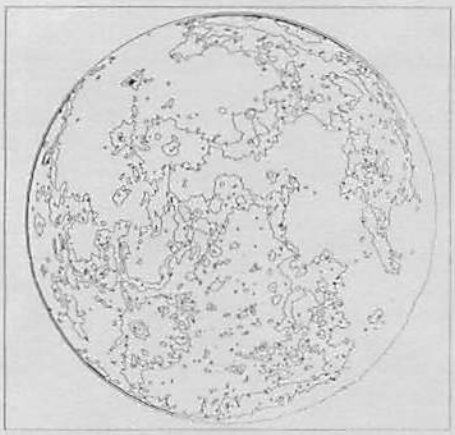
LUNAR SCAN PROGRAM 370-PM



COMPUTERIZED AUTOMATIC DRAFTING PRODUCED THIS DRAWING OF A LUNAR SCAN FOR BOEING

The Control

The stored program control of the Orthomat Graphic System 4000 utilizes DEC's **PDP-8/L** computer. Programs or drafting data are fed into the system by means of a high-speed paper tape reader with manual data entry through a teletypewriter keyboard. The computer accepts a wide range of functional programs to direct the drafting table in a broad range of applications. Computer output to the table is through an interface utilizing IC modules for utmost reliability.

The entire control is packaged in a desk console featuring a large working area and a movable control station. The control is designed to provide maximum output data manipulation with minimal operator intervention, and without sacrificing the flexibility inherent in a stand-along system.

The Table

The full vacuum 4′ x 6′ drawing area is centered on a precision table that is totally functional.

The low inertia, high response characteristics of the drive system deliver geometrically true lines at the fastest practical speeds.

Line quality is further enhanced by a new "feather-touch" pen system and a new "direct-view" optical position locator.

A rollaway cabinet fits neatly under the table and is optionally available to house paper, drawing supplies and tape reels.

The table supporting structure houses the main power distribution panel and power supply, the vacuum, and the digital stepping motor drive.

Both pedestals have full fan air cooling.

Software

The system software, designed for maximum utilization of the computer, consists of a Basic Drafting Package with supplemental features and functions available at operator's selection. These features include the ability to accept a variety of formats and a wide diversity of machine tool tapes. Additional programs provide the ability for drawing perspective and orthographic views from three axis tapes.

Basic Drafting Program includes . . . linear interpolation, 4-quadrant drawing capability, mirror image drawing, independent scaling for each axis, axis rotation via tape or teletype command in decimal degree increments of .001°, alphanumeric symbols in memory for call-up from tape input, symbol scaling independent of axis scaling, axis selection (2 of 3 axis), dash line – center line – phantom line drawing ability, EIA word address input format data blocks up to 64 characters, teletype entry of parameters, sequence number search (both directions), acceleration-deceleration and velocity with look-ahead ability, feedrate control (step, low, medium and high).

Supplemental Program includes . . . EIA circular interpolation; alphanumeric call-up from teletypewriter; perspective drafting from 3 axis tapes; orthographic drafting from 3 axis tapes; format conversions – absolute or incremental, leading or trailing zeroes omitted, 0.4 to 3.4 range; acceptance of following machine tool tapes – Bendix circular, GE circular (GECENT), Bunker Ramo 3100 circular, Cincinnati parabolic, Tab sequential.

For information on the Orthomat Graphic System 4000, contact AIL, A Division of Cutler-Hammer, Deer Park, Long Island, New York 11729.

Small Computer Added to Schizophrenic Reward System

A reward system, or, "token society" in operation at the state mental hospital in Patton, Cal., to help schizophrenics return to society, is being expanded and made more efficient with the addition of a computer, one of the first such applications of the computer. It will also have a role in studies into the treatment of alcoholics.

The system, still in the research phase, is the brainchild of Halmuth H. Schaefer, a doctor of psychology whose specialty is behavioral psychology. In it, persons suffering from schizophrenia are rewarded for "good" behavior, which might be nothing more than talking, if the patient has not uttered a word in some time, or keeping quiet if the patient jabbers constantly. The reward is a number of brass tokens, the amount depending on the person and type of behavior.

The tokens are a substitute for money and can be used to purchase a number of things, extra dessert in the dining room or cosmetics from the hospital commissary, for instance. As a patient's behavior becomes more and more socially acceptable, the reward is decreased until it is stopped entirely. Then, the patient is ready to return to society.

Schaefer, chief of research at Patton State, is careful not to claim success for his project, but says only that 600 have gone through the program since it was inaugurated six years ago, and the return rate has been less than with patients who underwent other treatment. In several instances, his former patients were considered incurable; some had been at the hospital for as long as six years before beginning treatment.

Work in this area led Schaefer to a similar approach with alcoholics. Here, his system uses punishment for "bad" behavior – drinking – rather than rewarding "good" behavior. The test subject is given a drink and a mild electrical shock when he takes the drink. Associating the shock with drinking makes drinking an unpleasant experience, one that the subject tends to avoid. Also, test subjects are shown video tapes of their actions while intoxicated in hopes that the resulting embarrassment might make drinking unappealing.

Schaefer is much less confident that his program is having any long-lasting positive effects. "Just not enough is known about alcoholism," he said. "It is hard to draw any conclusions."

The "token society" relies on 10 to 12 nurses watching approximately 100 patients and carefully noting their behavior. Before rewarding a patient, files must be checked to determine the size of the reward. Patients are viewed over 20 closed circuit television cameras that scan every location in the ward halls, day rooms, and bedrooms.

But, like many other areas in medicine, the work is getting to be too much for the available staff. Schaefer believes the program might work better if patient behavior could be checked against more criteria, patterns he has noted in his time at Patton State. Thus, the computer serves as the nurse's memory.

"It is impossible for a nurse to know all the facts about every case," Schaefer said, "five or six is the limit. But, the computer can. And, it can react faster than a human. This is of utmost importance because timing is a key to success," he continued. "The tokens are a form of reinforcement, and socially acceptable behavior in a schizophrenic must be reinforced the instant it occurs. The absence of reinforcement might have brought on the illness in the first place."

Also, Schaefer believes the computer, DEC's **PDP-8/L**, will free his nursing staff from the time-consuming reward calculation work, so they can make other contributions to the program. Their ability to do this and the encouragement to do it from Schaefer is what makes the program unique. It also could mean program expansion.

In the treatment of alcoholics, the PDP-8/L will store facts in amounts beyond the capacity of the human brain. "It seems particularly necessary to have an extensive knowledge of a patient in this area," the research chief stated. "We should know much about a patient's personal life and such other facts as the number of drinks taken, the rate at which they were taken, and the reactions of the drinker."

Even a computer will be taxed in these two tasks, so Schaefer had added large additional amounts of memory and is allowing at least six months for the development of the programs necessary to put the computer into operation. He is confident the computer will be a worthy addition to this project, serving to hasten the day when the schizophrenic can return to society and hopefully, the day when more is known about alcoholism.

For more information on DEC's PDP-8/I and PDP-8/L, please check customer service box #2.

INDAC-8 made its European trade show debut in May at the Instrumentation, Electronics and Automation exhibition held at the Olympia in London. The INDAC demonstration was highlighted by a real time "weigh-in" in which visitors' weights were calculated, displayed and averaged. In addition to this demonstration, the INDAC system was used to automatically test a motor generator set. The routine production and process monitoring functions were displayed on a keyboard CRT. More than 25,000 visitors attended the exhibition. INDAC systems are being sold and delivered for such applications as quality control for automative products manufacturing; accelerator beam tuning; process monitoring in petrochemicals; and natural gas pipeline monitoring.

Volunteer Gives Convicts a Chance

The requirements are unusual – high school diploma and at least two years left on your sentence – but the computer programming classes offered every Monday night at **New Jersey State Prison** in Rahway attract a full house and have launched several exconvicts into responsible and well-paying careers.

The program was set up five years ago by Frank Ponzio of New Providence, N.J., who spends his Monday nights teaching programming to Rahway inmates.

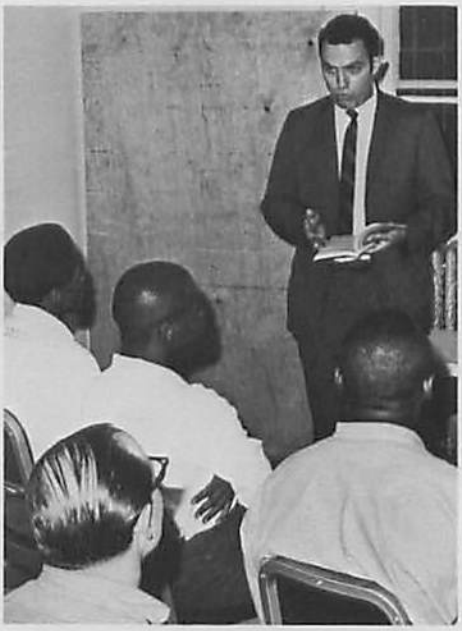
"Programming is an excellent form of rehabilitation for a convict because it forces him to make a decision; he can either learn something that will let him make an honest living or he can go back to crime," says Ralph M., who was paroled about a year ago, and now works as a programmer in a computer systems company. "Once he decides to take the program, he is totally involved; he works during the day at his assigned job and spends nights and weekends doing programming."

For James C., who has been out of prison just over three years, the program was especially awkward – he learned programming without the benefit of a computer. "Our class would get an assignment on Monday night, and we would work on it during the week," he said. "The students would flowchart the problem and write a program to solve it. Mr. Ponzio would collect the completed assignments the following Monday, edit the program, debug it, and run it on the computer he used at work. It sometimes took two weeks before we would get the program back. It could get pretty awkward."

Ralph M. was in the class when it received its own computer, DEC's **PDP-8/S**. "Getting the computer made all the difference in the world," he said. "We found out what it meant to enter a program through the switches on the control panel and do our own assembly. The class could also write and run its own programs and see the results."

"The people in the class have a lot of devotion to it," said Frank Ponzio, who started the program five years ago to "let others benefit from my education." They have to give up most of their recreation time in the evening – watching television or playing basketball – and spend it doing assignments.

The dropout rate in the course is high – over 50% of the people quit for one reason or another. "There are valid reasons for the high dropout rate," Ponzio said, "Rahway is a maximum security prison: some are transferred, others take minimum security on the prison farm, and still others are paroled. But some people stay voluntarily, and trade off getting out early or being transferred to minimum security for staying and getting more programming experience."



Inmates at Rahway State Prison, in Rahway, N.J., are taught computer programming every Monday evening by Frank Ponzio, of New Providence, N.J.

James C. turned his prison term from what could have been a wasted time into the base of a fulfilling career. "My first job out of prison was in the molding room of a factory, but soon after I got a job as a programming trainee," he said. After he gained experience, he was transferred to the company's West Coast operation to set up inventory systems. Since then he has broadened his responsibilities, and is now a senior systems analyst with 10 people working for him.

While he was in prison, Ralph M. was in a position to spend eight hours a day, five days a week with the computer. In addition, he taught the other inmates in the course, which, he believes helped him learn more. "The others in the class would ask questions, most of which started with the words 'Why?' and 'How come?'. Having to answer these on my feet in front of the rest of the class helped me understand programming much better than I ordinarily would have."

Ralph was at work as a programmer trainee only four days after he left prison, and after four months he was made a programmer. Now, nearly a year later, he is responsible for complete projects. "Programming is more rewarding than I thought it would be," he said. "I have done programming in COBOL, FOCAL®, MACRO-8, and PAL III. At first I was afraid I would be nothing but a business language programmer, but I have worked in a number of languages and on different projects."

Ponzio keeps in contact with his students who are out of prison, and keeps his students up to date on their progress on the job. "They are constantly asking how the parolees are doing," Ponzio said, "and I tell them the latest news. It has a lot of impact and gives them some incentive."

The prison administration and the inmates last year showed their gratitude for Ponzio's efforts by designating the room where the class is held as "The Frank J. Ponzio, Jr. Computer Center."

Ponzio plans to keep the course going. "Programming is one of the best ways for an exconvict to get a meaningful, challenging job," he said. "Many companies that do defense work cannot hire convicted felons, and many parolees who have no job experience find it hard to get work. But there is a shortage of programmers, so the jobs are there for people trained for them."

Accounting System for Office Products Distributors

A small computer-based accounting system for distributors of office products has been announced by DEC. It is the first system of this type to be offered by the company and the first to make use of its recently introduced business oriented language, DIBOL™.

The system, designated **AP-2**, is built around the **PDP-8/I** small computer and is designed to handle billing accounts receivable, inventory control, sales analysis, payroll and general ledger accounting, commodity catalogues, accounts payable, according to John Cohen, system marketing manager. The first AP-2 system was delivered to a Massachusetts office products dealer in January.

AP-2 may be purchased from DEC for $59,000 or leased through a third party leasing organization for about $1,500 a month. Costs include hardware, software, installation, and customer training but not the required input preparation device (for punched cards or paper tape). This must be leased from another manufacturer at about $60-75 per month per unit.

"The key advantage of the system," Cohen said, "is that it is ready to go as soon as it is installed. All the programs needed to operate the system are provided for the dealer. He won't have to hire expensive computer operating personnel."

Hardware for the AP-2 system includes the computer with 8,192 words of core memory, a Teletype, line printer, paper tape reader, and magnetic tape storage.

Software includes the AP-2 accounting package, and the DIBOL systems softwares package.

DEC Introduces Limited Version of its General Purpose Controller

A smaller, lower cost version of its general purpose programmable controller has been introduced by DEC's Control Products Group.

Designated the **PDP-14/L**, it is designed to replace the small to medium-sized electromechanical relay controls (20-80 relays) needed for such repetitive machinery as: lathes, grinders, and drill presses; conveyors, feeders, and stackers; special machinery for painting, welding, and assembly; process machinery used in the petrochemical, food, and textile industries; and a variety of packaging equipment. The controller is also applicable to non-manufacturing control functions associated with environment and security systems, pipeline and power networks, traffic signals, and elevators.

The new solid state controller is similar in design and function to DEC's larger PDP-14, introduced a year ago and now used with a variety of large, complex machines, such as transfer lines. Priced under $4,000, the PDP-14/L differs from the larger controller primarily in terms of the maximum number of machine inputs and outputs it can handle from the equipment it is controlling.

"What we have done for the PDP-14/L," explains Donald E. Chace, PDP-14 Product Manager, "is to strip away some of the capacity of the PDP-14, which the smaller machine user doesn't need right now, and shouldn't have to pay for. Furthermore, for the user of a variety of machinery, we have brought him another step closer to attaining intra- and inter-plant standards for his controls."

Chace explained that both controllers are physically and electrically compatible, and that the user programs each in the same way using simple Boolean statements. Furthermore, documentation, diagnosis, and maintenance procedures are the same, and spare parts are easily and economically maintained. "It is virtually impossible to achieve such a standard approach to meeting control needs with electromechanical devices," Chace added.

The principal differences between the PDP-14 and PDP-14/L are:

	PDP-14	PDP-14/L
Inputs (Such as push buttons, limit switches)		
minimum	32	16
maximum	256	64
Outputs (such as solenoids, motor starters)		
minimum	16	8
maximum	255	64
Memory (read-only, alterable) 12-bit word		
minimum	1,024	1,024
maximum	4,096	1,024
Number of relays displaced in control system by each unit (approx.)	70 and up	20-80

First deliveries of the PDP-14/L are scheduled for mid-summer.

Both controllers feature processing units, input/output interfacing to machinery, and a fixed, but mechanically alterable, read-only memory, which contains the user's control instructions.

For more information on DEC's PDP-14/L, please check customer service box # 1.

All prices mentioned in the Digital Newsletter are quoted in U.S. dollars and are subject to change without notice. Prices are exclusive of all federal, state, municipal or other government excise, sales, use, occupational, or like taxes now in force or enacted in the future.

PDP-9 Simulates Human Speech

A computer-based system that simulates human speech and musical composition is the goal of two separate research projects currently being undertaken by graduate students in the computer science, linguistics, music, and electrical engineering departments at the **University of Connecticut** in Storrs.

The talking computer project, under the direction of Dr. Ignatius Mattingly, seeks to simulate human speech by trying to electronically reproduce specific phonemes. Phonemes are the smallest units of speech that serve to distinguish one utterance from another in a language or dialect.

A DEC **PDP-9** medium-scale computer controls a speech synthesizer that produces electronic sounds similar to phonemes. Complete sentences are generated by specifying the phoneme sequence using a special input language developed by two computer science students.

A related project, under the direction of Dr. Taylor L. Booth of the electrical engineering department's computer science group and Dr. Jack Heller of the music department, uses the computer in music composition. Here, the same PDP-9, together with a 339 display, controls a Moog synthesizer that produces music electronically. Students, using a light pen, can compose music on the display screen, which is then "played" back immediately by the system. These compositions are part of graduate student theses.

Other projects underway include a joint effort by the psychology and electrical engineering departments in studying dynamic visual displays and optical illusions and one that involves the bioengineering laboratory in processing data obtained from the optic nerves of grasshoppers when their eyes are stimulated by visual patterns. In both; the PDP-9 is used to collect and process data, so that the necessary mathematical correlations can be made.

The electrical engineering department at the university also maintains a comprehensive undergraduate and graduate computer science curriculum using the PDP-9 and a DEC PDP-5 small computer.

PDP-15 Math Package

One of the bonuses customers receive when they purchase a PDP-15/20 is the PDP-15 Math Package, a book illustrated with FORTRAN computer routines, and a DECtape of those routines.

The book, "Data Reduction and Error Analysis for the Physical Sciences," was written by Dr. Philip R. Bevington, associate professor of physics at Case Western Reserve University in Cleveland, Ohio. Dr. Bevington's book presents simple, straightforward methods of applying statistical theory to the practical laboratory problems of handling errors in data reduction. "Dr. Bevington's book makes statistics fun," said Evelyn Dow, PDP-15 Marketing Manager for Applications Software.

The DECtape consists of the FORTRAN examples which appear in the book. These programs have been modified for use on DEC's PDP-15. Other programs delivered with the PDP-15/20 include FORTRAN IV, FOCAL®, Macro assembler (MACRO-15), Dynamic Debugging Technique (DDT-15), Text Editor, Peripheral Interchange Program (PIP-15), Linking Loader, and Chain and Execute.

Price of the PDP-15/20 is $36,000. Either the book or the DECtape can be purchased separately from DEC.

For additional information on the PDP-15 Math Package, contact a DEC sales office, or check customer service box # 4.

Computers Help Find Sockeye Salmon

A research project being conducted by the **Department of Interior's Bureau of Commercial Fisheries** in Seattle, Wash., uses small computers in oceanographic and fisheries research in the North Pacific Ocean.

A project in assessing the effects of the oceanographic environment uses two small computers aboard the bureau's research vessels: the RV *George B. Kelez*, a 185-foot-long ship that operates mainly in the gulf of Alaska, and the RV *Miller Freeman*, a 215-foot-long vessel that conducts research up and down the Pacific Coast. Bureau scientists are seeking to determine why sockeye salmon locate where they do in the ocean, and the ocean distribution of fish of Canadian, North American and Asian origin.

The shipboard computers, DEC **PDP-8** on the RV *George B. Kelez* and a **PDP-8/I** on the RV *Miller Freeman*, are the hearts of data acquisition systems that record such information as water salinity and temperature of various depths. The computer logs that data from instruments lowered into the ocean, and performs preliminary analysis to show the distribution of density and ocean currents.

Computer Special Systems
DESIGN NOTEBOOK

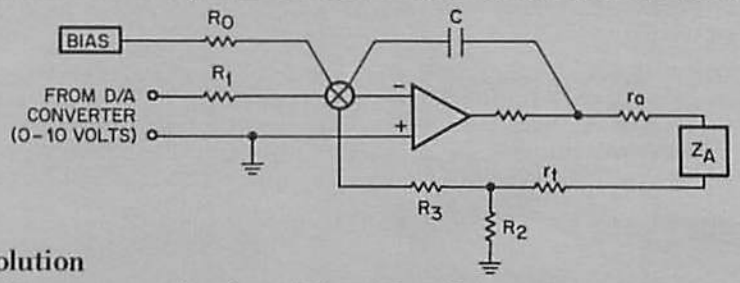
DRIVING CURRENT MODE DEVICES

B.J. Vachon
Computer Special Systems Manager

Problem

1. To connect a computer system to current-mode process actuators.
2. To provide for successful compensations for both the actuator and control lines for variations in line impedance in the process environment resulting from changes in temperature and line length.

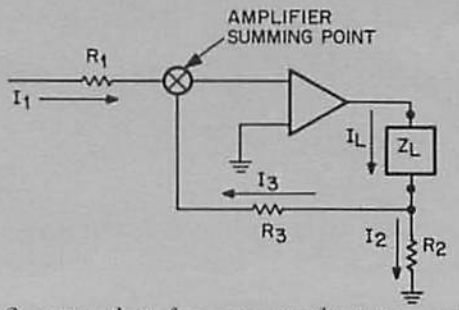
While many computer systems include digital-to-analog converters as peripheral device options, the available output signal is a voltage function, specified in millivolts (or volts) per bit. It therefore becomes necessary to convert the computer generated signal to produce a current output (milliamps per bit) that will tolerate a wide variation in load and signal transmission line impedance in order to drive current actuated devices.



Solution

A low cost operational amplifier with sufficient current drive capability can be connected in the "current pump" configuration between the digital-to-analog converter output terminals and the current operated process actuator. (See figure 1.)

In this configuration, the current-mode actuator is not grounded but allowed to float within the amplifier feedback loop. The actuator impedance Z_A and variable line impedance r_a and r_b can be considered together as Z_L representing the impedance of the actuator loop as shown in figure 2.



In figure 2, note that for any steady-state condition, $I_1 + I_3 = 0$ and $I_3 = I_L - I_2$. Therefore, the current in the load (Z_L) will be proportional to I_1. The current amplification can be selected by the ratio of I_3 to I_2 within the limits of the amplifier selected. Ambient effects on the process actuator or interconnecting lines will not affect the system since the amplifier will force $I_1 + I_3 = 0$ with wide variations in the impedance Z_L.

A typical configuration as shown in figure 1 would also include a Bias source and R_O, to produce nominal minimum output currents (i.e.: 4-20 ma.), and capacitor C, for optimum loop dynamics. A practical application of this amplifier configuration can result in a current amplification of 16 driving 4-20 ma. actuators with line lengths of a few feet up to 2 miles. Variations in design-center actuator loop impedances as large as ±50% can exist with a loop current change of less than 1/2 least significant bit referred to the D/A converter output.

Additional information about how Computer Special Systems can help you meet your system design needs may be obtained from your local DEC Sales Office.