digital

focal point

A PUBLICATION OF DIGITAL EQUIPMENT CORPORATION — 146 MAIN STREET — MAYNARD, MASSACHUSETTS 01754

NEW 'DEC' SYSTEM USES BASIC C.A.M.P. TEXTBOOKS

A new low-cost computer-based instructional aid, designed to be used with the popular CAMP (Computer-Assisted Mathematics Program) textbooks, is being offered by Digital Equipment Corporation.

The system allows high school students to program a computer by marking a data card with an ordinary pencil.

The system, called BASIC-8, uses either a PDP-8/I or PDP-8/L computer, an optical mark sense card reader, and a disk storage unit. It uses Dartmouth College's popular algebraic computer language, BASIC, (Phase I), which is composed of easy-to-learn English statements and mathematical expressions. BASIC is used throughout the four CAMP textbooks.

The CAMP series of textbooks are designed to teach high school students how to solve mathematics problems and develop mathematics concepts by using a computer.

To write a program using the data cards, a student just marks the appropriate phrases printed on the special card. One card is used for each line of a computer program. When the program is written, the student can turn his cards in to the instructor, who has them run on the computer, or the student can run them himself.

"The BASIC-8 allows schools to make more effective use of their computer," said Richard E. May, DEC's education marketing manager. "The school can use the computer on-line during the day for problem-solving programs and student use. The cards can be processed in the evening with the computer running in batch mode, which requires a minimum of supervision."

May also noted that BASIC-8 allows a large number of students to have access to the computer and to learn computer techniques. "Instead of having a small number of students using the computer as an instructional device, the number is increased manyfold," he said. "The system also accepts "hands-on" users automatically when the processing is completed.

May pointed out that schools already using DEC equipment could find the BASIC-8 an inexpensive and justifiable add-on. "If the school already has a computer and a disk storage unit, it just has to buy the mark sense card reader, which costs $4,999," May said. "The BASIC-8 programs can be obtained at no cost through our Program Library."

A single terminal system costs $21,550. This includes a PDP-8/L computer, 4,096 words of core memory, 32,768 words of disk memory, and the card reader. A single terminal BASIC-8 based on DEC's PDP-8/I computer, which can be expanded to accommodate 16 terminals, costs $24,300.

The first BASIC-8 deliveries are scheduled for May.

Two DEC computers designed for schools

Two of the seven computer models Digital Equipment Corporation offers to education are designed to allow schools to buy an inexpensive basic machine and expand it as the need requires. In price and performance, the PDP-8/L and PDP-8/I computers offer secondary schools an attractive alternative to a commercial time-sharing terminal.

The basic PDP-8/L, DEC's lowest-cost, general-purpose computer, is priced at $8,500. The computer is equipped with 4,096 words of core memory, enough capacity for most of the programs that normally are used by secondary schools. The PDP-8/L can be expanded to handle a maximum of seven users simultaneously.

The basic PDP-8/I, priced at $13,450, can be expanded to accommodate 16 users at the same time.

The prices of both include a teletypewriter.

The low cost of the DEC computers makes them an attractive alternative to subscribing to a commercial time-sharing service. Schools tied into a time-sharing network typically pay a monthly charge for the service — the fee is based on the number of terminals the school has, the complexity of the problems being calculated, and the amount of the computer's time the school uses. Typically, these charges can reach about $650 per month, in addition to monthly telephone line charges — almost two-thirds the price of a PDP-8/L. If the cost of the computer is amortized over a period of time — the common practice — the price is reduced to about $2,900 per year over three years, and about $2,100 annually over four years.

A basic DEC computer system consists of the PDP-8/I or PDP-8/L computer and all the programs required to oper- (Continued on page 4)

DEC's PDP-8/I and PDP-8/L
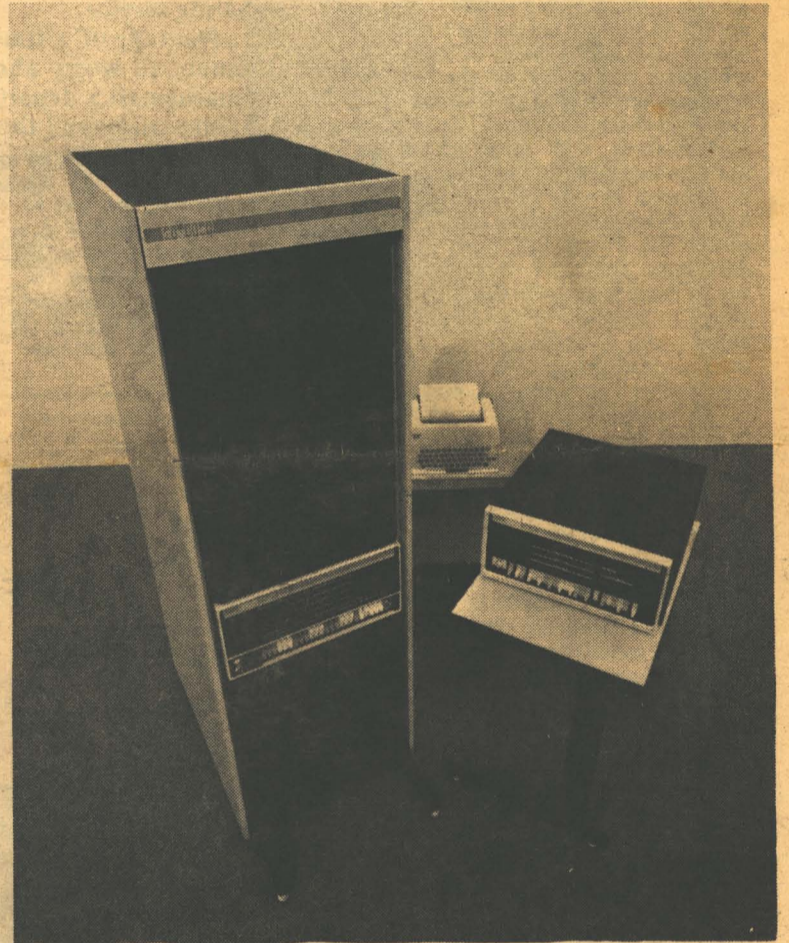
DEC offers two small computers, the rack-mounted PDP-8/I, left, and the tabletop PDP-8/L to educators. The basic PDP-8/L costs $8,500 and can be expanded to accomodate as many as seven users simultaneously. The PDP-8/I costs $13,450, and can serve as the basis of a 16-user system.
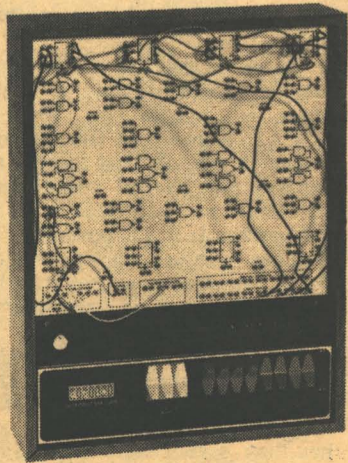
IN MATH ELECTRONICS
COMPUTER LAB DESIGNED AS CLASSROOM AID

Digital Equipment Corporation's educational training device, the Computer Lab, is designed to help teachers communicate the new mathematical and binary theory concepts that are widely used in modern electronics and computer technology. It is designed to be used in high school and technical school classrooms.

Digital Equipment Corporation's Computer Lab is a training device designed to help instructors teach the concepts of new math and binary concepts. The compact Computer Lab is only 17 inches long, 12½ inches wide, and 3¼ inches deep. It costs $445.

The Computer Lab costs $445, and comes with a 10-experiment self-teaching workbook that provides up to 50 hours of laboratory training in digital logic fundamentals. Each of the Lab's internal basic digital functions is represented on the front panel by a standard logic symbol. The student uses patchcords provided with the Computer Lab to design logic to perform an experiment. He can test a logic design he has wired by using a series of three manually operated switches which provide signals to the logic, or by using a clock that automatically supplies test signals at any point in the system.

In addition to being used in secondary schools, the Computer Lab is widely used in industry for training technicians and engineers in electronics and computer fundamentals. Industrial users include Sylvania Electronics Systems, and Raytheon, Inc. Other users include the United States Army, the Electronic Training Center of New Jersey and Pennsylvania, the University of Alabama, and Harvard University.

Ready Aim Compute!

Kids will be kids, and the students at The Taft School in Watertown, Conn., have devised a safe version of playing Russian Roulette with their PDP-8 computer. The computer picks a number between one and six at random, and the student playing the game also chooses a number between one and six. The student types his number on his teletype-writer, and if the numbers match, the computer wipes out most of its memory, forcing the student to re-load it, a time-consuming project when starting from scratch.

Rhode Island Project shares a PDP-8 L

A four-community project in northeast Rhode Island, established to offer computer training in high schools at a cost each town can afford, began operating late last year when it received its four-user PDP-8/L computer.

The project is called the Northeast Rhode Island Computer Project, and it is the brainchild of the superintendents of schools in Cumberland, Lincoln, North Smithfield, and Woonsocket, and Arthur J. McMahon, consultant in mathematics education for the state. It was established so every high school student in these communities will have some exposure to the computer, a necessity in this age, according to McMahon, at a cost that even the smallest community can afford.
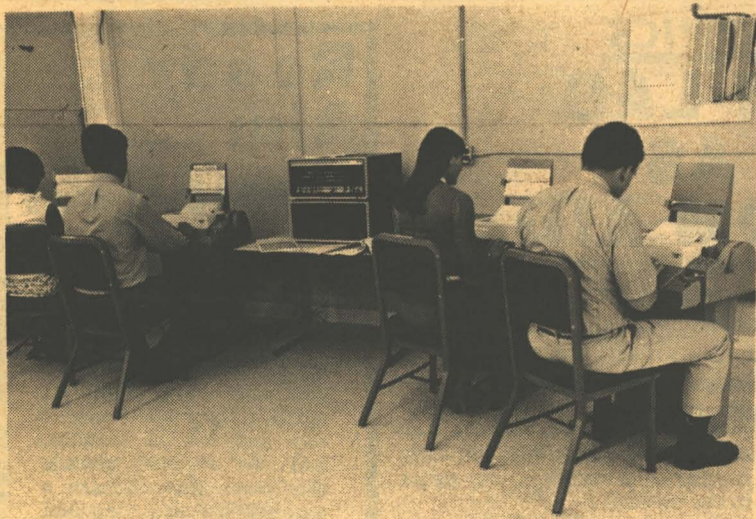
The special-purpose time-sharing system that the four towns are using is built around DEC's lowest-priced computer, the PDP-8/L. It uses a version of FOCAL, DEC's conversational computer language, that is written so that up to four communities can use the computer simultaneously. Four teletype terminals are included with the system. Its per terminal cost — about $5,000 — is less than the price of many less versatile electronic calculators or the per terminal cost of many commercial time-sharing systems.

McMahon said each school has a terminal, and the computer is housed in the Cumberland high school. This plan was the result of a careful study to determine the most economical use of local telephone lines, over which students communicate with the computer. "By incorporating, each school system shares the communications costs equally," McMahon said. "Careful planning was needed, on even the most minute details, to make the project a reality."

"The training is mathematics oriented," McMahon continued, "but we plan to teach students taking science and business courses. This means that eventually all students will have received some exposure. We are starting with the seniors and working down," he said. Besides mathematics instruction, the course will include principles of programming.

The DEC system, which can be used in a variety of engineering applications as well as in education, allows from two to seven users to work on different problems at the same time, as if each had his own computer. FOCAL can be mastered in less than two hours by a person with no prior computer experience.

The Rhode Island project's

ENTHUSIASM

How do students react when their school installs a computer? Some examples related to DEC by PDP-8/L and PDP-8/I users seem representative.

When Walter Koetke, mathematics instructor at Lexington, Mass. High School came to work in the school's data processing center during the summer, he was surprised to find some of the students drifting in soon after to use the school's PDP-8. After this happened several times, Koetke asked one student how they knew he was there. "One of the students lived just down the street," Koetke relates, "and she would call up the others when she saw my car parked at the school."

Time-Share or buy?
SAINT MARK'S BUYS OWN

St. Mark's School in Southboro, Mass., wanted to give its students the chance to work with a computer. So it did what most schools do — it subscribed to a commercial time-sharing service.

"The advantage of a time-sharing service is that there is no equipment to worry about," said Richard Rader, of St. Mark's mathematics department. "The monthly charge included maintenance, and the equipment was in the hands of the time-sharing company."

The computer service was so successful that St. Mark's decided to add a second terminal. "But we found that adding the terminal would have doubled the cost," Rader said. "That is when we decided to purchase

four-user system includes only the basic computer and 8,192 words of core memory. Larger PDP-8/L based systems require disk storage, but can be expanded with the addition of other options to accommodate seven terminals. Expansion also gives the system a general-purpose capability, permitting the use of a variety of computer languages.

McMahon pointed out that this was the first system of its type in Rhode Island, but he said he hopes every school in the state will have access to some type of system like this within two years. He sees no problem in devising courses for the computer, because instruction in computer programming has been offered high school teachers by Rhode Island colleges and the University of Rhode Island for several years.

our own computer."

The Hill School in Pottstown, Pa., was also a time-sharing customer. "The original service became so popular that students had to sign up for terminal time three days in advance," said Clifford Little, of The Hill's mathematics department. "But giving students unlimited access to the terminal resulted in charges exceeding $1,000 per month. The conclusion we reached was that The Hill should have its own educational computer system, so in the long run, we could keep our costs down and still give the students more 'hands-on' experience."

Both schools purchased Digital Equipment Corporation computers to replace the time-sharing services.

The monthly charge a time-sharing customer pays is based on several things, including the type of computer being used, the number of terminals the school has, and the amount of the computer's time the school uses. Typically, these charges can reach $650 per month. When added to monthly telephone line charges of about $3 per mile, the monthly time-sharing charges can become relatively high.

Buying a small computer, on the other hand, can be inexpensive. A DEC PDP-8/L with 4,096 words of core memory, sells for $8,500. When amortized over 40 months, the common amortization period in industry, the cost is under $215 per month. On a PDP-8/I, which is priced at $13,450, the monthly cost is less than $340.

Studies show that having a computer in a school, where they can see and use it, is useful to students. One of the purposes of the "Huntington Project" in Huntington, Long Island, N.Y., is to determine whether it is better to have a computer on hand in the classroom, or whether a time-sharing terminal will suffice. Although no final evaluation has been made, the small computer appears to have definite advantages. According to Warren Houth, who is in charge of the PDP-8/I at Walt Whitman High School in Huntington, having the computer on hand gives students a good feeling. "They like to think of it as their own, and when it comes to teaching about the machine itself, it has proven most desirable to have it there."

School puts PDP-8/L in machine shop

PATERSON, N.J. — Secondary school students are learning to use a computer to control machines at Don Bosco Technical High School here, in one of the first projects of its type in the nation. The project is one of several subject areas that have taken new direction since the school bought a computer last summer.

Don Bosco, a Roman Catholic school operated by Salesian brothers and priests, combines several trade programs with a

Computer lab in class

A course using the Computer Lab, above, provides up to 50 hours of instruction, ending with control circuitry for actual computer sub-systems.

college preparatory program. All students take courses in both areas. Don Bosco began as a trade school, but changes in the curriculum were made to meet the changing needs of industry. Because the school prides itself in recognizing and reacting to these changes, and industry was finding more and more applications for the computer, the decision to purchase a computer was an easy one. "We wanted the students to think computers," Brother William Sholl, the school's electronics instructor, pointed out.

The computer selected by Don Bosco was an $8,500 PDP-8/L. Although using the computer in machine shop instruction is perhaps unique, it also is extending instruction in physics, chemistry, mathematics, and electronics. Brother Sholl expects the computer to demonstrate computerized typesetting in the graphic arts department, and to teach automatic drafting, as well as to find uses in other departments.

Computer control of machines — called numerical control — is done mainly by punched tape and an electronic controller. Calculations are made in the computer, and an instruction tape is prepared. This tape is put into the controller, which selects the tools to be used and guides the machine through its work.

At Don Bosco, the tape and controller were found to be unnecessary. Using FOCAL[R], DEC's computer language developed originally for non-shop applications, and the PDP-8/L, students derive the formulas needed to operate a lathe. At the lathe, one student is the controller and reads the proper instructions to a fellow student lathe operator. This replaces a method where the lathe operator donned ear phones and heard control information read to him from a recording.

The computer enables students to do tasks before impossible because of the time-consuming mathematics involved. Also, student work is more advanced. Rather than being limited to formulas using the square or cube of a number, they now might work with a number raised to the 3.14157 power. This allows students to machine corrected parabolas and ellipses, and give them a better idea of machinery control's potential.

Similarly, electronics students are using the computer in amplifier design, in plotting AM/FM modulator signals, and in solving loop equations. In mathematics, physics, and chemistry, it is being used to demonstrate various principles, and an elective course for computer technicians is planned for the future. Students themselves have found a full range of uses for the PDP-8/L, from providing valuable aid in solving homework problems to helping design Christmas cards, and providing a Blackjack opponent. The computer has proven so popular among students that Brother Sholl has had to ration its use. Each student qualified as an operator must sign up in advance, and is allotted a 10-minute period. But he may use more time if no other name appears near his.

Other schools that have used a time-sharing terminal before buying their own computer find the presence of a computer helps students understand what the machine is and how it works. They also get valuable "hands-on" experience with the computer and its related equipment; they load their own programs into the computer, and can watch the computer function by watching and interpreting the indicator lights on the front panel. The result is that a student is not awed by a computer, and comes to regard it as just another tool he has at his disposal.

There are also some additional benefits from owning a computer. Schools in Project LOCAL, a group of five Boston area high schools that formed to explore the use of computers, sell time on their machines to other schools in the community. Because their charter forbids them to make a profit, the schools charge their "customers" a small amount.

St. Marks, which wanted only to add one terminal to the one it had, purchased a DEC computer system capable of handling seven users simultaneously. "This allows us to have the two terminals we wanted in the school, and still have the ability to tie two public schools in our community into our computer," Rader said. "This lets us perform a service to our community, and the income we receive helps defray the cost of our maintenance contract."

N. H. high school finds programming easy with FOCAL

WHITEFIELD, N.H. — Last August, just a few weeks before the academic year began, White Mountains Regional High School, a small (500 students) school in this northern New Hampshire community received a computer it had ordered, a PDP-8/S made by Digital Equipment Corporation. By the time classes began a few weeks later, Thomas Ford, chairman of the science department, and James Swenson, chairman of the mathematics department, had taught themselves programming, and were prepared to teach students how to use and program the computer. Ford, in fact, had written his own sophisticated programs for the students to use.

"We couldn't have done it without FOCAL," Ford said recently. FOCAL is an easily learned computer programming language developed by DEC specifically for schools. It uses English language statements to give instructions to the computer.

"We felt comfortable when we got the computer," Ford said, "because the literature DEC sent said FOCAL was easy to learn. We believed it." Ford and Swenson, whose departments share the computer, did some background reading about programming and began getting acquainted with the machine soon after it was uncrated.

"We read DEC's book, 'Introduction to Programming,' to learn about FOCAL," Ford said. "We typed some of the programs that appeared in the book into the computer and ran them to get the feel of how programs work. Once we had some practice, we started writing our own programs. They were pretty basic at first," he said, "but we saw the need for universal programs such as a conversion table for Kelvin, Celsius, and Fahrenheit temperatures."

Among the other programs Ford wrote was a demonstration that gave students practice in reading the blinking lights on the computer's front panel, intended to help prevent errors stemming from misinterpreted lamps and switches. The computer simulates a 12-bit word on the panel lamps; the student reads it and types it on his teletypewriter. The computer prints out the correct value, and keeps track of the number of correct and incorrect responses.

Ford incorporated the computer into junior and senior physics classes by writing programs that demonstrate Boyle's Law and Charles' Law, which deal with the interrelationship of temperature, volume and pressure of gases. Other programs Ford wrote for science classes can be used in Fourier synthesis of a square wave, and for plotting and adding sine waves. "All these were written within 45 days after we got the computer," Ford said.

Ford submitted nine programs to DECUS, the Digital Equipment Computer Users Society, where they were added to the educational program file and made available to other users of DEC computers.

Ford and Swenson began classes for students who would use the computer soon after school opened. "It took them between 12 and 15 hours before they could do useful things on the computer on their own," Ford said. Now, students can use the computer during their study periods or after school. "The computer is there for them to use as long as someone is in the school," Ford said. We have students at the computer between school bus runs and after school, and some even come in during basketball games at

night. Some days the computer is going 15 hours a day."

Students at White Mountains Regional High School are being introduced to the computer from the "top" down. "The degree to which our students will actually handle the computer depends on the level of difficulty of their course material," ford said. "Students in our advanced science, advanced math, and calculus classes will work individually with the computer as soon as possible, but lower grades will participate in computer demonstrations in the classroom."

PROJECT CUTS STUDENT COST WITH COMPUTER

WESTWOOD, Mass. — Buying their own computers cut the per-student cost of supplying computer services to high school pupils by 75 percent in five Boston area schools in the 1968-1969 academic year.

Project LOCAL, (Laboratory Program for Computer-Assisted Learning), made up of the towns of Westwood, Lexington, Natick, Needham, and Wellesley, paid about $100 per student for computer services in 1967-1968. In the 1968-1969 school year, Project LOCAL's per-student cost came to $25, said Project Director Robert N. Haven.

The difference was made by the purchase of five DEC computer systems, which replaced the outside commercial time-sharing system to which Project LOCAL subscribed. Each computer system was set up to meet the requirements of the specific school.

Buying the computers has enabled Project LOCAL itself to become a time-sharing service; in 1968-1969 eight schools were actually time-sharing customers.

Project LOCAL began operating in fall, 1967 as a pilot program to demonstrate and evaluate the use of computers in teaching high school mathematics and to train teachers how to use computer programming techniques in the classroom. It is funded jointly by the member towns and under provisions of Title III of the Elementary and Secondary Education Act of 1965.

computer makes learning fun

One of the ways computers can be used is in programmed instruction — it can ask a student questions, check the answer, let the student know whether the answer is correct, and then go on to another question. The young California student above ponders a question the computer has asked, left, and in the center photo, tentatively pecks an answer. The expression on her face in the last photo shows that she was right. The girl is using part of Stanford University's nationwide educational computer system, controlled by a DEC PDP-10. Stanford's efforts have been in three areas; drill and practice, tutorial, and dialog systems. The PDP-10 is DEC's largest computer, and is used in many university and industrial applications where a great deal of computing power is required. It is also popular as a central computer for time-sharing companies.
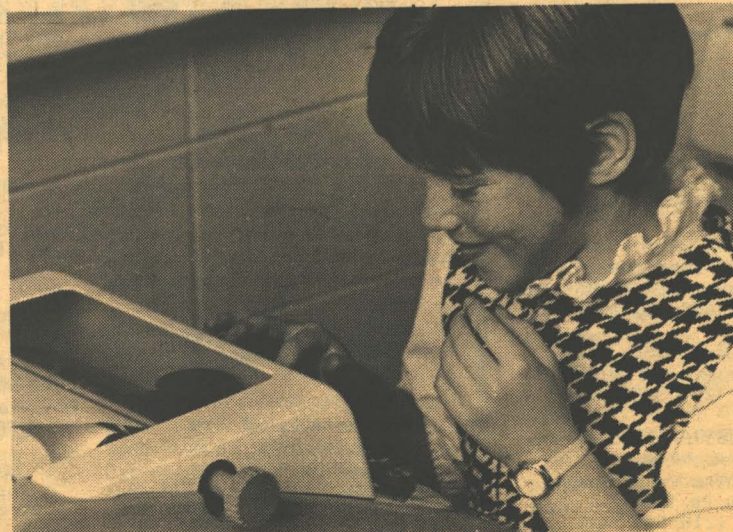
WHERE'S CHARLIE?

'12 year old thinks in octal'

When Charlie Hernig sat down in Digital Equipment Corporation's computer room a few weeks ago and started writing a machine language program on a TSS-8 terminal, he stopped traffic in the adjoining hall and raised a few eyebrows on programmers who walked in and out.

Charlie is only 12.

He was introduced to computers a year ago while in the sixth grade at the Franklin School in Lexington, Mass. He was one of 14 sixth graders selected to attend a class in computer programming on Lexington High School's TSS-8 time-sharing computer.

Charlie devoured the class material easily, and became so intrigued with the computer that he asked his instructor, Miss Lyn McLane, for a copy of DEC's book, "Introduction to Programming." Using the book, Charlie taught himself to program in machine language.

During the summer vacation, he received permission to use Lexington's TSS-8 and became a fixture in the computer room. After two months there, Walter Koetke, who is in charge of the school's computer, reported Charlie was "thinking in octal."

Charlie's parents, Dr. and Mrs. Arthur Hornig, a physicist and a former programmer, respectively, encouraged him after he showed an interest in computers, but neither could provide assistance, because neither was familiar with small computers or machine language.

Important decisions are something every programmer must face, even if that programmer is only 12 years old. Charles Hornig ponders his next move as he develops a program on Digital Equipment Corporation's small time-sharing computer. Hornig visited the company's Maynard, Mass. plant recently and spent the afternoon programming. He had learned the skill a year earlier while a sixth grader in Lexington, Mass. Besides computers, young Hornig is interested in football, baseball, and is a Boy Scout.

Charlie is quiet and unassuming, and seems to accept the computer like others his age would regard a typewriter. When he isn't busy at a terminal, Charlie plays baseball and football, and is active in the Boy Scouts.

FOCAL DESIGNED FOR EASY LEARNING

Mathematics and science instructors being introduced to a computer for the first time often have reservations about learning to program the machine. Demands on their time, whether for school functions, correcting homework assignments, and attending meetings or graduate level classes, severely limit the time they can devote to learning computer programming.

But FOCAL[R], Digital Equipment Corporation's easy-to-learn computer language, enables an instructor to write simple programs in less than an hour after being introduced to it.

FOCAL is used in virtually every secondary school equipped with a DEC computer. Instructors and students have written programs ranging from simple games and demonstration programs to a Fourier synthesis of a square wave program that ran uninterrupted on the computer for 16 hours.

FOCAL uses common teletypewriter keyboard symbols, (an asterisk is FOCAL's multiplication symbol, and an exclamation point is the carriage return and line feed symbol), and short English language commands (SET tells the computer to store the symbol that follows, and its numerical equivalent, and TYPE orders the computer to type out the expression, enclosed in quotation marks, that follows. ASK allows the user to insert data.

With only these basic examples and the knowledge that each line of a program must be numbered so the computer will store it in its memory, an instructor can write a simple program. For instance, a program to solve the simple algebraic equation for determining interest on a loan (I=P*R*T) looks like this:

```
1.1   ASK   "PRINCIPAL,"
      PRINCIPAL
1.2   ASK "RATE," RATE
1.3   ASK "TIME," TIME
1.4   SET INTEREST=PRINCI-
      PAL*RATE*TIME
1.5   TYPE   "INTEREST,"
      INTEREST!!
```

Line 1.1 tells the computer to ask how much money the borrower wants. The borrower types the amount after the equal sign. The computer stores the number in its memory and labels it "PRINCIPAL."

Line 1.2 asks the interest rate. The computer labels the reply "RATE" and stores the value in its memory.

Line 1.3 asks how long the borrower wants the money. The reply is labeled "TIME" and is stored by the computer.

Line 1.4 gives the computer the formula it needs to solve the problem. The computer will follow the instructions in the formula, that is, it will multiply PRINCIPAL, RATE, and TIME.

Line 1.5 orders the computer to type out the word "INTEREST" and then to type out the result of the calculations carried out in line 1.4. The three exclamation points will tell the computer to raise the paper in the teletypewriter three lines, so the operator can see the printed answer, and have enough space to start a new program.

When used with one of DEC's PDP-8 family of computers in its basic configuration, FOCAL has enough computational power to solve virtually all mathematical problems that come up in high school mathematics and science courses. Simply put, if the problem can be stated in English, it probably can be programmed in FOCAL.

DEC Offices throught U. S. A.

An extensive sales and service organization — 31 local sales offices and maintenance centers in the continental United States — make it easy for instructors and school administrators to get information about Digital Equipment Corporation computers.

DEC salesmen are qualified to help determine a school's computer requirments and to assist in planning a computer system that can expand to meet a school's growing needs.

Every sales office has a maintenance staff renown for its speed and dependability. In addition, DEC maintains seven maintenance depots where maintenance work on computers, teletypewriters, and computer-associated equipment can be done.

In the East, the locations of DEC sales offices are:

MASSACHUSETTS
15 Lunda Street
Waltham, Mass. 02154
TEL: (617) 891-1030

CONNECTICUT
1 Prestige Park
Meriden, Conn. 06450
TEL: (203) 237-8441

NEW YORK STATE
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Rochester, N.Y. 14618
TEL: (716) 461-1700

Suite One
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TEL: (201) 941-2016
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Centereach, L.I., N.Y. 11720
TEL: (516) 585-5410

NEW JERSEY
Route 1 and Emmons Drive
Princeton, N.J. 08540
TEL: (609) 452-2940

1259 Route 46
Parsippany, N.Y. 07054
TEL: (201) 335-3300

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(Philadelphia area)
1100 West Valley Road
Wayne, Pa. 19087
TEL: (215) 687-1405

400 Penn Center Blvd.
Pittsburgh, Pa. 15235
TEL: (412) 243-8500

WASHINGTON, D.C.
7100 Baltimore Blvd.
College Park, Md. 10740
TEL: (301) 779-1100

In the South, DEC has sales offices at:

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Durham, N.C. 27707
TEL: (919) 489-3347

TENNESSEE
5731 Lyons View Pike S.W.
Knoxville, Tenn. 37919
TEL: (615) 588-6571

GEORGIA
Suite 116
1700 Commerce Drive N.W.
Atlanta, Ga. 30318
TEL: (404) 351-2822

ALABAMA
Suite 41
Holiday Office Center
3322 Memorial Parkway S.W.
Huntsville, Ala. 35801
TEL: (205) 881-7730

FLORIDA
Suite 232
6990 Lake Ellenor Drive
Orlando, Fla. 32850
TEL: (305) 851-4450

DEC offices in the Midwest are located at:

ILLINOIS
(Chicago area)
1850 Frontage Road
Northbrook, Ill. 60062
TEL: (312) 498-2500

OHIO
(Cleveland area)
Park Hill Bldg.
35104 Euclid Avenue
Willoughby, Ohio 44094
TEL: (216) 946-8484

Southtown Bldg.
3101 Kettering Blvd.
Dayton, Ohio 45439
TEL: (513) 299-7377

INDIANA
21 Beachway Drive
Suite G
Indianapolis, Ind. 46224
TEL: (317) 243-8431

MICHIGAN
230 Huron View Blvd.
Ann Arbor, Mich. 48103
TEL: (313) 761-1150

MINNESOTA
(Minneapolis area)
15016 Minnetonka Industrial Road
Minnetonka, Minn. 55343
TEL: (612) 935-1744

MISSOURI
(St. Louis area)
Suite 110
115 Progress Parkway
Maryland Heights, Mo. 63042
TEL: (314) 872-7520

In the Southwest, DEC offices are located at:

TEXAS
1625 West Mockingbird Lane
Dallas, Texas 75235
TEL: (214) 638-4800

3417 Milam Street
Houston, Texas 77002
TEL: (713) 524-2961

NEW MEXICO
6303 Indian School Road, N.E.
Albuquerque, N.M. 87110
TEL: (505) 296-5411

In the West, DEC offices are located at:

CALIFORNIA
560 San Antonio Road
Palo Alto, Cal. 94306
TEL: (415) 326-5640

801 East Ball Road
Anaheim, Cal. 92805
TEL: (714) 776-6932

2002 Cotner Avenue
Los Angeles, Calif. 90025
TEL: (213) 479-3791

WASHINGTON
(Seattle area)
1521 120th N.E.
Bellevue, Wash. 98004
TEL: (206) 454-4058

COLORADO
2305 South Colorado Blvd.
Denver, Colo. 80222
TEL: (303) 757-3332

UTAH
431 South Third Street East
Salt Lake City, Utah 84111
TEL: (801) 328-9838

LOW-COST DEC SYSTEM FOR SCHOOLS

ate the system. Also included are two man-weeks of instruction at DEC's Training Department at the company's Maynard, Mass. headquarters.

DEC also offers a spectrum of software to educators — computer programs written in FOCAL[R] as well as other programming languages. All are available at no cost from DECUS, the Digital Equipment Computer Users Society.

A full line of peripheral equipment is also available from DEC. Most widely used in secondary education are disk storage units, high speed paper tape readers and punches, and additional terminals.

The disk units are available in large and small sizes, and most often are used when the school wants to allow five or more students to use the computer at the same time. The high speed paper tape reader and punch are useful when students work in assembly language, or when they develop long, sophisticated programs that take considerable time to load through the teletypewriter.

DEC has field service centers throughout the United States and Canada, as well as in Europe and the Far East.