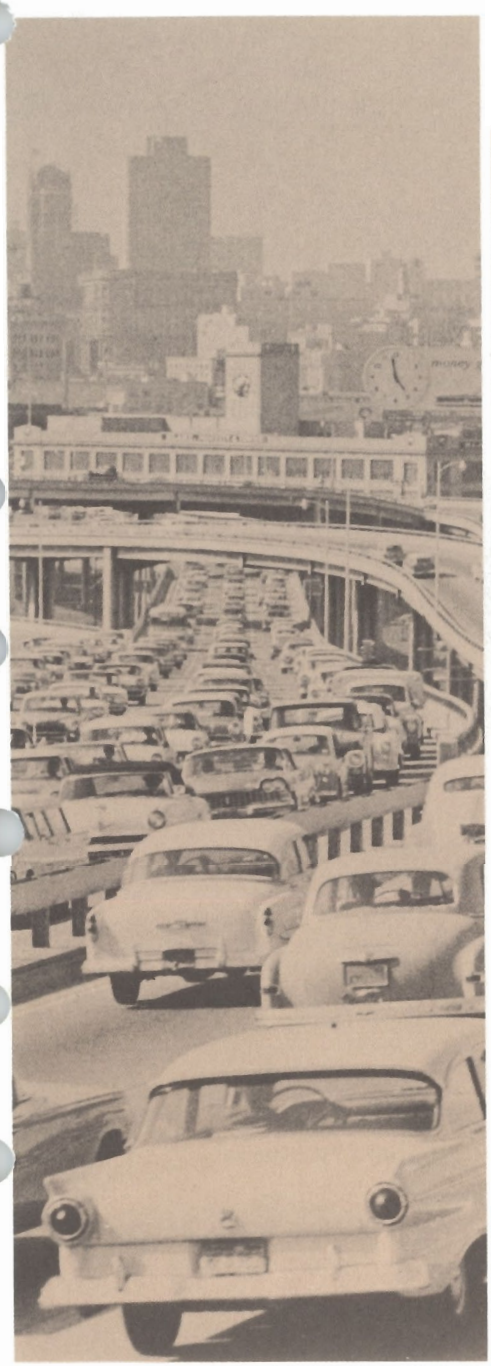
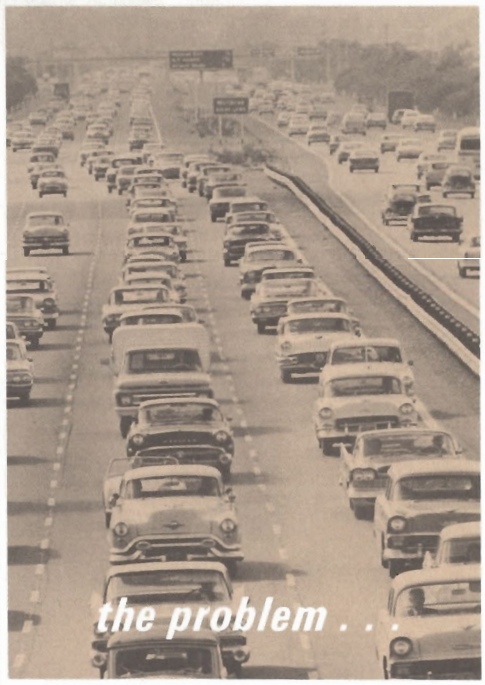




Measure

For the men and women of Hewlett-Packard / AUGUST 1957

Full-scale model of the cars BART will run illustrates the spaciousness of control cab and passenger compartment. The cab will house not an engineer but an attendant to observe train performance and assist passengers; the train itself will be controlled by an automatic computer to average 50 mph, reach top speeds of 80 mph, and stop 20 seconds at each station.

rapid transit to the rescue

☐ Out on the open highway, around the bricks at Indianapolis, or over the cobbled streets of Le Mans, it's obvious that plenty of romance still exists between modern man and the motor car. But if you've ever fought the peak-hour freeway free-for-all or the battle of the downtown parking lot, then you appreciate why the honeymoon is over for the commuter at least. You will also understand why more and more cities are turning to systems of mass rapid transportation as relief for congested traffic.

The San Francisco Bay Area, a leader in this movement, is well along in construction of a billion-dollar Bay Area Rapid Transit system that expects to operate high-speed electric trains on 75 miles of track by 1971. Included in the BART project will be a four-mile tube running under the bay, tunnels through the hills, subways under downtown areas, as well as surface and elevated lines.

Toronto and Montreal are two other North American cities that have started physical construction of modern systems of metropolitan transport.

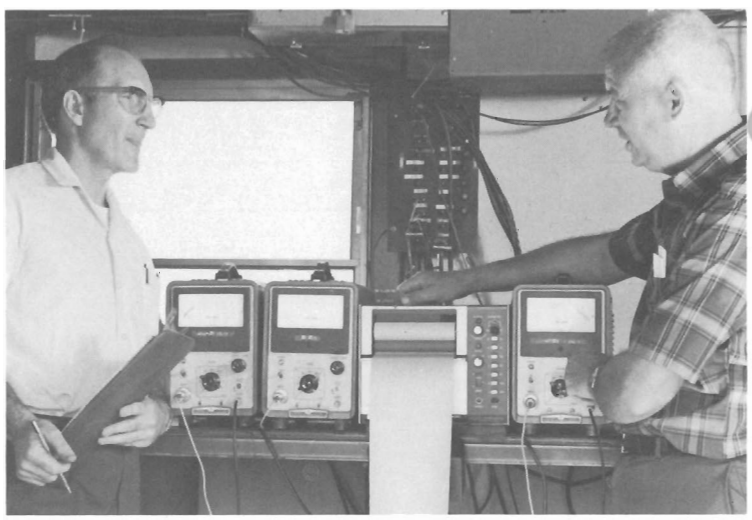
The list for cities with programs in the blueprint stage is somewhat longer: Los Angeles, with a plan for 64 miles of high-speed transit; Boston, with plans to make major improvements following the horrendous traffic snarl of December 30, 1963; Washington, D. C., which submitted a proposal to Congress in 1963 calling for an 83-mile system; Atlanta, which hopes to win approval for a 65-mile network; Philadelphia, where the plan is to extend subways and convert more than 200 miles of rail to high-speed commuter transport; St. Louis, which is updating shelved plans; and Baltimore and Seattle, which are just beginning to survey their needs.

Existing systems, such as those in New York, Cleveland, Chicago, and Pittsburgh, are being extended and improved to handle higher demands.

Internationally, considerable attention has been focused on Japan's New Tokaido Line with its 125 mph speeds and its ability to carry 120,000 passengers daily. Moscow with its palatial stations, Germany with its monorail development, Stockholm with its carefully planned approach to both rapid transit and community growth, and Edmonton, Canada, where a relatively small city of 300,000 population will start construction of a 25-mile system next year also represent worldwide advances in moving people quickly and more efficiently in and about metropolitan centers.

If the BART project is any criterion—and it is being watched with great interest by experts throughout the world—the rapid transit system of the future is going to be a masterpiece of comfort, convenience, and electronic

Advance testing of rapid transit techniques—automatic train control systems, power supply and propulsion systems, methods of eliminating noise and vibration, and track construction—have been conducted for more than three years at BART's test track. Westinghouse, one of HP's important customers, recently was awarded a contract to provide computerized train control.

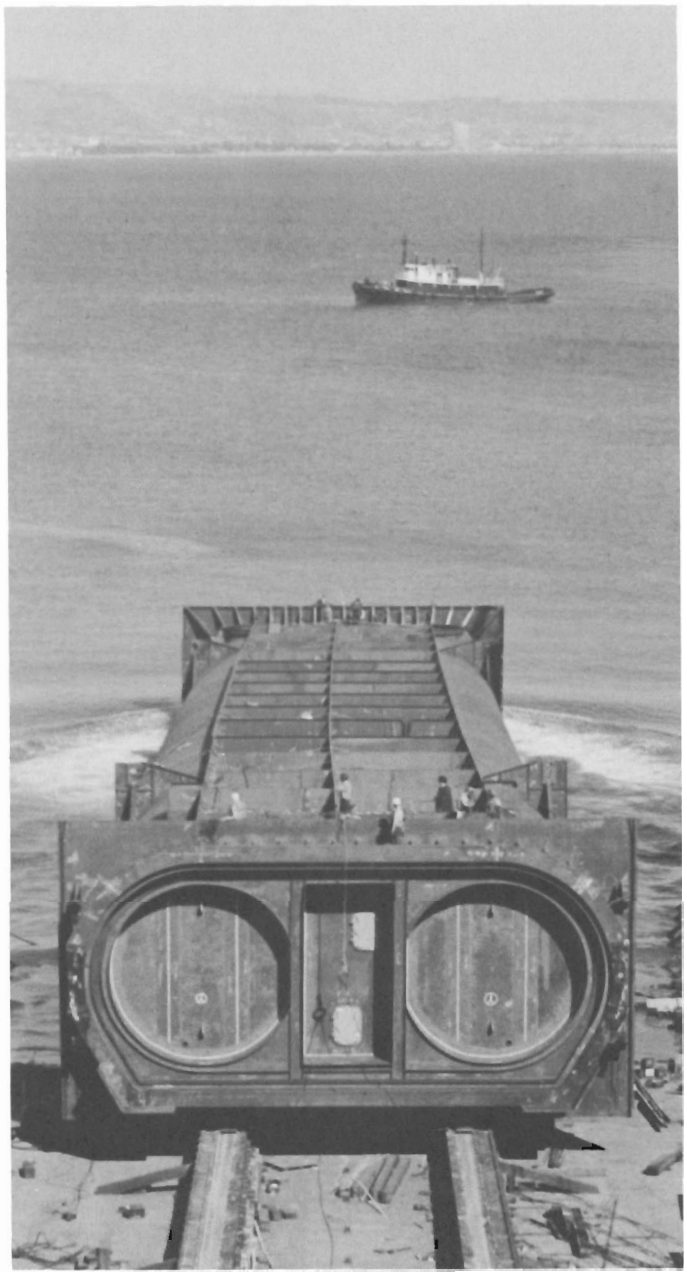


Inside one of three laboratory cars at BART's test track, instrumentation engineers Chet Engle, left, and Matt Zak initiate braking and propulsion test for 1,000-volt DC power system, using HP's 428B clip-on milliammeters.

controls. Quietly the lightweight electric trains will roll at speeds up to 80 mph, all 72 passengers per car seated in large upholstered chairs individually lighted for reading. The air conditioning system will adapt to the different climatic conditions encountered during the trip. Automatic computer-controlled scheduling will bring trains up to 10 cars in length into a station as close as 90 seconds apart during rush hours, allowing a single line to handle as many as 30,000 seated passengers per hour.

According to an estimate prepared for Consumer Reports, a trans-bay BART commuter will be able to park his car at the station near his home, travel 25 miles to work and return, all for an outlay of $1.40. By contrast, the monetary cost for the motorist will average close to $6.15 a day, including bridge tolls, city parking charge, and car expenses at 10 cents per mile for 50 miles.

Because the BART system of automatic controls was completely new, a 4½ mile stretch of the line has been in operation for more than two years as a test track for virtually every element. For example, extensive testing was required to determine the basic power system. In deciding on the 1,000-volt direct current system versus other possible systems, a series of HP 428B clip-on milliammeters was installed in laboratory cars for making dc measurements of the dynamic braking and propulsion system along the track. In another important test, an HP 202A low-frequency function generator was utilized to attain readings of the brake controls.



This section—one of the 57 needed for the four-mile, bay-bottom tube that will link Oakland and San Francisco—awaits launching, towing, and lowering into a trench dredged in the floor of the San Francisco Bay. Built in a San Francisco shipyard, the section's walls are of steel with two feet of reinforced concrete lining.

Bay Area Rapid Transit system will include tunnels through hills, subways under cities, tubes under the bay, and elevated tracks paralleling freeways.

A variety of other HP instruments are also finding application as contracting organizations and suppliers continue their investigations and check-out of components for the transit system.

The real significance of BART-like projects, however, goes far beyond their engineering, construction, and transportation aspects. The very quality of life of the communities they serve will be profoundly affected. Metropolitan centers which have had their resources depleted by the flight to the suburbs should see growth and stature restored, as witness the resurgent downtown development in San Francisco and Oakland. At the same time, property values along rights-of-way in the suburbs will be greatly enhanced, as witness the experience in Stockholm and elsewhere. Such segments of the population as the elderly and those unable to drive or fearful of road traffic will be greatly liberated.

Overall, a greater sense of urban unity and accessibility will result. As President Lyndon B. Johnson noted in an address at the BART groundbreaking ceremony in June, 1964: "Yesterday's frontiers were vast, empty lands waiting to be claimed and cultivated by settlers who crossed a continent to start a new life. Today's frontiers are teeming cities where too many people already lead a neglected life.

"We must develop adequate alternative means of transportation or the coming crisis of congestion may do more to frustrate the growth and development of America than all the burning deserts and barren mountains which stood in the path of our ancestors a century ago." □

HP Perspective:
F&M Scientific Division

□ Perhaps even more complex than the compounds analyzed in the chemical labs of HP's F&M Scientific Division are the many factors which today characterize its facility at Avondale, Pennsylvania.

Acquired two years ago, the division has experienced reorganizations and infusion of HP philosophy and personnel, and has broadened its development efforts to crystallize its position as an important member of the Hewlett-Packard family.

Since its founding less than 10 years ago, F&M's contributions to the then-infant science of gas chromatography (GC), propelled it to a position of instrument leadership in GC, a position of eminence still held today.

While GC was responsible for its beginning, F&M's horizons are broadening. Ed Porter, vice president of Eastern Operations and F&M's acting general manager, said one of the challenges facing the division is that of helping HP attain greater recognition and stature as a major producer of chemical instrumentation. To achieve this goal, he said, "We consider ourselves in the business of analytical instrumentation technology, rather than just GC."

The technological frontiers now being developed at F&M include automatic sample handling, application of

Expanding markets, dynamic

F&M management team checks plans of new research and administration building. From left: Mason Byles, engineering; Bob Kane, finance; Charles Butler, personnel; Ed Truitt, manufacturing; Jim Tebay, marketing; Ed Porter, VP eastern operations and acting general manager of F&M; Aaron Martin, research. Not shown: Gene Bennett of corporate applications.

Arlette Fulmer assembles switch for F&M's 5750 gas chromatograph which ranks as one of HP's top selling instruments. F&M products feature complex pneumatic systems often working at high temperatures.

Dymec's computer to the data processing problems of the analytical chemist, and development of GC detectors which are extremely sensitive to specific compounds—in short, tailor-made analytical instrument systems to help researchers working in specialized fields. As an example, F&M plans a fall introduction of a "redox" (oxygen reduction) attachment to increase the versatility of the present Model 185 carbon-hydrogen-nitrogen analyzer by enabling researchers to analyze for oxygen and eventually sulfur.

The scope and diversity of product lines was increased by transfer to Avondale of several of the former Mechrolab Division's macromolecular products: auto-viscometers, vapor pressure osmometers, and membrane osmometers.

The chemical and petroleum industries rank as the two largest users of gas chromatography. Other typical applications include determining the bacteria-killing agent hexochlorophene in soap, assaying the parts-per-million presence of pesticides in agricultural products, and crime detection.

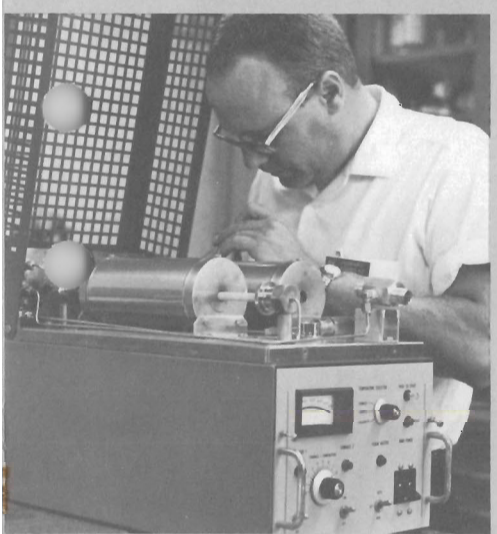
Worldwide, such applications make up a $35-million annual GC-instrumentation market to which F&M is the leading supplier. It's a growing market whose yearly rate of expansion is estimated at 15 percent. Almost two-thirds of F&M's total sales to this market are in the U.S., with the remaining third concentrated largely in Europe.

In its decade of operation, F&M has grown from a part-time basement activity into a large, modern manufacturing and research center employing more than 400 people. This summer, research and development laboratories and administrative departments were moved into a new 44,000-square-foot structure, leaving room for expansion of production facilities in the original 70,000-square-foot building.

F&M is strategically located in Pennsylvania's historic and scenic Chester County, 35 miles from Philadelphia and its many excellent universities. Even more significant, the nearby New Jersey and Delaware areas comprise the world's number one region for chemical manufacturing.

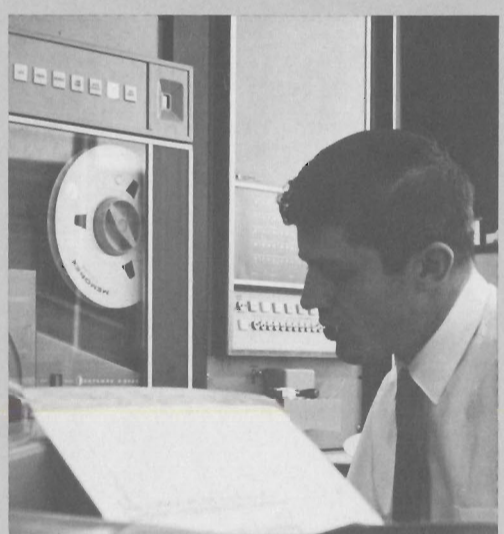
With the transition now history, with constantly expanding markets, and with dynamic product diversification efforts underway, the division's optimism is no longer "cautious." Confidence is not a mood but a way of life at F&M, making it an inspired contributor to HP technology's newest dimension, analytical chemical instrumentation. □

diversification

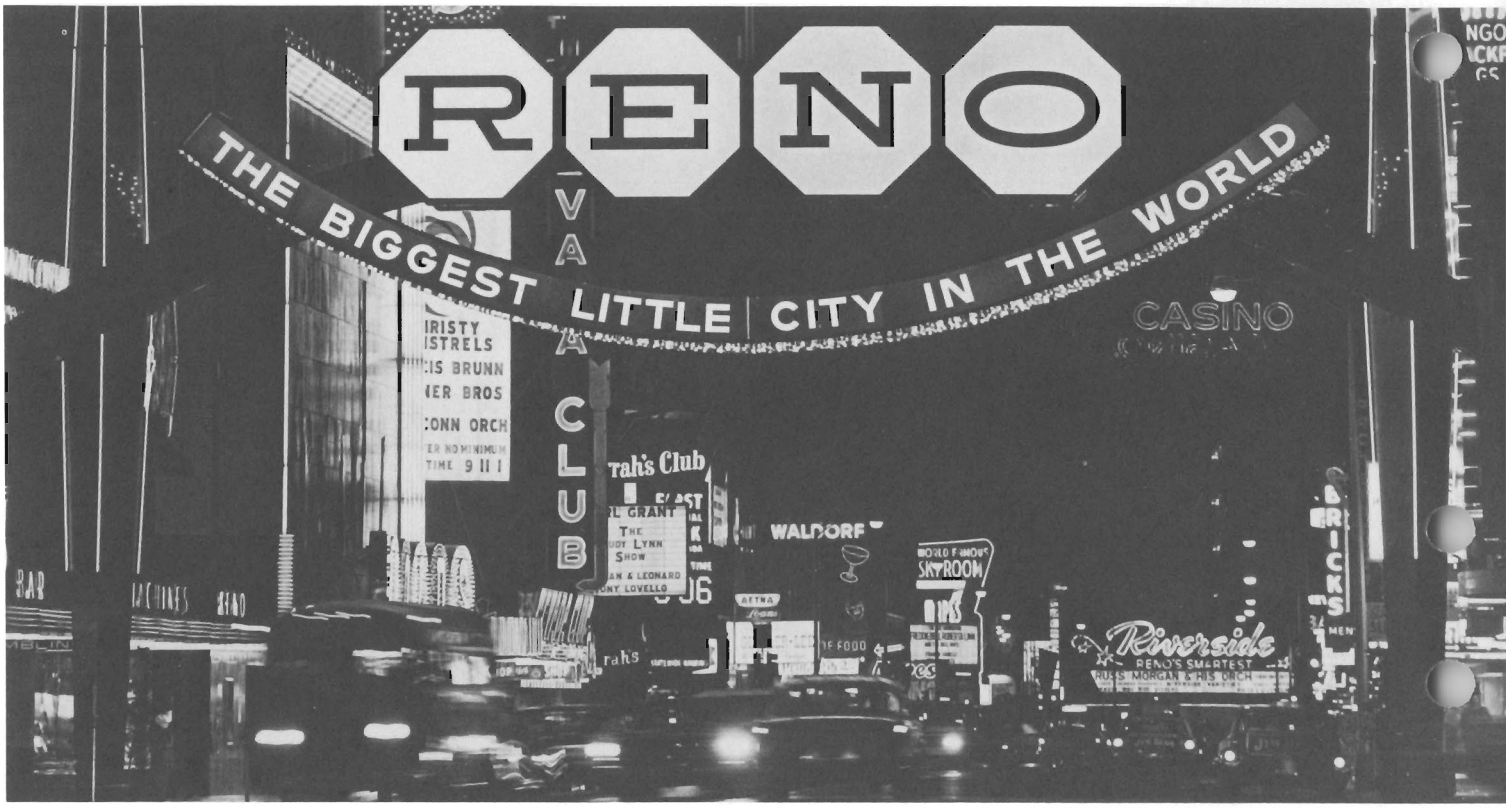


Newly developed Redox unit is checked by Howard Ashmead, supervisor of elemental and macromolecule section. Device can be added to Model 185 analyzer to enable it to check for oxygen and eventually for sulfur in addition to carbon-hydrogen-nitrogen tests.

Final test on Model 402 high efficiency chromatograph is made by test technician Jack West. All instruments are put through rigid check-out procedures before shipment to customers.



Dymec computer in background figures in project involving the application of computer technology to problems of chemical analysis. Here, Irme Radvany reviews programming.



□ Greek mythology has it that Palamedes invented money. Then, during the seige of Troy, he invented dice in order to relieve his troops of both their boredom and their surplus cash. This businesslike approach is nowhere better exemplified than in the casinos of Nevada, and no casino operator in that state is any more businesslike than Bill Harrah.

As sole proprietor of major operations at Reno and Lake Tahoe, Harrah is concerned 365 days of the year with the performance of many hundreds of employees, scores of different types of games, thousands of gaming devices, lavish big-name entertainment, an army of visitors each day and facilities to feed them in style. Like the sound businessman he is acknowledged by contemporaries to be, Bill Harrah has taken the lead among Nevada casino licensees in putting electronics to work on an important scale in the management of these many ingredients.

Heart and center of this approach is the computer room, located in the recesses of a quiet Reno building one block away from the bustling casino. Here a GE 415 electronically computes the daily contribution of each slot machine and pit or table game.

The Harrah's accounting process for a particular slot machine, for example, begins when the simple electronic counter device atop the machine records the new total whenever a jackpot is hit. In paying off the jackpot, the change girl marks a special "mark sense" card which she turns into the booth for more cash. At shift's end, her cash and the booth's cash and cards are tallied. Finally, the day ends at 4 a.m. in the casino count room where reports from all preceding shifts are compiled and taken to the computer room.

The computer run can tell a great many things about a machine's performance. First, using an audit-by-exception method, it can tell whether any discrepancy exists between cash, cards, and the counter. Jackpot fraud by insiders would thus be quickly spotted.

Al Linnen, electronic systems engineer who was brought in by Harrah seven years ago to institute electronic programs, says the analysis report of the computer is important in other ways.

Slots take severe treatment from patrons day in and day out, and they can become "tired" to the point where they pay too much or too little.

"While there is a limit to the degree of control we can establish in a machine," he said, "our analysis quickly tells us if there has been any erratic behavior that needs correction. The same goes for the other games."

Electronic controls play an increasing role in the actual operation of Harrah's gaming machines. Linnen has designed such hardware as the logic circuit for a coin-sensing device, the logic for a two-coin input device, the logic for a giant slot machine that has become a Reno landmark, and the circuit for the lights that flash signals to the change girls to hurry up with a fresh supply of coins.

Important use is made of Hewlett-Packard products in these various phases of Harrah's electronic programs. A 175A oscilloscope is in constant attendance at the computer room to perform any trouble-shooting analysis that may be needed for the computer itself. In the development

BILL HARRAH: The "King of Nevada gamblers" takes no chances, electronically speaking

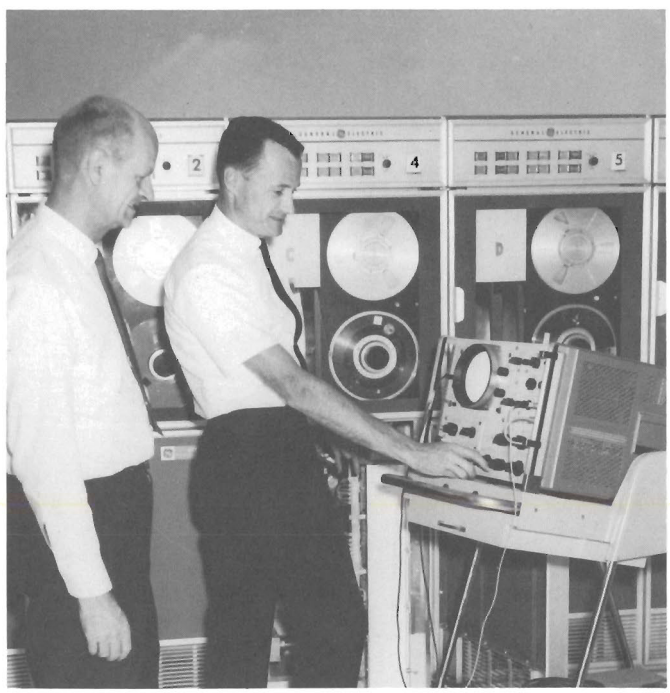
of circuits, Linnen makes regular use of a 410B vacuum tube voltmeter because of the versatile functions it provides. In addition, Paeco coils are incorporated into various devices designated for Harrah's machines.

Security is obviously highly important at all Nevada casinos. Las Vegas casinos, for example, are reported to have cameras ready behind one-way mirrors to film any suspicious action spotted by detectives. In the casinos which report jackpots over a PA system, the machines are all wired into a master system which flashes the news on a big board and triggers a tape recorded voice which announces the machine and the amount. Later, a tape of these announcements is monitored and checked against receipts from each cashier. It is common practice, too, to microfilm keno cards in advance of a game to forestall forgeries.

However, the desire to win easy money that is at the base of gambling's appeal also inevitably harbors a strain of larceny. Somebody's always trying to beat the system. Years ago, there actually existed in Nevada an underground school for slot machine busters. Students were taught to drill, probe, and magnetize slot machines to achieve instant jackpots.

Alert to such human failings, Linnen ran a test as soon as he heard of a super magnet—very powerful but compact—that might possibly be used to affect the roll of dice or the workings of a slot machine. The magnet flunked.

And so, most likely, will every other device—except luck—if the gaming industry's engineers have their way. □



Al Linnen (left), electronic systems engineer at Harrah's, and Bob Swan, GE computer technician, use an HP 175A scope for routine maintenance check of Harrah's data processing machines. Complex casino accounting is a daily task for the computer center. Linnen also uses an HP 410B voltmeter at a high-security, out-of-town laboratory to test prototypes of new gaming devices.

News in brief

Palo Alto—In June, HP set a new monthly record for orders, with a total of more than $24-million. The June performance broke a short-lived record of $21.8-million set in April.

San Francisco—Wescon/67, expected to attract 40,000 electronics professionals to San Francisco's Cow Palace, is scheduled for August 22-25. HP will introduce three dozen new electronic instruments at Wescon—the Western Electronic Show and Convention, which ranks as one of the world's largest technical events. Jack Beckett, HP's government relations manager, is Wescon convention director.

Palo Alto—On July 21, HP directors declared a regular semiannual dividend of 10 cents a share on the company's common stock, payable October 17 to shareowners of record October 2.

Denver—At the National Association of Accountants' recent national convention here, the Peninsula-Palo Alto chapter was awarded the coveted Stevenson trophy. This year 169 chapters competed for the trophy, given annually to NAA's outstanding chapter. Ernie Brioza, HP's corporate tax manager, received the trophy on behalf of the chapter, of which he was president.

Palo Alto—Emery H. Rogers has joined HP to manage the company's activities in the field of chemical instrumentation. Rogers, formerly a vice president of Varian Associates, is headquartered in Palo Alto.

Mountain View—HP's customer service organization has been restructured to improve and speed up the repair of customers' instruments. Each sales region will have a regional repair center at its headquarters location to handle repairs and to provide additional, "close in" support for all field offices within the region. The Western Service Center at Mountain View is now a corporate customer service facility, providing worldwide back-up on complex instrument repairs, replacement parts, and service information. Replacement parts will be distributed from stocking points in Mountain View and Rockaway. Inventory control and information processing will be provided by computer in Palo Alto.

Washington—Bill Hewlett, a member of the President's Science Advisory Committee, and three high Washington officials recently were sent by the White House to Western Europe. There they conferred with leaders in the capitals of six nations on better ways to exchange and apply peaceful technological developments and to improve technological cooperation between the U.S. and Western Europe.

New York—This year's *Fortune* magazine directory of the country's 500 largest industrial corporations shows HP, with 1966 sales of $203.3-million, ranked 341st, vs. 365th last year. The company ranks 241st in net income and 20th in earnings growth over the past decade, with an annual earnings-per-share growth rate of 21.65 percent.

People on the move

Corporate—To physical electronics lab from chemical and medical instrumentation research lab: Fritz Baur, Claus Hyllested, Don Norgaard and Pat Peterson. To electronics research lab from chemical and medical instrumentation research lab: John Eichorn, Bill Hanisch, Mike Lindheimer, Dave Mann, Dave Sidlauskas and John Walter. Russ Becker, to corporate finance, from finance manager, Loveland; Don Lutz, to product training, corporate marketing, from customer service manager, Southern Sales-Orlando.

Delcon—Ron Lowe, to engineering, from engineering, F&T.

Dymec—Jerry Carlson, to finance manager, from manager, Western Service Center.

Eastern Sales—Rich Jobin, to staff engineer, Rochester, from sales engineer, Rockaway; Chuck Innes, to medical field engineer, from staff engineer, Syracuse.

F&M Scientific—Mason Byles, to manager, research and engineering, from manager, manufacturing engineering; Aaron Martin, to manager, advanced research and engineering, from manager, research and engineering.

F&T—Bob Lorimer, to glass blower, frequency standards, from physical electronics lab, HP Labs; Rudy Papiri, to cost accountant, from internal auditor, Neely-North Hollywood.

International—Mollie McRae, to secretary to export marketing manager, from secretary to manager of chemical and medical instrumentation research lab, HP Labs.

Loveland—Steve Ford, to finance manager, from corporate finance; Charles Near, to development engineer, R&D, from corporate R&D.

Microwave—Steve Shank, to engineering, from engineering, Dymec.

Neely Sales—Jack Bringham, to internal auditor, North Hollywood, from corporate finance; Bill Gross, to computer specialist, North Hollywood, from corporate marketing.

Sanborn—Harold Norman, to marketing manager, from marketing services manager.

Southern Sales—Phil Carter, to computer specialist, Atlanta, from Huntsville; Delores DeGraff, to executive secretary to business manager, Atlanta, from secretary, High Point; Mettie Ferguson, to executive secretary to regional manager, from secretary; Niles Howard, to special projects, Atlanta, from assistant order processing supervisor, Orlando; Don Kurtzahn, to accounting/operations manager, Atlanta, from business manager, Orlando; Bruce Meyers, to customer service manager, from field engineer; Bill Smith, to purchasing and supplies manager, Atlanta, from supplies manager, High Point; Virginia Thornton, to order and credit manager, Atlanta, from order processing supervisor, High Point; Frances Willard, to order processing supervisor, from order department.

from the chairman's desk

Instrumental to the success of any business enterprise, whether it be a corner drugstore or a large industrial firm, is its consistent ability to anticipate and fulfill the needs of its customers. This is why our company, down through the years, has placed so much emphasis on building a strong field sales organization, one that is sensitive to customer needs and can effectively interpret those needs to the people in our laboratories and factories.

With the rapid growth of our markets and product lines, the role of the individual field engineer has become increasingly important. At the same time it has become considerably more difficult. With 180 sales offices extending from Palo Alto throughout the United States and overseas, communication lines have been lengthened. An expanding technology has made our instruments more complex and made it more difficult for the engineer to keep abreast of customer requirements. Moreover, as we have entered new fields of instrumentation, we have encountered increased competition, much of it provided by well-entrenched, highly successful companies.

All of these factors have affected our marketing environment, and made it necessary for the field engineer to bring a higher degree of initiative and professionalism to his job than ever before. It is no longer possible, in these days of fast-moving technology, for an HP salesman to do an effective job unless he is adequately trained, is constantly upgrading his technical knowledge, and is seeking ways in which he can apply that knowledge to the successful solution of customer problems.

It is gratifying to note that our field sales groups are meeting these new challenges with a great deal of determination and resourcefulness. With the aid of our central marketing staff, they are stepping up their recruiting efforts and strengthening their training programs. They are developing ways to use personnel more effectively, to improve communications, to increase operating efficiency, and to provide better and broader service for our many thousands of customers.

The results of these efforts are readily apparent. In my vists to our various sales offices, participation in seminars, and through other contact with our field sales groups, I am convinced that we have one of the most capable sales organizations in our entire industry. But I am equally convinced that we must continually strengthen the organization and provide it with the fullest support from our manufacturing divisions.

That support can be generated and maintained if we all recognize that the individual field engineer is the primary link between the customer and the company, and that our ultimate success depends upon his day-to-day performance. To the customer he *is* Hewlett-Packard, and in this unique and challenging role deserves the very best support we can give him.

David Packard

Measure

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Merle Mass

ASSOCIATE EDITOR
Les Carpenter

ART DIRECTOR
Tom Martin

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Vintage Collection

It may seem a little early in HP's history to begin enshrining models of older instruments in museum cases. Nevertheless, Western Service Center people feel it is time to begin a collection of increasingly rare company products and make it available for exhibits and promotional displays. Spearheading the move is Scott Grundemann, WSC quality assurance manager, who began the collection by sorting through the shelves of old equipment held in inventory. Out of this—along with exchanges from such interested customers as Stanford Research Institute—has emerged a gathering of some 15 vintage instruments. Included is one of the original signal generators, a Model 200, serial number 12, which likely was manufactured in the historic Palo Alto garage. Another is a Model B signal generator produced for the Naval Research Laboratories in World War II. During their off hours, WSC technicians have restored six of the instruments to mint condition. A companion project involving products of the Eastern manufacturing divisions is under discussion at Eastern Service Center. Some of the items—particularly those of wartime—plainly show the influence of the local hardware store in such components as handles. But, as Grundemann put it, "In spite of all the changes that have taken place, quality is still very evident throughout."