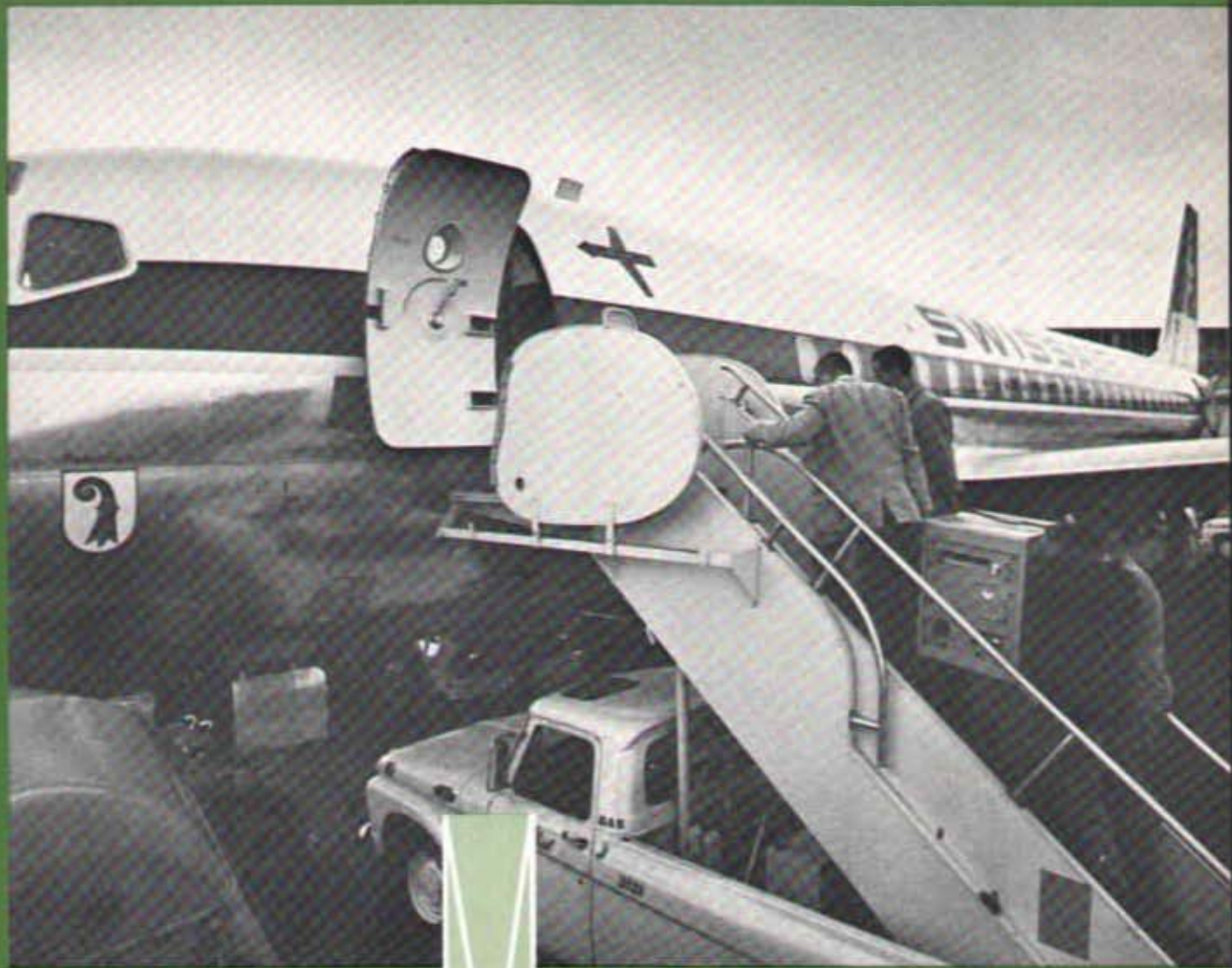


July 1964



# Measure

**In this issue**

*The Flight of Time*

*Perspective: HP Associates*



*from the chairman's desk*

**W**ITHIN THE NEXT few months, we will complete two major building projects overseas—a large addition to our manufacturing facility in West Germany and a new plant for Yokogawa-Hewlett-Packard, Ltd., our joint venture in Tokyo. These projects are of utmost significance to our international operations in that they will strengthen our competitive position in two of the most important electronics markets in the world.

As you know, our international business is growing very rapidly and it is quite obvious that the expansion of our overseas manufacturing facilities tends to accelerate this growth. Not so obvious, perhaps, is the beneficial effect which our overseas manufacturing has on our U.S. operations. On the surface, one would be inclined to think that an expansion of our manufacturing activity in foreign countries would diminish our manufacturing activity at home. But the figures show that just the opposite is true.

This year, our two plants in Europe will produce about \$6 million worth of instruments. These instruments will contain about \$2 million worth of components and fabricated parts manufactured in our U.S. plants. It is interesting to note that in 1958 our entire volume of business in Europe was only \$2 million. So, in parts alone, our domestic plants are producing as much for the European market as they were producing in finished instruments only six years ago.

Looking at it another way, for every three people we add to our European manufacturing operations we must add one person in the U.S. to produce the necessary parts for the European-manufactured instruments.

Of even greater benefit to our domestic operations is the continuing increase in our exports of finished products from the U.S. to overseas markets. Despite the fact that we have steadily expanded our manufacturing operations in Europe since 1960, our exports to that area have continued to climb.

For the first six months of the current fiscal year, they were up 12 percent over the corresponding period of 1963.

The answer to this seeming paradox is that our European manufacturing operations have enabled us to increase our stature and strengthen our position in this highly competitive area, and have tended to broaden the market for the HP family of products. So, although our plants in England and Germany are rapidly increasing their output, we have also had to step up our exports from the U.S. to fulfill a much larger demand for our products.

Although we have just begun to manufacture instruments in Japan, we expect a similar pattern to exist in this important market. In other words, we fully anticipate that our exports to Japan will increase even though Y-HP will have a major facility in Tokyo. As time goes on, we may even make some Y-HP products at our plants in the U.S.

During the coming years we also anticipate that our domestic operations will gain substantial benefit from the engineering and product development effort of our overseas companies. Until now, this effort has been directed primarily to getting our manufacturing operations under way and to building products already in the HP line. In the future, however, we can expect our overseas engineering staffs to develop an increasing number of new products, which will represent an important addition to our sales volume both at home and abroad.

The point to all this is that we are now a truly international enterprise and should operate with a high degree of intercompany cooperation and communication. We must constantly recognize that there are no borders to our technology or manufacturing capability, and that the progress achieved by people in one division directly benefits people in divisions many thousands of miles away—in some cases, on the other side of the world.

*David Packard*





## *Perspective: HP Associates*

**Y**OU MIGHT SAY that HP Associates is a company with a split personality. No offense intended, but it's a fact that this phenomenally successful organization can be looked at from many perspectives and, like a child's kaleidoscope, it always seems to present a different array of colors.

For instance, HP Associates is heavily committed to research and development in the field of solid state devices—diodes, triodes, transistors, optoelectronic components, and the like. The scientists there often speak an esoteric language—or so it seems to the layman—as they stalk the electron into uncharted regions. They are a patient breed, perhaps more intrigued with the promises of the future than with the mundane details of the present. And yet they talk about picoseconds and nanoseconds, which are a thousand times faster than the wink of an eye.

On the other hand, HP Associates is also heavily committed to the present as a manufacturer of very real and significant solid state products. And, here again, this Hewlett-Packard affiliate can be looked at from at least two viewpoints. It is an “in-house” developer and supplier of some 90 component parts for HP instruments, and it is also stressing the sale of several of these products to government and industry on the outside.

Does HP Associates know where it is going? Absolutely. Do its many interests and commitments conflict with each other? Absolutely not.

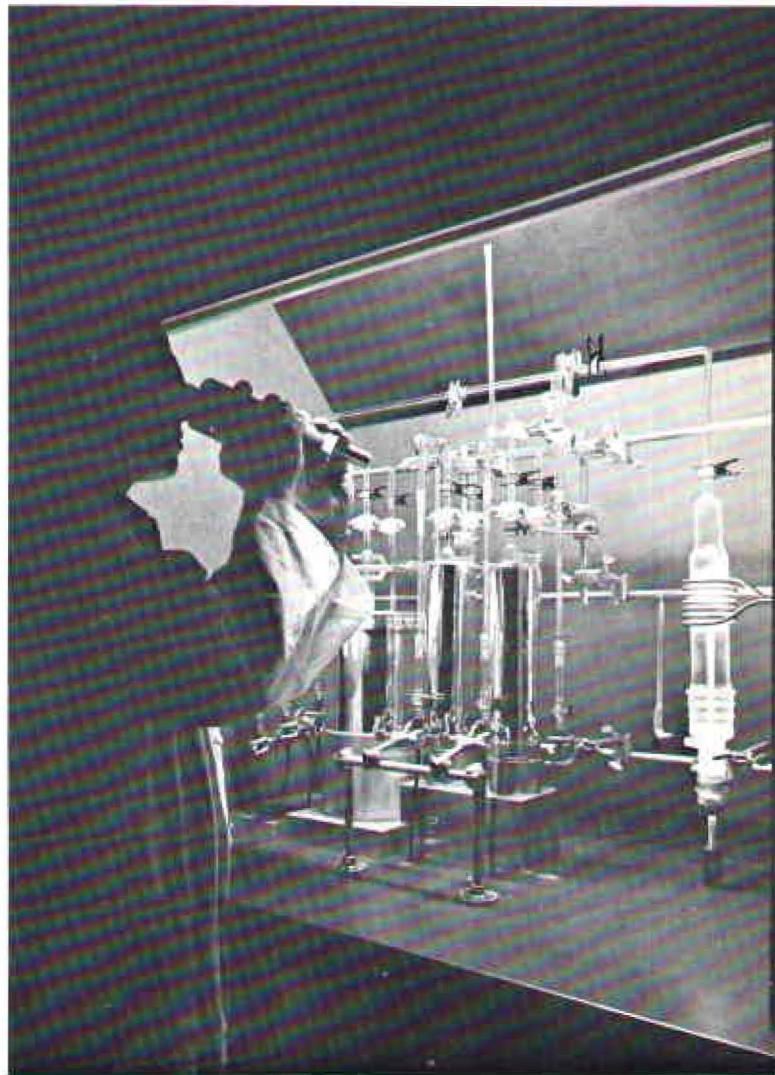
The fact is, the R&D side of the company is obviously essential to the manufacturing operation. Conversely, manufacturing brings in the dollars to pay for the vital R&D projects.

By developing a profitable sale of products for external markets, the increased volume benefits all HP divisions and affiliates who are customers. “Briefly, we’ve always aimed for a state-of-the-art capability which will enable us to develop components as efficiently and cheaply as possible for other Hewlett-Packard operations,” says Jack Melchor, head of HP Associates. “We go to outside markets to reduce component costs.”

HP Associates was founded just 2½ years ago in Palo Alto to develop advanced solid state products and make them available to the parent corporation. Such components were not available from outside sources, or they were of insufficient quality, or they were too expensive to be produced in relatively small quantities by suppliers geared for mass production. In this brief period, the firm has expanded to five locations within the same general area with a total of 38,500 square feet of floor space. Employment has grown to 190, including eleven scientists and engineers with doctorates.

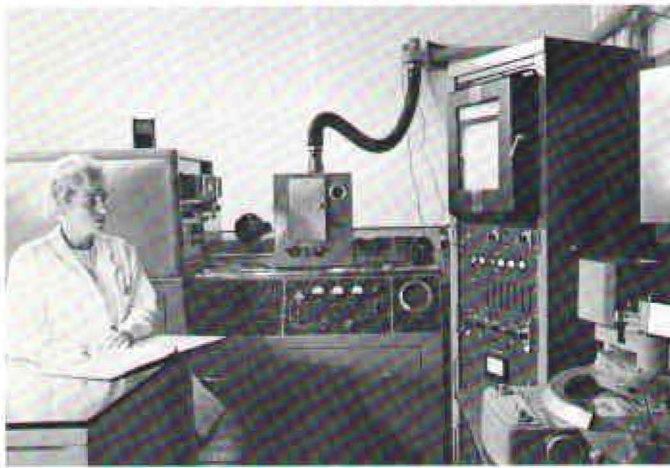
Hewlett-Packard is still HP Associates’ “best” customer, but things have changed here, too. As this article is being

## **The promises of tomorrow guide their work today**



HPA technician Larry Lawrence takes temperature of crystal as it “grows” from molten silicon. Crystal is then “sliced and diced.”





Most advanced laboratory devices and equipment available are used by HPA. Here, laboratory technician Anne Welch operates a GE x-ray diffractometer.



Jack Melchor (center background), HPA president, meets with key managers. Clockwise: Nick Mardesich, finance; Dave Penning, quality assurance; John Atalla, R&D; Frank Wezniak, marketing; Bill Bloom, manufacturing.



Manufacturing, with over 100 people, is expanding rapidly. All varieties of HPA's four basic semiconductor families are fabricated in this new facility.

written, internal and external semiconductor sales have reached an even balance for the first time.

In reviewing the progress of the affiliate, Dr. Melchor points out that it was originally set up as a solid state R&D facility to have state-of-the-art capabilities second to none. He believes this has largely been achieved. "With respect to the small-to-medium-size laboratories in the country, we are unsurpassed. As for the larger labs, we're at least equal in our field." He gives a big share of the credit for this achievement "to people like John Moll and John Atalla." Dr. Moll, a professor at Stanford, is also a consultant to HP Associates. Dr. Atalla is manager of research and development. Both men have led the way in attracting top people and guiding R&D activities.

At least a dozen specific HP instruments have been improved by components which were developed and manufactured by HP Associates. Perhaps the 188A oscilloscope plug-in, the 215A pulse generator, and the new time domain reflectometer are the best examples.

Current projects are many and varied. "This is one of the problems we have to face each day," says Dr. Melchor. "We're in a lot of different businesses . . . R&D for the military and outside industries . . . R&D for the corporation . . . manufacturing of components for outside customers . . . and manufacturing for HP."

He believes that optoelectronics represents one of the next major fields for the electronics industry and much effort is being placed on developing optoelectronic devices.

R&D projects for the government include the study of hot electron emitters, searching for more sensitive ways of detecting infrared energy, and the development of a high speed, high current step recovery diode, to name just a few. There are also many projects underway for nearly all HP divisions and affiliates—a silicon bridge transducer for Sanborn, a new photopotentiometer for Moseley, a solid state nuclear detector for Frequency & Time.

In spite of HP Associates' record of growth up to the present day, Jack Melchor has his scientist's eye on the future. The firm's biggest impact on HP instrumentation and the electronics industry as a whole lies several years ahead when the creative ideas of today become the realities of tomorrow.

Solid state diodes are major products. Standard glass diode is shown being held, surrounded by other types of glass and ceramic diodes. Solid state devices such as these replace vacuum tubes, conserve valuable space.





. . . and leave the driving to us



Mike Talbert gives guided tour of new Neely mobile demonstrator to San Diego businessman Ash Bown as Norm Neely looks on.

**T**RAVELABS . . . Mobile Laboratories . . . Voltswagons . . . Lecturelabs . . . Electrocrusers . . . call them what you will, the purpose of HP's growing fleet of mobile demonstrators is always the same: to promote sales by bringing instruments to customers' doorsteps.

All together, there are ten demonstration vans in operation at this moment in the U.S. and Europe, with an eleventh in the building stage. Latest addition to the fleet is a 40-foot beauty purchased by Neely Enterprises for service in California, Nevada, Arizona, New Mexico, and El Paso County, Texas. It will accommodate 20 people at one time.

Mike Talbert and Pete Kuhn (he will operate the bus for Neely) supervised design and construction, a project which took nearly a year from start to finish. A 220-horsepower diesel engine propels the Crown Coach body over the road without a whimper, and a 200-gallon fuel capacity minimizes stops between customer calls in Neely's vast Western territory. At 35,000 pounds, this new mobile lab is no lightweight.

Inside, a man 6 feet 5 inches tall can stand straight and not bump his head. And he can do this in perfect air-conditioned comfort regardless of the weather outside.

The vehicle used by Neely for demonstrations since 1957 has been renovated (see above) and is now operated by Don Barkley in the Eastern sector of the country. This

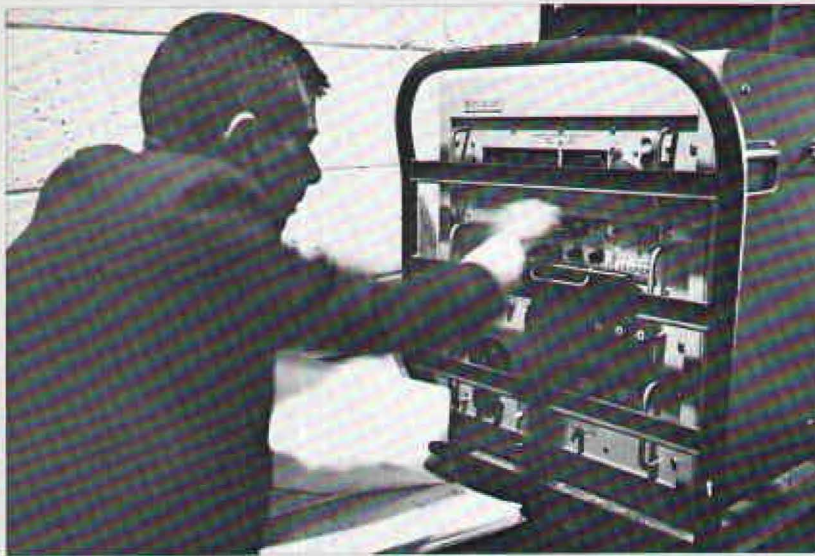
Eastern Travelab was extensively rebuilt last year and boasts an interior divided into three basic compartments: a conference area, and two instrument demonstration and lecture areas.

In the Robinson and Southern sales division territories, the Eastern Travelab will supplement demonstrators already in operation. It will provide a new sales approach in other Eastern sales divisions not now served by a traveling display arrangement, including Yewell, Stiles, Syracuse, HP Canada Ltd., and RMC. Barkley stays from a week to a month in each territory and works with the field engineers representing each specific region.

In addition to Robinson and Southern, other division display rolling stock includes Crossley's Electrocruser and Southwest Sales' Travelab (a name, incidentally, coined by Earl Lipscomb for his demonstrator some years ago).

In Europe, a van-type laboratory operates in Germany and another travels to other parts of the continent. They have traveled as far as Northern Finland, to England, and as far south as Greece and Yugoslavia. A third vehicle to serve the Geneva-based sales organization is being built. It will be more spacious than the vans; somewhat similar to the larger HP demonstrators in the U.S.





Al Bagley makes last-minute adjustment to one of the cesium beam standards at San Francisco International Airport. United Air Lines then flew Bagley, Len Cutler, and the clocks to Washington, D.C.



At the U.S. Naval Observatory in Washington the instruments, now operating under battery power, are unloaded by John Haltiwanger (left) of Horman Associates, and Cal Lidback of the observatory.

## Time flies . . . especially at Hewlett-Packard

**T**HE F&T DIVISION really knows the time of day. In fact, a group of engineers there have developed an atomic clock with such incredible accuracy that, if it were flown to the moon, the elapsed error for the entire 2½-day journey would be less than thirteen millionths of a second!

Perhaps flying HP atomic clocks to the moon is a little far-fetched at the moment, but flying them to Switzerland from Palo Alto actually happened in early June. The purpose of the trip was to use the company's new cesium beam standard (Model 5060A) to compare time as maintained by the U.S. Naval Observatory in Washington, D.C., to time at the Swiss Observatory in Neuchatel.

Al Bagley, F&T Division head, and Len Cutler, physicist

*MEASURE'S COVER* shows one of the atomic clocks being carried aboard a Swissair jet at Kennedy Airport in New York City prior to takeoff for Lisbon and then on to Switzerland.

on the Corporate Advanced Research and Development staff, carried out the experiment with two HP atomic clocks as part of their participation in the International Conference on Chronometry held every five years at Lausanne, Switzerland. Backing up the two travelers was a group of midnight oil-burning F&T engineers who designed special power supplies and worked out other details for the unusual journey.

During their 13,000-mile round trip, the clocks received V.I.P. treatment from airline personnel. Strapped snugly into their comfortable, reserved seats, both instruments were kept in operation by special power circuits installed by the airlines.

From Palo Alto, Bagley and Cutler accompanied the clocks via United Air Lines to Washington where they synchronized them exactly with official time at the Naval Observatory. After a 9-hour drive to New York City, they then flew Swissair to Switzerland for a time comparison with the clocks at Neuchatel. As a result of this experiment, time agreement





At Neuchatel, HP atomic clocks compared Swiss Observatory and U.S. Naval Observatory time at accuracy never before achieved. L to r: Dick Reynolds, HPSA European marketing manager; Cutler; Dr. Jacques Bonanomi, director of the Swiss observatory.

Swissair hostess Madeleine Cavegn fastens safety belts of both clocks. The airlines provided special power sources to keep clocks running en route.

between the two observatories has been established to an accuracy of a few millionths of a second, a significant improvement over the precision of previous measurements.

In recent years, nuclear science has made it possible to build large atomic clocks of unprecedented steadiness, so stable, in fact, that they will not wander apart by as much as one second in hundreds or even thousands of years. But the problem has been in correlating time between widely separate places, such as Washington and Neuchatel. High frequency radio is generally used for such comparisons and most of the ships at sea and planes in the air depend on these transmissions of time information for navigational purposes.

However, for the super-accuracy required in aerial mapping, space research, and in scientific work of the future, radio transmission has the disadvantage of being relatively unpredictable over intercontinental distances due to atmospheric interference.

Two ways are presently known to achieve comparisons

accurate to a few millionths of a second. One is by microwave techniques using earth satellites. The other—as demonstrated by Bagley and Cutler—is to physically transport a highly accurate clock between locations where time is to be compared. Prior to the development of HP's cesium beam clock, the size, weight, and power requirements of previous atomic clocks made the transporting method extremely difficult. The new HP instrument is about the size of a television set and with its special power supply, weighs just slightly more than 200 pounds.

At the heart of the instrument is a new lightweight atomic standard frequency generator. The unit uses atomic resonance control, based on an unvarying physical characteristic of cesium atoms, to control the frequency of an electronic oscillator. The cesium beam standard frequency generator, by itself, is a solid-state instrument weighing less than 65 pounds, making it practical for the first time to obtain atomic accuracy in mobile and airborne applications.



around



the circuit

BY NOEL E. PORTER, *Vice President, Operations*

THE SUMMER MONTHS usually bring a seasonal upswing in our business, and this year has been no exception. While the exact figures aren't available at the time of this writing, shipments during June should total over \$11 million and incoming orders in the neighborhood of \$13 million. Moreover, we're anticipating another good month in July.

A particularly bright spot in the corporate picture in June was Dymec, whose incoming orders hit an all-time monthly high of \$1.2 million. Dymec is extending its business capability and in many cases providing customers with the contracting and supervising of complete system installations. It's getting a helping hand here from our HP plant engineering group.

From time to time we've talked about our capability for making our own components and parts. This enables us to obtain better quality and precision in our products, and also to reduce costs. Once we get into the business of making a particular type of component, then we attempt to make maximum use of the necessary plant and facilities required for its production.

For example, we have a wire- and cable-making facility in Palo Alto which supplies such items as multi-conductor cables, coax cables, and special wires for the entire corporation. This requires a considerable amount of equipment which we couldn't keep busy all the time just to meet these specialized needs. So we round out production by making some of the simpler hookup wires which normally would be purchased from outside suppliers. In this case we actually save money by utilizing our available equipment and capability to best advantage.

Another example is our quartz crystal department. Here our primary concern is to make highly precise devices which are difficult to obtain from outside sources. In the process of making these "tough" ones, we automatically fulfill nearly all the crystal requirements for our entire product line.

A recent issue of *Measure* described our taut-band meter manufacturing operation at Loveland. This unique facility provides meters of the highest quality and accuracy for a host of HP instruments. Moreover, the meters are supplied to all divisions at the same price regardless of quantity. By careful production control, we're able to give the small quantity user the advantage of large volume prices.

Our precision resistor operation at Loveland is also highly successful, growing to 15 people in about a year. It is now

turning out precision resistors for our voltmeters, calibrators, etc., which are every bit as good as any we can buy on the outside. In addition, these are being produced at competitive prices and we expect the price situation to improve even further as we supply the needs of more and more divisions.

HP Associates, of course, continues to provide us with the most advanced solid state devices. Often these devices, while ahead of the art, are needed only in small quantity for our own use and the cost is relatively high. As soon as outside manufacturers of components catch up, we often buy these devices from them and turn our HPA effort back to developing new solid state concepts and products.

Various other divisions and affiliates are in the component business in one way or another. Sanborn makes a wide variety of transducers for its own and outside consumption, and Moseley manufactures precision motors for use in recorders. Harrison, Paeco, and Loveland make various types of transformers, and Loveland also produces variable air capacitors.

These HP component operations are highly important. They improve the quality of our products, provide good jobs for many of our people, and tend to reduce costs and increase profits all across the board.

**Don't call at 4:30 . . .  
but wave as you go by**

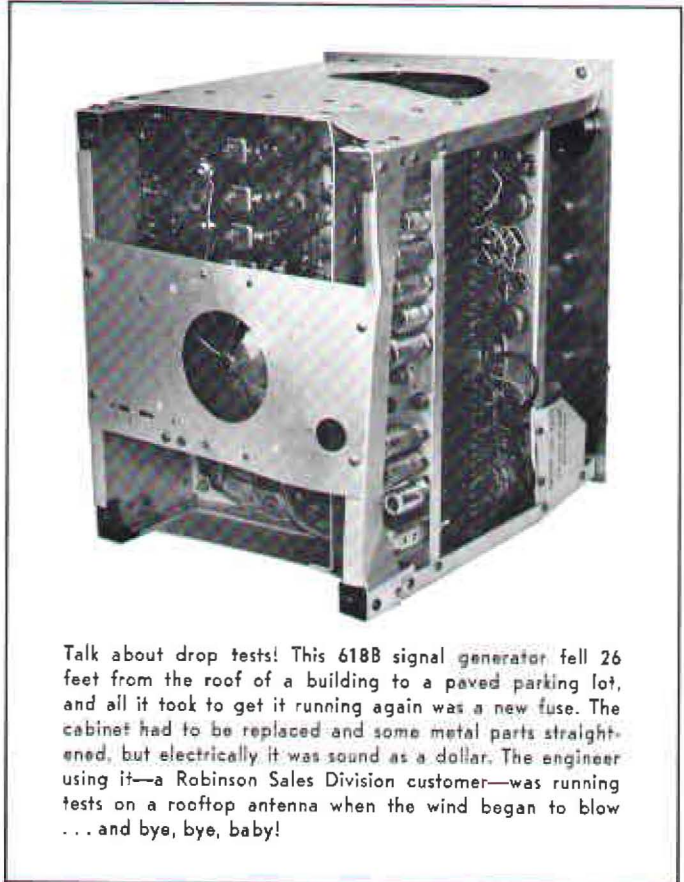
THE FOLKS in the RMC sales division, being good sales types, are about as hospitable as anyone you ever met. And now that the World's Fair is in town, all of them in the NYC office over on East 75th Street are amazed at the countless number of true-blue friends acquired through the years.

They aren't complaining, mind you, but they would appreciate a few hours' notice on requests for last-minute reservations at already crowded hotels or for tickets to sold-out Broadway shows. As one harried secretary put it, "It's just that the impossible takes a little longer than a quitting-time phone call allows."





Computer logic card testing is automated with this impressive system developed and manufactured by Collins Radio Co. Heart of the equipment is a Dymec 5844 measuring system and an HP 185B 1,000-megacycle oscilloscope supplied by Crossley Associates.



Talk about drop tests! This 618B signal generator fell 26 feet from the roof of a building to a paved parking lot, and all it took to get it running again was a new fuse. The cabinet had to be replaced and some metal parts straightened, but electrically it was sound as a dollar. The engineer using it—a Robinson Sales Division customer—was running tests on a rooftop antenna when the wind began to blow . . . and bye, bye, baby!

## NEWS IN FOCUS

Young engineering students become familiar with Hewlett-Packard quality as the result of equipment donations to schools. Valparaiso University was the recent recipient of a 160B scope from Crossley Associates. William Shewan, chairman of the school's EE department, is shown instructing a student.



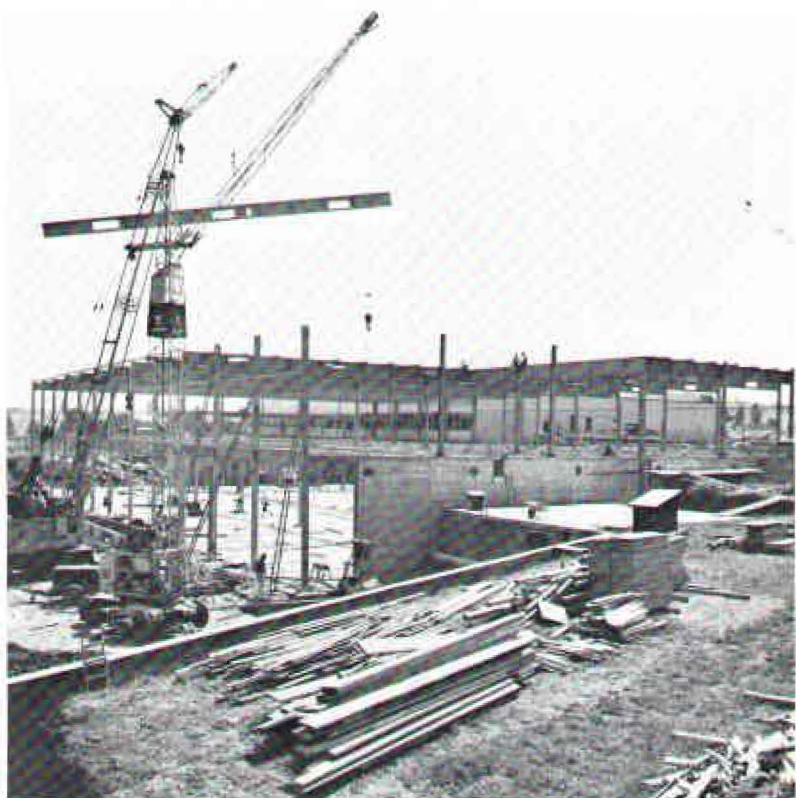


## GmbH addition set for October completion

WITH CONSTRUCTION now on schedule, the big new addition to the GmbH plant at Boeblingen, Germany, is expected to be ready for occupancy by the first of October.

The two-story structure will more than double the space available for manufacturing, engineering, and administrative operations, bringing the total usable area to 80,700 square feet. The present plant building, which is immediately adjacent, has 32,300 square feet.

Currently, 180 people work there but plans call for a substantial increase within the next five years. When the new building is completed, several product lines will be added to the German company's growing list. Included will be industrial and X-Y recorders, and power supplies.



## New Sanborn ECG unveiled

"500 Viso-Cardiette" is Sanborn's descriptive name for a compact, lightweight, new electrocardiograph loaded with features of importance to physicians and their patients. The "500" isolates noise from the heart signal to a degree never before achieved. It is the tenth ECG machine developed by Sanborn since the first "Einthoven quartz string" model was introduced in 1925.

## Lahana seminars

ONE-DAY SEMINARS for nurses and medical technicians will be held regularly by Lahana & Company at the Denver and Salt Lake City offices through August and September. The purpose is to demonstrate Sanborn electrocardiographs and other clinical equipment. Don Thomas, medical field engineer who recently joined Lahana from Sanborn, is organizing and will conduct the meetings.







# people on the move

## HP PALO ALTO

**Hal Dugan**, procurement and stock, Oscilloscope Division — to inventory control, Materials department.

**Blair Harrison**, Frequency & Time Division engineering—to research and development, Oscilloscope Division.

**Wally Klingman**, staff assistant, HP GmbH—to manufacturing engineering manager, Oscilloscope Division.

## MOSELEY

**Frederick A. Wolfe**, digital computer operator, Lawrence Radiation Lab—to sales engineer, F. L. Moseley Co.

## SANBORN

**Ralph Hanson**, manager of medical sales, Marketing Dept — to manager of Marketing.

**Ken King**, technical advisor, Manufacturing Dept.—to manager of Manufacturing.

**Albert Napolitano**, manager of accounting, Finance Dept. — to manager of Finance.

## COLORADO SPRINGS

**Jerry Boortz**, engineering lab, Microwave Division, Palo Alto—to Oscilloscope Division, Colorado Springs.

**Al Corbett**, order administration, Oscilloscope Division—to Colorado Springs.

**Del Fillmore**, accounting department, Oscilloscope Division — to Colorado Springs.

**Don Gardner**, engineering lab, Oscilloscope Division—to Colorado Springs.

**Scott McClendon**, engineering lab, Oscilloscope Division — to Colorado Springs.

**Jeffrey Smith**, engineering lab, Oscilloscope Division—to Colorado Springs.

## DYMEC

**Lee Eggherman**, engineering lab, Oscilloscope Division—to applications engineering, Dymec Division.

## LOVELAND

**William McCullough**, advanced R&D, Palo Alto—to R&D, Loveland.

**Joe Phillips**, service engineer, F&T products—to in-plant engineer, Loveland.

## Marketing news briefs . . .

BIVINS AND CALDWELL, one of HP's sales divisions in the southern United States, became the Southern Sales Division effective July 1. The division also announced the opening of a new branch office in Louisville, Kentucky. Southern Sales has its main office in High Point, N.C., with other branch offices in Atlanta, Ga.; Huntsville, Ala.; and Richmond, Va.

Southern Sales Division has 43 employees, and serves the states of Mississippi, Alabama, Georgia, South Carolina, North Carolina, Kentucky, Tennessee, and large sections of Virginia and West Virginia.

Nearly 90 field engineers from 22 HP sales divisions, subsidiaries, and foreign representatives are expected to attend the July Sales Seminar in Palo Alto. The five-day seminar provides an opportunity for field sales people to meet with representatives of the manufacturing divisions, be briefed on new products, and hear talks by corporate management.

The other half of the HP field sales force attended a similar sales seminar last January.

# Measure

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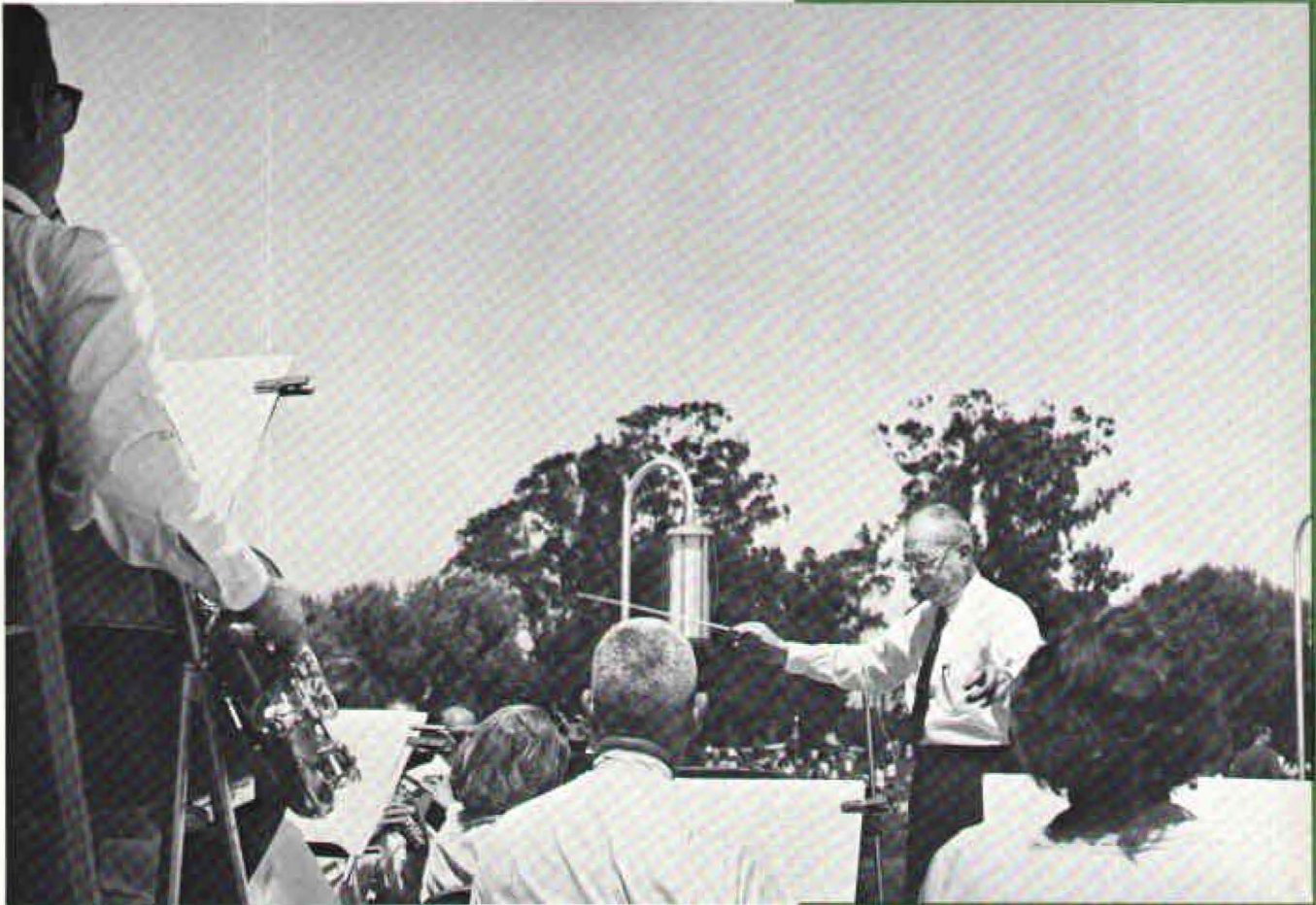
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HELEN HOBSON, Southwest Sales Division  
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HEIKE WOLLRAB, Hewlett-Packard GmbH

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind . . ." LORD KELVIN (1824-1907)





## The Music Man

NOT SO LONG AGO, some are heard to say, a Sunday afternoon meant a city band concert in the park complete with tag games for the very young, hand-holding for those too old for tag, and a time to relax and listen to Sousa marches and Strauss waltzes for the rest. But we don't remember, answers today's generation. So, HP's Jim Preshaw set out to do something about that. For the past several months Jim, who is a prototype machinist in the model shop at the Palo Alto Stanford plant, spent evenings and weekends forming a city band for nearby Mountain View. Whipping up interest can be tougher than the last turn on the ice cream freezer crank, but Jim's 20 years of experience directing bands and orchestras and his enthusiasm for music is catching. He soon had the support of many, including others from HP who remembered those Sunday afternoons of really not so long ago. And finally, on the last Fourth of July afternoon, Jim Preshaw raised his baton and a new generation played tag, or held hands, or relaxed to the marches and waltzes of a yesteryear.

