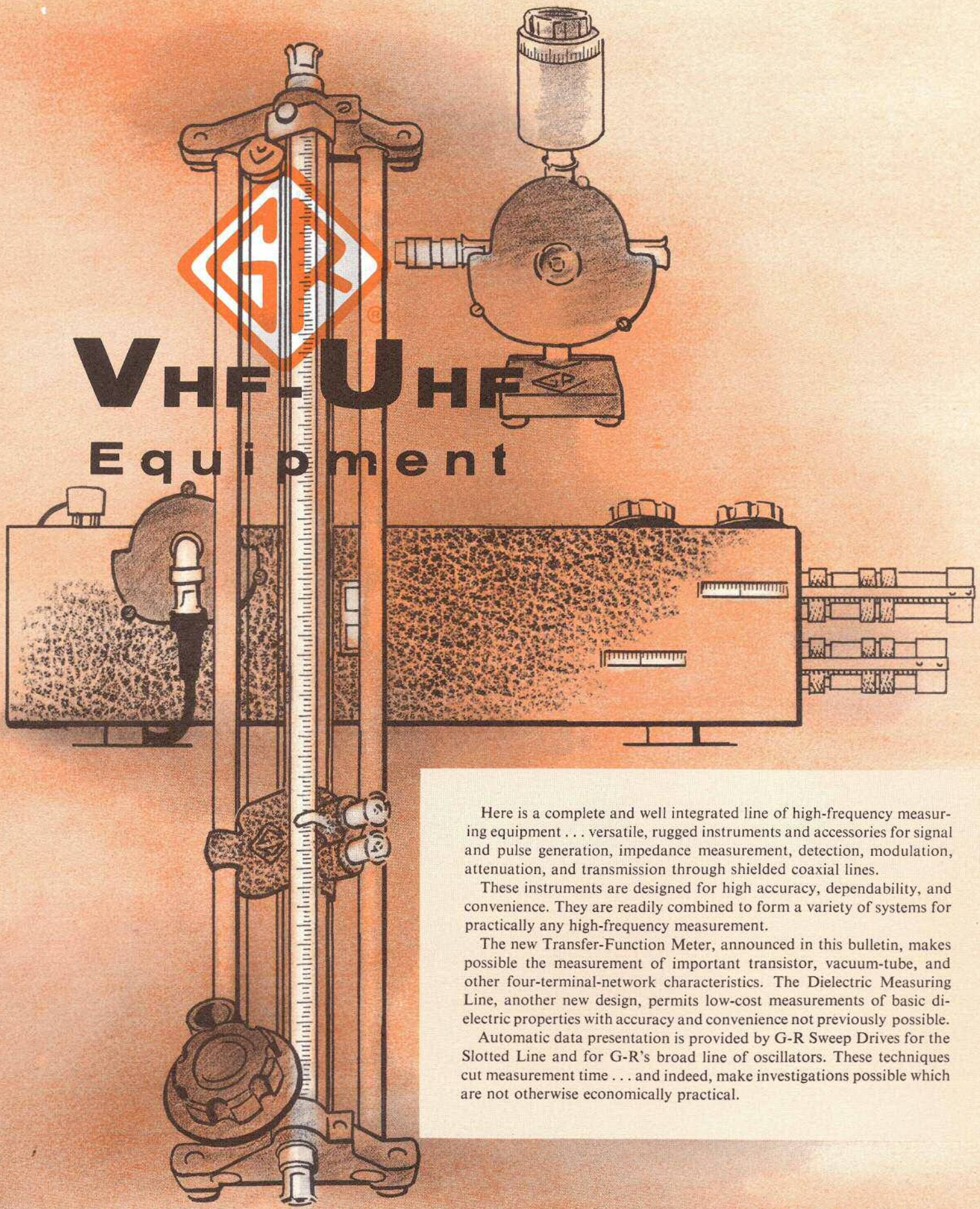


VHF-UHF Equipment

Here is a complete and well integrated line of high-frequency measuring equipment . . . versatile, rugged instruments and accessories for signal and pulse generation, impedance measurement, detection, modulation, attenuation, and transmission through shielded coaxial lines.

These instruments are designed for high accuracy, dependability, and convenience. They are readily combined to form a variety of systems for practically any high-frequency measurement.

The new Transfer-Function Meter, announced in this bulletin, makes possible the measurement of important transistor, vacuum-tube, and other four-terminal-network characteristics. The Dielectric Measuring Line, another new design, permits low-cost measurements of basic dielectric properties with accuracy and convenience not previously possible.

Automatic data presentation is provided by G-R Sweep Drives for the Slotted Line and for G-R's broad line of oscillators. These techniques cut measurement time . . . and indeed, make investigations possible which are not otherwise economically practical.

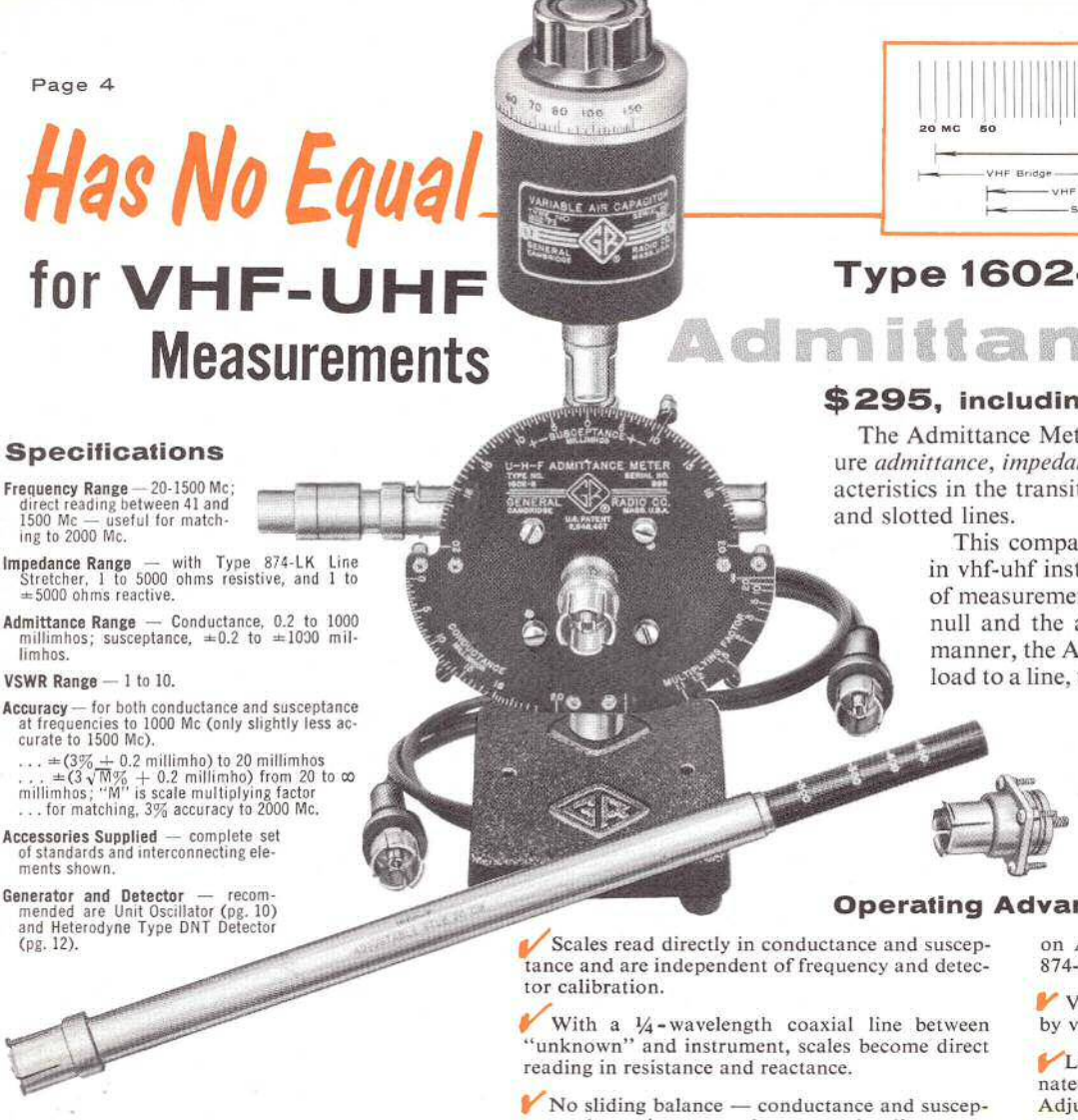
GENERAL RADIO Company

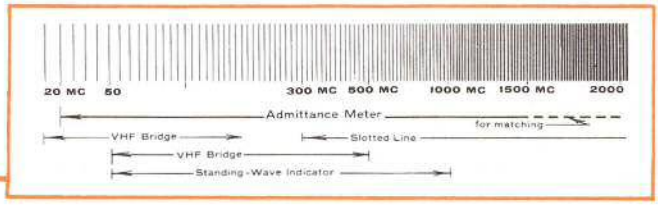
275 Massachusetts Avenue
Cambridge 39, Mass., U.S.A.

NEW YORK PHILADELPHIA WASHINGTON CHICAGO LOS ANGELES SAN FRANCISCO TORONTO

Has No Equal

for VHF-UHF Measurements





Type 1602-B Admittance Meter

$295, including accessories

The Admittance Meter is the only instrument that can measure *admittance*, *impedance*, *VSWR*, as well as many other characteristics in the transitional range between impedance bridges and slotted lines.

This compact device represents a unique technique in vhf-uhf instrumentation. It offers unmatched speed of measurement — move two levers to obtain detector null and the answer appears directly on dial. In this manner, the Admittance Meter can be used to match a load to a line, to compare directly the impedance of one circuit or component to that of another, as well as for direct impedance measurements.

Low cost is due to the simplicity of the operating principle. Accuracy, wide impedance and frequency ranges are inherent in the design.

Specifications

Frequency Range — 20-1500 Mc; direct reading between 41 and 1500 Mc — useful for matching to 2000 Mc.

Impedance Range — with Type 874-LK Line Stretcher, 1 to 5000 ohms resistive, and 1 to ±5000 ohms reactive.

Admittance Range — Conductance, 0.2 to 1000 millimhos; susceptance, ±0.2 to ±1000 millimhos.

VSWR Range — 1 to 10.

Accuracy — for both conductance and susceptance at frequencies to 1000 Mc (only slightly less accurate to 1500 Mc).
. . . ±(3% + 0.2 millimho) to 20 millimhos
. . . ±(3$\sqrt{M}$% + 0.2 millimho) from 20 to ∞ millimhos; "M" is scale multiplying factor
. . . for matching, 3% accuracy to 2000 Mc.

Accessories Supplied — complete set of standards and interconnecting elements shown.

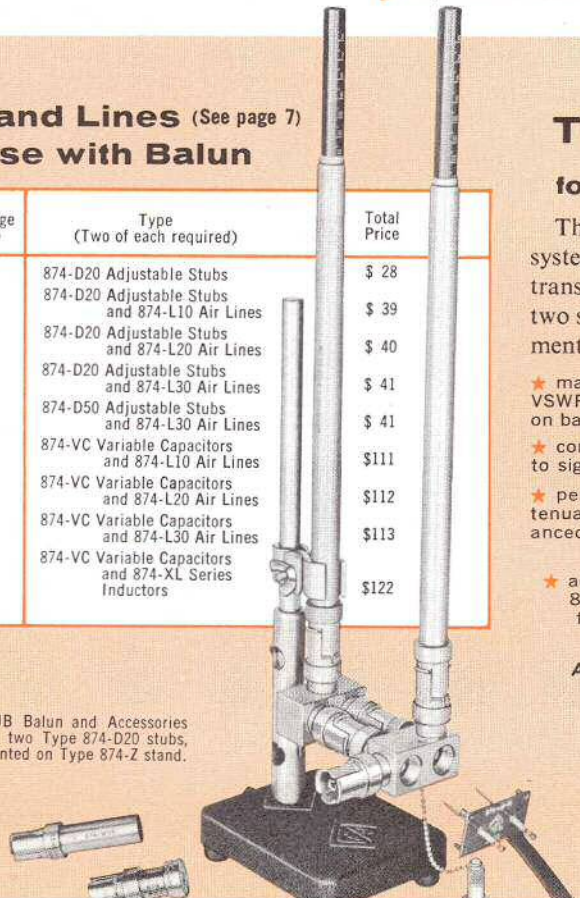
Generator and Detector — recommended are Unit Oscillator (pg. 10) and Heterodyne Type DNT Detector (pg. 12).

Operating Advantages

- Scales read directly in conductance and susceptance and are independent of frequency and detector calibration.
- With a ¼-wavelength coaxial line between "unknown" and instrument, scales become direct reading in resistance and reactance.
- No sliding balance — conductance and susceptance (or resistance and reactance) adjustments are independent of each other.
- Impedance of balanced circuits is read directly on Admittance Meter when used with the Type 874-UB Balun and ¼-wavelength line.
- VSWR can be measured simply and directly by voltage-ratio methods.
- Line-length corrections are completely eliminated when the Type 874-LK Constant-Impedance Adjustable Line is used.
- The many Type 874 accessories described on following pages permit practically any measurement which may be required.

Stubs and Lines (See page 7) for use with Balun

Frequency Range (Megacycles)	Type (Two of each required)	Total Price
470 to 1000	874-D20 Adjustable Stubs	$ 28
350 to 525	874-D20 Adjustable Stubs and 874-L10 Air Lines	$ 39
275 to 380	874-D20 Adjustable Stubs and 874-L20 Air Lines	$ 40
225 to 280	874-D20 Adjustable Stubs and 874-L30 Air Lines	$ 41
170 to 280	874-D50 Adjustable Stubs and 874-L30 Air Lines	$ 41
174 to 216	874-VC Variable Capacitors and 874-L10 Air Lines	$111
140 to 174	874-VC Variable Capacitors and 874-L20 Air Lines	$112
88 to 140	874-VC Variable Capacitors and 874-L30 Air Lines	$113
54 to 88	874-VC Variable Capacitors and 874-XL Series Inductors	$122



Type 874-UB Balun and Accessories shown with two Type 874-D20 stubs, mounted on Type 874-Z stand.

Type 874-UB Balun $75

for measurements on balanced lines and circuits

The Balun is a unique device for converting from balanced to unbalanced systems over the range from 54 to 1000 Mc. The balanced-to-unbalanced transformation is obtained by using a semi-artificial, half-wave line made up of two sections of 50-ohm coaxial line and two shunt tuning elements. The instrument is tunable for maximum accuracy.

★ makes possible accurate impedance, VSWR, gain and sensitivity measurements on balanced systems

★ converts grounded signal generators to signal sources with balanced outputs

★ permits accurate measurement of attenuation as well as impedance of balanced twin-lead, twin-line, other TV transmission lines, and on TV receiver inputs and other communication equipment. Write for the booklet "The Measurement of Cable Characteristics"

★ facilitates measurement of balanced antennas — determines VSWR introduced into 300-ohm twin-lead by filters, lightning arrestors, etc.

★ accessories supplied: Type 874-UB-P1 terminal for use with 300-ohm systems; Type 874-WN3 Short-Circuit Termination and Type 874-WO3 Open-Circuit Termination to facilitate tuning

Additional Accessories Available

Type 874-UB-P2 200-ohm Terminal Unit . . . compensated for connecting 200-ohm balanced transmission line directly to Balun; completely eliminates line-length corrections with 874-LK Line Stretcher **$6.50**

Type 874-UB-P3 300-ohm Terminal Unit . . . consists of two 50-ohm resistors in series with the balanced terminals . . . when used with the Balun's coaxial terminal terminated with 50-ohms the balanced source or load becomes 300 ohms . . . also useful for producing 300-ohm balanced output from a 50-ohm signal generator **$15.00**

Transfer-Function Meter

New

a **VHF-UHF** Instrument for Direct Measurement of all Forward and Reverse Complex Transfer Functions

. . . of Transistors

α ($-h_f$) ..... Common-base, short-circuit current gain

β ..... Common-emitter, short-circuit current gain

h_r ..... Open-circuit, voltage feedback factor

r_b ..... Base impedance

r_e ..... Emitter impedance

. . . of Vacuum Tubes

μ ..... Open-circuit voltage gain

Y_m (Y_{21}) ..... Transadmittance (Transconductance and Transusceptance)

Y_{12} ..... Feedback Transadmittance

. . . of General Networks

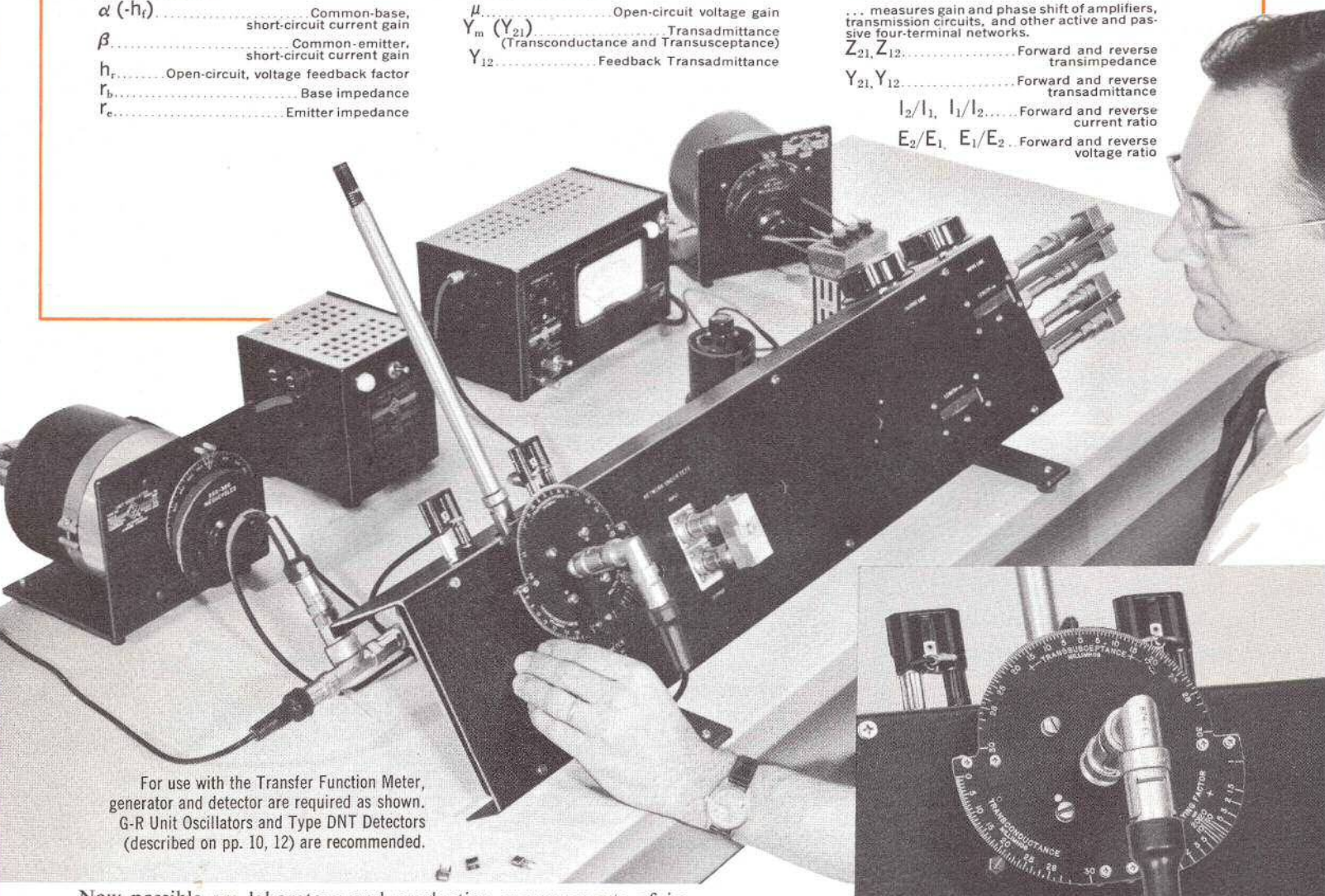
. . . measures gain and phase shift of amplifiers, transmission circuits, and other active and passive four-terminal networks.

Z_{21}, Z_{12} ..... Forward and reverse transimpedance

Y_{21}, Y_{12} ..... Forward and reverse transadmittance

I_2/I_1, I_1/I_2 ..... Forward and reverse current ratio

E_2/E_1, E_1/E_2 ..... Forward and reverse voltage ratio



For use with the Transfer Function Meter, generator and detector are required as shown. G-R Unit Oscillators and Type DNT Detectors (described on pp. 10, 12) are recommended.

Instrument measures real and imaginary parts, or absolute magnitude, as desired, of all above transfer functions.

Now possible are laboratory and production measurements of important transfer characteristics, including complete investigation of basic transistor and vacuum-tube properties from 25 to 1000 Mc. The means for such measurements have long been needed.

For example, at low frequencies the short-circuit current gain α ($-h_f$) has a pure real value and can be measured on conventional transistor testers. At high frequencies α becomes a complex number, and until *now* there has been no simple way to measure it up to 1000 Mc. This *can* be done with the new G-R Transfer-Function Meter, which measures all other transistor transfer functions as well. Results are given directly in real and imaginary components.

In addition, the instrument can measure forward and reverse transimpedance, complex voltage gain, complex current gain and phase characteristics of networks . . . transmission lines . . . multi-stage amplifiers . . . attenuators . . . and other four-terminal devices. Operation is straightforward. In each case the answer is given *directly*, with multipliers, in terms of real and imaginary components. The instrument is suitable for use in routine measurements by relatively unskilled personnel.

With suitable component mounts, two-terminal grounded or ungrounded impedances and admittances can also be measured.

Type 1607A Transfer-Function Meter **$1525**

SPECIFICATIONS

FREQUENCY RANGE: 25 to 1000 Mc

BIASING provisions built-in for use with external d-c sources.

MEASUREMENT RANGES:

	Smallest Scale Division	Maximum	Accuracy
Voltage & Current Ratios (R)	0.025	30	$2.5\,(1+R)\% + 0.025$
Transimpedance (Z_{21})	1.25 Ω	1500 Ω	$2.5\left(1+\frac{Z_{21}}{50}\right)\% + 1.25\ \Omega$
Transadmittance (Y_{21})	0.5 mmho	600 mmhos	$2.5\left(1+\frac{Y_{21}}{20}\right)\% + 0.5$ mmho

Transfer-Function Meter

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a **VHF-UHF** Instrument for Direct Measurement of all Forward and Reverse Complex Transfer Functions

...of Transistors

- α ($-h_f$) ..... Common-base, short-circuit current gain
- β ..... Common-emitter, short-circuit current gain
- h_r ..... Open-circuit, voltage feedback factor
- r_b ..... Base impedance
- r_e ..... Emitter impedance

...of Vacuum Tubes

- μ ..... Open-circuit voltage gain
- Y_m (Y_{21}) ..... Transadmittance (Transconductance and Transusceptance)
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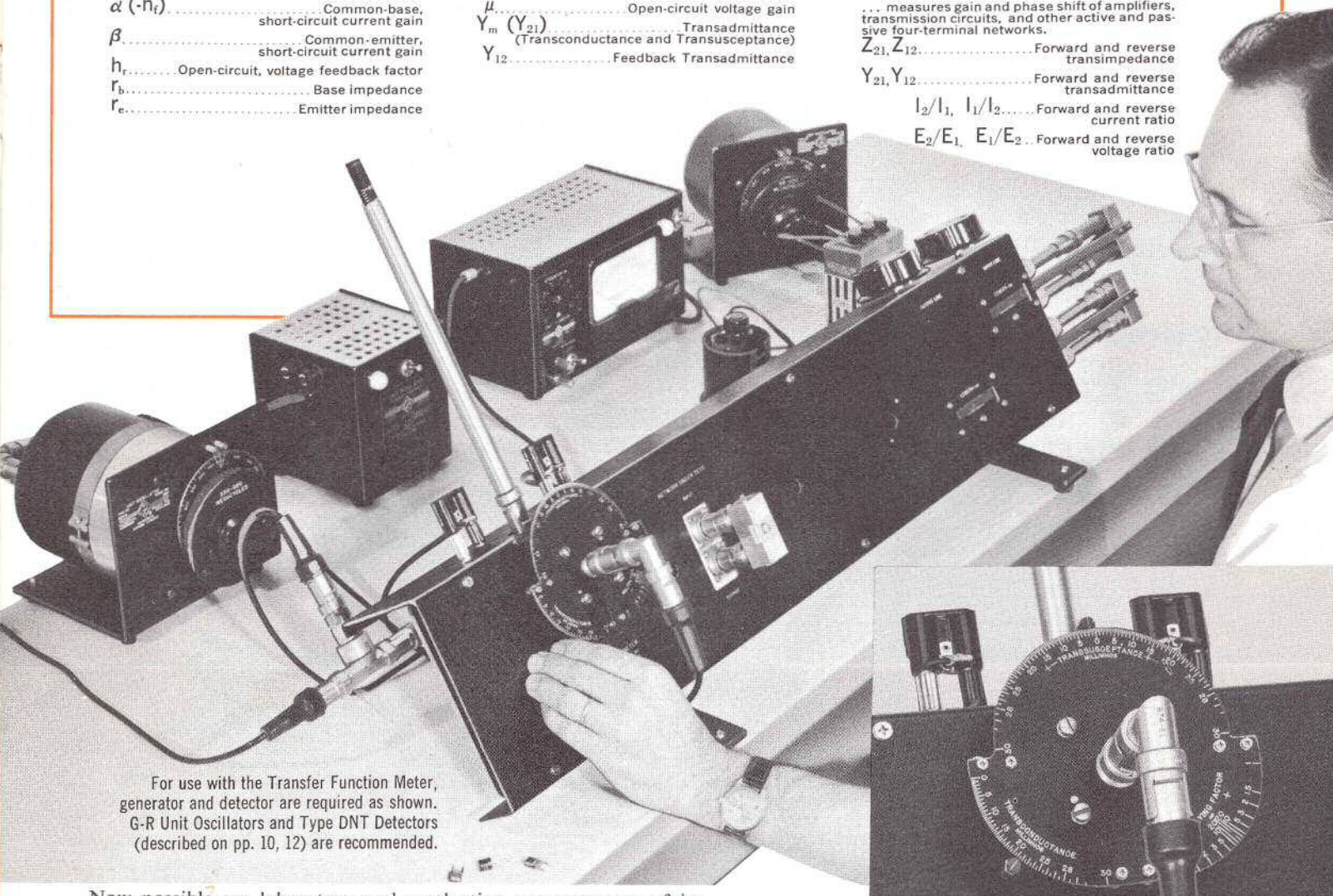
...of General Networks

... measures gain and phase shift of amplifiers, transmission circuits, and other active and passive four-terminal networks.

- Z_{21}, Z_{12} ..... Forward and reverse transimpedance
- Y_{21}, Y_{12} ..... Forward and reverse transadmittance
- I_2/I_1, I_1/I_2 ..... Forward and reverse current ratio
- E_2/E_1, E_1/E_2 ..... Forward and reverse voltage ratio



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In addition, the instrument can measure forward and reverse transimpedance, complex voltage gain, complex current gain and phase characteristics of networks . . . transmission lines . . . multi-stage amplifiers . . . attenuators . . . and other four-terminal devices. Operation is straightforward. In each case the answer is given *directly*, with multipliers, in terms of real and imaginary components. The instrument is suitable for use in routine measurements by relatively unskilled personnel.

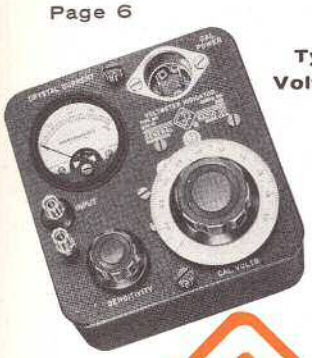
With suitable component mounts, two-terminal grounded or ungrounded impedances and admittances can also be measured.

Type 1607A Transfer-Function Meter $1525

SPECIFICATIONS

FREQUENCY RANGE: 25 to 1000 Mc
BIASING provisions built-in for use with external d-c sources.
MEASUREMENT RANGES:

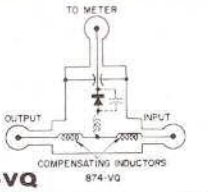
	Smallest Scale Division	Maximum	Accuracy
Voltage & Current Ratios (R)	0.025	30	$2.5\,(1+R)\% + 0.025$
Transimpedance (Z_{21})	1.25 Ω	1500 Ω	$2.5\left(1+\frac{Z_{21}}{50}\right)\% + 1.25\ \Omega$
Transadmittance (Y_{21})	0.5 mmho	600 mmhos	$2.5\left(1+\frac{Y_{21}}{20}\right)\% + 0.5$ mmho



Type 874-VI
Voltmeter Indicator . . . $80

The Voltmeter Indicator, used in combination with the Voltmeter Detector or Rectifier is a compact, accurate system for measuring or monitoring voltage in coaxial systems. The Indicator consists of a microammeter, sensitivity control and 60-cycle circuit for calibrating the crystal at any level between 0.1 and 2 volts. Accuracy of measurement is independent of crystal characteristics.

Crystal Current: 200 μa for full scale calibration
Range and Accuracy: 0.1 to 2 volts ±0.05 volt
Input Resistance: 600 ohms minimum — 10,000 ohms maximum



874-VQ
Voltmeter Detector . . . $30

A general purpose detector of either modulated or unmodulated signals. Can be inserted at any point in 50-ohm line without introducing appreciable discontinuity. With the 874-WM 50-ohm Termination, this unit can be used as a matched Detector, and with the 874-VI Voltmeter Indicator it will measure voltage in a 50-ohm line. VSWR is less than 1.1 at 1000 Mc, less than 1.2 at 2000 Mc.

874-VR
Voltmeter Rectifier . . . $30

Similar to 874-VQ but contains resistor which makes output impedance 50 ohms. In combination with the Voltmeter Indicator, makes possible conversion of any oscillator into a 50-ohm signal generator by providing means to monitor output voltage.

Frequency Range: from below 15 Mc to above 2500 Mc, subject to resonance correction above 1000 Mc; resonance at 3600 Mc.
Maximum Voltage: 2 volts
By-Pass Capacitance: approximately 300 μμf; crystal shunt capacitance is 1 μμf.

Coaxial Elements an

Universal Type 874 50 ohm
Coaxial Connectors

★ Excellent Electrical Characteristics

★ Easily Interconnected

Cross Section of Mated 874 Connectors illustrates uniform connection formed. VSWR is less than 1.04 to 4000 Mc. The unique design permits any Type 874 Connector to plug into any other, minimizing the need for large stocks of male and female components. This Connector has proven superb for measurement purposes and instrument use.

Panel Connectors with adaptor and nut for mounting **$2.90 for any listed**

Panel Connectors with flanges for mounting **$2.90 for any listed**

Cable Connectors $2.00 for any listed

874-B Basic Connector for rigid, 50-ohm, air-dielectric coaxial line.....**$1.25**

			For use with cables below	
			Impedance Match	Unmatched
874 P	874-PB	874-C	874-A2	RG-7/U
874-P8	874-PB8	874-C8	RG-8/U	RG-11/U, -63/U, -114/U, -133/U, -144/U
874-P9	874-PB9	874-C9	RG-9/U, -87A/U, -116/U	
874-P58	874-PB58	874-C58	RG-29/U, -55/U, -58/U, -141/U, -142/U	
874-P62	874-PB62	874-C62		RG-59/U, -62/U, -71/U, -140/U

and adaptors to all Common Systems

To Adapt to Type	Order G-R Type Jack On Adaptor	Plug On Adaptor	Price
N	874-QNJ	874-QNP	$3.75 & $4.50
C	874-QCJ	874-QCP	$4.75 & $6.25
BNC	874-QBJ	874-QBP	$4.75 & $4.75
UHF	874-QUJ	874-QUP	$4.00 & $4.25
HN	874-QHJ	874-QHP	$6.50 & $6.50
LC	874-QLJ	874-QLP	$19.50 & $30.00

874-QU3A Adaptor to 3⅛-inch uhf line . . . **$125** . . . couples to standard 50.0-ohm uhf transmission line . . . makes possible direct connection of any G-R coaxial test-equipment to antenna systems for impedance and VSWR measurements at the operating frequency.

This element is silver plated for minimum loss. Electrical characteristics excellent; VSWR less than 1.03 to 920 Mc.

874-QU1 Adaptor to ⅞", 50.0-ohm uhf transmission line....**$21**
874-QU2 Adaptor to 1⅝", 50.0-ohm uhf transmission line...**$75.00**

874-QV2A Adaptor to 1⅝-inch line . . . **$62.50** . . . similar to 874-QU3A but couples to 51.5-ohm vhf transmission line. Used with Admittance Meter for rapid, reliable antenna testing; VSWR is less than 1.02 over complete vhf band.

874-QV3 Adaptor to 3⅛", 51.5-ohm vhf transmission line.....**$110.00**

874-Q6 Adaptor fits G-R Type 274NF Lead Assembly **$2.25**

874-Q7 Adaptor to G-R Type 774 Connector..**$4.25**

874-Q2 Adaptor for connecting Type 874 system to Type 274 Connector, binding posts, banana plugs.....**$4.25**

Cables and Patch Cords

874-A2 Polyethylene Cable is 50-ohm ±5%, double shielded **27c**/ft. for 25 ft. or more; **50c**/ft. for less.

874-A3 Polyethylene Cable small-diameter, double-shielded, 50-ohm ±5% cable . . . 3/16" outside diameter, has stranded center conductor for good flexibility (similar to RG-58A/U except is double shielded) . . . **20c**/ft. for 25 ft. or more; **35c**/ft. for less.

874-R20 Flexible Line 3-ft. 874-A2 double-shielded cable with 874-C Connectors **$6.50**

874-R22 Patch Cord 3-ft. Type 874-A3 double-shielded cable. Very good flexibility **$6.00**

874-R21 Patch Cord 3-ft. single-shielded, 50-ohm cable, 874-C58 Cable Connectors **$6.50**

874-R32A Patch Cord has 3-ft., 50-ohm single-shielded cable with 874-C58 Cable Connector and G-R Type 274-ND Shielded Double Plug **$5.50**

274-NF Lead Assembly for connection to 874-Q6 Adaptor, 274-ND Shielded Plug and 838-A Alligator Clips **$1.50**

Filters and

874-FR-1 Rejection Filter tunable from 54 to 72 Mc, rejects fundamental.....useful for measuring harmonics of transmitters, oscillators and other equipment.....**$35.00**

874-FR-2 Rejection Filter tunable 76-88 Mc....**$35.00**

874-FR-3 Rejection Filter 130-216 Mc.....**$35.00**

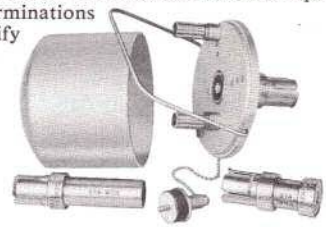
Type 874-MR
Mixer Rectifier . $32.50

. . . for mixing signals between 50 and 5000 Mc to produce i-f signal below 40 Mc . . . has minimum conversion loss. This Rectifier is a component of the G-R Type DNT Null Detector (page 12).

Operating Frequency Range: 50 to 5000 Mc
Maximum Crystal Current: 5 ma
Maximum Input from Local Oscillator: 2 volts
Cut-Off Frequency of Output Filter: 40 Mc
Conversion Loss at 30-Mc Output, dependent on load impedance; about 6 db with Type 1216-A Unit i-F Amplifier.

Type 874-M
Component Mount . . . $25. complete

. . a shielded enclosure which greatly minimizes effects of "lead" reactance and stray capacitance in high-frequency impedance measurements of resistors, capacitors, inductors and combinations of circuit elements. Useful from dc to 5000 Mc. The Mount connects directly to Slotted Line, Admittance Meter and other G-R Coaxial Elements. Open and Short Circuit Terminations are supplied to simplify determination of line-length corrections.



Type 874-VC
Variable Capacitor . . .
$50.00 (*Shielded Case Supplied*)

a general-purpose tuning element for use at lower frequencies where adjustable stubs and lines are inconvenient because of their large physical sizes.

Features milled aluminum rotor and stator, high-temperature polystyrene insulation, precision ball bearings, accurately-engraved drum dial and well-shielded enclosure. Capacitance variation is 56 $\mu\mu$f at 1 kc. Minimum capacitance setting remains essentially constant at 14 $\mu\mu$f to 200 Mc; maximum capacitance setting is 70 $\mu\mu$f to 50 Mc.

d Accessories for Every Need

Connecting and Coupling Elements

874-LR Radiating Line enables coupling to field within line . . **$8.50**

874-T Tee
for connecting elements in shunt with a coaxial line
$9.00

874-JR Rotary Joint permits rotation of one section with respect to another
$10.00

874-MB
Coupling Probe
for electrostatic coupling to external fields
$3.25

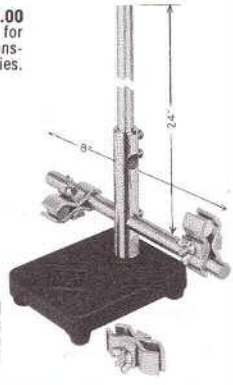
874-MA
Adjustable Coupling Loop
can be clamped in any desired position **$6.50**

874-EL
90 Degree Ell for right-angle bends **$7.50**

874-XL Series Inductor . . . $11.00
General purpose tuning element for resonant line circuits, matching transformers, and baluns at low frequencies. 0.226μh ± 5% at 1 kc.

Type 874-X Insertion Unit $9.00
. . . a shielded enclosure, for "home-made" filters, attenuators, impedance-matching networks, vhf transformers and other components. Cylindrical space is 2" long by 9/16" diameter.

874-K
Coupling Capacitor
blocks dc and low audio frequencies **$8.50**



Type 874-Z Stand
for supporting coaxial systems; includes heavy base, horizontal and vertical rods and three universal clamps **$17.50**

Terminations

874-WN
Short-Circuit Termination for establishing reference conditions at connector
$2.50

874-WO
Open-Circuit Termination with shielding cap . . **$1.75**

874-WN3 has "short" 3-cm further away from connector
$4.25

874-WO3 with "open" 3-cm further down the line from connector **$3.00**

874-WM 50-ohm Termination provides impedance match to 50 ohm systems from dc to sev eral thousand Mc **$12.50**

874-W100 100-ohm Coaxial Standard short length of 50-ohm line terminated in 100-ohm resistance . . . useful for checking accuracy of measuring devices, for use in matching networks and as general-purpose standard from 0 to over 2000 Mc **$32.50**

874-W200 200-ohm Coaxial Standard same as above but with 200-ohm resistor **$32.50**

874-BM Balanced Termination for use with 300-ohm balanced transmission line from dc to 900 Mc . . . has VSWR of less than 1.2 and ½-watt rating **$9.00**

Stubs and Lines

874-D20
Adjustable Stub with calibrated cm-scale indicating position of termination; 20-cm travel **$14.00**

874-D50 50-cm travel; movable marker replaces scale **$14.00**

874-L10 10-cm Air Line with 874-B Connector at each end **$5.50**

874-L20 20-cm Air Line **$6.00**

874-L30 30-cm Air Line **$6.50**

874-LK20
Constant-Impedance Adjustable Line
. . . line stretcher with low VSWR and uniform 50-ohm impedance; telescopes 22 cm . . . **$36.00**

874-LK10 similar to 874-LK20, but has shorter over-all length and only 10-cm travel; small size is greater convenience at higher frequencies . . . **$33.00**

874-LT Trombone Constant-Impedance Line . . . two 874-LK20's permanently connected to U-block gives adjustable range of 44 cm; permits line length to be varied without moving either input or output **$85.**

874-LA Adjustable Line (not constant impedance) with 25-cm travel **$17.50**

Attenuators

874-F4000 Low-Pass Filter reduces harmonics above 4000 Mc . . . maximum 4-db insertion loss in passband
$14.00

874-F2000 Low-Pass Filter cuts off at 2000 Mc **$14.00**

874-F1000 Low-Pass Filter cuts off at 1000 Mc **$14.00**

874-F500 Low-Pass Filter cuts off at 500 Mc **$16.00**

874-F185 Low-Pass Filter cuts off at 185 Mc **$25.50**

874-G20 Fixed Attenuator, 20 db, has very low VSWR less than 1.1 to 1000 Mc, less than 1.3 to 4000 Mc . . . 1-watt power handling capacity (3000 watts, peak) **$25.00**

874-G10 Fixed Attenuator, 10 db **$25.00**

874-G6 Fixed Attenuator, 6 db **$25.00**

874-G3 Fixed Attenuator, 3 db **$25.00**

Type 874-GA
Adjustable Attenuator $55.00

. . . a precision-tooled, continuously adjustable Attenuator for producing accurately known voltage ratios, for adjusting voltage magnitude and for attenuation measurements with high precision.

Frequency Range: 100 to 4000 Mc

Attenuator Range: 120 db

VSWR Introduced Into Line: less than 1.03 at 1000 Mc

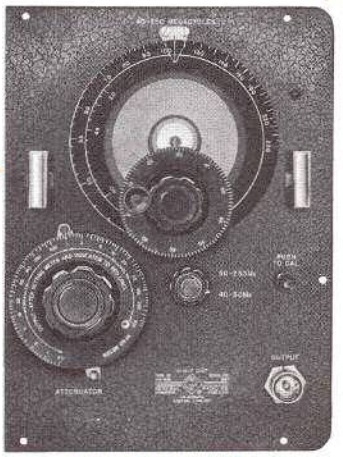
Accuracy with Stub-Terminated Input: ±(1% of difference in Attenuation readings +0.2) db.

VHF-UHF Signal Generators

40 to 2000 Mc

Three Oscillator Sections • Same Power Supply

Type 1021 Standard-Signal Generators



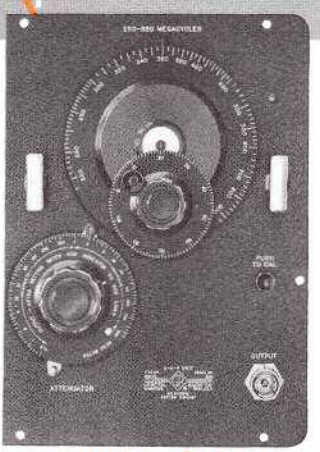
40-250 Mc
Type 1021-P3B Oscillator Unit

Frequency	Standard-Signal Generator		Power Supply		Oscillator Unit	
40- 250 Mc	1021-AV,	$710	consists of 1021-P1, $280 and		1021-P3B,	$430
250- 920 Mc	1021-AU,	$700			1021-P2,	$420
900-2000 Mc	1021-AW,	$930			1021-P4,	$650

For flexibility and economy, each of these signal generators is built in two units mounted in a single cabinet. The power supply, modulator, and metering system make up one unit — one of three readily interchangeable carrier-oscillator units fits in the other side of the cabinet.

The two lower-frequency models have wide-range butterfly circuits in which tuning is achieved by simultaneous variation of inductance and capacitance without use of sliding contacts. These two units deliver one volt, open circuit. The highest-frequency model with an output of 0.7 v is tuned by adjustable transmission lines. Double shields enclose the oscillator units, and power lines are well filtered. All three instruments feature good stability and low drift.

Simplicity, economy, and reliability were important considerations in this design, and the resulting instruments are moderately priced, compact, light in weight, and durably built.



250-920 Mc
Type 1021-P2 Oscillator Unit

Frequency Calibration: direct reading to ±1%

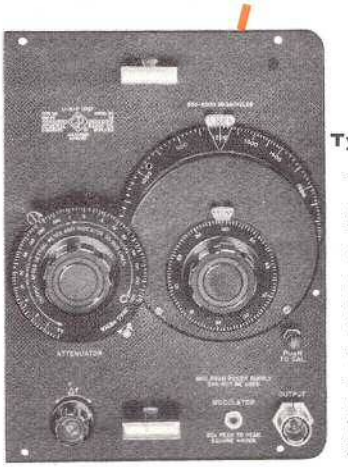
Output Voltage: continuously adjustable, 0.5μv to 1.0v, open circuit

Output Impedance: 50Ω ±10%

Output Meter: voltage indications accurate to better than 20%; meter circuit can be calibrated against accurately known 60-cycle line — switch permits reading of percentage modulation applied.

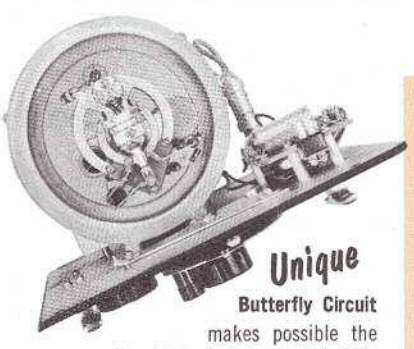
Amplitude Modulation: 40-250 Mc and 250-920 Mc oscillators adjustable 0-50%; Internal, 1000c; External, flat within 3 db from 30c to 15kc — 900-2000 Mc unit may be square-wave modulated over 100-5000 cycles from external modulator.

Shielding: stray fields and residual output voltage are sufficiently low for measurements on receivers of 1μv sensitivity.



900-2000 Mc
Type 1021-P4 Oscillator Unit

This high-frequency Oscillator Unit is a grid-separation triode oscillator with a Type 5675 uhf-pencil tube. The instrument has provision for square-wave and pulse modulation from external modulators . . . is essentially free of noise modulation caused by microphonics and vibrations . . . frequency calibration is ±1% . . . drift is less than 0.1% per day . . . output is continuously adjustable from 0.5μv to 0.7 volt, open circuit at 50 ohms . . . shielding is excellent.



Unique Butterfly Circuit makes possible the unusually wide tuning range of this 250-920 Mc oscillator — sliding contacts and varying ground currents through the bearings are avoided.

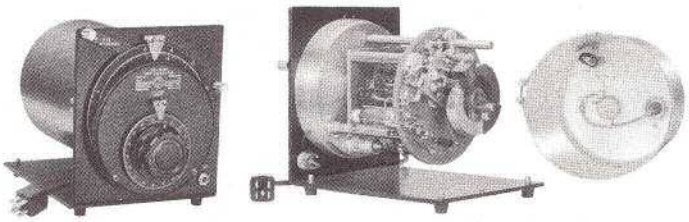
Television Picture Modulation is readily produced at any frequency from 40- to 2000 Mc with the Type 1000-P6 Crystal-Diode Modulator (pg. 9) and the video output from a standard TV receiver. With the Type 1000-P7 Balanced Modulator, 100% modulation is readily obtained, and pulsing with fast rise times and short durations is possible with a high degree of carrier suppression.

High Frequency Unit Oscillators

Coverage from 500 Kc to 7425 Mc

These oscillators are efficient, well-shielded sources of power with unusually wide frequency ranges. They are built for maximum utility in the research laboratory, production-test department, and college experimental class. All but the Type 1208-B are adaptable to sweep techniques.

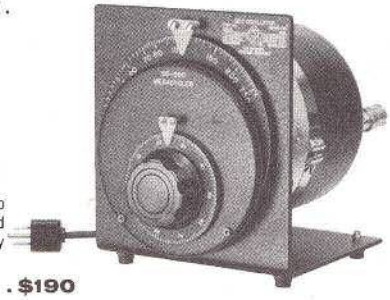
The output system for each of these oscillators consists of a coupling loop at the end of a short 50-ohm coaxial line which can be rotated. Each oscillator is mounted in an aluminum casing and is shielded with a spun-aluminum cover. A jack is provided for direct external amplitude modulation; approximately 40 volts audio is required for 30% modulation. The Type 1000-P6 Crystal Diode Modulator (see page 9) can be used with carriers above 20 Mc. Calibration accuracy is ±1% for all models except the Type 1208-B (±2%). All units have vernier dial drives. Unit power supplies are required, see page 11.



500 kc to 50 Mc

in two 10:1 frequency ranges . . . 2 watts output from 500 kc to 5 Mc, 200 mw from 5 to 50 Mc . . . frequency increment settings to 0.0002 of each main dial division.

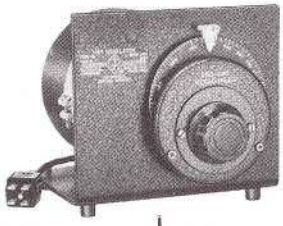
Type 1211-B R-F Unit Oscillator . . . $275



50 to 250 Mc

. . . semi-butterfly tuning circuit (no sliding contacts) varies inductance and capacitance simultaneously to supply at least 80 mw.

Type 1215-B VHF Unit Oscillator. . $190



180 to 600 Mc

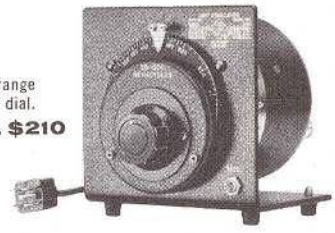
. . . 300 mw output . . . identical to the Type 1209-B, except has lower frequency range produced by elimination of one of two parallel inductances in its butterfly circuit.

Type 1209-BL VHF-UHF Oscillator . . . $245

250 to 920 Mc

. . . 200 mw output . . . butterfly-tuning circuit assures smooth frequency adjustment, avoids uhf tuning difficulties . . . 4-inch dial; vernier makes 4½ turns for 270° of dial calibration.

Type 1209-B UHF Oscillator . . . $245



65 to 500 Mc

. . . 100 mw output; up to 500 mw at center of range . . . 90° butterfly rotation spread over 270° on dial.

Type 1208-B VHF-UHF Oscillator . . $210

900 to 2000 Mc

. . . 200 mw output . . . drift is less than 0.1% per day . . . may be sine-wave, square-wave, pulse, or frequency modulated.

Type 1218-A Unit Oscillator. . $465

LOW COST Klystron Oscillator $215, without tube

2700 to 7425 Mc

The Type 1220-A Klystron Oscillator is a low-cost, small and compact microwave signal source using standard reflex klystron tubes with self-contained cavities. Eight different tubes are available to cover the 2.7 to 7.4 kMc range.

An important feature is the provision for internal square-wave modulation, and the ease with which the instrument can be pulse or frequency modulated from external sources. This Oscillator is convenient and flexible in operation . . . a VHF-UHF signal source that is capable of producing stable, high-frequency signals of adequate power for laboratory measurements, production-test work, or for use in college experimental classes.

Range	Type No. & Price Klystron Oscillator including tube	Klystron Tube Type	Price for Tube only	Nominal Power Out (mw) Average Over Frequency Range
2700-2960 Mc	1220-A1, $264.65	726C	$ 49.65	100
2950-3275 Mc	1220-A2, $282.90	6043	$ 67.90	90
3400-3960 Mc	1220-A3, $275.75	2K29	$ 60.75	90
3840-4460 Mc	1220-A4, $322.15	2K56	$107.15	75
4240-4910 Mc	1220-A5, $271.45	2K22	$ 56.45	100
5100-5900 Mc	1220-A6, $311.45	6115	$ 96.45	80
5925-6450 Mc	1220-A7, $282.90	QK404	$ 67.90	100
6200-7425 Mc	1220-A8, $282.90	5976	$ 67.90	90

Note: The klystron tubes used in these oscillators are designed for relatively infrequent tuning. The flexible copper diaphragm used to vary the frequency is subject to failure due to fatigue.

Frequency Range: Depends on klystron tube used (see table); all units are otherwise identical — frequency range of any unit can be changed to that of any other by inserting the appropriate klystron tube.

Internal Modulation: 1-kc square wave, adjustable ± 15 cycles

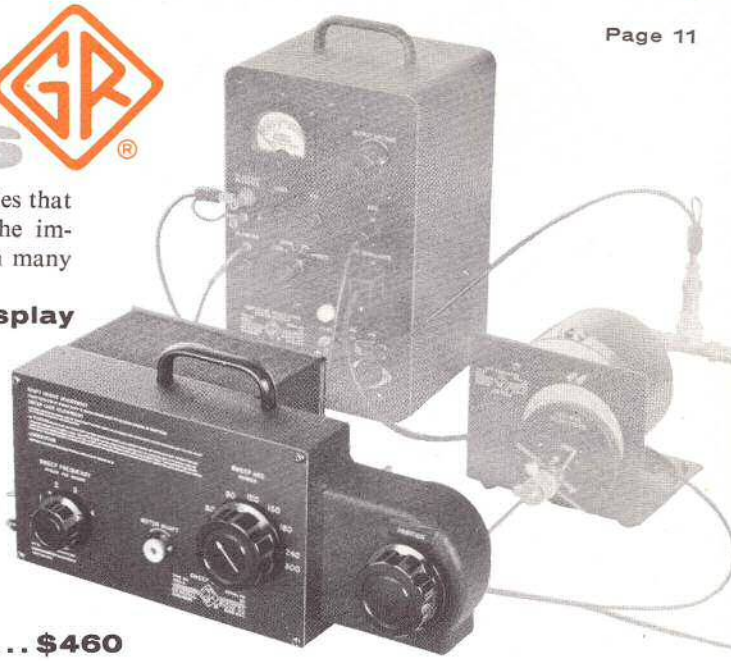
External Modulation:

- Square wave, 50c to 200 kc; sine or square-wave modulating signal of at least 15v, rms required — G-R Type 1210-B-R-C Oscillator recommended (pg. 9).
- Pulse, 1 to 10,000 μs duration, 0.25 μs rise and fall time, 50 c to 200 kc repetition rate; at least 20v peak pulse voltage required — Type 1217-A Unit Pulser recommended modulator (pg. 9).
- Frequency Modulation at least ± 10 Mc excursion obtained with less than 3 db change in output — at 60c an rms input of the order of 10v is suitable.

Power Supply Units on page 11 recommended.

Sweep Drives

The sweep drives described in this section are mechanical accessories that convert manually-operated equipment to automatic operation. The improved efficiency of the converted instrument pays for the conversion many times over.



For Wide Range Automatic Data Display

The GR 1750-A Sweep Drive has provision for adjustment of sweep arc, sweep speed, and center position . . . even while the drive is operating. This instrument attaches to any dial, knob, or shaft for automatic sweeping of oscillators, potentiometers, switches, and other equipment.

Ever-changing oscilloscope patterns show the effects of circuit changes with unequaled clarity. Measurements are made simply and in a fraction of the time required by point-by-point methods.

In combination with continuously tunable, wide-range G-R Unit Oscillators which cover the complete frequency range from 0.5 to 2000 Mc, a versatile and inexpensive system of sweep signal sources is available at r-f, v-h-f and u-h-f frequencies. The Sweep Drive can be coupled to either the vernier control for sweeping over moderate ranges or can be connected directly to the main oscillator dial.

Type 1750-A Sweep Drive . . . $460

Type 907-R and 908-R Dial Drives

for automatic sweeping of G-R Unit Oscillators and other equipment using G-R Type 907 and 908 Dials. They are available at lower cost, but are less flexible than the Type 1750-A Sweep Drive. Driven by synchronous motors, they are restricted to one speed. The two low-speed models are designed for nonreversing counterclockwise traverse only. The higher speed models reverse direction by means of adjustable mechanical stops.

The sweep voltage provided by a built-in potentiometer and external battery can be used to drive the independent variable axis of an x-y plotter, an oscilloscope, or a separate channel on a single-axis recording system.

Type	Dial Speed	Price
907-R18 Dial Drive	18°/min.	$55.00
907-R144 Dial Drive	144°/min.	55.00
908-R12 Dial Drive	12°/min.	55.00
908-R96 Dial Drive	96°/min.	55.00

Type 908-P Synchronous Dial Drives

use the constant-speed characteristics of their synchronous motors to supply position information. Thus maximum reliability is provided at lowest possible cost.

Type 908-P1 is primarily for use with graphic recorders. Type 908-P2, operating at higher speed, though useful with recorders, is particularly suited for limited sweep applications with long-persistence oscilloscopes. Both drives are self-reversing and have adjustable sweep ranges.

	Speed		Torque
	On 908 Dial	On 907 Dial	
Type 908-P1 Synchronous Dial Drive $29.00	4/15 RPM (225 secs/rev)	4/10 RPM (150 secs/rev)	5 in.-oz.
Type 908-P2 Synchronous Dial Drive $29.00	2 RPM (30 secs/rev)	3 RPM (20 secs/rev)	2/3 in.-oz.

Amplitude-Regulating Power Supply

Type 1263-A $295

is invaluable for automatic sweep applications. This instrument is designed for use with oscillators whose outputs can be controlled by varying plate voltage. D-C potential developed by an auxiliary rectifier at the oscillator output is compared with a d-c reference potential within the Regulator — the difference is minimized by a correction applied to the oscillator plate supply. Output amplitude is held constant within ±2% (independent of frequency).

Plate Voltage Supplied: 0 – 250 volts at 25 ma as required by oscillator to maintain pre-set output level (with 105-125 or 210-250 line volts)

Heater Voltage Supplied: 6 volts d-c at 0.5 amperes at 115/230 volt line

Output Control: permits r-f level to be set from 0.2 to 2 volts

Response Time: plate current changes at 3 ma per millisecond or faster

Output Meter: built-in d-c VTVM calibrated in r-f output

Unit Power Supplies

. . . are designed especially for G-R Unit Instruments not having built-in power supplies. They combine small physical size with high performance, and are useful for general laboratory work.

FOR ECONOMY AND GENERAL PURPOSE applications.

Output: 300v d-c, 50 ma max.
6.3v a-c, 3 amps max.
Input: 115v, 50-60 cps.
Hum level: less than 80 mv at 300v and 50 ma d-c output

Type 1203-B Unit Power Supply $40

FOR CRITICAL OPERATION requiring stable plate voltage.

Output: 300v (±1%) dc at 70 ma.
6.3v ac at 4 amps unregulated
Input: 105-125 v, 50-60 cps.
Ripple: Less than 2 mv (120 cps) at full load.
Regulation: ±0.5% for all values of load current and line voltage.

Type 1201-A Unit Regulated Power Supply $85

FOR FLEXIBILITY OF USE IN FIELD AND LABORATORY

. . . provides a-c or d-c power from either 6- or 12-volt storage battery. In addition, it can be operated from a 115v a-c line.

Input: Six-volt or twelve-volt storage battery or 115v, 50-60 cps power line.
Output: 300v at 55 ma dc; 6.3v at 2.7 amps ac. With battery input, 115v at 115 cps is also available.

Type 1202-A Unit Vibrator Power Supply $125

Complete Detector Assemblies

Fundamental Frequency Operation

Type DNT-1	35 to 530 Mc	**$626**
Type DNT-2	25 to 280 Mc	**$606**
Type DNT-3	220 to 950 Mc	**$659**
Type DNT-4	870 to 2030 Mc	**$879**

Higher frequency operation to 5000 Mc using oscillator harmonics. Any of these assemblies may be converted to any other by using the appropriate local oscillator for that range.

DNT Detector

for High-Frequency Measurements **25 to 5000 Mc**

- ★ High Sensitivity — detects 5μv or less over most of range
- ★ Excellent Stability and Shielding
- ★ Large, Calibrated Output Meter — db as well as linear voltage scale
- ★ Built-in Precision 70-db Attenuator. Accuracy is ±(0.3 db + 1% of indicated attenuation)
- ★ Accurately Measures Relative R-F Voltage Levels Over 80-db Range
- ★ AVC Provided for Null Detection
- ★ Modulation Envelope Brought out to Binding Posts
- ★ Two Separate Internal Power Supplies — one for operating the I-F Amplifier, another for driving the local Oscillator minimizing number of units necessary.
- ★ Compact and Light Weight — Detector with all interconnecting cables and accessories is less than 17 pounds.

The Type DNT Detector is especially designed to meet the need for a sensitive, thoroughly-shielded, general-purpose vhf-uhf Detector.

The signal to be detected and a local-oscillator frequency are mixed in the Type 874-MR Mixer Rectifier to produce a 30-Mc difference frequency which is detected by the Type 1216-A Unit I-F Amplifier. The crystal-diode Mixer Rectifier is accurately linear over a voltage range of about 80 db, and hence the relative level of the signal to be detected is easily measured by means of the calibrated step attenuator and calibrated output meter in the I-F Amplifier. This type of detector has high sensitivity, good linearity, excellent discrimination against harmonics, and eliminates frequency-modulation errors present in many measurements when the signal source is amplitude modulated.

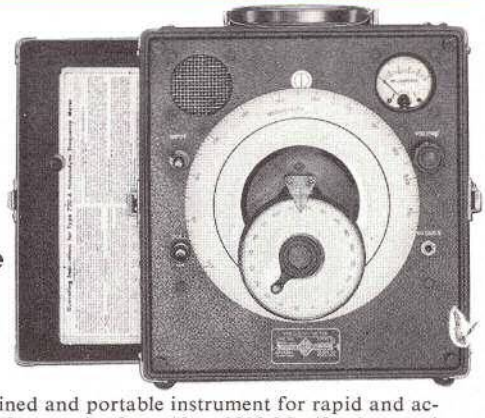
The four-stage Amplifier provides 100-db gain. Less than 5μv from a 50-ohm source gives 1% meter deflection over residual noise at frequencies between 50 and 950 Mc — less than 80 μv produces full-scale deflection. The 0.7 Mc bandwidth is sufficiently wide to detect pulsed signals and is broad enough to eliminate detuning due to slight changes in frequency.

Accurate high-frequency measurements of *voltage*, *current*, *power* and *attenuation* are possible with this system. The precision step-attenuator permits accurate insertion loss and attenuation measurements of filters, attenuators, coaxial cables and coupling networks.

The small physical size and compactness of the several units make this versatile high-frequency detector easily portable.

Type 1651-A **Bolometer Bridge** $340

a flexible bridge-circuit for measuring r-f power in the milliwatt range; useful in educational laboratories as well as in industrial research and development for innumerable applications. A variety of G-R Thermistor Units and Bolometer Holders are available for measurements from 0 to 500 mw. Other measurements can be made using a variety of power-sensitive elements of other makes with resistances from 25 to 400 ohms at frequencies up to 4000 Mc.



Type 720-A **Heterodyne Frequency Meter** $455

a completely self-contained and portable instrument for rapid and accurate measurement of frequencies from 10 to 3000 Mc (fundamental range, 100-200 Mc). Measurement accuracy is ±0.1%.

Many operating conveniences: butterfly-tuned circuit avoids difficulties inherent in u-h-f tuning; adjustable panel-antenna eliminates need for direct connection to source under measurement; panel meter, internal speaker, and terminals for headphones available for detection.

GENERAL RADIO Company

275 Massachusetts Avenue
Cambridge 39, Mass., U.S.A.

WE SELL DIRECT. Our District Sales Offices are staffed by engineers especially trained to help you in the selection of instruments and measuring systems best suited to your needs. We welcome your inquiries — will help solve your problems.

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Form 828C Printed in U. S. A.

KEM 258100M

Broadcast Equipment Bulletin

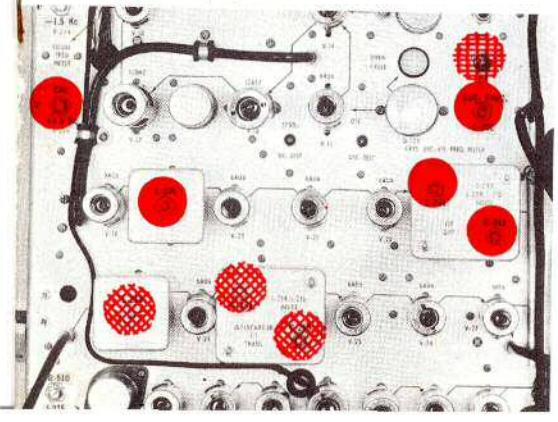
March 1959

27 Years of Cooperation with Broadcasters, Consultants, and Transmitter Manufacturers

Field experience with the thousands of G-R monitors and auxiliary equipment used in the broadcast field provides a fund of experience unmatched in the industry. This background guarantees both a full understanding of the needs of broadcasters and experience in methods of meeting their requirements. Advanced, thorough design is the key to satisfactory trouble-free service. Such design is essential in broadcast equipment where operating conditions are exacting and uninterrupted operation is vital.

Over 70% of all AM and TV stations in the United States use General Radio Monitors to assure quality of transmissions and adherence to FCC regulations . . . proof that the G-R label is the Hallmark of Quality in the broadcast and television field, where economics demands the best.

- **RED** "Do not change setting without consulting instruction book."
- **YELLOW** "Some external equipment (voltmeter, oscilloscope) required to set."
- **GREEN** "Easily set without external test equipment."



Only General Radio Transmitter Monitors

Give You All These Important Advantages:

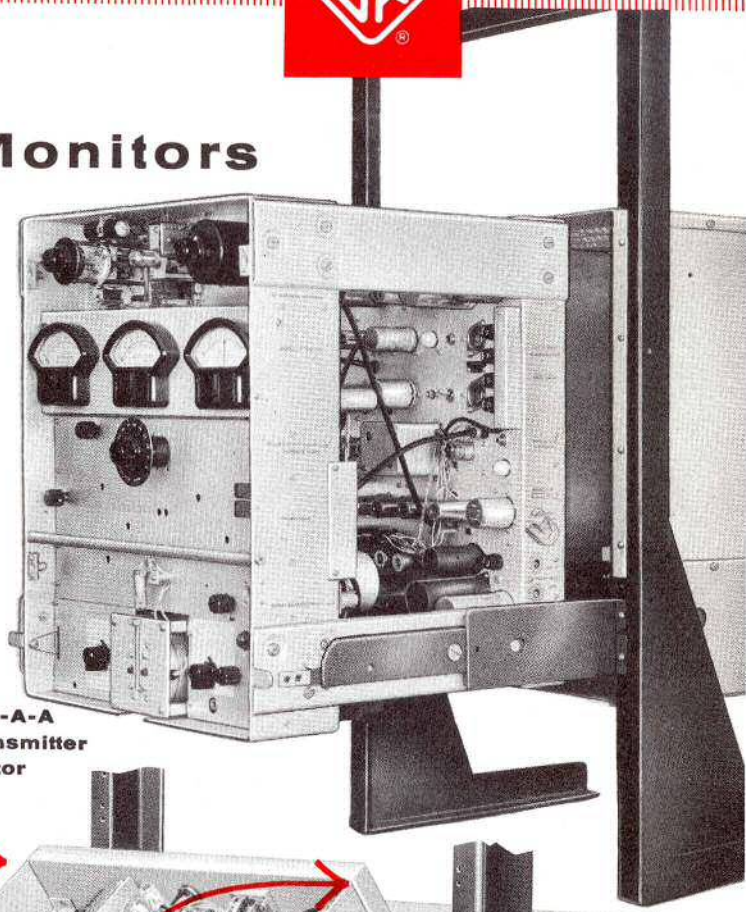
★ **FCC Type-Approval**

★ **Local or Remote Monitoring**

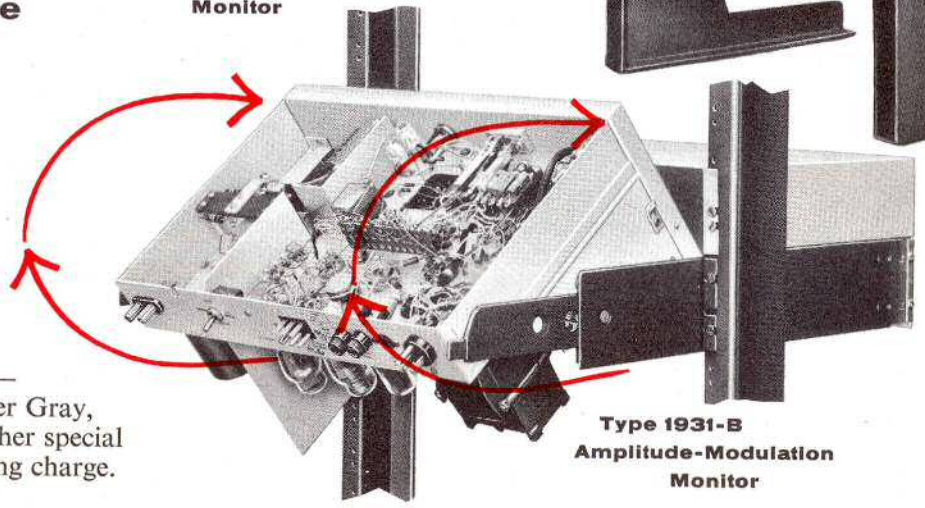
★ **New Mechanical Design** — every step in the installation, use and maintenance can be handled from the front. The monitor slides out of its rack, tilts forward and back for easy access to tubes and adjustments. As the monitor is drawn forward, its dust cover remains firmly attached to the rack; all power and other connections remain completed.

★ **Convenient Maintenance** — all test points are clearly labeled; adjustments are coded RED, YELLOW, or GREEN, according to their degree of importance. The inside face of the front panel carries a block diagram and condensed operating instructions, which, together with the signal-flow lines on the chassis, enable most maintenance to be performed without the need of an instruction book or a circuit diagram.

★ **Choice of Panel Finish** — General Radio black crackle, RCA Umber Gray, or GE Blue available at no extra cost. Other special finishes available at nominal extra handling charge.



Type 1184-A-A TV Transmitter Monitor

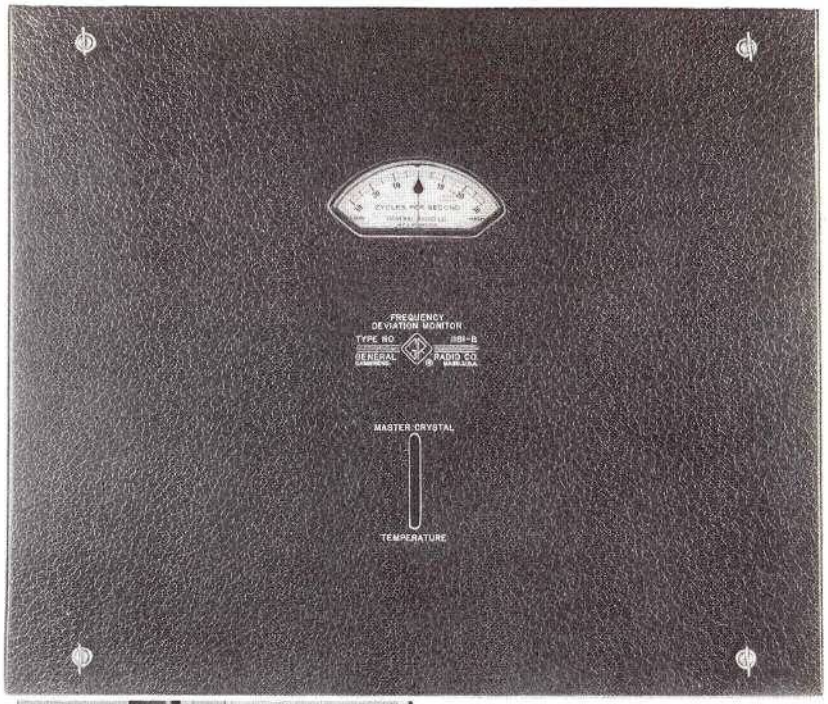


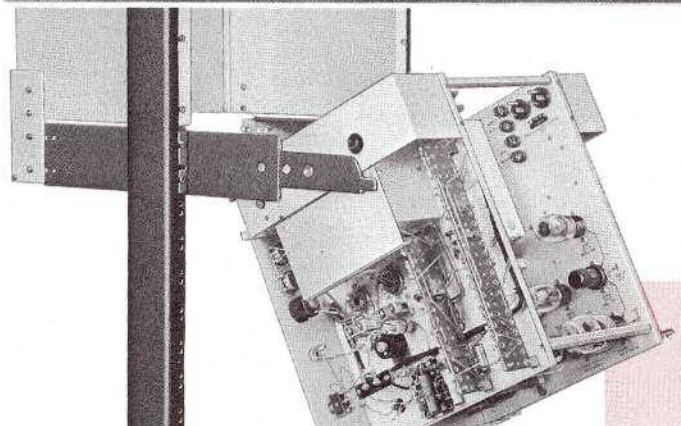
Type 1931-B Amplitude-Modulation Monitor

★ *THESE MONITORS are available through your Transmitter Manufacturer as part of your transmitter "package," or directly from General Radio.*

Type 1181-B
Frequency Deviation Monitor

- High reliability for continuous service
- Suitable for remote monitoring
- External frequency-deviation meter is easily connected
- Deviation indication is substantially independent of r-f input level and is unaffected by am.
- Very low r-f input required — only 50 mw
- Positive indication of transmitter failure provided by signal lamp
- Unique instrument mounting arrangement permits all installation, operation, and maintenance to be done from the front of the rack.





The Type 1181-B Frequency Deviation Monitor indicates directly the magnitude and direction of a-m transmitter frequency deviation from its assigned frequency. The crystal oscillator, temperature control, and other circuits are improvements over those of the superseded 1181-A model, whose stability and reliability have been proven in over 1700 installations all over the world.

The Monitor can be used either at the transmitter site or at a remote location in accordance with FCC rules permitting unattended operation of transmitters. The low input signal required (50mv) permits operation up to several miles from the transmitter, with only a single-wire antenna needed to pick up adequate voltage.

A new circuit for external meter connections permits the external loop resistance to be as high as 5000 ohms. A switch is provided to disconnect the external meter and connecting lines for checking purposes, substituting for them an internal 5000-ohm resistor that permits the monitor to function independently of external connections.

Type 1181-BH Frequency-Deviation Monitor is identical to the 1181-B except that it operates in a higher frequency range for such services as aeronautical, maritime, public-safety, and international broadcast.

Type 1181-BT Color-Subcarrier Monitor, similar to the 1181-B, is designed for continuous monitoring of the 3.579545-Mc color-tv subcarrier frequency, which the FCC requires to be held within ±10.7 cycles. Stability is ±5 cycles for one year, so that annual independent frequency checks are all that is necessary to insure compliance with FCC specifications. Provision for external or remote metering.

	1181-B	1181-BH	1181-BT
Input Frequency:	500-1600 kc	1.6-15 Mc	3.579545 Mc
Signal Input:	50 mv	0.1-2.5v, 1.6-5 Mc	0.05 to 2.0v
Deviation Range:	±30 cycles, readable to one cycle		
Stability:	1 part in 10^6 for 6 months	±5 parts in 10^6 for 1 yr. ±1 ppm for 30 days	±5 cycles for 1 yr.; ±1 cycle for 30 days
Price:	**$1025**	**$1025**	**$1025**

ALL G-R
Fea
FCC TYPE
Unique Inst
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Color-Codec
to enable most
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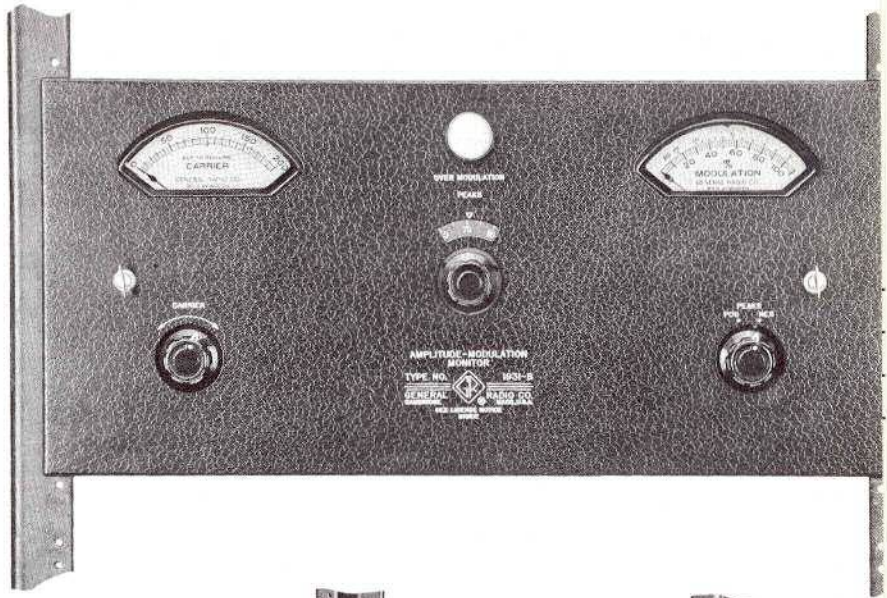
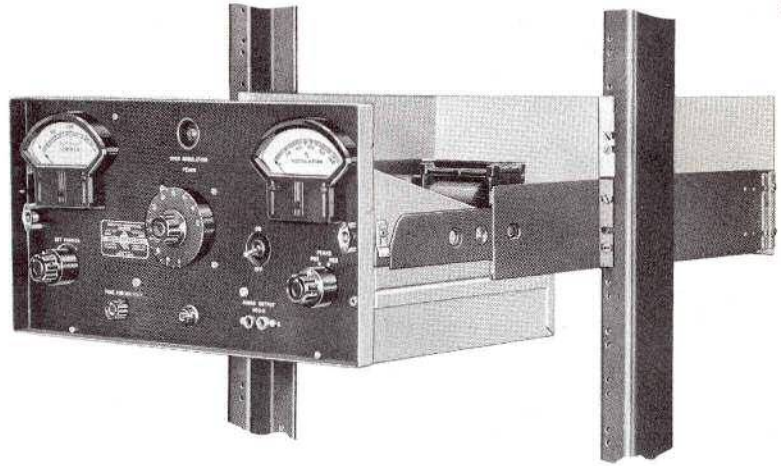
instruction book

Type 1931-B
Amplitude Modulation Monitor





- Fast and Simple to Operate.
- Operates over a Wide Carrier Frequency Range.
- R-F Power Input required in broadcast range is less than 0.5 watt.
- Overmodulation Warning Light.
- Remote Percentage-Modulation meters can be connected to the instrument.
- Outputs for Audio Monitoring and Distortion and Noise Measurements.

The Type 1931-B is used with broadcast and radio-telephone transmitters to perform the following functions:

1. Continuous measurement of modulation percentage on either positive or negative peaks.
2. Overmodulation indication.
3. Program-level monitoring.
4. Measurement of carrier shift when modulation is applied.
5. Measurement of transmitter audio-frequency response.

Two auxiliary audio output circuits are provided. One of these, at 600 ohms, is intended for audio monitoring; the other, a high-impedance circuit, gives a faithful reproduction of the carrier envelope (less than 0.1% distortion under most conditions) for use in distortion and noise-level measurements. The General Radio Type 1932-A Distortion and Noise Meter is recommended for this type of measurement (see page 6).

MONITORS
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APPROVAL
rument Mount-
nt permits all instal-
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k or circuit diagram.

SPECIFICATIONS

Range: Modulation percentage, 0 to 110% on positive peaks, 0 to 100% on negative peaks. Flashing of warning lamp can be adjusted to occur anywhere from 0 to 100% on negative peaks.

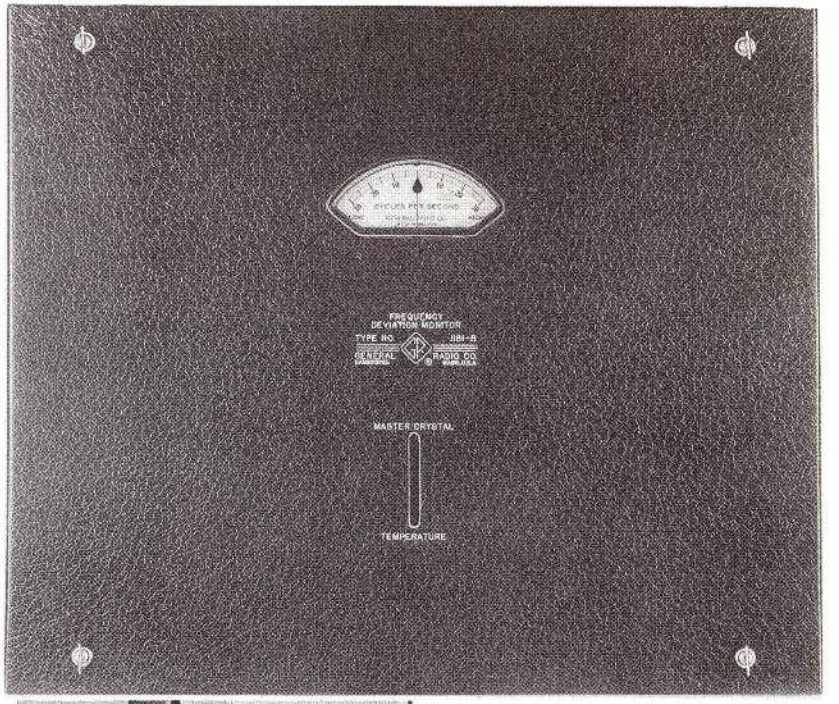
Accuracy: ±2% of full scale at 0% and 100% with 400-cycle modulation, and ±4% of full scale at any other modulation percentage.

Carrier Frequency Range: The Monitor will operate at any carrier frequency from 0.5 to 60 Mc. A single set of r-f tuning coils (either for 0.5-8 Mc or 3-60 Mc) is supplied with each instrument, unless both are specifically ordered.

Price: $625; extra set of coils, $23.

Type 1181-B
Frequency Deviation Monitor

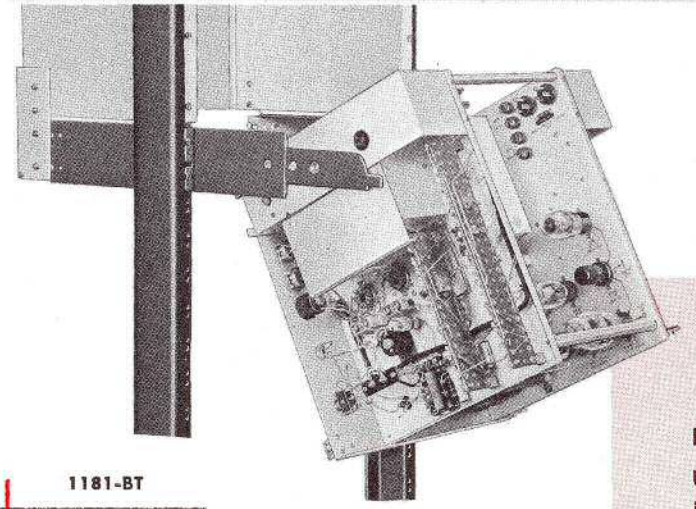
- High reliability for continuous service
- Suitable for remote monitoring
- External frequency-deviation meter is easily connected
- Deviation indication is substantially independent of r-f input level and is unaffected by am.
- Very low r-f input required — only 50 mw
- Positive indication of transmitter failure provided by signal lamp
- Unique instrument mounting arrangement permits all installation, operation, and maintenance to be done from the front of the rack.



The Type 1181-B Frequency Deviation Monitor indicates directly the magnitude and direction of a-m transmitter frequency deviation from its assigned frequency. The crystal oscillator, temperature control, and other circuits are improvements over those of the superseded 1181-A model, whose stability and reliability have been proven in over 1700 installations all over the world.

The Monitor can be used either at the transmitter site or at a remote location in accordance with FCC rules permitting unattended operation of transmitters. The low input signal required (50mv) permits operation up to several miles from the transmitter, with only a single-wire antenna needed to pick up adequate voltage.

A new circuit for external meter connections permits the external loop resistance to be as high as 5000 ohms. A switch is provided to disconnect the external meter and connecting lines for checking purposes, substituting for them an internal 5000-ohm resistor that permits the monitor to function independently of external connections.



Type 1181-BH Frequency-Deviation Monitor is identical to the 1181-B except that it operates in a higher frequency range for such services as aeronautical, maritime, public-safety, and international broadcast.

Type 1181-BT Color-Subcarrier Monitor, similar to the 1181-B, is designed for continuous monitoring of the 3.579545-Mc color-tv subcarrier frequency, which the FCC requires to be held within ±10.7 cycles. Stability is ±5 cycles for one year, so that annual independent frequency checks are all that is necessary to insure compliance with FCC specifications. Provision for external or remote metering.

	1181-B	1181-BH	1181-BT
Input Frequency:	500-1600 kc	1.6-15 Mc	3.579545 Mc
Signal Input:	50 mv	0.1-2.5v, 1.6-5 Mc	0.05 to 2.0v
Deviation Range:	±30 cycles, readable to one cycle		
Stability:	1 part in 10^6 for 6 months	±5 parts in 10^6 for 1 yr. ±1 ppm for 30 days	±5 cycles for 1 yr.; ±1 cycle for 30 days
Price:	**$1025**	**$1025**	**$1025**

ALL G-R M
Fea

FCC TYPE A

Unique Instr
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to be done fron
rack.

Color-Coded
to enable most
adjustment oper
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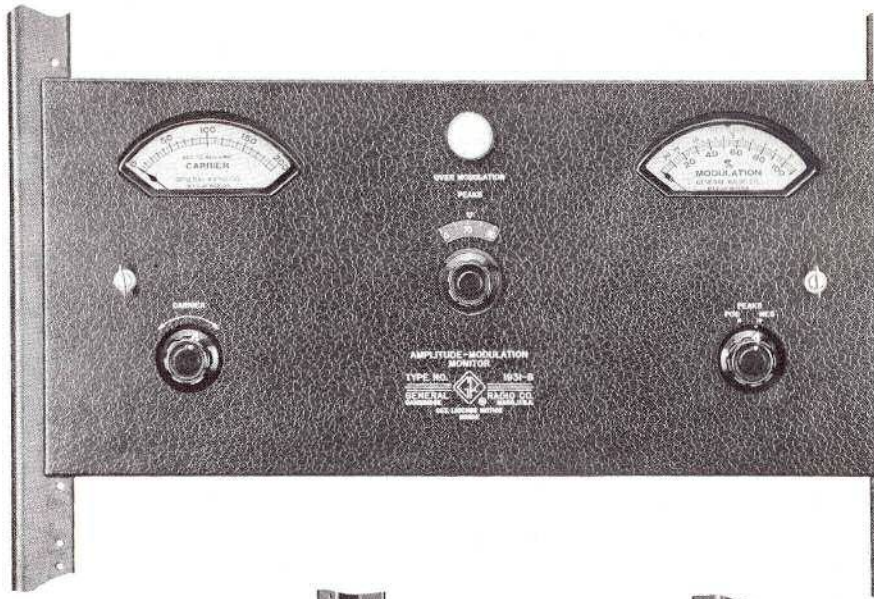
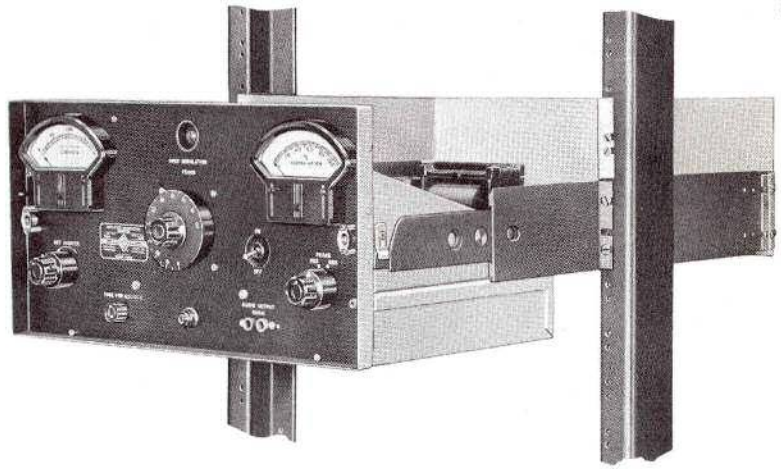
instruction book

Type 1931-B
Amplitude Modulation Monitor





- Fast and Simple to Operate.
- Operates over a Wide Carrier Frequency Range.
- R-F Power Input required in broadcast range is less than 0.5 watt.
- Overmodulation Warning Light.
- Remote Percentage-Modulation meters can be connected to the instrument.
- Outputs for Audio Monitoring and Distortion and Noise Measurements.

The Type 1931-B is used with broadcast and radio-telephone transmitters to perform the following functions:

1. Continuous measurement of modulation percentage on either positive or negative peaks.
2. Overmodulation indication.
3. Program-level monitoring.
4. Measurement of carrier shift when modulation is applied.
5. Measurement of transmitter audio-frequency response.

Two auxiliary audio output circuits are provided. One of these, at 600 ohms, is intended for audio monitoring; the other, a high-impedance circuit, gives a faithful reproduction of the carrier envelope (less than 0.1% distortion under most conditions) for use in distortion and noise-level measurements. The General Radio Type 1932-A Distortion and Noise Meter is recommended for this type of measurement (see page 6).

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SPECIFICATIONS

Range: Modulation percentage, 0 to 110% on positive peaks, 0 to 100% on negative peaks. Flashing of warning lamp can be adjusted to occur anywhere from 0 to 100% on negative peaks.

Accuracy: ±2% of full scale at 0% and 100% with 400-cycle modulation, and ±4% of full scale at any other modulation percentage.

Carrier Frequency Range: The Monitor will operate at any carrier frequency from 0.5 to 60 Mc. A single set of r-f tuning coils (either for 0.5-8 Mc or 3-60 Mc) is supplied with each instrument, unless both are specifically ordered.

Price: $625; extra set of coils, $23.

More Instruments of Interest

Type 1932-A Distortion and Noise Meter . . . $650

. . . for the measurement of distortion, noise, and hum level in audio systems.

The 1932-A can be used in conjunction with G-R Monitors to measure audio distortion and noise directly at the transmitter output. Easily operated, the 1932-A will measure distortion as low as 0.1% and noise levels that are down 80 db below a calibrated reference level. The instrument provides accurate wave analysis of fundamentals from 50 to 15,000 cycles; circuits pass frequencies up to 45 kc, permitting measurements of the 3rd harmonic. It can also be used as an accurate (±3%) audio-frequency meter, and for voltage measurements from 1 mv to 100v.

- ★ Useful as a direct-reading vu or dbm meter over a range of +20 to −60 dbm.
- ★ Easy to use — only one main tuning control. Rapid in use — range selection made by push buttons.
- ★ Duplicate connectors in rear for rack installation.
- ★ Can be used with oscilloscope for visual identification of individual noise and distortion frequency components — continuous visual indication can be obtained by simply tuning the 1932-A through its frequency range.
- ★ Can be supplied in panel finishes to match transmitter.

Type 1301-A Low-Distortion Oscillator . . . $595

Ideal test source for distortion and frequency-response measurements. Frequencies selected instantly by push buttons, including those frequencies recommended by the FCC for distortion measurements on broadcast transmitters. Duplicate outputs in rear of instrument for rack installation. Twenty-seven fixed frequencies: 20, 25, 30, 40, 50, 60, 75, 100, and 150 cycles with X1, X10, and X100 multipliers. Accuracy: ±(1.5% + 0.1 cycle). Output impedance: 600Ω balanced or unbalanced, and 5000Ω unbalanced. Distortion: less than 0.1%. Can be supplied in panel finishes to match your transmitter.

NEW Type 1650-A Impedance Bridge . . . $440

Will measure the inductance and storage factor (Q) of inductors, capacitance and dissipation factor of capacitors, and the a-c and d-c resistance to all types of resistors.

R-L-C Ranges:
Resistance, 1 mΩ to 10 MΩ
Capacitance, 1 μμf to 1000 μf
Inductance, 1 μh to 1000 h

Accuracy: ±1% ±(1 mΩ, 1 μμf, or 1 μh)

Frequency Range: 20c to 20 kc for 1% accuracy in L and C measurements; 20c to 5 Kc for 1% R accuracy.

Orthonull, a unique ganging of controls permits low-Q balances to be made without the annoyance of "sliding nulls". A new cabinet design provides protection as well as a means of tilting the bridge panel to any angle for maximum convenience in making measurements.

Write for Complete Information

Type 1213-C Unit Time/Frequency Calibrator . . . $260

Type 1201-B Unit Regulated Power Supply required, $85

Compact secondary reference standard that provides marker frequencies at 10 kc, 100 kc, 1 Mc, and 10 Mc. Harmonics usable to 10 Mc from 10-kc output, 100 Mc from 100-kc output, 500 Mc from 1-Mc output, and 1000 Mc from 10-Mc output. After one hour warm-up, drift rate is approximately 1 ppm/°C.

By calibrating against WWV and utilizing an audio oscillator as an interpolation oscillator, accurate frequency standardization of monitors and transmitters can be made. By this means, the instrument is not restricted to measurements at harmonics of the calibrator's fundamentals. Measurement or standardization at any frequency from 10 kc to above 1000 Mc becomes possible, including, for example, the setting of any television transmitter to its assigned frequency to within ±100 cycles or better. To illustrate: for an assigned frequency of 567,250 kc (Channel 30, visual), the interpolation frequency is 7,250 kc; or 2,750 kc, i.e., 560 + 7.250 Mc, or 570-2.750 Mc. By this simple interpolation technique, a broadcast station on any channel can perform its own frequency checks on visual, aural, and color-subcarrier frequencies, as well as performance checks on all equipment including monitors.

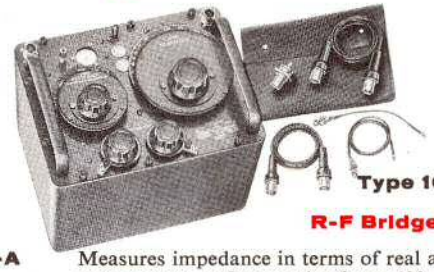
Write for publication B-10, "Frequency Measurements in the Broadcast Field," for complete information.

to Broadcast Engineers...

Type 1603-A

Z-Y Bridge... $370

Will measure, in terms of quadrature components, any impedance from short circuit to open circuit, real or imaginary, positive or negative, over the entire audio-frequency range. This Bridge will measure grounded, direct, or balanced impedances or admittances with ±1% basic accuracy. Ideal for motional-impedance measurements of electro-acoustic transducers such as loudspeakers, microphones, and magnetic recorder heads.



Type 1606-A

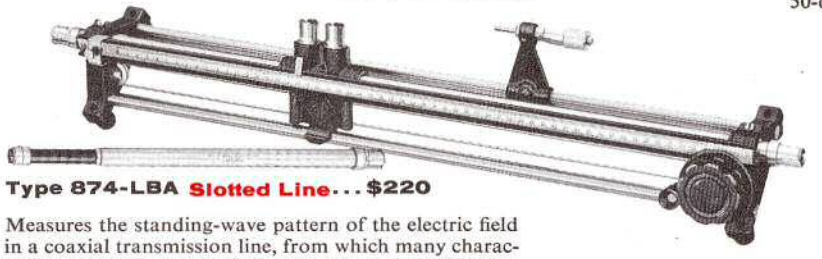
R-F Bridge... $620

Measures impedance in terms of real and imaginary components at frequencies from 400 kc to 60 Mc. Useful for antenna, transmission-line, and component measurements. Resistance range: 0 to 1000Ω. Reactance range: ±5000Ω at 1 Mc (range varies inversely as frequency).

Type 1601-A

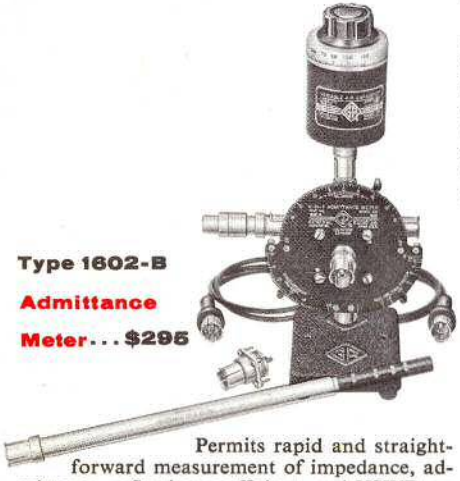
V-H-F Bridge... $520

For the measurement of low-value impedances at frequencies between 10 and 165 Mc — will measure high impedances indirectly. Resistance range: 0 to 200Ω; accuracy: ±(2% + 1Ω). Reactance range (at 100 Mc): ± 200Ω; accuracy: ±(5% + 2Ω). Useful for measurements on antennas, lines, networks, components, and in particular, 50-ohm systems.



Type 874-LBA Slotted Line... $220

Measures the standing-wave pattern of the electric field in a coaxial transmission line, from which many characteristics can be determined, including: standing-wave ratio, phase of the reflected wave, impedance of the load, and degree of mismatch between load and line. Useful from 300 to 5000 Mc.



Type 1602-B

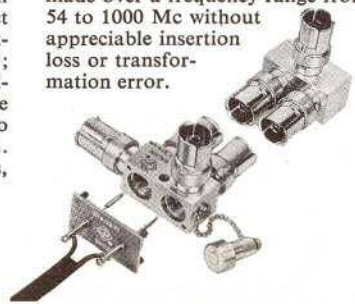
Admittance Meter... $295

Permits rapid and straightforward measurement of impedance, admittance, reflection coefficient, and VSWR on lines and antennas from 41 to 1500 Mc. Scales calibrated in terms of conductance and susceptance; with ¼-wavelength coaxial line between unknown and instrument, scales become direct reading in resistance and reactance. Admittance range: conductance, 0.2 to 1000 mmhos; susceptance, ±0.2 to ± 1000 mmhos. Impedance range (with Type 874-LK Adjustable Line): resistance, 1 to 5000Ω; reactance, ±1 to 5000Ω. VSWR range: 1 to 10. Accuracy ±3%. A complete line of connectors, air lines, stubs, adaptors, and detectors is available.

Type 874-UB

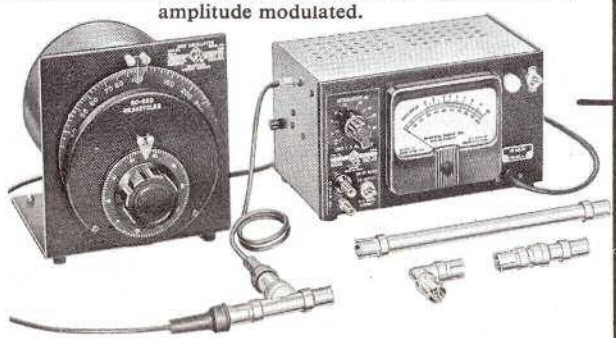
Balun... $75

Tuned, balanced-to-unbalanced coaxial transformer permits measurement of impedance, VSWR, attenuation, and gain of balanced devices such as antennas and transmission lines with unbalanced measuring equipment. When used with Type 874-LBA Slotted Line or Type 1602-B Admittance Meter, balanced measurements may be made over a frequency range from 54 to 1000 Mc without appreciable insertion loss or transformation error.



Type DNT Detectors

General-purpose, sensitive, heterodyne-type vhf-uhf detectors for measurements of insertion loss, attenuation, and voltage ratio of filters, attenuators, cables, and coupling networks. Ideal as bridge and slotted-line null detectors — can detect 5 μv or less. Built-in step attenuator. Each consists of a local oscillator, mixer, low-pass filter and 30-Mc i-f amplifier. Excellent harmonic discrimination. F-M errors minimized in measurements where signal source is amplitude modulated.



DNT-1	40 to 530 Mc	**$626**
DNT-2	40 to 280 Mc	**$606**
DNT-3	220 to 950 Mc	**$659**
DNT-4	870 to 2030 Mc	**$879**

Any of these assemblies may be converted to any other by using the appropriate local oscillator and low-pass filter for that range.

Type 874 Adaptors

For Connecting G-R Equipment...

...to all Common Connector Systems

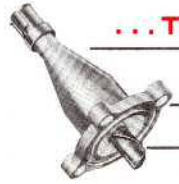
To Adapt to Type	Order G-R Type No. Jack Adaptor	Plug Adaptor	Price
N	874-QNJ	874-QNP	$3.75 & $4.50
BNC	874-QBJ	874-QBP	$4.75 & $4.75
UHF	874-QUJ	874-QUP	$4.00 & $4.25

874 adaptors to Types C, HN, LC, LT, SC, TNC also available

...To 50-Ω Transmission Lines

Type	Line Size	Price
874-QU3A	3⅛" UHF Line	$125
874-QU2	1⅝" UHF Line	$ 75
874-QU1	⅞" UHF Line	$ 21

...To 51.5-Ω Transmission Lines

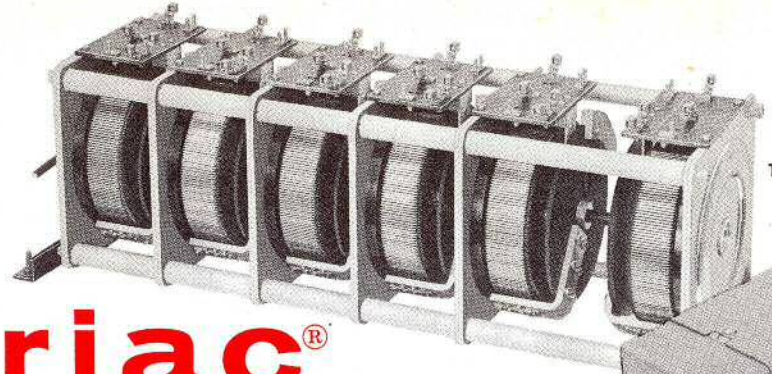


Type	Line Size	Price
874-QV3	3⅛" VHF Line	$110
874-QV2A	1⅝" VHF Line	$62.50

Type 874-FR

Rejection Filters $70/pair

Used with the Type DNT-1 or -2 Detector Systems, an oscillator, and various pads and low-pass filters for the measurement of v-h-f television transmitter harmonics in accordance with FCC specifications. Each filter consists of a series-resonant L-C circuit in series with a short section of 50-ohm coaxial line. Write for Complete Information.



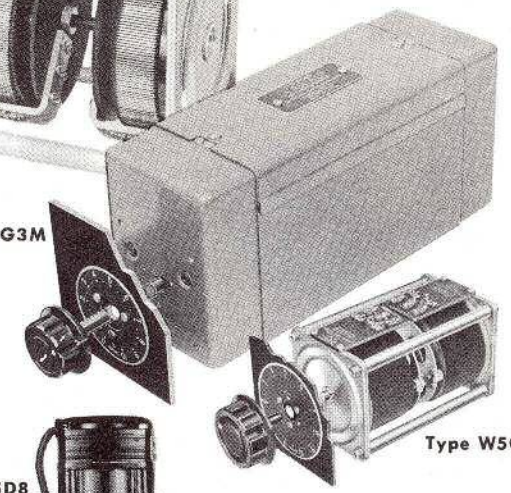
Type W50BBG6

Variac®

Autotransformers

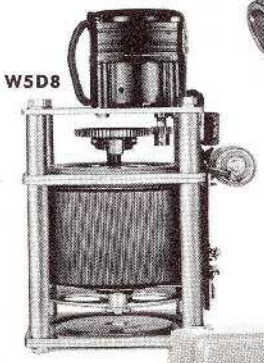
For smooth, efficient control of a-c voltages from 0 to 117% of input . . . Basic models available with current ratings from 2.4 to 50 amperes; may be ganged for additional capacity or polyphase operation . . . Available in ball-bearing or motor-driven types for remote positioning . . . Can be readily designed into equipment for either panel, behind panel, wall, or table mounting . . . Available cased, uncased, or in a portable package with overload protection . . . Basic models priced from $13.50 to $120.

Write for Complete Information

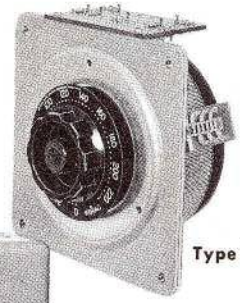


Type W5G3M

Type W5G2



Type W5D8



Type W50H

Type W5MT3

Type W5

Type W5MT3A

Type W50M

Type W2

Type 1551-B
Sound-Level Meter, $395

The basic instrument in the G-R line of sound-measuring equipment. Measures sound levels from 24 to 150 db (re 0.0002 μbar) in accordance with ASA standards for sound-level meters. A complete line of analyzers and accessories is available for all types of acoustic measurements. For complete information, write for the G-R Sound Bulletin.

All G-R Products covered by a *2-Year Warranty*

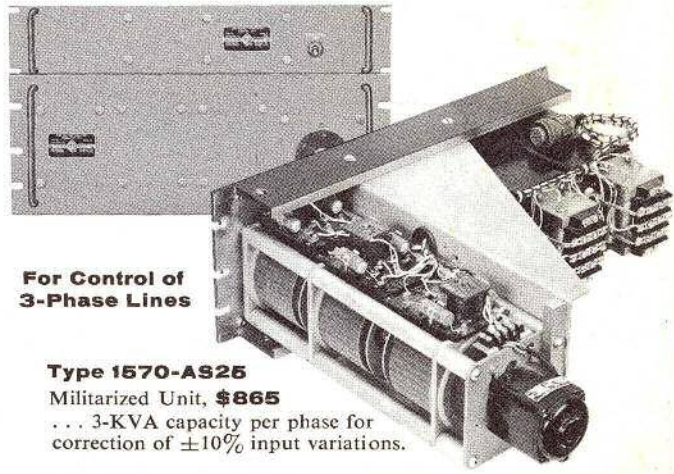
Type 1570-A Automatic LINE-VOLTAGE REGULATORS

Ideal for regulating transmitter filament supplies to reduce tube burnouts. Each model consists of a Variac autotransformer, a "buck or boost" transformer, and a proportional-control servomechanism to automatically position the Variac. Can be connected to handle either ±10% or ±20% line-voltage changes:

Percent of Line Voltage Variation Handled	Power Capacity	Percent Output Voltage Variation
10%	6 KVA	0.25%
20%	3 KVA	0.5%

1570-AL . . . . . 115v, 60c $490
1570-AH . . . . . 230v, 60c . . . . . $ 510

Three units may be used to regulate legs of a 3-phase circuit.



For Control of 3-Phase Lines

Type 1570-AS25
Militarized Unit, **$865**
. . . 3-KVA capacity per phase for correction of ±10% input variations.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

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