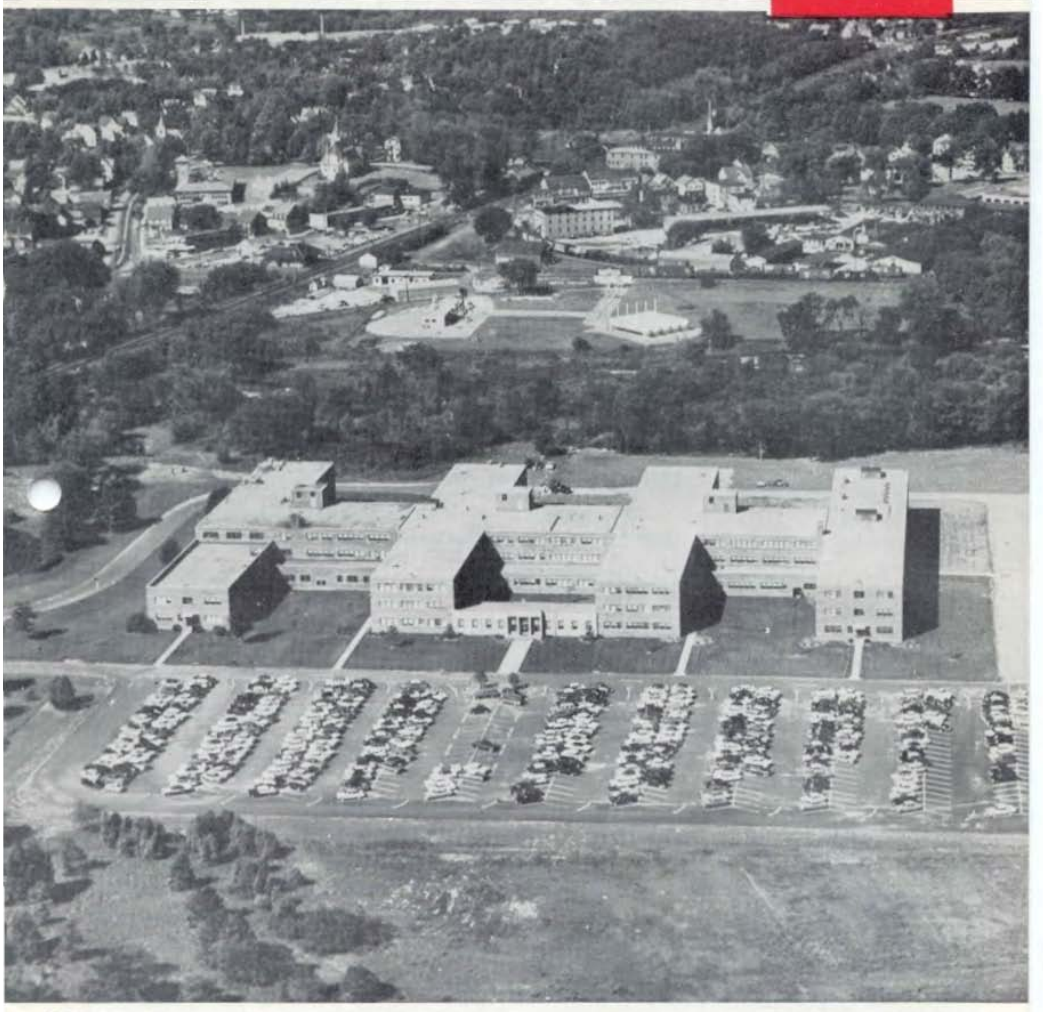
THE GENERAL RADIO EXPERIMENTER



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THE GENERAL RADIO

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COVER

Airplane view of the new General Radio Plant.

GENERAL RADIO AT CONCORD

General Radio, after 44 years in Cambridge, has now completed its move to a new home in Concord, Massachusetts. The fact of this westward migration is established in our signature on nameplates, letterheads, and labels. To GR's friends who would like to know something about the new plant, and how we came to be here, we offer the following brief account.

Since 1915, General Radio had stayed within a block or two of its birthplace in heavily industrialized Cambridge. We had expanded steadily, at a rate controlled to ensure a good environment for the production of quality instruments. By the end of World War II, GR's brick-and-mortar consisted of five buildings, with about 150,000 square feet of plant and office space. With these buildings and several off-street parking areas, the Company had run out of adjacent real estate for future growth and began to plan for relocation.

Why Concord? Choice of a plant site naturally involved many interlocking factors but, basically, General Radio chose to build in Concord because most of its employees lived in that direction (i.e., west of Boston), because Concord and its environs were desirable residential towns, and because there was available in Concord a clear, level, 84-acre tract, adjacent to a main highway and a rail junction. (Assumed here is the earlier, easier decision to remain near Boston, for its educational, cultural, business, and transportational advantages.)

The land was acquired in 1948. There on the banks of the Assabet, 20 air miles from the gilded dome of Boston's State House, our first Concord plant — a 72,000 square-foot T-shaped, three-story building — was completed in 1952.

For the next five years, the Concord plant was a separate manufacturing division — primarily for Variac® autotransformers. What is now known as "the move to Concord" began in early 1958, with the completion of the second T and the transfer of Engineering and some Production operations to Concord. An H-shaped building, completed in 1959, finished the building pattern symmetrically, and GR ended its stay in Cambridge. For the first time in seven years, the entire organization (with the exception of our district sales offices) was together, enjoying the easy communication, efficient material flow, and simplified administration provided by a modern, well-planned, integrated manufacturing plant.

General Radio's new home is a smart, three-story, brick complex of 293,000 square feet (about twice the size of our Cambridge plant). The building configuration is a series of H's (see cover photo), planned so that every office is an outside office. Around the building are a small fish pond (mostly black bass, with some perch and pickerel), a 600-car parking lot, and a well-groomed outfield (the word is apt; the grass mixture is the same as that used at Fenway Park). State Route 2, the Mohawk Trail from

View of a section of the spacious employees' cafeteria.

View of a typical engineer's office, which combines office desk and laboratory bench space for convenience and efficiency.

Boston to New York State, brushes the land, and the West Concord railroad station is nearby. (West Concord is our postal address, incidentally; politically, we are in the town of Concord.) The plant is a half-hour drive from Cambridge's Harvard Square and is about seven miles west of Greater Boston's famed circumferential highway, Route 128.

Although the plant was built in three stages, each part anticipated the next, so that departments were laid out to minimize movement of people and material. For instance, raw aluminum sheets are now received, cut to panel size, and stored in the same area of the first floor. Similarly, a panel is cleaned, painted, and engraved all in one area. Machine tool sections are arranged as logically: a metal cabinet is punched, drilled, formed, welded, and sanded all at one end of the department. Parts manufacture and processing operations (machine shop, painting, plating, etc.) feed, from their first- and third-floor corners, the centralized second-floor stockroom and Assembly Department. The machined

Instrument display area in the Sales Engineering Department.

part does not detour to a mechanical inspection department; this group is split up to function in the several critical areas where it is needed. Such logistic layout ensures the straight-line material flow that is the essence of any efficient manufacturing operation.

In the Engineering Department, the Company's one-engineer-per-office policy is maintained throughout. The typical office is a miniature library, laboratory, and sanctum for the development man. The offices of the Sales Engineering staff surround a demonstration area, where the GR product line is neatly displayed. Near the Sales Department is the Commercial Department, and the heavy paper traffic between these two groups is swift and direct.

The Concord plant is not just a new shuffle of an old deck. Plating, painting, and cleaning equipment is all new, and includes 48 stainless-steel tanks, new baking ovens and spray booths, and even a well-stocked, professionally manned chemical laboratory. Separate data-processing installations in the Commercial and Production offices get smarter day by day, as invoices, inventories, payrolls, and other statistics become holes in IBM cards. Add Autocall and voice-paging systems, Dial-a-Matic pneumatic-tube network, and a 3000-volume technical library, and you have a plant second to none in modern facilities.

But people, not devices, determine a company's future, and the new plant is, not accidentally, a very pleasant place to work. A precedent Concordian named Emerson once wrote that "Nothing great was ever achieved without enthusiasm." General Radio employees find it easier than ever to be enthusiastic. Everything from the vast private parking lot to the new 350-seat cafeteria is larger, cleaner, and more comfortable. The grounds are ideal for extracurricular activities (so far, archery sets, ice skates, golf clubs, fishing rods, horseshoes, and toy rockets have sprouted on campus). The town is a peaceful community, as proud of its present as it is of its past. And the countryside is pure New England, more handsome than pretty, and never letting you forget what season it is.

This is the "new plant," in detail necessarily sketchy, but, we hope, revealing enough to make you think of visiting us when you have a chance. There are bigger plants, and there are undoubtedly even a few newer ones. What makes General Radio so proud of its new home is neither its size nor newness; it is the conformance of structure and setting to an ideal. We think it *looks* like GR: solid, friendly, of lasting value. From it you can expect what we are historically committed to produce — the best instruments in electronics.

— F. T. Van Veen

General Radio's Walden.

THE CASE OF THE WELL DESIGNED INSTRUMENT

The word design means many things to many people. To us at General Radio it means the integration of functional, electrical, mechanical, manufacturing, and esthetic factors to produce a more useful product. To some degree, all these factors are interdependent, and appearance, in particular, becomes most effective when tied closely to function.

General Radio's new color scheme, use of proprietary meter cases, and complete instrument packaging philosophy are some of the results of an appearance-design and mechanical-design program in which human engineering is given its proper emphasis.

THE COLOR

The new color scheme uses a scale of grays. Black dials, charcoal-gray panels, medium-gray knobs and cases, and white legend and hardware combine eye convenience with eye appeal. The light gray of the control knobs stands out in contrast to the charcoal gray of the panel, as does the white aluminum exposed by the engraved panel legend.

Meters and dials on which the eye must usually concentrate are in black and white. To yield maximum contrast with minimum eyestrain in prolonged use, dials have black backgrounds with white legend. For dial behind windows, however, and for meter dials, reflections must be avoided, and so here the pattern is reversed — black lines on a white background.

Instrument cases are a medium gray, a shade carefully chosen to look cleaner longer. Too dark a gray shows dust easily, while too light a gray shows smudges.

Natural-color anodized aluminum in the metal hardware harmonizes well with the cabinet gray and is as durable as it is decorative.

THE PACKAGE

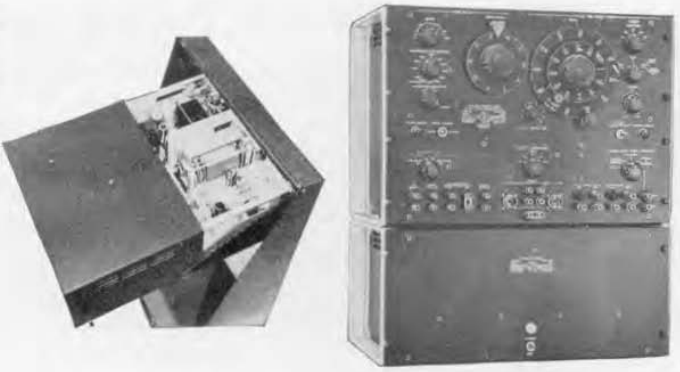
Supporting and complementing this well designed façade is the instrument cabinet. General Radio instrument cases can be classified into five basic types, each designed to meet specific requirements of function and use. These are shown in the accompanying illustrations. A prominent feature of all these designs is the adaptability to rack mounting of the basically bench-mounted types and, conversely, the bench-type mounting provision in relay-rack instruments.

Relay-Rack

General Radio's relay-rack design is used for fairly large instruments. These instruments can be mounted in standard 19-inch relay racks, with front and rear accessibility to the interior of the instrument without complete removal from the rack. Although designed primarily for rack mounting, they can also be supplied with different hardware for use out of the relay rack, on a bench or stacked one above another in a quasi-relay-rack assembly.

The new-look panel, charcoal gray, with black dials, light-gray knobs. Proprietary meter design yields maximum scale length for panel space occupied.

Relay-rack instruments make possible cabinet removal from rear of rack, as shown at left, and stacking in tiers with bench-mount end frames, as shown at right.



Relay-rack instruments have heavy-gauge metal cabinets capable of supporting the weight of the instrument. These cabinets are mounted in the rack by means of two sheet-metal supports. With an instrument cabinet mounted in a relay rack, the instrument can be slid into it from the front just as a drawer is slid into place. The instrument is retained in its case by screws going through the panel into the rack. The instrument can be partially withdrawn and serviced from the front of the rack, or the case can be removed from the instrument at the rear of the rack, with the instrument left mounted in the rack.

For bench use, the relay-rack instrument can be equipped with end frames that hold the instrument into its cabinet as the rack does, and which serve as carrying handles and supporting feet at the same time. These end frames are designed to nest one above the other so that instruments can be stacked. Holes are provided for bolting the end frames together to make a permanent stack.

Rack-Bench

Small and medium-sized instruments, which are commonly used on the bench, are housed in a cabinet having carrying handles, rubber feet, a tilting feature, and readily removable dust cover. Panel extensions permit them to be used in a relay rack.

The rack-bench instruments can be lifted by handles on the side panels and can be tilted by the extension of the front feet. Quick-action clamping fasteners hold the dust cover in place and at the same time permit easy removal of the cover. The same screws that hold the instrument sides to the panel also attach the panel extenders installed for relay-rack mounting.

Laboratory-Bench

Laboratory instruments, such as impedance standards and decade boxes which are seldom, if ever, mounted in relay racks, are equipped with cases appropriate to their size and weight. Very small units have one-piece drawn-

The three aspects of the rack-bench cabinet: *left*, conventional rack-bench cabinet; *center*, with wings for relay-rack mount; tilted for convenient operation.

Standard inductor shows laboratory-bench type of cabinet with locking strip at side.

metal boxes, whereas larger units are housed in heavy-gauge aluminum enclosures. These enclosures are fabricated from sawed or extruded plates and held together by locking strips. Rugged construction, electrical shielding, and pleasing appearance are combined in these cases.

Unit Instruments

For the Unit-line instruments, where economy and small size are the controlling factors, a very simple case is used. The panel is bent into a U, as is the dust cover, and the two interlock firmly to comprise the entire enclosure. With this design, too, relay-rack mounting is possible and adaptor panels are available.

Flip Tilt

Instruments of a basically portable nature use the General Radio Flip-Tilt case, which boasts the following features:

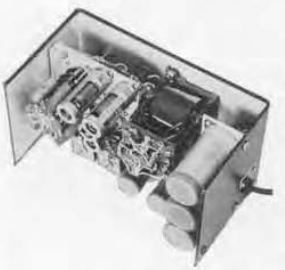
It is its own complete enclosure for transport without an extra carrying case.

It can be readily set up for use at any desired viewing angle.

The protective cover is attached by a convenient carrying handle.

An accessory storage space is provided. It can be simply adapted to relay-rack use.

A one-piece drawn-aluminum instrument case and control-panel cover results in a lightweight yet sturdy enclosure. The control-panel cover serves as storage space for accessories, and functions as a base when the instrument is in operation. A rubber gasket around the edge of the control-panel cover seals the closed case. When the instrument is in use, this gasket provides the friction to keep the instrument at whatever tilt angle is selected. The mechanical linkage uniting the instrument case and control panel is extended in the form of a carrying handle, which also serves as the lever for lifting the instrument while it is being flipped.



Unit-type construction uses U-shaped chassis, as shown here; mating U-shaped piece provides dust cover and complete enclosure.

The Flip-Tilt type instrument is easily mounted in a rack, since the cabinet reinforcing frame at the edge of the panel serves as a natural stop against a relay-rack panel cut out to fit the instrument case.

— H. C. Littlejohn

The Flip-Tilt case folds compactly for transport, opens easily for operation with panel at any desired angle.

GENERAL RADIO DISTRICT OFFICES

While the General Radio home office sales organization plays the usual important part in the over-all business operations of the Company, it is largely through our engineers in branch offices that we meet our customers. By means of our own factory-trained people we are best able to provide the high-quality service expected of a producer of precise measuring instruments.

District offices with service and repair sections as well as sales-engineering and order-handling groups are situated in the larger centers of electronic activity: New York, Chicago, Los Angeles, and Boston. Other offices, but without service and repair organizations, are located near Philadelphia, Washington, D. C., San Francisco, and Toronto, Canada.* Each of these offices is staffed by two to four sales engineers, and clerical and secretarial personnel.

District Office Functions

The district office serves the customer by:

- Bringing to his attention General Radio instruments and developments.
- Making certain that his General Radio equipment is operating well and is being used in the most effective manner.
- Furnishing information and advice about measurement techniques.
- Providing liaison between the customer and the engineering or production specialist at our plant.
- Furnishing price and delivery quotations, processing orders, clarifying incomplete orders, making special arrangements for the customer's convenience, and keeping track of scheduled dates and shipments so as to be able to furnish progress reports when requested.
- Stocking many products for over-the-counter sales, thus providing prompt attention to the needs of local customers.
- Maintaining a collection of demonstration instruments that can be seen at the district office and can be borrowed for trial.
- Feeding back information to the home office concerning instrument acceptance, future instrument requirements, and industry trends that may aid the Company in its planning of new products.

*Repair service is provided in Toronto by Bayly Engineering Limited, First Street, Ajax, Ontario, Canada.

Up-to-date service facilities at New York District Office are also typical of those at Chicago and Los Angeles. These installations are fully equipped for the repair and recalibration of General Radio products. Every instrument handled is completely recalibrated regardless of other work requested and receives a warranty of one year from the date of its servicing.

District-office engineers hear R. A. Soderman, of the Development Engineering Department, describe characteristics of a new instrument at a typical Workshop Session.

By means of the telephone, or through personal visits, the district-office engineer is in close touch with those in his area. Such short-distance work has the advantage of informality and convenience. Those in need of assistance can, and do, call frequently for information — technical or otherwise. In fact, many have developed the habit of first telephoning the district office when they have a measurement problem, because they have learned that the district office's specialized knowledge will often provide an answer. When, as with unusual applications, a complete answer cannot be given over the telephone, the district office will arrange a trial of the equipment at the customer's plant.

District offices are inherently able to give personal attention to individual requirements. For instance, customer orders can be serviced faster if they come to the nearest district office rather than traveling farther to the home office. No time is lost — shipment priority of orders is determined by their *date of arrival at the district office*, and not the date (usually the following day) the order arrives at the main office from the district office.

The General Radio Sales Engineer

The General Radio district office engineer has a substantial stake in his Company and is an important member of the professional and management group who administer its operations. He is typically one of the Company's stockholders (almost all General Radio voting capital stock is owned by about 100 professional and managerial employees). Thus the GR man's interests are long-term. He is on straight salary; he loses no commission if the sale of some particular equipment is not made. He will recommend only equipment that is suited to the need at hand, even if it is a competitor's product. He knows that only through quality business and engineering service will he produce the lasting customer satisfaction upon which the future of his Company depends.

General Radio sales engineers are engineering graduates (many have advanced degrees). These men are thoroughly familiar with the design, manufacture, and use of the products they sell. Because the extensiveness of the GR product line involves them in work in practically all areas of the frequency spectrum and in diverse industries, they *must* be well trained technically. Each district-office engineer has spent considerable time in the Development Engineering Department. In addition to valuable engineering experience acquired there, he gains a familiarity with engineering methods which stands him in good stead if later he has occasion to refer back to an engineering specialist for information. In short, he learns where to go for the answer and what it means when he gets it.

At least once a year, General Radio district-office engineers return to the plant to acquaint themselves with new instruments and measurement methods. They learn these techniques by *working* at them at lengthy workshop sessions alongside the design engineer who developed the products or ideas.

These men are active participants in professional-society activities. The typical district-office engineer is a member of a number of different committees, some purely technical and others primarily concerned with local or national activities of the IRE, AIEE, and other organizations.

Recalibration, Repair, and Service

The service groups, located in im-

TORONTO OFFICE


A. KINGSNORTH
Manager


R. J. PROVAN
Engineer


J. G. HUSSEY
Manager


D. M. VOGELAAR
Engineer

SAN FRANCISCO OFFICE
Los Altos
California

NEW ENGLAND OFFICE
West Concord, Mass.


R. B. RICHMOND
Manager


C. W. ALSEN
Engineer


D. S. NIXON
Engineer


R. J. PETERSON
Engineer

PHILADELPHIA OFFICE
Abington, Pa.


K. ADAMS
Manager


J. E. SNOOK
Engineer


C. W. HARRISON
Manager


F. J. FINNIGAN
Engineer


J. C. HELD
Engineer

WASHINGTON OFFICE
Silver Spring, Md.

CHICAGO OFFICE
Oak Park, Illinois


W. M. IHDE
Manager


R. P. DELZELL
Engineer


L. C. FRICKE
Engineer


L. W. GORTON
Engineer


J. A. DUNN
Service Mgr.

LOS ANGELES OFFICE


J. E. BELCHER
Manager


A. O. ABEL
Engineer


F. J. THOMA
Engineer


J. R. ROSS
Engineer


A. J. GUAY
Service Mgr.

G. G. ROSS
Manager

L. J. CHAMBERLAIN
Engineer

P. B. BISHOP
Engineer

E. F. SUTHERLAND
Engineer

D. W. BROWN
Service Mgr.

NEW YORK OFFICE
Ridgefield, N. J.

portant areas of electronic activity, are staffed by factory-trained service engineers and expert technicians. These service organizations in the field are available for repair, recalibration, and standardization of General Radio equipment of all types. For those customers able to make their own repairs, a good stock of parts is available as well.

The availability of local service facilities not only cuts transportation costs but minimizes time for service as well. Furthermore, where circumstances require it, a service engineer can visit the customer at his plant. This service is as near as the telephone. For those outside district office territories, prompt service can be obtained from the Service Department at Concord, Massachusetts.

— C. J. LAHANAS

AT THE IRE SHOW

General Radio will be in Booths 3201-3208, directly opposite the escalator on the third floor.

We shall show a complete laboratory for the low-frequency standardization of inductance and capacitance, plus bridges and other equipment for impedance measurements from dc to 5000 megacycles. Accurate laboratory standards of inductance and capacitance will be displayed, as well as precise bridges for their intercomparison and for their use in the calibration of other elements. Other bridges will be set up for impedance measurements on components and circuit elements for the measurement of dielectric properties of insulating materials and for VSWR, impedance, and transfer-function measurements at ultra-high frequencies. A feature of the Transfer-Function Bridge display will be the measurement of tunnel diode characteristics at several hundred megacycles.

All these bridges will be in operating condition, and engineers will be in attendance. General Radio is one of the leading manufacturers of this type of equipment and will show a truly impressive array of instruments.

Also on display and in operation will be the TYPE 1554-A Sound and Vibration Analyzer, the TYPE 1390-B Random-Noise Generator, and the TYPE 1300-A Beat-Frequency Video Generator, all of which have been described in recent issues of the *Experimenter*, and pulse and time-delay generators.

Another display will illustrate the new design features of General Radio instruments, which are described in this issue of the *Experimenter*.

A conference area will also be provided in the booth, for the convenience of customers who wish to discuss their measurement and instrumentation problems with GR engineers, free from the distraction of normal exhibit-booth traffic.

We look forward to seeing you.

Look for this booth, 3201-3208, just in front of the escalator on the third floor.

General Radio Company

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