

THE *General Radio* EXPERIMENTER

VOLUME XXIV No. 8

JANUARY, 1950

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ELECTRICAL MEASUREMENTS AND THEIR INDUSTRIAL APPLICATIONS

SIMPLE, COMPLETE COAXIAL MEASURING EQUIPMENT FOR THE U-H-F RANGE

● **NOW COMMERCIALY AVAILABLE** for the first time is a complete set of measuring equipment for the 300-Mc to 3,000-Mc frequency range. It will measure, rapidly and accurately, impedance, standing-wave ratio, power, voltage, attenuation, and many other quantities. The set consists of a number of inexpensive coaxial elements, each one simple in itself, that can be plugged together to make many different measurement setups easily and quickly. Thus a relatively small investment in these versatile parts provides the necessary equipment for most measurement problems encountered in a high-frequency laboratory. In the proposed u-h-f television band, 475 Mc to 890 Mc, coaxial elements can be used for checking everything from antennas to components.

The fundamental measuring tools are a slotted line for impedance and standing-wave ratio measurements, bolometer elements and a bolometer bridge for power measurements, and a crystal rectifier and indicator for voltage measurements. These devices are supplemented by all the necessary accessory parts, such as tuning stubs, a "line-stretcher," a tee, an ell, line sections of various lengths, a matching resistance termination, fixed and adjustable attenuators, low-pass filters, and other specialized devices.

With Type 874 Coaxial Elements, any required measurement setup can be assembled quickly and easily, as shown here.



IET LABS, INC in the GenRad tradition

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The keystone of this group of coaxial elements is the TYPE 874 Coaxial Connector.¹ This unique connector, any two of which, though identical, can be plugged together, is ideally suited for use on coaxial measuring equipment and was specifically designed for this purpose. Its quick-connect-and-disconnect feature simplifies the assembly of coaxial elements into complete measurement setups, and its low reflections at ultra-high frequencies can be neglected except in very accurate work.

Although the equipment was designed primarily to cover the frequency range from 300 Mc to 3,000 Mc, many of the coaxial elements can be used equally well at much lower frequencies (some at dc), and others perform well up to 5,000 Mc and beyond. The first higher-order transmission mode appears at about 9,000 Mc. A characteristic impedance of 50 ohms is used wherever possible throughout. The various transmission-line sections have air dielectric, and the

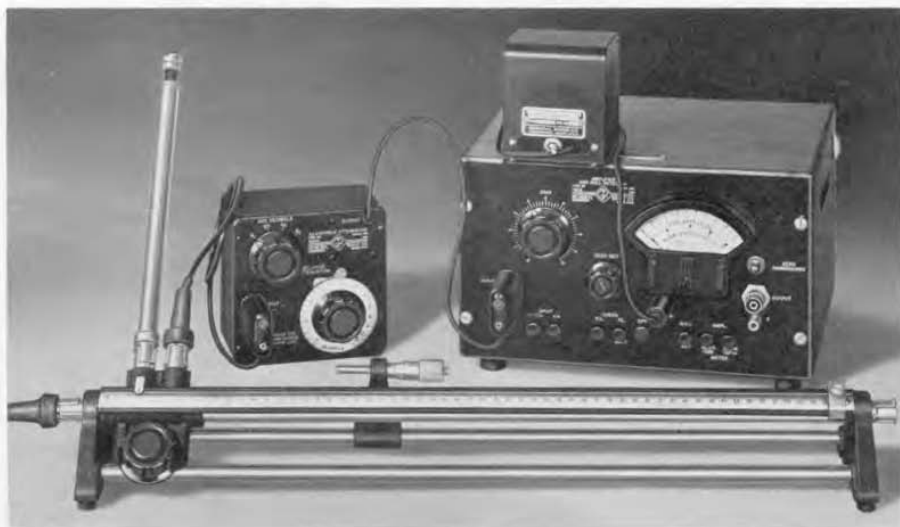
inner conductors are supported at their ends by the thin, polystyrene beads in the connectors. The outside diameter of the outer conductor tubes is in most cases $\frac{5}{8}$ inch.

Applications for this new equipment are numerous. It is ideal for college laboratories, where experimental setups are continually being assembled, taken apart, and changed, and where the versatility of the coaxial elements will permit the same elements to be combined in many different ways for various experiments. Furthermore, the relatively low cost means that more equipment can be obtained within a given budget, so that it becomes practical to have more setups with fewer students per setup, thereby increasing the effectiveness of the laboratory work.

The sturdiness and light weight of TYPE 874 equipment make it convenient for field use. The TYPE 874-LB Slotted Line, for example, has been found to be very satisfactory for making antenna measurements at the top of antenna towers.

¹W. R. Thurston, "A Radically New Coaxial Connector for the Laboratory," *General Radio Experimenter*, Vol. XXIII, No. 5, October, 1948.

View of complete equipment for standing-wave measurements, consisting of Type 874-LB Slotted Line with Type 874-LV Micrometer Vernier, Type 1231-P4 Adjustable Attenuator, Type 1231-B Amplifier with Type 1231-P2 Tuned Circuit, and Type 874-R32 Patch Cord.





Certain research and development laboratories have devised a clever method of taking full advantage of the quick-assembly feature of the coaxial elements. A "tea wagon," fitted out with a complete assortment of the equipment and using spring clips to hold the smaller elements, can be wheeled out of the instrument room to any desired location in the department whenever any high-

frequency measurements are to be made. The appropriate combination of coaxial elements can then be assembled from the group stored on the "tea wagon" and after the measurements are completed can be replaced ready for the next person. The short time required to assemble the equipment makes the use of several, permanent, single-purpose setups unnecessary.

— W. R. THURSTON

1. EQUIPMENT FOR STANDING-WAVE MEASUREMENTS

Type 874-LB Slotted Line

An air-dielectric, coaxial transmission line with a longitudinal slot in the outer conductor. An electrostatic pickup probe, mounted on a sliding carriage, projects through the slot and samples the electric field within the line. The depth of probe penetration is fully adjustable, and the probe travel distance is 50 cms., which is a half wavelength at 300 Mc. The line inner conductor is supported at its ends by two TYPE 874 Connectors. The first higher-order mode of transmission can exist only above about 9000 Mc.

Either a crystal rectifier or a receiver can be used as a detector. The probe carriage incorporates a built-in crystal mount, and a Type 1N21-B silicon crystal is supplied with the line. When a receiver is used as a detector, the energy picked up by the probe is fed to the receiver by a flexible coaxial cable, such as the TYPE 874-R20 Patch Cord described on page 11. When the crystal is used as a detector, it is tuned to the operating frequency by a TYPE 874-D20 Adjustable Stub, available separately

and described on page 7, which plugs into a connector on the probe carriage. The u-h-f generator should be amplitude modulated, so that the crystal output is an audio-frequency voltage that can be amplified and indicated by the TYPE 1231-B Amplifier and Null Detector. The stub will tune the crystal over the frequency range from 300 Mc to above 5000 Mc. The probe carriage has two TYPE 874 Connectors, one for the crystal output and the other for the tuning stub or for a patch cord to a receiver.

Characteristic Impedance: 50 ohms.

Frequency Range: 300 to 5000 Mc.

Dielectric: Air.

Accuracy: Constancy of probe penetration— $\pm 2\frac{1}{2}\%$ or better.

Voltage Standing-Wave Ratio of Terminal Connectors— Less than 1.02 at 1000 Mc.
Less than 1.07 at 4000 Mc.

Accuracy of Characteristic Impedance— $\pm 1\%$ or better.

Dimensions: 26 x 4 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inches, overall.

Net Weight: 8 pounds.

Type 874-LV Micrometer Vernier Attachment for Slotted Line

For measurement of high standing-wave ratios by the width-of-minimum method. Consists of a micrometer caliper head, calibrated in centimeters, mounted on an arm that can

be attached to the rear base rod of the slotted line. One turn of the micrometer barrel advances the head by one millimeter. Maximum range is 2 cms.

Type		Code Word	Price
874-LB	Slotted Line	COAXRUNNER	\$220.00
874-LV	Micrometer Vernier Attachment	COAXREADER	30.00

Type 1231-B Amplifier² (Standing-Wave Indicator)

Amplifies and indicates slotted-line crystal detector output in decibels. Consists of a high-gain audio amplifier and an output meter. Full-scale meter deflection is produced by an input voltage of less than 100 μ v at full gain. The output meter has an approximate calibration in decibels for rough measurements of standing-wave ratios up to about 6 db. The instrument is normally furnished with internal batteries for power supply, but the TYPE 1261-A Power

Supply, which fits into the battery compartment of the TYPE 1231-B Amplifier, is available separately if operation from a-c lines is preferred. With the a-c power supply, a line-voltage regulator may be needed if line voltage is not reasonably constant. If the modulation frequency is either 400 cycles or 1000 cycles, the TYPE 1231-P2 Tuned Circuit can be used to eliminate the slight fluctuations of the Type 1231-B output meter caused by amplifier noise. For details of TYPE 1231-B Amplifier, see current General Radio catalog.

²W. R. Thurston, "An Improved Amplifier and Null Detector," *General Radio Experimenter*, February, 1948.





Type 1231-P4 Adjustable Attenuator

For increasing the range and accuracy of standing-wave measurements with the TYPE 1231-B Amplifier. Is a high-impedance, resistance-type attenuator for use between the output of the slotted-line crystal detector and the input of the amplifier. Has three 20-db steps and a 20-db potentiometer to cover the range between steps.

Source Impedance: 30 k Ω — approximately equal to output impedance of crystal detector in slotted line at low voltage levels.

Initial Insertion Loss: Approximately 3 db.

Attenuation Range: 80 db; dial can be read to nearest tenth db.

Accuracy of Attenuation Increments: ± 0.3 db or better when operated between rated source and load impedances. Additional errors caused by source impedance between 15 k Ω and 60 k Ω are less than ± 0.3 db.

Frequency Error: Negligible below 2 kc.

Maximum Input Power: $\frac{1}{2}$ watt.

Terminals: Input, TYPE 938-W Binding Posts; Output, shielded cable with TYPE 274-ND Shielded Plug to fit amplifier input terminals.

Circuit: Modified voltage divider.

Mounting: Metal cabinet.

Over-all Dimensions: $5\frac{1}{2}$ x $5\frac{1}{2}$ x $4\frac{1}{2}$ inches, overall.

Net Weight: 2 pounds, 11 ounces.

Type		Code Word	Price
1231-B	Amplifier	VALID	\$210.00
1231-P2	Tuned Circuit	AMBLE	20.00
1231-P4	Adjustable Attenuator	ANNEX	52.50

Connections between the crystal output connector of the TYPE 874-LB Slotted Line and the input of the TYPE 1231-B Amplifier or TYPE

1231-P4 Adjustable Attenuator can be made by the TYPE 874-R32 Patch Cord described on page 11.

2. EQUIPMENT FOR POWER MEASUREMENTS

Type 1651-A Bolometer Bridge

For conveniently measuring h-f power by either d-c substitution or direct-reading method with the three bolometer units described below. This new instrument will be described more fully in a forthcoming issue of the *Experimenter*, since specifications are not yet available.

Type 874-H25 Thermistor Unit (25 mw.)

Consists of a thermistor mounted in a coaxial holder with a disc-type by-pass capacitor. Binding posts are provided for connections to

bolometer bridge. Can be used for power measurements over the frequency range from 5 Mc to several thousand megacycles. A d-c path is required in the r-f source. Complete with thermistor.

By-Pass Capacitance: Approximately 2000 $\mu\mu\text{f}$.

Physical Length Overall: $3\frac{3}{8}$ inches.

Maximum Total Power: 25 mw.

Type 874-H100 Thermistor Unit (100 mw.)

Similar to TYPE 874-H25, with maximum power rating of 100 mw. Complete with thermistor.

Physical Length Overall: $3\frac{3}{4}$ inches.

Type 874-HF Fuse Bolometer Holder

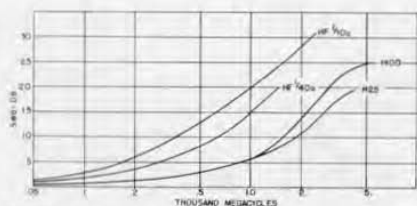
A coaxial holder for fuse bolometers 1 inch long by $\frac{1}{4}$ inch diameter (SAG size). Otherwise similar to the thermistor units described above. Supplied with one TYPE 874-HF-P1 Fuse Assortment.

By-Pass Capacitance: Approximately 2000 $\mu\mu\text{f}$.

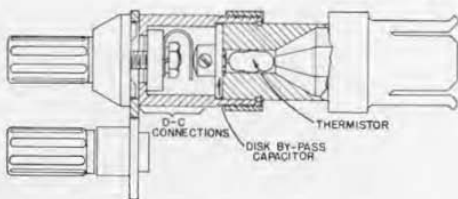
Physical Length Overall: 4 inches.

Typical assembly of equipment for power measurements, consisting of the Bolometer Bridge, with Thermistor Unit and Lamp Termination in the foreground. Patch cord is Type 274-NC.





Standing-wave ratio as a function of frequency for the Thermistor Units and Fuse Bolometer.



Cross section of the Thermistor Unit.

Type 874-HF-P1 Fuse Assortment

Replacement fuses for TYPE 874-HF. Includes five 1/10-amp. fuses (Buss AGX 1/10) and five 1/40-amp. fuses (Buss MJB 1/40). Maximum total power is 25 mw. for the 1/40-amp. fuses and 700 mw. for the 1/10 amp. fuses.

Connections

Between the bolometer bridge and the bolometer units can be made by the TYPE 274-NC Shielded Connector.

Type 874-WL Lamp Termination

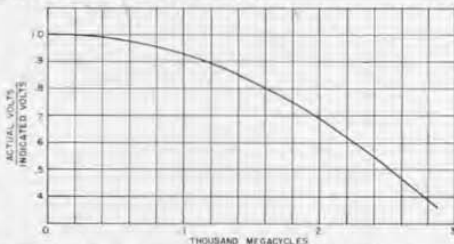
For rough indications of power in the 50 mw. to 100 mw. range. Useful for making preliminary tests on experimental oscillators. Consists of a flashlight bulb in a screw-type, miniature socket on the rear of a connector. Bulb has a straight-wire filament and is rated at 1.35 volts. Either TYPE 874-MA Loop or TYPE 874-MB Probe can be used for coupling to power source. Can be used with a photoelectric cell and meter (such as a photographic exposure meter) in a d-c substitution method for more accurate measurements.

Type		Code Word	Price
874-H25	Thermistor Unit	COAXWARMER	\$40.00
874-HP25	Replacement Thermistor for Type 874-H25	THERM	9.00
874-H100	Thermistor Unit	COAXHEATER	40.00
874-HP100	Replacement Thermistor for Type 874-H100	CALDO	9.00
874-HF	Fuse Bolometer Holder	COAXHOLDER	34.00
874-HF-P1	Fuse Assortment	FUSOR	2.50
874-WL	Lamp Termination	COAXLAMPER	5.00
274-NC	Patch Cord	STANPARZOO	2.75

3. EQUIPMENT FOR VOLTAGE MEASUREMENTS

Type 874-VR Voltmeter Rectifier

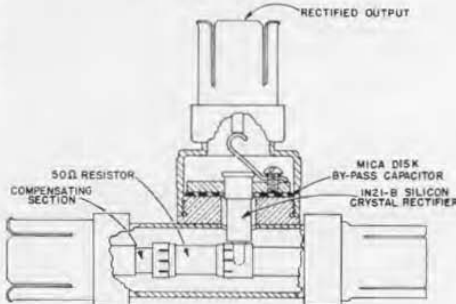
Consists of a short coaxial line with a crystal rectifier mounted between inner and outer conductors and with a 50-ohm cylindrical resistor in series with the line inner conductor at one end. A by-pass capacitor is incorporated in the crystal mount. The crystal rectifies the high-frequency voltage across the line, and the rectified output is brought out to a coaxial connector. Placed in a coaxial system, the voltmeter rectifier can be used to monitor voltage levels. The 50-ohm resistor provides an effective termination for a 50-ohm cable or line extension connected to the resistor end of the unit, so that at the far end of the cable or line extension the open-circuit voltage equals the voltage at the crystal, less attenuation, and the effective source impedance is 50 ohms.³ The resistor can be replaced by a suitable metal tube if no termination is desired, however. The voltmeter

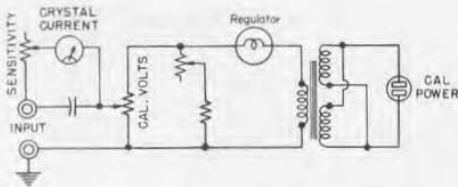


Correction factor for resonance in the Type 874-VR Voltmeter Rectifier.

³Arnold Peterson, "Output Systems of Signal Generators," *General Radio Experimenter*, XXI, 1, June, 1946.

Cross section of the Voltmeter Rectifier.





Schematic circuit diagram of the Type 874-VI Voltmeter Indicator.

rectifier can also be used as a general-purpose detector in conjunction with a high-gain amplifier such as the General Radio TYPE 1231-B.

Resonant Frequency: Approximately 3600 Mc.
Maximum Voltage: 2 volts.

By-Pass Capacitance: Approximately 300 μ f.

Frequency Range for Voltage Measurements: Approximately 15 Mc to 2500 Mc, subject to resonance correction above 1000 Mc.

Frequency range for voltage *indications* extends to both lower and higher frequencies.

Type 874-VI Voltmeter Indicator

Includes a meter and a sensitivity control for indicating rectified d-c output of the TYPE 874-VR Voltmeter Rectifier. A 60-cycle circuit is also included for calibrating the crystal of the voltmeter rectifier at any desired level between 0.1 volt and 2 volts, so that errors due to gradual changes in crystal rectifier characteristics are eliminated. The 60-cycle calibrating voltage is regulated against line-voltage fluctuations.

Accuracy of Calibrating Voltage: ± 0.05 volt.

Crystal Current for Full-Scale Indication: 200 μ a.

Dimensions: $5\frac{1}{2} \times 5\frac{1}{2} \times 4\frac{1}{2}$ inches, overall.

Net Weight: 3 pounds, 1 ounce.

Connections

Connections between the TYPE 874-VR Voltmeter Rectifier and the TYPE 874-VI Voltmeter Indicator can be made by the TYPE 874-R31 Patch Cord. For completely shielded connections between the voltmeter rectifier and more sensitive indicating instruments, the TYPE 874-R32 or 874-R20 Patch Cords can be used. These patch cords are described on page 11.

Equipment for voltage measurement, consisting of Type 874-VR Voltmeter Rectifier, Type 874-VI Voltmeter Indicator, and Type 874-R31 Patch Cord.



Type		Code Word	Price
874-VR	Voltmeter Rectifier	COAXRECTOR	\$25.00
874-VI	Voltmeter Indicator	COAXVOLTER	65.00

4. FIXED LINE ELEMENTS

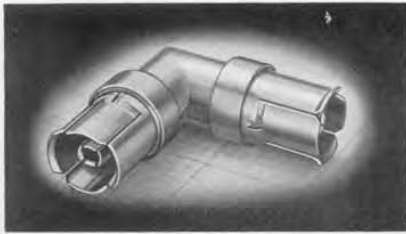
50-Ohm Air Lines

For spacing stubs or other elements of a coaxial system. Each air line consists of a length

of 50-ohm, air-dielectric, coaxial line with a connector at each end. The electrical lengths are 10 cms., 20 cms., and 30 cms., respectively.

Type		Code Word	Price
874-L10	50- Ω Air Line (10 cm.)	COAXDECKER	\$10.00
874-L20	50- Ω Air Line (20 cm.)	COAXVENTER	11.00
874-L30	50- Ω Air Line (30 cm.)	COAXTRIPLY	12.00





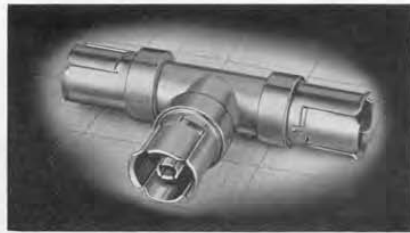
Type 874-EL 90° EII

For making a right-angle bend in a coaxial system.

Characteristic Impedance: 50 ohms.

Electrical Length: Approximately 7 cms.

Type	Code Word	Price
874-EL 90° EII	COAXANGLER	\$6.50



Type 874-T Tee

Used for connecting stubs and other elements in shunt with a coaxial line.

Note: All cross-section backgrounds shown in photos are 1/8-inch squares.

Type	Code Word	Price
874-T Tee	COAXTOGGER	\$8.50

5. ADJUSTABLE LINE ELEMENTS

Adjustable Stubs

For matching or tuning, and use as reactive elements. Can be used with indicator and scale as reaction-type wavemeters. Stubs consist of a coaxial line with a sliding short circuit of the multiple-spring-finger type. The short circuit is moved by a bakelite tube having a sliding reference marker to facilitate use as a wavemeter.

Characteristic Impedance: 50 ohms.

Maximum Travel of Short Circuit:

- 20 cms. for 874-D20
- 50 cms. for 874-D50.

Type 874-LA Adjustable Line (Line-Stretcher)

An air-dielectric, coaxial line that can be telescoped to change its length. Used in matching networks. Contacts are made by multiple spring fingers.

Length Change: 25 cms.

Characteristic Impedance: Not constant — approximately 50 ohms when fully collapsed. Approximately 57 ohms when fully extended.

Type	Code Word	Price
874-D20 Adjustable Stub (20 cm.)	COAXTUBBER	\$15.00
874-D50 Adjustable Stub (50 cm.)	COAXBIGGER	16.00
874-LA Adjustable Line	COAXLAPPER	18.00



Type 874-JR Rotary Joint

Used when one part of a system must be rotated with respect to another part, as when measuring antenna patterns or when changing the coupling of a loop.

Type	Code Word	Price
874-JR Rotary Joint	COAXJOINER	\$8.50





6. TERMINATIONS

Type 874-WM 50-Ohm Termination



Provides a good impedance match for 50-ohm coaxial systems from dc to several thousand megacycles. Useful for establishing reference conditions, for terminating filters and attenuators, and for many other purposes. Consists of a 50-ohm cylindrical resistor mounted in a tapered coaxial holder.

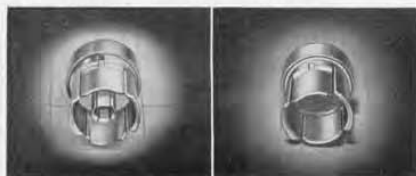
D-C Resistance: 50 ohms $\pm 1\%$.

Maximum Power: $\frac{1}{2}$ watt.

Left, Short-Circuit Termination and, Right, Open-Circuit Termination.

Type 874-WN Short-Circuit Termination
Type 874-WO Open-Circuit Termination

Useful for establishing reference conditions on coaxial lines. Can be used in substitution measurements when the unknown is to be replaced by a short circuit or an open circuit. The short-circuit termination consists of a fixed shorting strap mounted in a connector. The effective position of the electrical short-circuit is fixed. The open-circuit termination is a shielding cap for open-circuited lines. Because of unavoidable end capacitance, the effective position of the electrical open-circuit varies with frequency over a distance range of 2 mm. On the average, it is 2 mm. from the effective position of the electrical short-circuit produced by the short-circuit termination.



Type

Code Word

Price

874-WM	50-Ohm Termination	COAXMEETER	\$8.00
874-WN	Short-Circuit Termination	COAXNULLER	3.50
874-WO	Open-Circuit Termination	COAXOPENER	3.00

7. ATTENUATORS

Type 874-GA Adjustable Attenuator

A mutual-inductance (waveguide-below-cut-off) type attenuator useful for producing known voltage ratios, for measuring attenuation, and for adjusting voltage magnitude. Consists of a loop that can be positioned longitudinally within a hollow tube by rotating an outside sleeve. One turn of the sleeve produces a 20 db change in attenuation. The sleeve advances when it is turned, so that complete turns are indicated by engraved lines on the tube. Sleeve and tube are calibrated directly in decibels, and unit is read like micrometer calipers. The input system is a short coaxial line with a connector at each end, one end for connection to the power source and the other

for connection to a 50-ohm termination, an adjustable stub, or any desired load. The hollow tube of the attenuator joins the input line at right angles and is excited through a hole in the outer conductor by the inner-conductor current. Calibration holds when the loop is within the hollow tube, but higher, uncalibrated output can be obtained by moving the loop beyond the mouth of the tube and into the input line. The output of the loop is brought out through three feet of double-shielded flexible cable, which is approximately matched at the loop end by a 50-ohm resistor between the low side of the loop and ground.

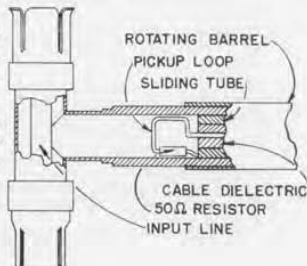
Calibrated Range: 120 db — usable range depends upon shielding between input and output.

Insertion Loss at Beginning of Calibrated Range: Approximately inversely proportional to fre-



At left, view of the adjustable attenuator.

At right, cross section of the coupling system.





quency up to 1000 Mc; approximately 20 db at 1000 Mc with tuned input; approximately 33 db with input line terminated in 50 ohms.

Minimum Insertion Loss (Outside of Calibrated Range): Approximately inversely proportional to frequency; approximately 18 db at 1000 Mc.

Waveguide Mode: TE_{1,1}; cutoff frequency: 12,300 Mc.

Accuracy of Attenuation: ±0.5 db when corrected; correction chart supplied.

Frequency Range: 100 Mc to 3000 Mc.

Type 874-GF, GG Fixed Attenuators

A single-section, π -type resistance attenuator useful over the frequency range from dc to several thousand megacycles. Consists of two disc resistors and one cylindrical resistor as the shunt and series elements respectively.

Impedance: 50 ohms.

Maximum Power Input: ½ watt.

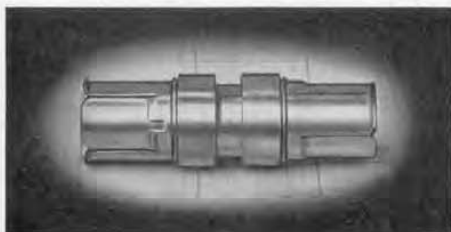
Physical Length Overall: 2½ inches.

Low-Frequency Accuracy: ±0.5 db.

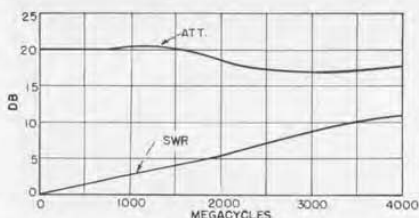
Attenuation and standing-wave ratio of the Type 874-GF Fixed Attenuator as a function of frequency,

Type

Type		Code Word	Price
874-GA	Adjustable Attenuator	COAXLOSSER	\$55.00
874-GF	Fixed Attenuator (20 db)	COAXNEPPER	18.00
874-GG	Fixed Attenuator (10 db)	COAXBELLER	18.00



View of the Type 874-GF Fixed Attenuator.



8. FILTERS

Type 874-F500, F1000 Low-Pass Filters

Reduction of harmonics from an u-h-f generator by filters such as these is usually necessary for best measurement results, particularly if a system contains peak-reading voltmeters or sections that might resonate at a harmonic frequency, or if high standing-wave ratios are to be measured using a slotted line. These filters are of the Tscheybscheff type, in which very sharp cutoff is obtained at some sacrifice of uniformity in the pass band. The alternately large and small diameter sections of the inner conductor form the equivalent of shunt capacitances and series inductances respectively. Unequal section lengths reduce the likelihood of spurious pass bands above cutoff.

Insertion Loss: In pass band, varies as a function of frequency between 0 and 4 db; beyond cutoff, 20 db at 10% above cutoff, 40 db at 30% above cutoff.

Cutoff Frequencies:

$$\text{TYPE 874-F500, 500 Mc } \left\{ \begin{array}{l} -0 \\ +10 \end{array} \right\} \%;$$

$$\text{TYPE 874-F1000, 1000 Mc } \left\{ \begin{array}{l} -0 \\ +10 \end{array} \right\} \%.$$

Physical Length Overall:

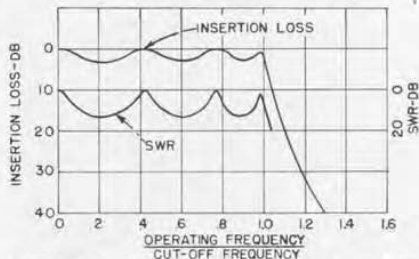
TYPE 874-F500, 10 $\frac{3}{16}$ inches;

TYPE 874-F1000, 7 $\frac{1}{8}$ inches.

View of Type 874-K Coupling Capacitor, described on next page.



View of the Type 874-F1000 Low-Pass Filter.



Insertion loss and standing-wave ratio of the Type 874-F1000 Low-Pass Filter.



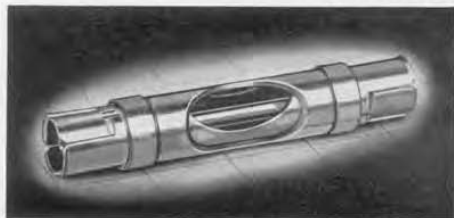
**Type 874-K Coupling Capacitor**

Consists of a short length of coaxial line having a cylindrical capacitor in series with the inner conductor. High frequencies are transmitted with small reflections, but dc and low

audio frequencies are blocked. This unit is often necessary for separating d-c paths in systems including two or more crystal rectifiers, as in measurements of insertion loss.

Coupling Capacitance: Approximately 5000 μf .

<i>Type</i>		<i>Code Word</i>	<i>Price</i>
874-F500	500-Mc Low-Pass Filter	COAXDIPPER	\$22.50
874-F1000	1000-Mc Low-Pass Filter	COAXMEGGER	22.50
874-K	Coupling Capacitor	COAXKICKER	12.00

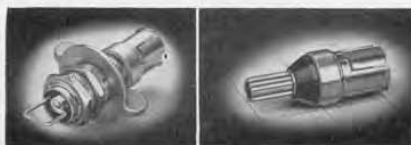
9. EXTERNAL COUPLING ELEMENTS**Type 874-LR Radiating Line**

Allows coupling an external wavemeter or heterodyne frequency meter to the fields within a coaxial system. Consists of short coaxial line with hole in outer conductor that can be partially or completely covered by a rotatable sleeve.

Type 874-MA Adjustable Coupling Loop

A general-purpose coupling loop. Consists of short coaxial line with a one-turn loop at one

<i>Type</i>		<i>Code Word</i>	<i>Price</i>
874-LR	Radiating Line	COAXMITTER	\$12.00
874-MA	Adjustable Coupling Loop	COAXLOOPER	7.50
874-MB	Coupling Probe	COAXPROBER	5.00



At left, Type 874-LR Radiating Line; above, left, Type 874-MA Adjustable Coupling Loop; above, right, Type 874-MB Coupling Probe.

end and a connector at the other. A collet is supplied for panel mounting. The loop can be adjusted for desired degree of coupling and clamped in that position by the collet.

Physical Length Overall: 3 inches.

Maximum Diameter: 1 $\frac{7}{8}$ inches.

Type 874-MB Coupling Probe

A general-purpose electrostatic probe consisting of a binding post, acting as a probe, mounted on a connector.

Physical Length Overall: 2 $\frac{3}{8}$ inches.

10. FOUNDATION ELEMENTS**Connectors**

All TYPE 874 Connectors are supplied unassembled with complete assembly instructions. No special tools are needed.

Type 874-B Basic Connector

For use on rigid, 50-ohm, air-dielectric, coaxial lines. Consists of inner and outer conductors, insulating bead, coupling nut, and retaining ring. Fits lines made from $\frac{5}{8}$ " O.D., $\frac{9}{16}$ " I.D. tubing, and 0.244" D rod. The inner conductor is to be screwed into an 8-32 tapping in the end of the rod, and the retaining ring for the coupling nut is to be snapped into a $\frac{1}{64}$ " deep, 0.035"-wide groove cut in the $\frac{5}{8}$ " tubing.

Type 874-C Cable Connector

For use on TYPE 874-A2 Polyethylene Cable. Consists of the basic connector parts plus inner





and outer transition pieces, a soft copper ferrule, and a rubber guard. The transition pieces are tapered so as to maintain the 50-ohm characteristic impedance of the connector and cable throughout the change in diameters. The cable inner conductor is to be soldered to the inner transition piece, and the cable braid is attached to the outer transition piece by crimping the

ferrule. The rubber guard provides strain relief and a protective handle.

Type 874-C8 Cable Connector

For use on Army-Navy Type RG-8/U Cable. Same as TYPE 874-C, except outer transition piece fits R-8/U Cable.

PANEL CONNECTORS

Type 874-P Panel Connector

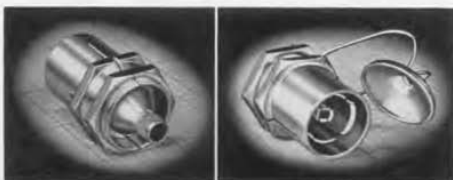
For use on panels. Rear end fits TYPE 874-A2 Cable. Is similar to the cable connector, except a panel adaptor and nut are supplied in place of rubber guard. The panel adaptor fits into a $1\frac{5}{16}$ " D hole in panels from $\frac{1}{16}$ " to $\frac{1}{4}$ " thick and is designed to clamp the connector in any desired orientation.

Type 874-P8 Panel Connector

Same as TYPE 874-P, except rear end fits Army-Navy Type RG-8/U Cable.

Type 874-PC Panel Connector with Cap

For use on panels. Same as TYPE 874-P, with addition of a spring-hinged cap to shield the connector when not in use. Rear end fits TYPE 874-A2 Cable.



Left, Panel Connector; right, Panel Connector with Cap.

Type 874-PC8 Panel Connector with Cap

Same as TYPE 874-PC, except rear end fits Army-Navy Type RG-8/U Cable.

ADAPTORS

Type 874-Q1 Adaptor to Type N

Plugs into Army-Navy Type UG-22/U and similar jack-type connectors.

Type 874-Q2 Adaptor to Type 274

Makes output of a coaxial system available at a pair of $\frac{3}{4}$ -inch-spaced binding posts or banana plugs.

Type 874-Q7 Adaptor to Type 774

Plugs into any General Radio TYPE 774 Connector.



Above, left, Type 874-Q1; right, Type 874-Q2; below, Type 874-Q7.

PATCH CORDS

Type 874-R20 Patch Cord

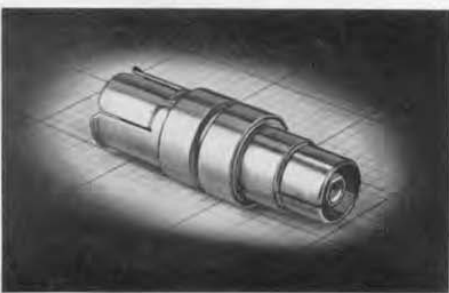
For making shielded connections. Consists of three feet of TYPE 874-A2 Polyethylene Cable with a TYPE 874-C Connector on each end.

Type 874-R31 Patch Cord

Makes output of a coaxial system available at a pair of phone tips. Useful as a test probe with clips or prods on phone tips. Consists of three feet of rubber-dielectric, flexible coaxial cable with a TYPE 874 Connector on one end and phone tips on the other.

Type 874-R32 Patch Cord

Similar to TYPE 874-R31, with a TYPE 274-ND Shielded Plug in place of phone tips. Makes output of a coaxial system available at a pair of shielded, $\frac{3}{4}$ -inch-spaced, banana plugs.



Type 874-R20.

Type 874-R31.

Type 874-R32.





Type 874-A2 Polyethylene Cable

Bulk cable for permanent or semipermanent installations and for making long patch cords. Characteristic impedance is 50 ohms $\pm 5\%$. Cable is double-shielded and has good mechanical flexibility. Nominal capacitance is 32 $\mu\mu\text{f}$ per foot. Attenuation at 100 Mc is about 2.6 db

per 100 feet, and at 1000 Mc about 10.5 db per 100 feet. Consists of a No. 14 stranded inner conductor, separated from the two, braided, tinned-copper shields by 0.244" OD Polyethylene insulation, and an outer gray Plastex jacket 0.365" OD.

Type 874-Z Stand



Provides firm support for the parts of a wide variety of coaxial systems. Consists of a heavy bronze base with rubber feet, 22-inch and 8-inch brass rods, and three universal clamps. Will not rust or corrode. The vertical rod can be used to hold long tuning stubs. The horizontal rod can be moved longitudinally or interchanged with the vertical rod to provide support where needed. Two bases can be used with one 22-inch rod between them to support a long horizontal run of coaxial parts. Clamps will fit a range of diameters and will hold between two rods of different diameters. Any desired arrangement can be set up quickly. Base can be screwed down to table top for permanent setups.

Type	Code Word	Price
874-Z Stand	COAXHELPER	\$12.50

CREDITS

Development of the TYPE 874 Coaxial Elements was directed by Eduard Karplus. Electrical and mechanical engineers on the project were, respectively, William R. Thurston and Harold M. Wilson.

Type		Code Word	Price
874-B	Basic Connector	COAXBRIDGE	\$1.50
874-C	Cable Connector	COAXCABLER	2.00
874-C8	Cable Connector	COAXCORDER	2.00
874-P	Panel Connector	COAXPEGGER	2.25
874-P8	Panel Connector	COAXPUTTER	2.25
874-PC	Panel Connector with Cap	COAXCAPPER	2.75
874-PC8	Panel Connector with Cap	COAXTOPPER	2.75
874-Q1	Adaptor to Type N	COAXNUTTER	6.00
874-Q2	Adaptor to General Radio Type 274	COAXTIPPER	5.00
874-Q7	Adaptor to General Radio Type 774	COAXPASSER	5.00
874-A2	Polyethylene Cable	COAXCUTTER	.50/foot 27.00/100 feet
874-R20	Patch Cord	COAXHATTER	8.00
874-R31	Patch Cord	COAXFLEXOR	4.50
874-R32	Patch Cord	COAXFITTER	5.25

Type 874 Coaxial Connectors are licensed under U. S. Patent 2,125,816. Also patent applied for.

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