

# Life Sciences Control Kit Introduced

**LAB-K**, a solid state logic controller kit designed for use in life science research to control time and events in experiments, has been announced by DEC.

According to William Kunkle, Marketing Manager for the LAB-K, the basic module kit will be marketed to the psychology, psychophysiology, and psychopharmacology disciplines for such applications as operant conditions for animals, human learning, and correlation of studies in behavior and neurophysiology.

Introduction of the LAB-K solves major problems with which psychological researchers previously had to cope. In the past, logic modules and relays have been used to control experiments, frequently resulting in varied test findings due to a lack of uniformity in laboratory equipment. A researcher using relays to control an experiment might produce different results from those obtained in an identical experiment by a researcher using solid state modules. Relay experiments have often proved mechanically difficult, and the presence of noise or unwanted interference in solid state experiments has made consistent results impossible.

Made from DEC's K-Series integrated circuit logic modules, LAB-K eliminates electrical and high frequency erratic noise while giving the psychological researcher more logic power for less money. Only the steady, low frequency signals normally wanted by the researcher are recognized by the modules.

Designed to function without, in parallel to, interfaced to, or as a backup for an on-line laboratory computer LAB-K can:

- Operate alone, recording results on existing electromechanical devices:
- Hardware program an experiment with delayed processing of results by computer.
- Interfaced to a computer, control an experiment on-line, allowing the computer to process and store the resulting data. It can also provide direct access to a computer for arithmetic computations.

- Act as a backup for the computer.

With the LAB-K, the researcher can manually control early experiments until the development of software, which often takes considerable time, is complete. Control of experiments can then be turned over to the computer when software development has been completed. In fact, work done with the hardware-programmable LAB-K can make development of the researcher's own software a relatively easy task.

"The LAB-K's modular configuration makes changes and expansions simple since researchers assemble the logic kit to suit their experiments," noted Kunkle, "and, because the researcher purchases only the logic functions and capability he needs, LAB-K is extremely low cost!" The basic kit, which costs \$2600, includes: a 200 pin programming plug-board mounted in a table top cabinet; input logic; a sequence controller;

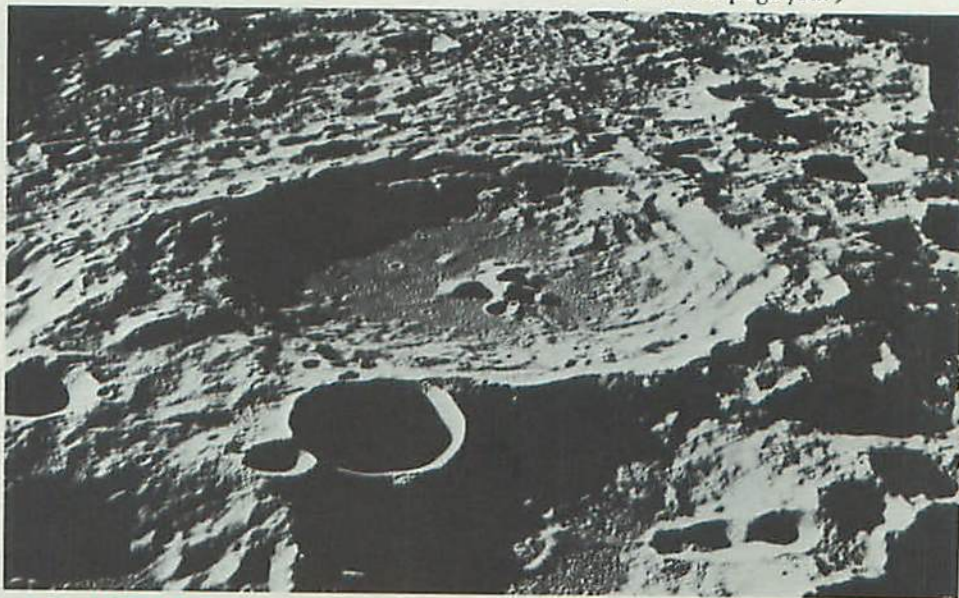
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## PDP-8/L Controls Lunar Sample Experiments

The age and history of lunar samples brought back by the Apollo astronauts will be determined in part by a computer not much larger than the containers used to bring the specimens to Earth. A suitcase-sized **PDP-8/L** computer

controls a mass spectrometer that makes two types of tests: one to find the total amount of a particular element in the lunar sample, and the other to determine how often an element occurs compared to other elements. The latter test yields

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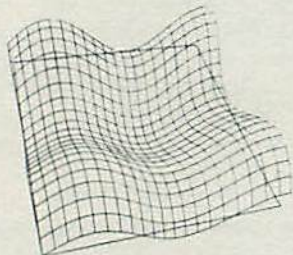


The PDP-8/L computer weighs only 83 pounds — 13 pounds more than the maximum amount of lunar material the astronauts can bring to earth.

## 3-D Plotting Program Developed

A new program for plotting three-dimensional surfaces in perspective, using a small digital computer with only 4,096 words of core memory has been developed by DEC.

The new graphics program, based on DEC's conversational language, **FOCAL**<sup>®</sup>, uses only 15 lines of code. No mass storage peripherals are necessary, yet the program allows complex three-dimensional surface plots and Euler Angle rotations to be performed by even the smallest computer in the DEC stable, the \$8,500 **PDP-8/L**, when connected to any plotting system. It also can be used with DEC's new, low-cost KV graphics option.



Using only 15 lines of instruction in a 4K 12-bit computer, the new program requires no mass storage devices be attached to the computer.

Useful in many areas of analysis, such as field gradient studies, the new plotting software will even permit stereoscopic pairs to be generated for more refined visual investigations.

The plotting program, like the **FOCAL** language and the graphics option, can be used with any of the **PDP-8** family of computers in their minimum configurations.

For more information on the 3-D Plotting Program please check customer service box #1.

## First PDP-12 Delivered

The first **PDP-12** computer was shipped today to the Communications Biophysics Group at the **Massachusetts Institute of Technology** in Cambridge, Mass.

The **PDP-12**, while a general purpose computer, is designed primarily for laboratory applications and offers a greater computational capacity than DEC's **LINC-8** system, which it superseded. It was introduced in January, 1969.

(cont. on page 3)

page two

## Computer Analyzes Flight Data

Faster, more accurate flight data analysis aimed at greater aircraft safety and accident prevention is now possible with the **Data Playback Units** manufactured by **Leigh Instruments Limited**, Ontario, Canada, to complement their **Flight Data Recording Systems**. The **Playback Units**, using **DEC PDP-8/I** and **8/L** computers, are used to reduce and analyze data recorded by the **Recorder Systems** carried aboard the aircraft.

The **PDP-8** computers are used to reformat data from the airborne tape for a "Quick-look" analog display, to produce a line printer output, and to transfer the data to computer-compatible magnetic tape, allowing the final analysis to be performed at a faster speed than was previously possible. Both military and civilian flight data are being analyzed by this type of system.

Still in the final stages of development by **Leigh Instruments Limited**, is an extension of this technique in which the computer analyzes aircraft flight data

records as part of a regular maintenance program. By such analysis, it will be possible to identify problems as they begin to develop, thus increasing safety while reducing repair costs.



Operating check-out of **Leigh Instruments Limited's Data Playback Unit DPU-5**, incorporating the **PDP-8/L** computer, used for the reduction and analysis of recorded aircraft flight data.

## 1401 Languages for PDP-8 Computers

**Automation Research Mechanisms, Inc.**, an organization providing design, development, manufacturing, and consulting services in the field of real-time digital systems, has developed a unique software package called **ARMSim**<sup>™</sup> that permits the use of **IBM 1401** languages on **DEC PDP-8** family computers.

The **ARMSim** software package simulates, without expensive emulation hardware, all of the features of an **IBM 1401** and makes available to a **PDP-8** user the wealth of public domain **1401** programs for business management, record processing, accounting, and scientific applications. All of the speed, economy, and power of a large business-oriented computer is thus available to **DEC PDP-8**, **PDP-8/S**, **PDP-8/I**, and

**PDP-8/L** users in business environments.

Because the software is device independent, **ARMSim** permits the substitution of input/output devices that most optimally match the requirements of each installation.

The software package easily handles real-time tasks during normal batch **1401** operation. This feature encourages the user to expand his system's applications to include on-line data collection or alphanumeric graphic display, and complements the complete array of **DEC** furnished software, such as **MACRO-8**, **FORTRAN**, **FOCAL**, **BASIC**, **ALGOL**, and the many utility, support, and application packages.

For more information on **ARMSim**, contact **Automation Research Mechanisms, Inc.**, P. O. Box 579, Livermore, California 94550 Tel. (415) 443-0912.

# First PDP-14 Production Deliveries Made

First production deliveries of its **PDP-14** machine controller are now being made by DEC's Control Products Group. DEC is presently quoting 60-90 day delivery of the PDP-14, a solid state replacement for electromechanical relays used for control of mass production machinery or any sequential control requirement.

Among those receiving first shipment of the PDP-14 are the **Ingersoll Milling Machine Company** and the **W. F. and John Barnes Company**, a division of Babcock and Wilcox, both of Rockford, Illinois, and **Agrippa-Ord Corporation**, Carlisle, Massachusetts.

Commenting on the deliveries, PDP-14 Engineering Manager, Donald Chace said, "We announced in March that we would be delivering production units by midsummer, and we are. We believe the PDP-14 will continue to be a very production-oriented unit because of its simple design and the fact that practically the entire controller is assembled from solid state components which are handled as standard items at DEC.

"The PDP-14 is basically a large control module built from smaller modules which DEC has been building for a number of years. In fact, we can assemble and test a complete unit in less than 36 hours."

The PDP-14 consists of three basic units: input and output boxes for machine interfacing; a central control unit;

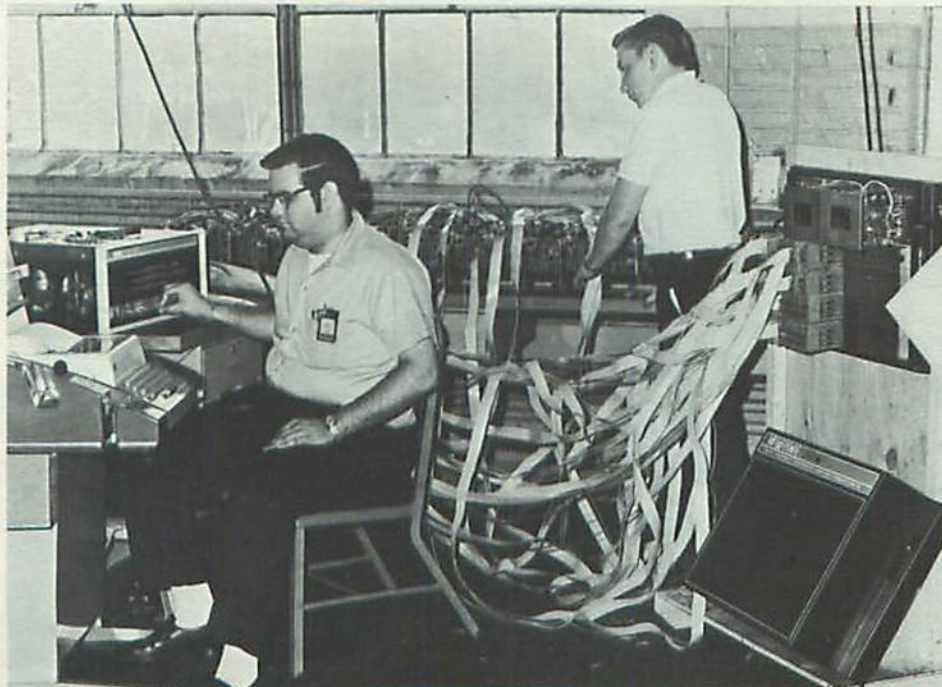
and a read-only memory — an interchangeable memory which stores user-defined control instructions. These units are assembled using DEC's standard K Series industrial control modules and M Series logic modules.

To insure maximum operating reliability, each unit is individually subjected to 100 per cent computer checkout and environmental testing. "This testing is actually redundant because the DEC modules used are all completely tested during their own production," Chace noted. "The 160 degree Fahrenheit heat test to which each unit is subjected is considerably higher than comparable tests used on other devices now being sold to this control market," he added.

The PDP-14, recently demonstrated in Chicago, Illinois at the 1969 ASTME International Engineering Conference and Tool Exposition, is designed for the control and monitoring of mass production equipment performing such functions as machining, gauging, and assembling; also materials handling systems such as pipelines, grain elevators, stacker cranes; and other processes including those found in such areas as building automation.

Price of the basic PDP-14 unit, which can handle up to 32 inputs, such as limit switches and push buttons, and 16 outputs, such as motor starters, solenoids, and indicators is \$4,900. The unit can be expanded to accommodate up to 256 inputs and 255 outputs.

For more information on the PDP-14 and its capabilities check customer service box #4.



Ed Permon (1.) and Dick Powers of DEC Control Systems use a PDP-8/L computer to run computer diagnostics on a large PDP-14 system.



The first PDP-12 to be delivered undergoes final acceptance check before shipment to the **Communications Biophysics Group** at the **Massachusetts Institute of Technology** in Cambridge, Mass.

## PDP-12 (cont. from page 2)

In its laboratory system configuration the PDP-12 includes a central processor with 4,096 words of memory, expandable to 32,768 words; two magnetic tape storage units, a seven-by-nine-inch cathode ray tube display, a 16-channel analog-to-digital converter and multiplexer, and a teletypewriter, including a paper tape punch and reader. The PDP-12 in this configuration is priced at \$27,900.

M.I.T. will use its PDP-12 in auditory research experiments, for on-line control of stimuli and analysis of responses.

Some of the uses planned for the PDP-12 by early customers include monitoring classical conditioning experiments in psychology, performing on-line stock exchange analysis, managing an assessment program for elementary school achievement, analyzing data from a nuclear magnetic resonance spectroscope and monitoring gas chromatographs.

A significant feature of the PDP-12 is its ease of operation and programming. Pushing a button on the system's console loads the machine programs by controlling the operation of the magnetic tape storage units. Programming is expedited by displaying the last 32 lines of program text being developed. To make a correction, the programmer merely points a controllable cursor at the error, and edits the text by using the keyboard.

The reliability of the PDP-12 is enhanced by the maximum use of integrated circuits.

For more information on the PDP-12 and its capabilities check customer service box #3.

## Lunar Sample *(cont. from page 1)*

the ratios that help determine the age and history of the samples. The spectrometer was built by the **National Bureau of Standards** in Gaithersburg, Md., to specifications set by the **National Aeronautics and Space Administration**.

The PDP-8/L computer weighs only 83 pounds — 13 pounds more than the maximum amount of lunar material the astronauts can bring to earth.

A mass spectrometer is a scientific instrument that determines the chemical makeup of a material by ionizing the sample and passing it through a magnetic field. The one used at the Manned Spacecraft Center is designed specifically to give precise abundance ratios from as small a sample as possible — as small as one-trillionth of a gram, (there are 28.3 grams in an ounce).

For instance, the spectrometer will look at various isotopes of strontium and rubidium and determine the ratio between

them. From ratios like this it is possible to calculate how long that particular sample has been a solid. The same is true of ratios of lead, uranium, and thorium isotopes.

Scientists will look for the occurrence of rare earths in the lunar samples — at least rare earths with more than one isotope. The rare earths can yield the history of the sample — how it has been separated from other material on the lunar surface. If there was melting from volcanic activity, the rare earths can give valuable clues about it.

The computer will do two things: it will control the instrument, and it will do the calculations needed to analyze the results of the tests.

If there was no computer, an investigator would have to sit at the spectrometer to control the tests while they were being run. The results would be plotted on graph paper, and the scientist would have to measure and record the readings

manually. The computer takes the readings automatically and records them instantly on magnetic tape. The data is statistically analyzed and the computations punched out on paper tape and a teletypewriter. The information on the paper tape will be analyzed in detail on a larger computer, while investigators can do preliminary work from the printed figures.

The computerized spectrometer also will be used to perform the same types of tests on terrestrial materials as part of NASA-sponsored research by post-doctorate students and professors.

An especially sensitive spectrometer was needed because scientists did not know how much lunar material they would receive; therefore they had to be prepared to use as small a sample as possible.

The computer controlled spectrometer will be used to analyze lunar samples early next year.

## LAB-K *(cont. from page 1)*

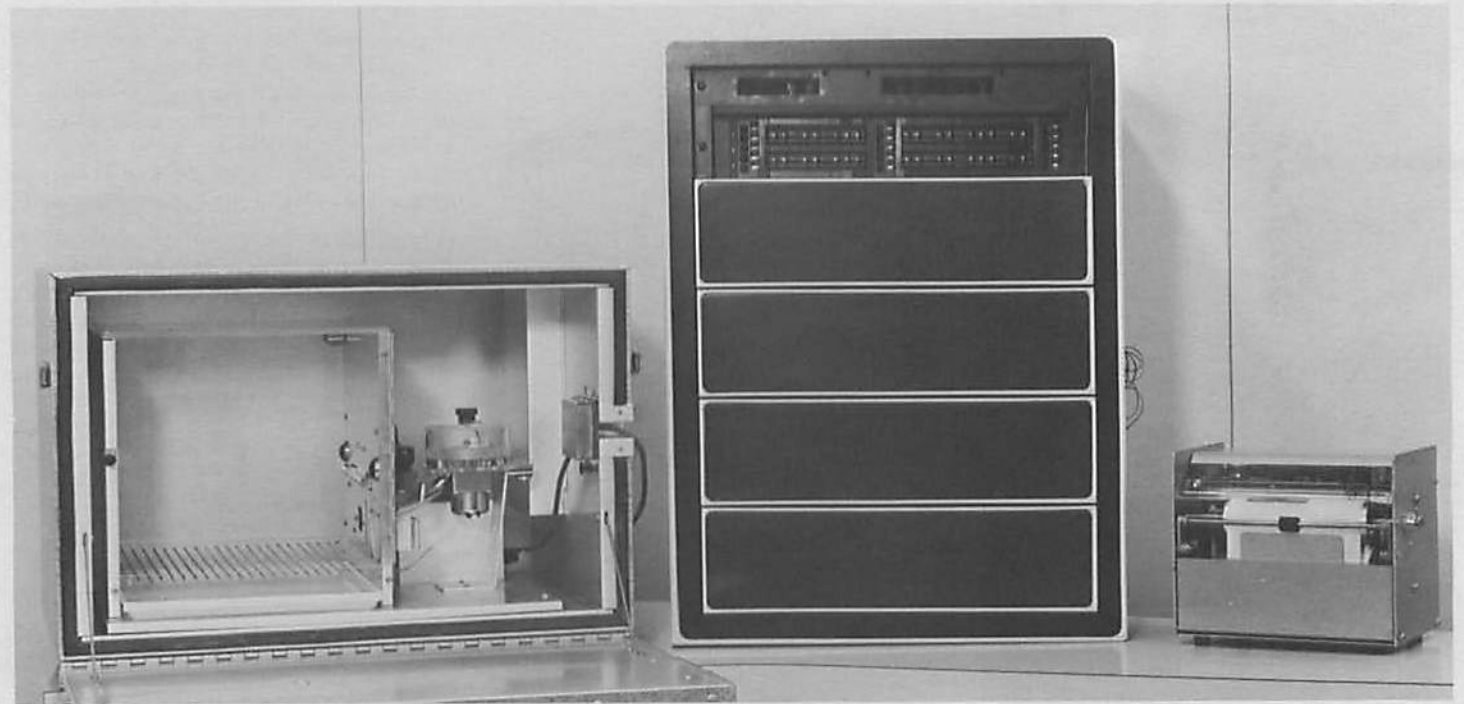
groupings of BCD counters; 6-time base generators; appropriate output logic for either A.C. or D.C. current; and a 7 amp-5 volt power supply. Many options for the kit are available up to a maximum configuration costing less than \$5,000. A group of K Series control and indicator light modules conveniently located behind a modular panel equipped with magnetic strips makes possible param-

eter adjustment during experiments. Changes can be made within the panel to allow for addition or removal of individual control modules.

Another major convenience of LAB-K is its fast and simple manual program changing through a 200 position plug-board, which allows a vast number of program variations. All changes to experiments are made through the plug-

board, giving the psychological researcher all the functional control capabilities he will ever need.

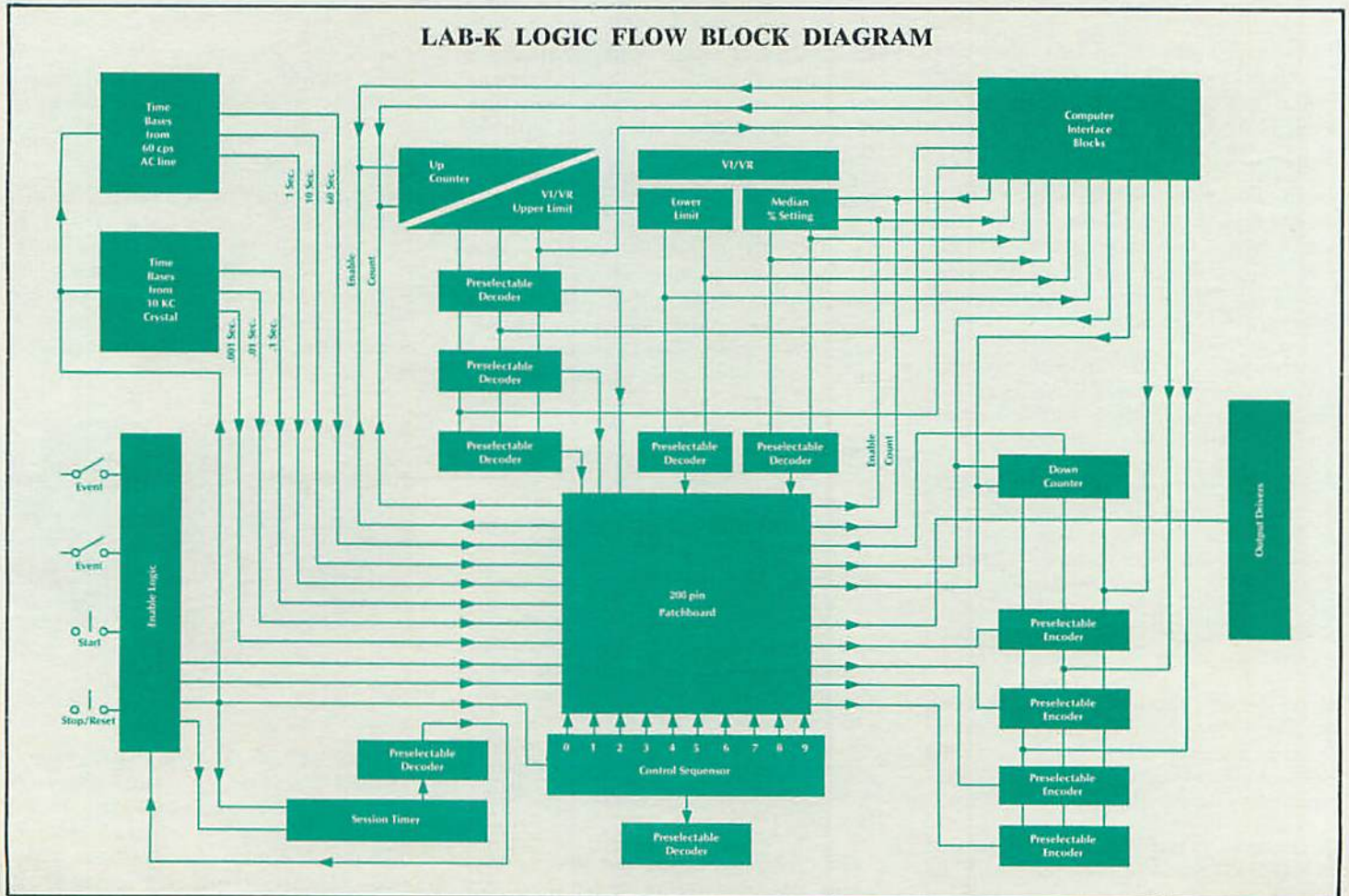
An additional feature of the LAB-K is Nixie tubes, which give the experimenter a readout in decimal rather than in the often confusing binary numbers. Decimal readouts are less prone to interpretation errors than binary ones. These are made



# LAB-K Features:

- \* K-Series solid state modules  
A hybrid module of discrete and IC circuits  
A maximum speed of 100 KHz  
Slow down feature to 5 KHz (maximum Noise Immunity)  
Signal levels: 0 volts = Logic "0" and +5 volts = Logic "1"  
Fan out: 15 ma available from all outputs; typical inputs 1-3 ma  
High noise immunity  
Manual controls
- \* Logic independent of a computer which offers convenience and low cost
- \* Programmable patchboard kit — easily changes experiments and eliminates back wiring by customer
- \* Complete logic documentation and installation instructions
- \* Automatic wirewrap service
- \* Prewired for maximum logic configuration allowing ease for expanding

LAB-K LOGIC FLOW BLOCK DIAGRAM



For more information on the LAB-K Logic Controller Kit check customer service box #2.

# DEC Reports Record FY 1969 Earnings

## Operating Results for the Fiscal Year Ending:

	June 28, 1969	June 29, 1968
Net Sales	\$87,867,700	\$57,339,400
Income Before Taxes	17,029,800	12,934,690
Provision for Income Taxes	7,701,000	6,078,000
Income After Taxes	9,328,800	6,856,690
Income Per Share*	1.03	.78

\*Based on average shares outstanding and adjusted for a 3 for 1 stock split in June 1969.

Record sales of almost \$88 million were reported by DEC President Kenneth H. Olsen for the fiscal year ended June 28, 1969. Volume of sales was 53 percent higher than for the previous year. The Company reported earnings of \$1.03 per share, against 78¢ for the same period last year, adjusted for the recent 3-for-1 stock split.

According to Olsen, the Company introduced four new computers during the year, a special purpose computer/controller, and additions to its M Series logic and K Series control module lines, as well as a variety of new low-cost peripheral equipment and software packages for existing systems.

In June, the number of DEC computers in the field passed the 5,000 mark with initial deliveries of the PDP-12 and PDP-14 being made during the fourth quarter.

In the Company's small computer lines, multi-purpose time-sharing, data communications, low-cost graphics systems, and INDAC-8, the first small computer industrial data acquisition and control system, were introduced.

In the area of medium-scale systems, deliveries of the PDP-9 passed the 400 mark while more than 100 orders for the new PDP-15 were received.

For DEC's large-scale computer system, a new keyboard display, improvements to the Monitor package, and a COBOL software package were added — improving the PDP-10's already favorable position in the time-sharing field. To date, more than 70 PDP-10's are in operation around the world.

Olsen noted that DEC had opened up 16 new field service facilities for maintaining its computers, bringing to 65 the number of sales and service facilities around the world.

A continuing manufacturing expansion program designed to keep pace with the Company's growth was announced in May. At that time, several new manufacturing facilities were announced, including: the leasing of a 60,000 square

foot building in Leominster, Mass.; construction of a 250,000 square foot plant in Westfield, Mass.; plans to occupy a 58,000 square foot module manufacturing plant now being built in San German, Puerto Rico; and expansion of the existing manufacturing facility in Carleton Place, Canada.

## CCC Adds Second PDP-10, Mass Storage

**Computer Center Corporation**, a computer time-sharing utility serving the Pacific Northwest, more than doubled its capabilities this month with the installation of a second PDP-10 computer system and a RB10 mass memory disk.

The DEC RB10 disk file storage system is adding 20 million words, field expandable to 104 million, for on-line storage of users' data and programming. The unit features dual head positioning, an average access time of 190  $\mu$ sec. and a transfer rate of 22.5 to 72  $\mu$ sec. per word depending upon the zone being accessed.

A second PDP-10 computer was installed with the disk to provide even more computing power for CCC's expanding customer base.

The firm offers both on-line time-sharing and batch processing for schools, consulting engineers and industrial firms. According to Carl Young, company president, the PDP-10 system was chosen because "of DEC's long standing experience with interactive time-sharing dating back to this system's predecessor, the PDP-6".

"The 36-bit word size, the monitor program and monitoring capacity of the PDP-10," he continued, "make this

For more information on the PDP-10 check customer service box #5.

## PDP-8/S Monitors Seaway Locks

Traffic control personnel in charge of the two St. Lawrence Seaway Locks here are employing a small, 75-pound Digital computer to discover new ways to improve lock efficiency and compile a comprehensive history of their operation.

The small computer, a PDP-8/S, logs data on lock operations and vessel performance, automatically recording the times for the lock operating equipment and microwave radar equipment that senses the presence of each ship in the area of the locks.

By using information supplied by the traffic control personnel, the PDP-8/S, which sells for less than \$10,000, can keep track of each ship passing through the locks and record its history while in the lock complex. This information is then recorded on a high capacity computer at Cornwall, Ont. for analysis and storage.

system very appropriate for performing large scientific batch operations simultaneously with on-line time-sharing."

The two PDP-10 processors are configured for dual access to the RB10 disk file. Other hardware in the CCC facility includes 128K of core memory, 13 DECTape units, 8 magnetic tape drives (7- and 9-channel), four swapping disk units, two card readers, card punch, two line printers, and a plotter. Two DEC communication control systems provide line monitoring capabilities.



Users of the Pacific Northwest-based computer time-sharing service, Computer Center Corporation, have more than doubled their capabilities with the acquisition of a second PDP-10.

# Computer Produced Braille

## Three DEC Products at WESCON

On display at the DEC booth at the 1969 WESCON Show was its newest computer, the medium scale **PDP-15**, a variety of interfacing and control circuit modules and a multi-user version of its lowest priced computer, the **PDP-8/L**.

The new **PDP-15** was shown in its PDP-15/20 configuration, one of four in which the 18-bit computer is being offered. This configuration includes 8,192 words of core memory; a rugged KSR35 Teletype; two magnetic tape storage units; a high speed paper tape reader and punch; extended arithmetic element; advanced monitor software; FORTRAN IV; DEC's conversational language, FOCAL®, MACRO assembler; linking loader; batch processor; system generator; and scientific linking, debugging and utility routines. It sells for \$36,000.

This mass storage oriented system is designed for research and engineering environments where real-time data acquisition and control tasks are combined with program development and testing.

Program development, debugging and modification all are handled under monitor control, virtually ending intermediate operations. The PDP-15 made its debut last month.

Highlighting DEC's module display were the new one-card interfacing devices that permit interfacing many standard peripherals to the company's PDP-8 line of small computers. The new **N-730** series modules greatly simplify interfacing to each peripheral. The devices range from \$110 to \$190 in price.

The multi-user **PDP-8/L** is actually a single-purpose time-sharing system. It includes four Teletype terminals and 8,192 words of core memory. The system uses FOCAL, and is designed for educational and engineering applications. It reduces time-sharing terminal costs to \$5,100 per terminal. There also are five- and seven-user versions of the systems.

Reading what you want, when you want to, is something sighted persons take for granted. For the blind, it is a constant source of frustration. Braille, the most efficient method for getting reading material to the blind, has been limited in its use by the expense of producing it.

Textbooks, reports, and technical articles often are not available in Braille; this has forced blind people to turn to other means for the reading material they need in a complex and competitive world. Alternatives to Braille include tape recordings and volunteer readers, but they are not enough.

In 1963, while a graduate student at Brandeis University, in Waltham, Mass., Kenneth Ingham joined the research staff of the **Cognitive Information Processing Group (CIPG)** at the **Massachusetts Institute of Technology**, where researchers were investigating the possibilities of reading machines. Ingham was blinded in a chemistry lab explosion in 1955. Thanks to the encouragement of CIPG's group leader, Dr. Sam Mason, Ingham began work on his PhD in speech analysis.

With Ingham doing the bulk of the programming, a system was developed in Mason's lab that translates printed material into both Braille and voice. It has four principal components: A reading machine capable of scanning a printed page, a DEC **PDP-9** medium-scale computer, a typewriter with Braille keys and a speaker.

The reading system program makes it possible for the computer to recognize the characters on a printed page placed

in the reading machine. Ingham's programs translate the characters in Braille and operate the Braille typewriter.



In addition, he developed programming that allows the computer to spell out words through a speaker. This involves the recording of letter sounds and their insertion into the computer's memory. When a printed page is placed in the reading machine, the computer translates the printed material into spelled words. "Owing to the high spelling rate and the coalescence of the individual letter sounds, the entire spelled expression may be conceived by the blind person as a single unit," Ingham says.

Ingham's colleague, D. F. F. Lee, has continued the speech work with new programming that will allow the computer to speak whole words.

Other programs under development will make it easier for blind people to operate computers themselves.

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## Low Cost Computer System For Brokers

A small in-house computer system that provides daily investment services to individuals, investment houses, and institutional investors has just been developed by **L & W Data Systems Limited** of Toronto, Canada.

Using a **PDP-8** computer, the basic S4 (Stock Sales Service System) data processing system offers the financial community a quick means of obtaining daily updated portfolio information. The system can service up to 1,000 clients, each of which might hold any combination of up to 10,000 securities, while affording closer control over margined accounts.

The computer stores security price and dividend data and customer portfolio information necessary to produce margin accounting on two DECTape magnetic tapes, both of which are updated at the end of each trading day. For those who require stock charting and analysis of account profitability, an expanded system with a plotter and an additional DECTape is available to store weekly statistical information for charting purposes.

If, during a trading day, the prices of certain securities decline and the user wishes to know the precise effect of this

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drop on certain margined accounts, he enters the current prices into the computer and calls for a printout showing the debit balance, loan value of marginal securities, excess of loan value over debit, and total market value of all securities for all margined accounts. Or, if a smaller printout is desired, the user can call out only those client accounts whose debits exceed loan value.

Users can select specific accounts for which a complete printout is needed, including: the securities held, their prices, market values, percentage that may be margined, and loan value. When requested, the PDP-8 computer will produce detailed portfolio information on current price, total value, indicated dividend and income for each security. Securities are even grouped by type (common stocks, preferred stocks, bonds, etc.)

For more information, contact  
L&W Data Systems, Ltd., 20  
Victoria Street, Toronto 1, Canada.  
Tel. (416) 362-6459.

## 1,000th PDP-8/L Delivered

The 1,000th PDP-8/L small computer manufactured by DEC was delivered recently, less than one year after its introduction. It was shipped to MTS Systems Corporation in Minneapolis, Minn.

MTS Systems Corporation manufactures materials testing devices used in tension, fatigue and creep tests, component tests, fracture mechanics tests, and torsional tests by industrial and aircraft companies.

The PDP-8/L is one of a line of small general purpose computers manufactured by DEC. Its features include a 12-bit, 4,096-word core memory expandable to 8,192 words, and a 1.6 microsecond cycle time. The computer has been used in applications in industry and the laboratory, as well as in shipboard satellite navigation systems, type-setting operations, data communications networks, and educational programs.

The PDP-8/L was designed for applications that do not require fully expanded computers. Automated assembly and checkout techniques allow DEC to build one of the 83-pound machines in three hours. They can be completely tested and readied for shipment in three days.

For more information on the  
PDP-8/L check customer service  
box #6.

Of all the word games children play, one of the best known through the years has been "hangman." Dr. Robert Miller's three children play this game, but the rules are a little different. They are assisted by the DEC computer their father brought home recently.

Dr. Miller, a statistician and research fellow in the resource management studies department of The Travelers Research Corporation in nearby Hartford, did not buy the small PDP-8/L computer just so his children could play games with it. However, to give his son and two daughters experience with computers was one of the primary reasons. "Frankly," Miller said, "I can't see a future for my children in which computers are not involved, and hopefully, with the PDP-8/L, they will have a head start."

"Now that computers are relatively small and low in price (the PDP-8/L weighs 83 pounds, is little larger than an electric typewriter and costs but \$8,500)," Miller said, "it is possible for parents to bring them into the house so that we can better prepare our children for the future." However, Miller must be one of the first parents to have done this because a check of DEC sales personnel throughout the United States failed to turn up any similar applications.

In "hangman," a limb is added to a stick figure every time one of the participants fails to guess the right word.

The computer assists in determining which is the right word. The computer also aids the Miller children in more serious efforts.

Daniel, 14, is developing a French-to-English dictionary for his twelve-year-old sister, Nancy. For eight-year-old Susan, he has devised a multiplication quiz.

Daniel has become so proficient in the operation of the computer that he helps his father develop programs. The father uses the machine for his own "pet" projects — the problems that plague housewives and various industries, including the entertainment industry.

The senior Miller currently is using the PDP-8/L to sort opinions of groups who, by past performance, have proven expert in judging the success and failure of theatrical ventures. Also, he is developing a telephone-based computer system for long range weather forecasting, studying the telephone timing sequences of department stores to make recommendations for improving customer service, attempting to determine a person's "insurability" for automobile insurance, learning when to invest in the stock market and how to improve traffic systems.

"I want the computer to be a family thing," Miller said. "Sure I use it a lot, but the major consideration in its purchase was the children. I want them to learn to use modern technology; not be afraid of it."



A "family" computer in the home gives 14 year old Daniel Miller a working insight into current technology.