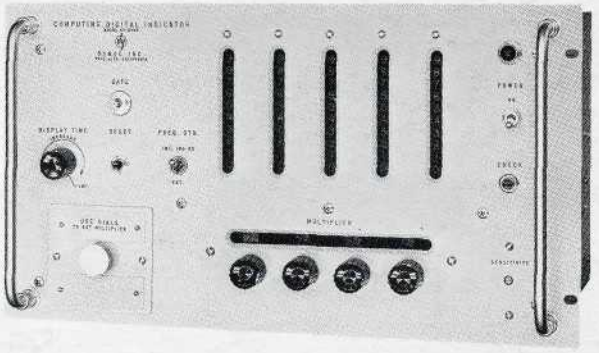
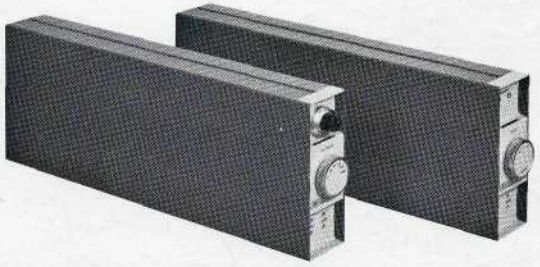
the first ten years of DYMEC



1956



1966

On January 3, 1956, a company, Dynac, was formed. Its original purpose was "to carry on a business of measurement system engineering and custom-designed instrument manufacture, sometimes utilizing as components measuring instruments regularly marketed by Hewlett-Packard Company." In 1959 this company, formerly owned jointly by its own and HP employees, and by the Hewlett-Packard Company, became an HP division.

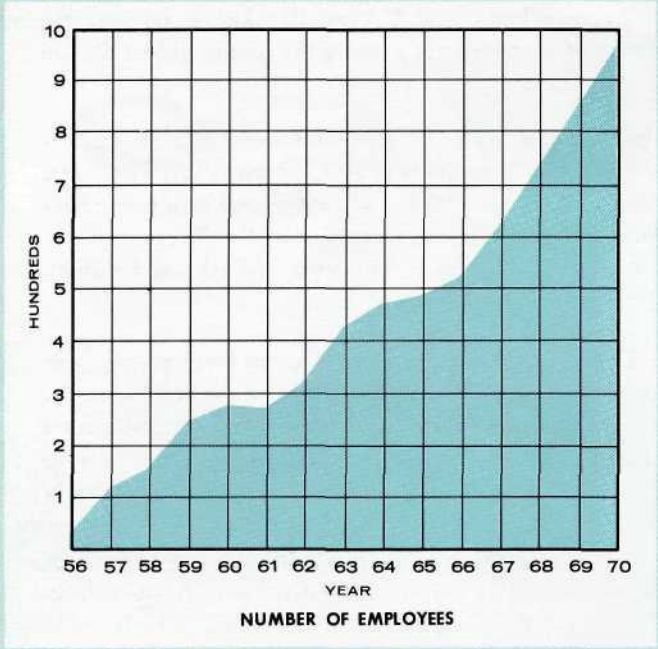
This year, on the tenth anniversary, the employees of the Dymec Division can look with pride at their accomplishments. Many can recall obstacles and significant problems, particularly during those years in which our business was almost entirely custom systems and instruments. But out of this has come a Division which is a recognized leader in data acquisition systems.

The quality of the job that is done by each person today determines our tomorrow. The two and a half times growth in the past five years is a recent measure of the enthusiasm and the quality of the job that was done each day. The opportunities of the next five years and the future are just as great.

This booklet commemorating our tenth anniversary describes some of our past and present products and facilities. But it is mainly about people — the people that have and are making the contributions that are creating our tomorrow.

Bob Graves

Dymec early employees, L to R Lois Ghan, Bob Grimm, Don Loughry, Rose Carson, Truman Boston, June Hall, Dave Stead, Ven Franco.



More of Dymec's early employees, L to R George McClelland, Nellie Monsees, Chris Drysdale, Zella McFadden, Myrt McClintock, Bob Knapp.

Dymec People and Early Events

The thing that makes a company tick is people. Policies must be established for ease of company maintenance, but people make it go. Dymec is very fortunate to have a whole company full of people, some of whom date back to the earliest of Dynac's days, and some of whom don't. Tying places and events together with people paints an interesting picture of our growth.

Dynac's original employee and general manager was Bob Rawlins. He set up shop in the front office of the Redwood Building (the building familiar to most *–hp–* people as the original *–hp–* building) located at the corner of Page Mill and Ash Streets. A couple of offices and a desk were at one end of the original room and way down at the other end were benches for development engineering and production . . . nothing was in between. The operation grew from there. The company purpose was to build modified versions of *–hp–* instruments and complete systems to fit specialized customer applications.

The original engineering department was a guy named Jack Humphries, and the wiring and assembly department (now called Manufacturing) was two people: George McClelland and Nellie Monsees. To provide direction for this large staff, Bob Grimm was commissioned (in responsibility, if not in name) to Production Manager. George Climo set up Dynac's books and did the Accounting, Contract Sales, Publications, and the many jobs necessary to business management.

In order to properly fulfill the requirements of a manufacturing operation, products must be produced and eventually shipped. A special type of counter, a "computing digital indicator" (Model 2500) was the product which had been under development. George McClelland organized a run; two assembly benches were filled with parts; Nellie wired, George assembled; Humphries tested; Grimm directed the operation and Rawlins managed and looked for new buisness. The new company called Dynac was established and in business. When asked what he remembers most vividly about early Dynac, George McClelland said it was: "The thrill of starting with a new company. Everyone I talked to thought the company had good potential." Very shortly, wiring and assembly gained Lois Ghan and Zella McFadden.

Simultaneously with the 2500 run, a standard *–hp–* Model 522 Counter was being repackaged into a different shape at *–hp–* by Dave Stead. Dynac provided a reasonable outlet for this specialized equipment, so Dave took this job and a specialized microwave system being done for Bendix-Pacific and transferred temporarily to Dynac engineering for completion of the projects. Dave was loaned to Dynac for two weeks, and as far as he knows he is still on loan. The first thing Dave remembers about Dynac is Bob Rawlins asking him to buy a refrigerator to keep beer in. "I was going to buy a $20 refrigerator and keep it stocked at all times in the summer months to keep us cool, since we didn't have any air conditioning. When Bob couldn't put that idea over with *–hp–*, he had his wife come around every summer afternoon with iced tea."

About this time Bob Adam came to Dynac on loan to test the repackaged 522. He, however, returned to *–hp–* and returned

to Dynac a year or so later. John Hasen came aboard as a project engineer, and Truman Boston joined to test the Bendix system. Truman and another technician moved into a small room which was closed up for classified work. "The door into the room was always closed so you couldn't see anything that was going on, and the room didn't have any PA system or phone. One day while we were in there, there was a fire in the machine shop right across the aisle from us. We heard all the bells and people, of course, but we didn't know what was going on. We really tore out of there when the fire trucks came."

Exact dates have a tendency to get lost with time, but in the ensuing few months, the company got larger. June Hall joined to load PC boards, Myrtle McClintock set up pre-fab, and Christine Drysdale provided necessary extra help in production. June remembers, "the close feeling, working together with a small group." Myrt remembers, "the confusion after so much order at –*hp*–." (She now sees more order.)

The product line grew. Six or seven months after Dynac's founding, new engineering projects were afoot and the company needed more people. Bob Knapp joined engineering and became Dynac's first direct hire (all other employees were –*hp*– transfers). He worked on the 5001 Boeing Wind Tunnel System. Nellie Monsees remembers Bob needing a breadboard of one of the system components. He gave Nellie a schematic and a box of parts and said, "go." Nellie, of course, was used to –*hp*–'s wiring sample technique and didn't read schematics. She didn't want to look uneducated to this new-hire so she took a quick course in schematic reading from Humphries and Hasen and finished her first breadboard.

Don Loughry, our Engineering Manager, joined Dynac as the test group in the fall of 1956. A special jet engine test set for Northrup was his first assignment. One of Don's vivid recollections is taking inventory with George Climo and a bunch of other guys on Christmas Eve.

New "standard special instruments" were set up for production. The 5003 X-Band Test Set, 2200 Oscillator for Ling, and the 207 Oscillator were put into the mill, more special systems were contracted and built . . . and the Dynac operation grew.

Rose Carson and Ven Franco remember working with early Dynac products, although they did not join the payroll until 1957 when Dynac was over 1 year old. Ven's first recollection of Dynac is the Christmas Party in the Redwood Building. "It was a lot of fun. We used to work hard too, anywhere from 10 to 12 hours a day trying to meet our schedules." Rose tells the story about the crash when a customer wanted something extra engraved on a system front panel at the last minute. "The engraving machine had to be brought to the hardware because the system was a special and everything was already finished and in place and painted, and ready to ship out the door. The engineers were there helping to hold everything in place, and we did get the shipment out on time."

In the early months of 1957 Byrd Beh became the first person assigned to the Dynac sales department full time. Shortly after Byrd began doing contract and correspondence work, Ed Morgan (later to become Sales Manager) started sharing his time between Dynac sales, –*hp*–, and the U.S. Army.

As Dynac got larger, job functions became more specialized. Beg, borrow, and boondoggle policies regarding equipment, parts, and manpower became less of a way of life. Dynac got more organized and in mid-1957 even incorporated. At about the time of the incorporation, physical expansion was taking place. Dynac took over the entire Redwood Building, which added 5,000 square feet of floor space to the existing 1,500. Bob Grimm remembers this expansion as, "All of a sudden people could move around again." Bob Knapp remembers being cooped-up in the one little room in the Redwood Building . . . "The whole Dynac engineering, production, and administration staff, and then in about November –*hp*– vacated the room next door for us. The floor got polished one day and I recall Bob Rawlins saying it would be a great place to have a dance. So, that night, the Dynac employees and their wives or girl friends and some –*hp*– people were invited to a dance in that area. A punch bowl was brought in and I can recall Bruce Wholey and Ed van Bronkhorst pouring the Vodka and one of the gals pouring the orange juice. We had a great time that night."

We also gained a second building on Olive Street. This building was given the magnificent name, "Dynac Plant Two," and at this site, the 2500s, 207s and 2000s were produced. Subsequent moves put Dynac people into the "Pepper Street Building," the stockroom at the corner of Park and Lambert, and other buildings on Park.

Early Dynac, with a population of some forty people, was supported in the field by a sales staff in excess of 100 people. Dynac was never at a loss for good ideas and suggestions on products to invent and manufacture. Sales get-togethers were extremely active exchanges of ideas on what Dynac really should build.

Soon the Dynac name was changed to Dymec, and a year later the independent company became a division of Hewlett-Packard. Dynac got its own personnel department in early 1959. Prior to this time everyone did his own hiring. The organization structure got its first major change in 1960 when Cort Van Rensselaer took Dymec's reins as General Manager. The products gained additional standardization.

In June 1960 Dymec engineering and administration groups moved from the Redwood Building to the present "sawtooth" building (Bldg. 8). Additional facilities were added; we expanded and became more efficient, more profitable.

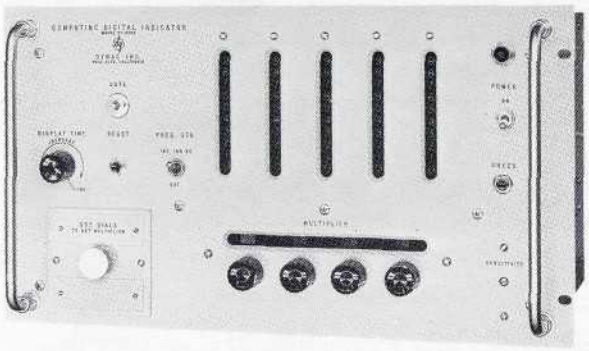
General Managership changed again in February 1961 when Bob Grimm succeeded Cort who moved to manage the 'Scope Division. Bob's manufacturing position was filled by Vic Buell, then Karl Schwarz, and most recently Frank Wheeler.

While the past is of interest, the future holds at least equal interest. Many of the people who helped mold Dymec's character are still here and elsewhere in the –*hp*– organization. The company outlook has varied from dreary to excellent, but the record of accomplishment is one to be proud of . . . and the feeling at Dymec is a proud one. The future of the company is in its capacity for accomplishment, and this is Dymec's strong suit.

Dymec Products — Past, Present and Future

THE BEGINNING: As the old-timers will recall, Dymec owed its start to the Hewlett-Packard Company's need for a small, flexible organization which would be more suited to building systems based on standard and modified *–hp–* instruments, plus special instruments and purchased items as might be needed to fulfill a given customer requirement. The fledgling company's product line was "Instrumentation," which left those few early employees plenty of room to maneuver in.

OUR FIRST INSTRUMENT: Dymec's first "catalog" instrument was the DY-2500 Variable Time-Base Counter — we have a data sheet dated January 31, 1956! Using proven *–hp–* counting techniques, but with the addition of a manually presettable gate time, the 2500 enabled outputs of tachometers and flowmeters to be displayed in useful engineering units such as rpm and gpm. In view of its scale factoring and normalizing capabilities, the 2500 was later given the more impressive title of Computing Digital Indicator.



DY-2500 Computing Digital Indicator — Dymec's first standard instrument.

Other counters followed from the 2500 — a 2500N which offered then-novel in-line digital readout instead of the usual columnar neon display; the 2503A/B Telemetering Counters (1957) which provided normalized readings of FM/FM telemetry subcarriers; and the 2507 Dual Preset Counter (1958) which compared the counter reading against preset upper and lower limits for go/no-go checking.

DIGITAL VOLTAGE MEASUREMENTS: The year 1958 saw Hewlett-Packard's first step into the field of measuring analog quantities by digital techniques with the introduction of the DY-2210 Voltage-to-Frequency Converter. In fact, the 2210 could be considered the seed that led to Dymec's entry into digital data acquisition systems.

Introduced in 1958, Dymec offered DY-2210 Voltage-to-Frequency Converter in both cabinet and rack-mount versions.

The DY-2210 introduced a completely new circuit technique to convert dc voltages to proportional pulse rates that could be counted on a conventional electronic counter. Normal gate times decimally related to 1 second gave a readout in voltage, whereas a variable time base counter such as the DY-2500 allowed voltage outputs from transducers to be displayed directly in engineering units. The 2210 and its companion

Dymec's latest voltage-to-frequency converter, DY-2212A, will be introduced in early 1966.

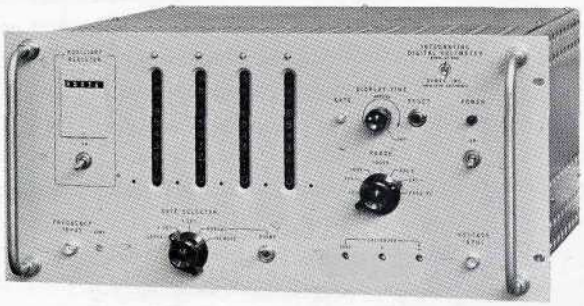
instruments, 2211A and B, are still with us, soon to be joined by a completely new voltage-to-frequency converter, the 2212A.

THE ILLUSTRIOUS 2401: Certainly Dymec's single most valuable product, in terms of both dollar-volume and contribution to the measurement art, is the DY-2401 Integrating Digital Voltmeter.

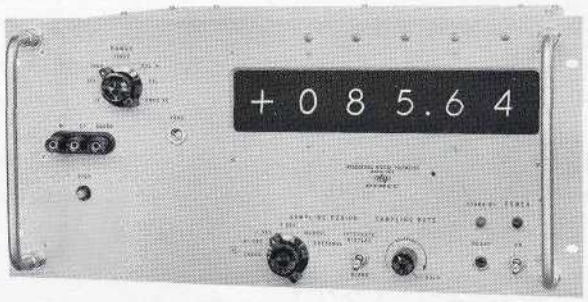
Formally introduced at the 1960 IEEE (then IRE) Show, the DY-2401 was the first of a new kind of digital voltmeter, using a novel integrating technique to average out noise superimposed on the signal, and guarding to eliminate common mode noise. With these two features, the DY-2401 was the first commercially-available digital voltmeter capable of making accurate measurements in the presence of noise. The value of these features has been graphically illustrated by the number of guarded, integrating digital voltmeters now on the market.

Although a by-product of the 2401's basic design, its ability to operate as a counter for frequency and (optionally) period measurements gave it yet another unique sales advantage over other digital voltmeters.

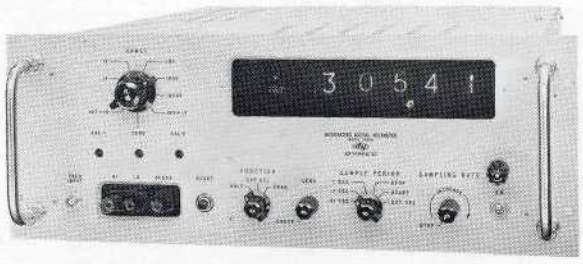
Many improvements have been incorporated in the 2401 through the "A," "B" and now the "C" versions. (The latest 2401 advertisement tells that there have been 135 production changes!) When it started out, the 2401 had an 8¾ inch panel, rolled handles and a 4-digit columnar neon display. Improvements in packaging reduced panel height to 7 inches, new handles were used to harmonize with the modern *–hp–* look, and a 6-digit in-line display became standard. These changes, plus many improvements in performance and added measurement capabilities through options and accessory instruments such as the 2410B AC/Ohms Converter, 2411A Amplifier and 2417A Data Linearizer, have enabled the 2401 to continue to sell strongly after six years of fierce competition. Eventually, as with all instruments, the 2401 will gracefully make way for newer products, but because there are still many things the 2401 can do which other instruments cannot do (let alone do better) we can expect it to be around for quite some time to come.



The Original 2401. (Note resemblance to 2500 counter.)

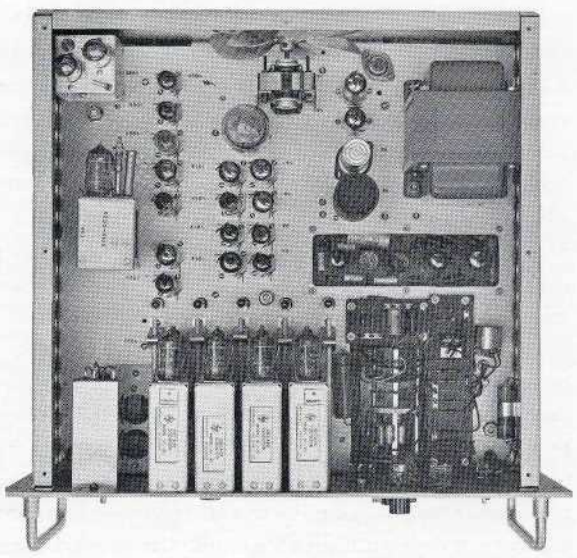


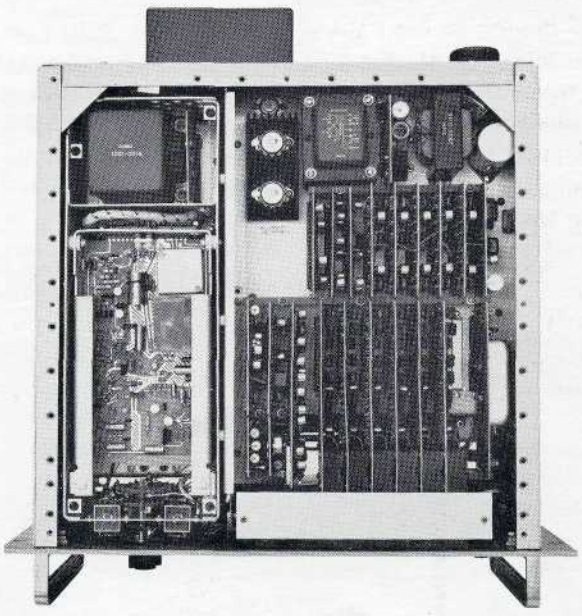
DY-2401 as it looked in 1960. This version provided 5-digit in-line readout, and guarded input.



In 1962 DY-2401A was reduced in size, front panel layout improved.

Latest of a long line, DY-2401C sports 6-digit readout with the modern look.

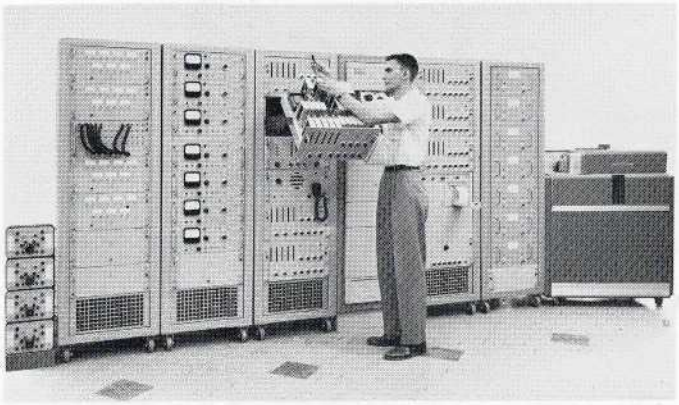




Contrast in construction techniques, 1959 to 1965; DY-2401 all-tubes to DY-2401C all-transistors.

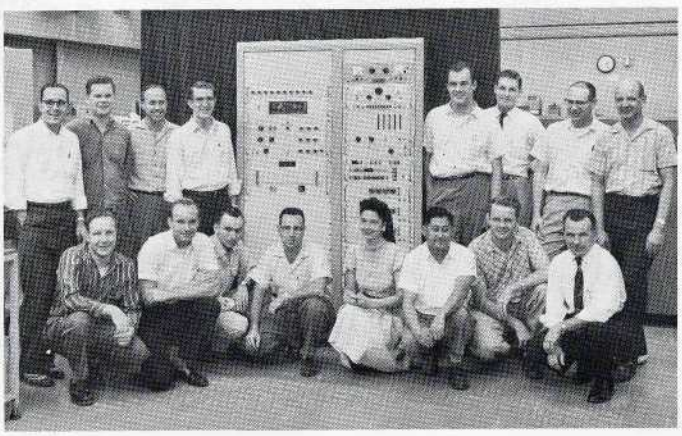
DATA ACQUISITION SYSTEMS: As long ago as 1957, Dymec jumped into the systems business with both feet in the form of the DY-5001, a 6-bay system supplied to Boeing for multi-channel pressure measurements. Pressure data from fifty transducers was recorded simultaneously on magnetic tape, played back for measurement by a bank of –*hp*– 500B Frequency Meters, and recorded on an –*hp*– printer and IBM card punch. Our project engineer on the DY-5001 is still with us and he well remembers the headaches this one caused.

However, not all of Dymec's efforts were on such a grandiose scale, and during this period the ground work was being laid for Dymec's present building-block approach to manufacturing systems.



Dymec's first data acquisition system, the DY-5001 Data Handling System.

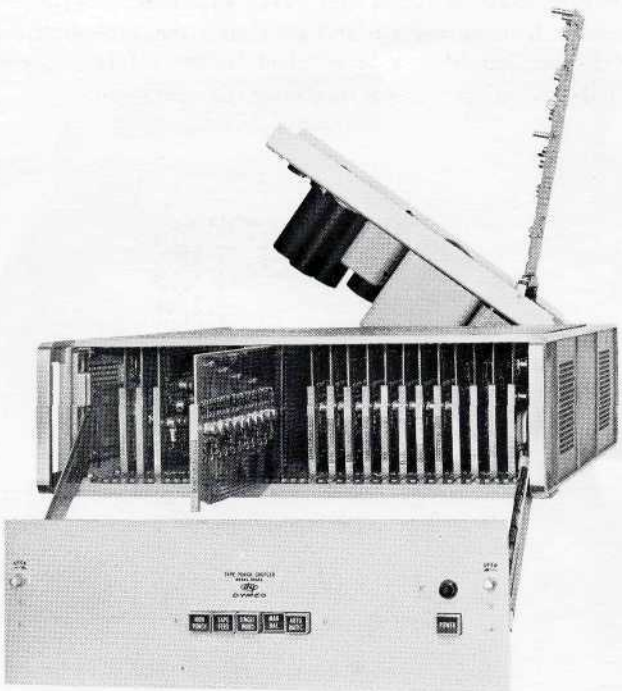
Two key instruments, both still in our product line, were the DY-2530 Binary/Decimal Register and the DY-2540 Coupler. The 2530 (1958) transferred information from digital sources, typically –*hp*– and Dymec counters and the –*hp*– 405 digital voltmeter, to various parallel-entry digital recorders, which included IBM card punches, the –*hp*– printer, Dymec digital comparators (2531, 2532, 2538) and Dymec digital displays (2533, 2536).



Dymec designed two 'highly special' component test systems for Boeing in 1960. Photo shows DY-5573, for testing diodes and zeners.

The DY-2540 performed a similar task, except that it was designed to operate with serial-entry digital recorders, most commonly a tape punch and/or IBM typewriter.

While the DY-2530 and 2540 continued to provide yeoman service, the need arose for more modern output couplers which would include data storage capability for faster overall system operation. First of these was the DY-2545 Tape Punch Coupler, introduced in 1962. This was followed by the DY-2526 Card Punch Coupler in 1963, and by the DY-2546 Magnetic Tape Coupler in 1964. Transistor circuitry was used throughout these couplers, which were packaged in the front-access "card-cage" enclosure now widely used in Dymec instruments.



'Card-cage' construction now widely used in Dymec instruments. (Photo shows DY-2545A Tape Punch Coupler.)

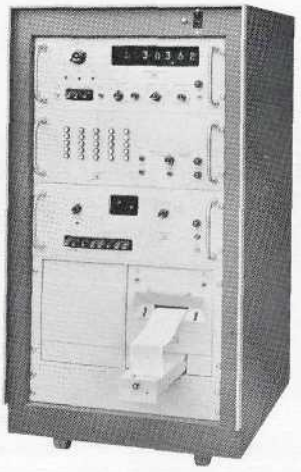
Along with development of output couplers, work progressed on building blocks for the input end of the system. The DY-2901 (1961) was Dymec's first standard signal input scanner; it provided several new features such as pushbutton selection of channels to be scanned, and built-in system programming capability. Dymec's increasing interest in systems operating with low-level transducer signals led to the introduction of a fully-guarded crossbar scanner, the DY-2911 (1962), and in the same year a low-cost scanner, the DY-2900, was developed for use in "economy" systems.

STANDARD SYSTEMS: In 1962 Dymec scored a "first" in the data acquisition market that was to shape Dymec's subsequent product emphasis and also influence our competitors' method of selling systems.

Manufacturers of data acquisition systems had been talking for several years about "building-block instruments" for easy assembly of systems to fill specific customer needs without special engineering, but in practice, the customer was supplied

with a custom-engineered system, and paid the commensurate price. And at Dymec the idea of standard systems that could be sold by our field sales engineers from a data sheet, just like an instrument, instead of through lengthy consultations with the factory, had been debated for some time.

We finally decided "let's do it," and so a series of systems which would use the DY-2401 voltmeter as the digitizing element was mapped out. The first system, the DY-2010A, was formally introduced, with a fully-specified and priced data sheet, at the 1962 Wescon show. The 2010 combined a 2901 scanner, 2401 voltmeter, and –*hp*– 562A printer. Between Wescon and the following IEEE show the series was expanded to six systems, providing the customer with a choice of printed strip, perforated tape and punched card recording, with two different scanners (2901 and 2911) plus many standard options such as ac voltage and resistance measurements, low-level signal amplifier, a digital clock for time-of-day recording and data logging at preset time intervals, and so on.



The first standard system, Model DY-2010A, as it appeared in 1962.

Subsequently (1964 IEEE show) two more systems were added to the 2010 series which provided a digital magnetic tape output, with a view to the rapidly growing number of customers interested in processing their data on a magnetic tape entry computer. At that point Dymec could offer a customer three different kinds of recording medium for computer entry plus a simultaneous "hard copy" (printed strip) for direct reading.

Since then the DY-2010 systems have been made increasing versatile by the addition of many options, including a programmer which operates from instructions coded on punched tape (DY-2560A). This programmer offers the user a degree of system control otherwise obtainable only by use of a computer; besides selecting channels to be measured and all measurement conditions, the 2560A is able to change its own program sequence as a result of the actual measurements obtained.

Current standard system, DY-2010J, features crossbar scanner and computer-compatible magnetic tape output.

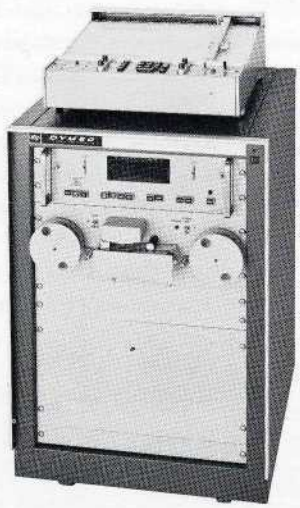
The standard systems product line has also been expanded by the addition of three more series. The DY-2015 series closely parallels the 2010s, but employs the –*hp*– 3460A digital voltmeter as the digitizing element. The 2013 series, utilizing the less expensive –*hp*– 3440A digital voltmeter, is designed for situations requiring less system, at lower cost. Most recently the DY-2017 series has been created, patterned also after the 2010s, but incorporating the 2417A data linearizer for direct readout of transducer measurements in engineering units.

Example of standard 2010 system (1965) expanded to 2000 channels, with on-line plotting capability.

DATA PLOTTING: Not long after *–hp–* acquired the F. L. Moseley Company, it was decided that it would make the most sense to have them concentrate on the manufacture of instruments—X-Y plotters and associated devices—and transfer their small-scale systems operation to Dymec. That is how Dymec got into the data plotting business back in 1961.

The technical problems consequent on taking over a new product line proved less severe than those of entering a new product area—computer peripheral equipment—where the Hewlett-Packard name was not an open sesame. Dymec set up two series of plotting systems, the 2030 series which plotted data recorded on punched cards or punched tape, and the highly sophisticated 2035 systems which operated from computer-prepared magnetic tapes. The 2035 was necessarily an expensive item, and it was found that we just did not have the market penetration to effectively sell a product in this price range. The 2030 systems, however, gained some acceptance in computer installations, but to a greater extent as adjuncts to our data acquisition systems, where they offer the user an opportunity to view his data immediately without waiting for computer processing.

Therefore, new instruments were developed to replace the Moseley-conceived components of the 2030 series, resulting in the present 2031 series which offer improved performance, and the capability of plotting lines as well as discrete points.

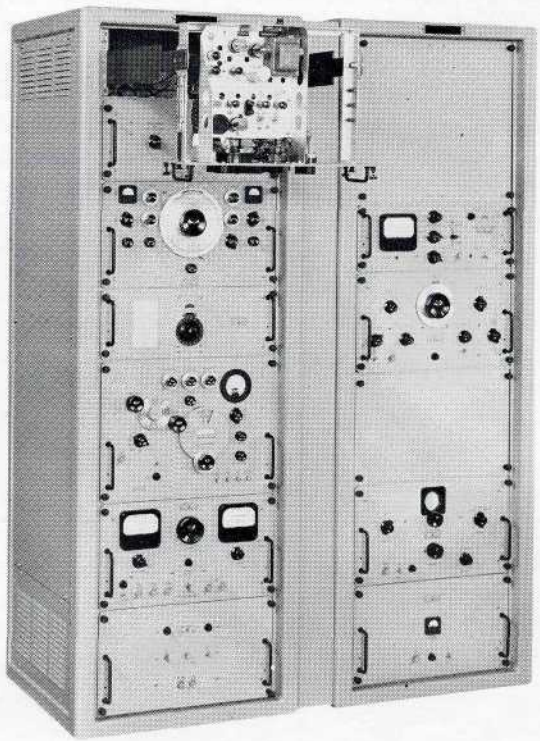


DY-2031 Data Plotting System makes point or line plots from data on punched tape.

RF INSTRUMENTATION: For the first several years Dymec had two separate engineering design groups, the one responsible for data acquisition instruments and systems, and the other active in the microwave field.

This latter group designed and built microwave signal generators and comprehensive radar simulators for checking and calibrating missile radar systems. Some of you will recall that the classified nature of the work necessitated strict security procedures, including a "closed room" in which all the people working on these projects were confined.

By 1960 design changes in missile guidance systems and also a shift toward use of inertial guidance greatly reduced the demand for the types of system we could offer, so the efforts of this engineering group were redirected toward the development of instruments and systems for very precise frequency measurement and control, using phase-locking techniques.



DY-6190A Radar Simulator (1956) is typical of early Dymec microwave systems.

The first phase-lock instrument produced by Dymec was the DY-5796 Transfer Oscillator Synchronizer (1961), which made possible microwave frequency measurements with counter accuracy, using the *–hp–* 540 transfer oscillator and 524 counter.

Following on the heels of the 5796 came the 2650 Oscillator Synchronizer (1961) which provided a frequency-stabilized microwave signal source by phase-locking a klystron oscillator to an internal crystal reference. In 1963 another synchronizer, the 2654, was introduced. This worked on the same principle as the 2650 but used an external reference such as an *–hp–* quartz oscillator or the *–hp–* frequency synthesizer.

Other contributions by the rf design group included two instruments for precise comparison of local frequency standards against VLF transmissions of primary standards. First of these was the 5842 (1961) which operated in conjunction with an external time interval counter to make a frequency comparison.

In 1962 a completely self-contained VLF Phase Comparator, the DY-2365, was developed. This sophisticated instrument would tune to 161 VLF channels (the 5842 was limited to 5) and included a high-resolution strip-chart recorder for direct display of phase difference between the VLF transmission and the local frequency standard.

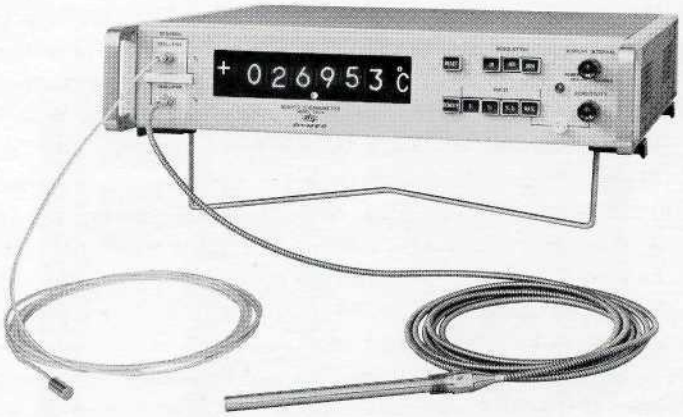
In late 1963 the somewhat cumbersome 5796/540 synchronizer/transfer oscillator combination was replaced by one instrument, the *–hp–* 2590 Microwave Frequency Converter. Besides extending the frequency range of the *–hp–* 5245 counter to 15 gc (or as high as 40 gc by piggy-back techniques) the 2590 includes a highly-linear fm discriminator for precise measurements of signal fm, and is a very versatile microwave tool for cw and pulse carrier frequency measurements, with am and fm demodulating capabilities.

While in recent years Dymec has gradually relinquished development of rf instruments to other *–hp–* divisions concentrating heavily in those specific areas, development of the 2590 has been continued, with introduction of a new "B" version in the near future.

Latest of Dymec's phase-lock instruments, DY-2590B Microwave Frequency Converter is versatile microwave measurements tool.

QUARTZ THERMOMETRY: In 1964 Dymec entered an entirely new measurement field for Hewlett-Packard—direct measurement of temperature. For some time the *–hp–* Quartz Crystal Laboratory had been investigating crystal behavior with a view to devising a crystal oscillator that would exhibit a linear change of frequency with temperature. They were successful, and Dymec was given the responsibility for designing a series of instruments utilizing this technique. And so the Dymec Quartz Thermometer was born.

Originally called the DY-6615, it was redefined as two instruments, models DY-2800A and 2801A, which were displayed for the first time at the 1964 ISA show. Providing convenient direct digital readout, very high resolution, and many other advantages in a unique combination, acceptance by *–hp–*'s field sales force and customers was immediate. However, as with any new "breakthrough," problems in manufacturing the crystal sensors in large numbers were inevitable, and we have had our share.



DY-2801A Quartz Thermometer is capable of direct-reading differential and absolute temperature measurements to .0001° resolution.

In the past year the quartz thermometer line has been expanded to include an accessory signal amplifier (2831A) to permit probes to be located far from the parent instrument, a combined probe and oscillator (2833A) for rugged environments such as well-logging and oceanography, a special probe assembly (2832A) for temperature measurements to the ocean's deepest regions, and both a manual sensor selector (2840A) and automatic scanner (2918A) for multi-probe applications.

Present and Future

DATA ACQUISITION: In 10 years Dymec has worked itself from a position of obscurity to leadership in the small to medium size, low-speed data acquisition market.

When we launched our standards systems, our competitors clearly thought this approach would never work, and we would lose our shirts. However, this didn't happen, and the success of the 2010 series, and other series of standard systems that followed, is now history — although everyone at Dymec discovered just how much effort it took to make the standard system concept come true in practice. Now many of our competitors offer standard systems, at least on paper.

Today, in contrast to following in others' footsteps, we are discovering the difficulties of being a leader; while the competition had to move over for us, it is far from beaten out of existence. On the contrary, our competitors are vigorous and growing in number; they are hungry and ambitious, and therefore quick to seize advantage of any lack of leadership in this, our principal field of interest.

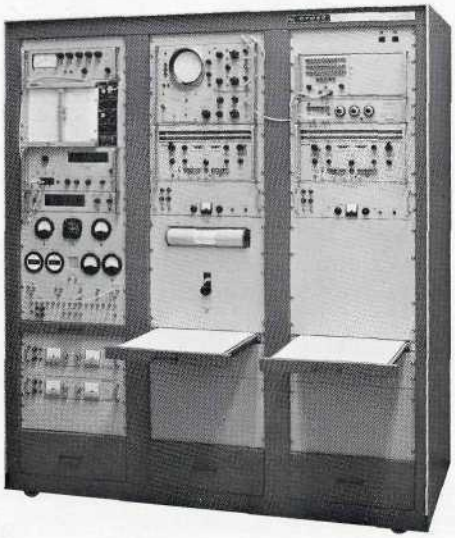
Therefore, Dymec is developing a new digital voltmeter which, besides being a fine bench instrument in its own right, will primarily be used as the nucleus of a new series of data acquisition systems. When introduced (in the spring) these new systems will provide, at the same time, the highest resolution and speed available from our present systems. New couplers and recording devices will later offer this same resolution at twice our present maximum speeds.

Moreover, Dymec is working toward offering a complete systems capability, that will include all electronic instrumentation required to serve the customer's physical measurement problem. Eventually we hope to provide installation service as well.

Illustrating Dymec's broadened systems capability, recent DY-6913A system measures 384 pressure channels (using pressure scanners), 400 temperature (thermocouple) channels, in addition to voltage, frequency and period measurements. Measurements are recorded along with manual data simultaneously on magnetic tape and high-speed printer.

To this end we have a development program on a family of transducer signal conditioners (presently purchased from outside suppliers); this program is progressing well and promises to yield products for introduction this summer. We are also accumulating a fund of technical knowledge on transducers for all types of physical measurements, and the practical problems involved in their use.

Our many years of experience in developing and selling both standard and special systems now allow us to build systems utilizing components from *–hp–*'s growing family of divisions —known as "corporate systems" —and also to take on, profitably, systems with a greater special engineering content than we could in the past.



Example of a 'corporate' system, DY-6824 Stabilized Sweep Frequency System combines instruments from seven (hp) divisions and one outside supplier.

But, while the future looks good for Dymec in data acquisition, it is a fast-moving area in which the pressure of competition is increasing as other large corporations see the possible returns and either acquire or set up their own data acquisition manufacturing facility. And so it is up to us to offer cheaper, better-engineered systems with a wider range of capabilities to match every customer need, to stay ahead.

QUARTZ THERMOMETRY: The present feeling is that we have only just begun to tap the myriad potential applications of the quartz thermometer. While its many features grant it a tremendous competitive advantage over other temperature measuring devices, more history on its behavior will hopefully lead to its eventual acceptance also as a secondary laboratory temperature standard.

New probe configurations will be devised for specialized measurements in science and industry, and also for rugged environments such as oceanography, well-logging, measurements within the earth's crust, and even as part of the instrument complement on lunar and other space exploration vehicles. Direct measurements of physical quantities other than temperature are also a strong possibility, based on changes in crystal resonant frequency with physical stimulus.

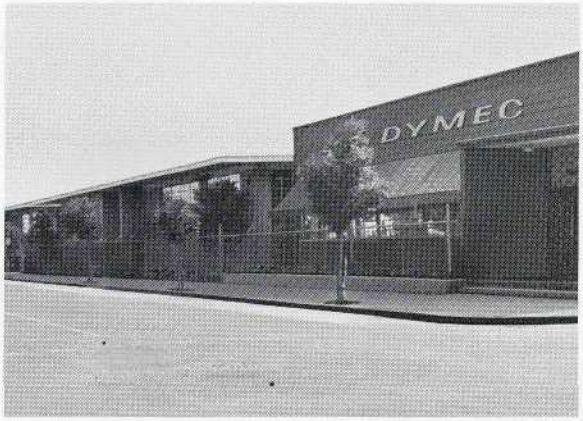
COMPUTERS — A NEW FIELD: Besides the more obvious advantages of being a part of *–hp–*, such as access to laboratory and manufacturing facilities too expensive for a small company to support independently, and direct selling through a vast field sales organization, Dymec has been afforded some unique opportunities in new technologies.

In retrospect, it can fairly be stated that Dymec has made good use of *–hp–*'s know-how and position in the field of electrical measurements to become a leader in data acquisition. The quartz thermometer promises to be another significant contribution by Dymec. We have now been given the greatest single opportunity for growth in our history—design and manufacture of *–hp–* digital computers and computer systems.

With *–hp–* becoming a dominant manufacturer in the electronic instrumentation market, it became natural to look at another vast market, exploited by a relatively few companies, that of electronic data processors, or computers. *–hp–*'s Advanced R&D Laboratory has therefore been investigating various aspects of computer technology.

From our work here at Dymec on programming and calculating accessories for data acquisition systems, it became evident that we must eventually market a system incorporating a bona-fide computer for both self-programming and computation, in order to broaden our market by solving more complicated measurement problems. A satisfactory commercially-available computer was selected, and a "computing data acquisition system" combining this computer and Dymec data acquisition components is now very close to completion.

This computing data acquisition system will later be supplanted by a new system incorporating our own computer. From sales of our computer and peripheral systems we expect to realize our predicted tripling of Dymec's size in the next five years.



Dymec's first home, the 'Redwood Building'.

The Dymec Factory — 1956 to 1966

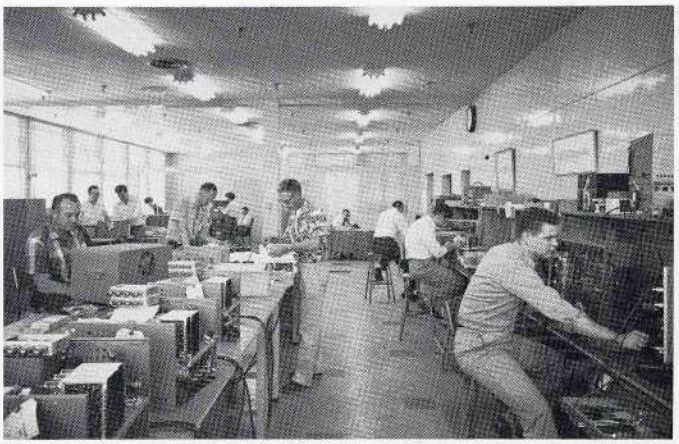
The ten years of Dymec's growth have demanded a fifty-fold increase in floor space, in what seems to have been a continuous series of large and small moves. However, each move has resulted eventually in improved working conditions, making the whole thing worthwhile once the dust has settled. Some of the milestones are illustrated in the accompanying photographs and drawings.

Dymec started out in the original Hewlett-Packard 'Redwood Building' (Building 7A) occupying only the front portion — 1500 magnificent square feet. In just three years the company swallowed up the rest of that building, occupied several leased buildings close by, and even spilled over into a portion of adjacent *–hp–* territory (Building 7B).

When *–hp–* moved into the first of its new buildings 'on the hill,' Dymec engineering, sales and administration took over the ground floor of the 'Sawtooth Building' (except for one wing occupied by *–hp–* customer service). Manufacturing moved into 7C, sharing this area with *–hp–*'s oscilloscope division, which was phasing its operation gradually to Colorado Springs.

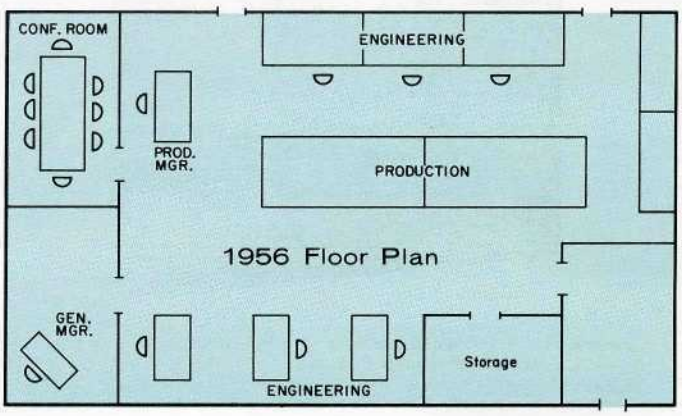
Now Dymec is in the throes of yet another major change which promises to be the most rewarding one so far. A complete modernization of the manufacturing area is taking place, with the goal of greatly increased production from the same area (and number of people) through completely new layouts for each department, new equipment, and improved working conditions.

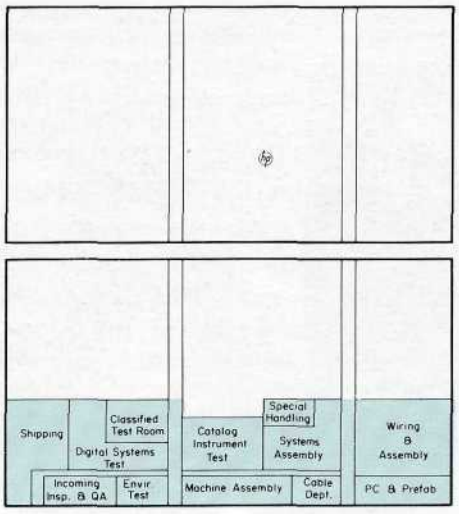
To raise the ambient light level and enhance general appearance, a light-colored tile floor is being installed throughout the area, and furniture and equipment have been repainted. Benches are all reduced to desk height, allowing people to sit comfortably rather than perch on stools. Storage for parts and materials is now entirely off the floor. Conveyor belts and roller lines have speeded flow of parts and completed assemblies, and have minimized fetching and carrying. No furniture exceeds five feet in height, allowing unobstructed visibility for a feeling of spaciousness, plus easier personnel contacts.

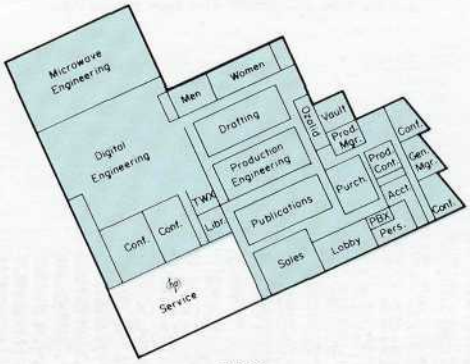


The earliest picture of Dymec we have. This was the entire engineering, manufacturing and test operation in 1956.

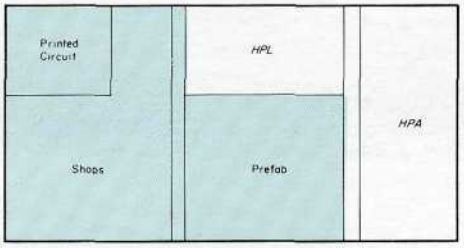
But this isn't all. The plan has been of such a complete and far-reaching nature that it has succeeded in consolidating *all* manufacturing and support functions under one roof — and in much less overall space. The machine shop and stockroom are no longer inaccessible in separate buildings. Manufacturing engineering, production control, Kardex and purchasing are right where they need to be, in the heart of the manufacturing area. The benefits of this consolidation are already apparent, and when the modernization is completed Dymec will have a very impressive — and efficient — manufacturing facility.

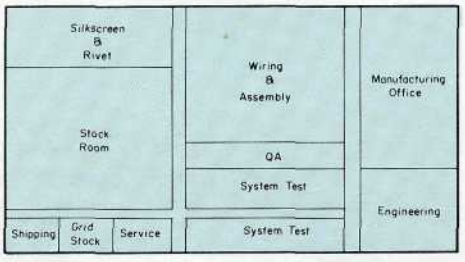


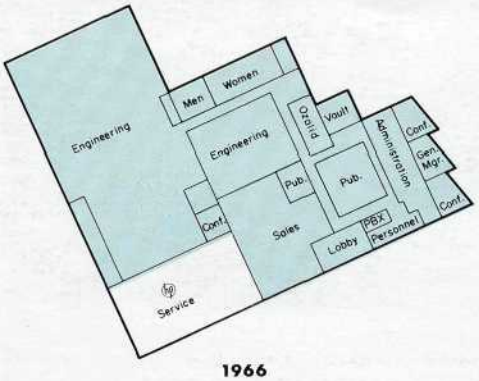




1960







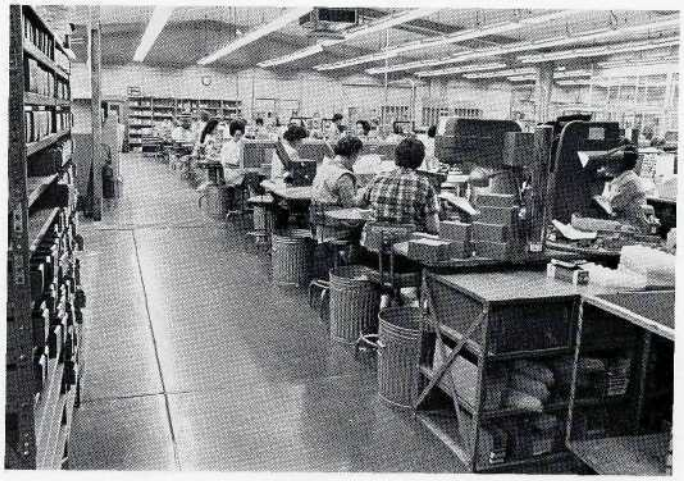
1966

DYMEC TERRITORY

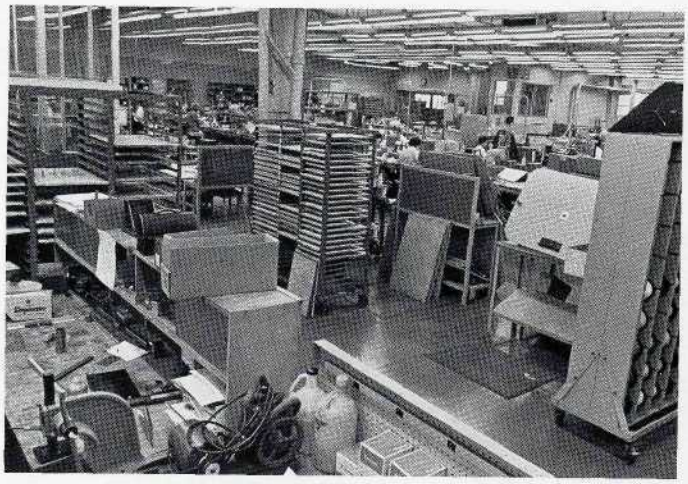
DY-2401 wiring and assembly line in 1962. This arrangement makes people move around unecessarily, picking up parts and handling equipment. New production layout will greatly improve production efficiency, particularly for high-volume instruments like the 2401.

RF wiring and assembly line. While adequate for Dymec's volume in the past, modernized layout will streamline parts and work flow, cutting down wasted movement. Production volume for given floor space will be increased.

Photo shows new semi-automatic, flow-soldering machine at right. Soldered boards pass through fully-automatic washing machine and are delivered by roller conveyer (section is missing in immediate foreground) to touch-up and secondary assembly line, finishing up in pre-fab test area at back of room. New work benches allow parts to be stored off floor, are at normal desk height.



Pre-fab area prior to recent modernization. Note material stored on floor and inconvenient availability of parts, high shelving cutting visibility across room.



Cable harness area. Dymec's manufacturing volume has outgrown this type of facility.

Dymec's present location, the 'Sawtooth Building'.

Photo shows *main printed circuit loading line.* Conveyer belt brings parts to women as well as delivering loaded boards to soldering area.

New benches are designed to make cable harness *manufacture convenient* and efficient. This arrangement is designed to handle current volume smoothly, is easily expanded for future growth.

Trade Shows

Dyneral Ylectric

This company's name has had its colorful moments. Most of you are aware of the official names we have had: Dynac, Dynac Inc., Dymec, Inc., and Dymec, a Division of Hewlett-Packard Co. Many of you remember the turmoil created by name changes, what with destroying letterheads, vouchers, business cards, ads, data sheets and myriad other printed matter.

Recently the DYMEC logo dy became history . . . and we are still going through the post-partum blues looking hp -like.

To recap: Dynac was Dynac from its founding, January 3, 1956 through July, 1957, and Dynac, Inc. from then until July, 1958. In January, 1957, Westinghouse suggested (nicely, but firmly) that we find ourselves a little different name because they had already legally named one of their electric motor brakes a Dynac.

The suggestion to change our name spurred many imaginations into motion. The Dynac name was chosen originally because the first two letters *dy* are *hp* upside down. Therefore, one of the preferred ground rules toward selection of a new name was preservation of the *dy* — and it took 1½ years to agree upon and finalize a name.

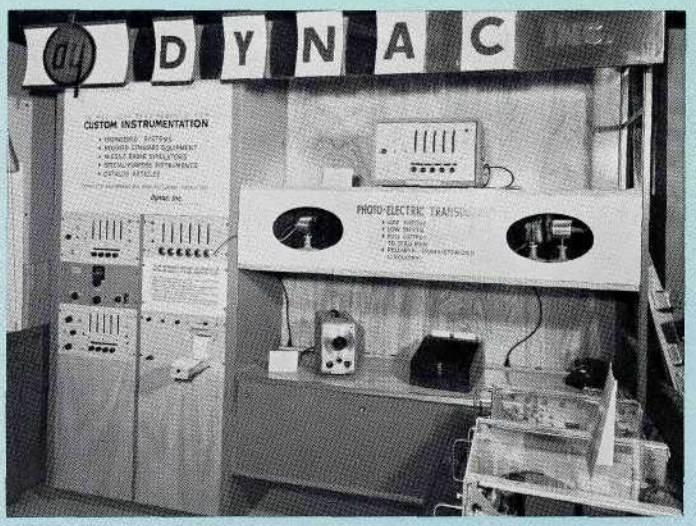
Name suggestions were solicited from employees, lists were drawn up, memos flew between Dynac and HP administration, trade names were searched, attorneys consulted, and you can visualize the hair that turned gray through this project. Here are some of the suggestions:

Dynadata or Datadyna
Dyad, Dyo, Dybernetics
just plain DY Electronics
Dyinc (could be Brooklyn-ese, dalinc)
Dytron, Dyrac, Dynems
Dyode, Dymond, Dyalogue
Division Y (heaven help), Dycor
Dycan (why not Dywill),

one enterprising individual figured that if *hp* comes from Hewlett and Parkard, why not call ourselves *db* for Dave-Bill. Then . . . someone at Westinghouse suggested "Dymec" and it was all over (1½ years later).

Our new name was publicly announced July 1, 1958, and official notification of the change was sent to Westinghouse that same month.

The moral of this story is: any name that has the blood, sweat and tears in it that DYMEC has is well worth preserving.



1957 WESCON
Showed 2500 Counter, 207 Oscillator, 2504 Tachometer.

1958 IRE
First display of data system capability.

1959 ISA
Note instrument and system assortment, company name change.

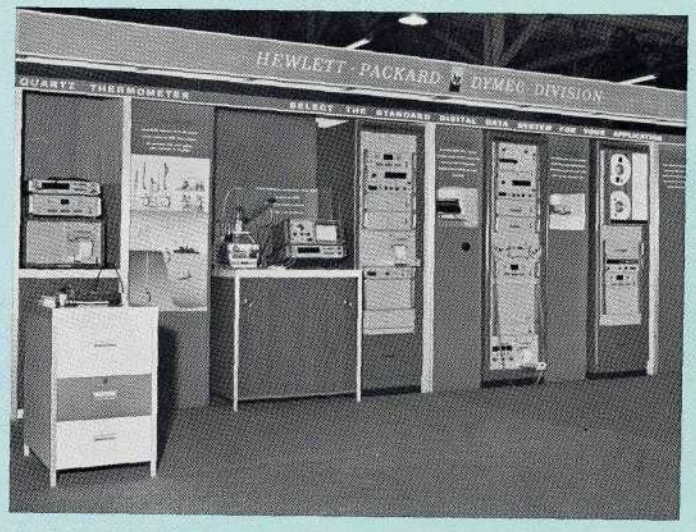
1960 IRE
Systems dominated display.

1963 ISA
A particularly attractive booth.

1961 IRE
Showed systems standardization.

1964 IEEE
Broad line of standard systems.

1962 IRE
Systems for data acquisition, data plotting, rf.



1965 WESCON
Quartz Thermometer highlighted.

HEWLETT PACKARD DYMEC DIVISION

Printed in U.S.A.