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ELECTRICAL MEASUREMENTS AND THEIR INDUSTRIAL APPLICATIONS

A UNIT OSCILLATOR FOR THE 0.5- TO 50-MC RANGE

Also
IN THIS ISSUE
Page
EXPERIMENTER INDEX 4

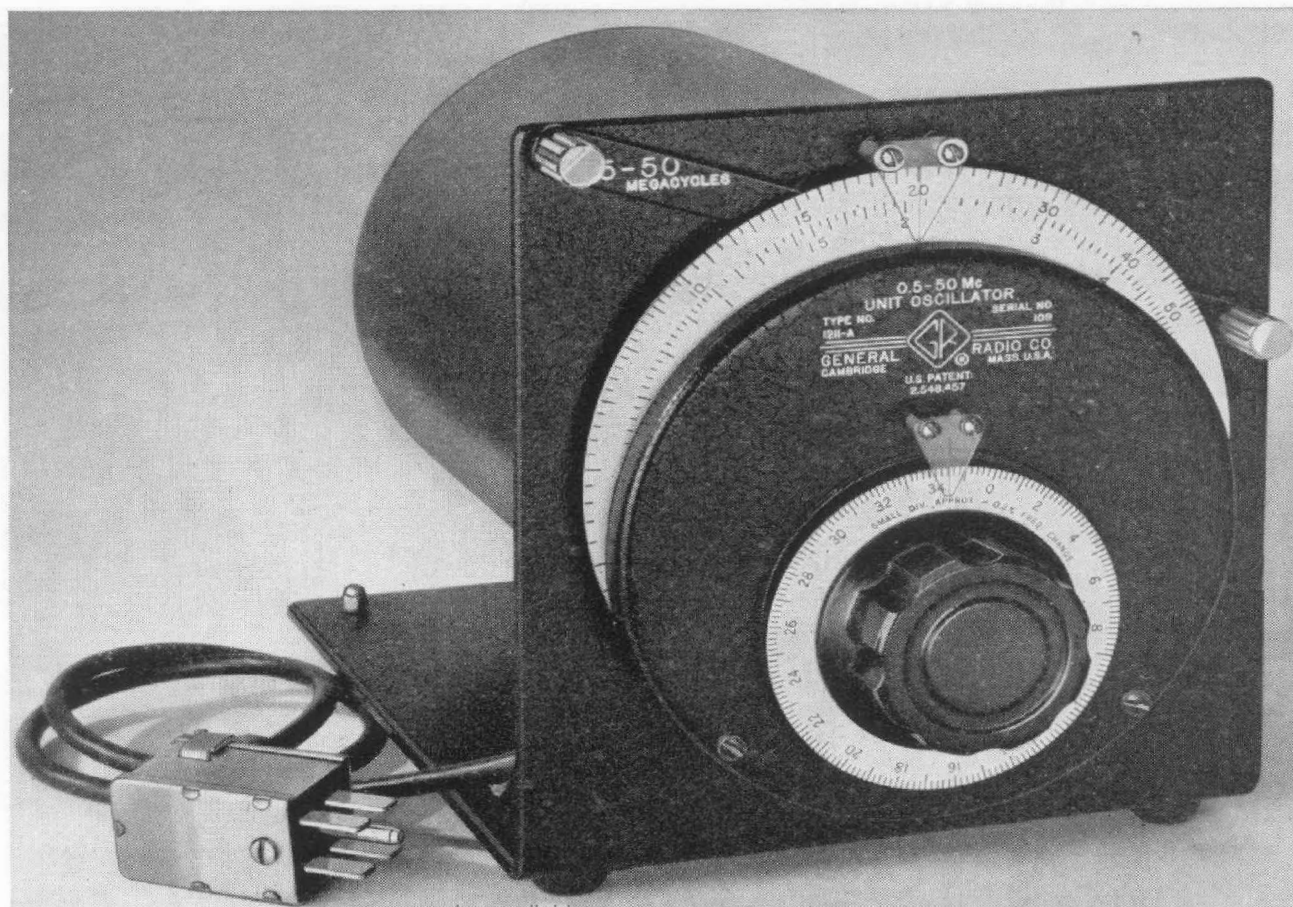
● THE TYPE 1211-A Unit Oscillator, latest addition to the rapidly growing line of General Radio Unit Oscillators¹, extends the frequency range covered by the versatile units downward by a factor of 100.

This new oscillator has a frequency span of 0.5-50 Mc, which is covered in two logarithmic ranges. The output power is well over one

¹Eduard Karplus, "V-H-F and U-H-F Unit Oscillators," *General Radio Experimenter*, Vol. 24, No. 12, May, 1950.

A. G. Bousquet, "A New Unit Oscillator — 50 to 250 Mc," *General Radio Experimenter*, Vol. 27, No. 8, January, 1953.

Figure 1. View of the Type 1211-A Unit Oscillator.



watt over the 0.5-to-5 Mc range and is at least 200 milliwatts over the 5-to-50 Mc range. The frequency is indicated directly on a six-inch dial, and approximate increments of frequency expressed in percentage are given on a 3¼-inch slow-motion-drive dial.

To avoid the necessity of frequent range switching, the tuning ranges have been made as wide as possible. The span of each of the two ranges in the TYPE 1211-A Oscillator is 10 to 1. This wide frequency range is obtained by varying simultaneously the capacitance and the inductance as the frequency dial is turned. A frequency change of about 5 to 1 is due to the variable capacitor, and the remaining 2 to 1 frequency change results from inductance variation.

Electrical Circuit

The TYPE 1211-A Unit Oscillator uses a Hartley circuit with a TYPE 5763 oscillator tube. This tube type was selected because it can handle all the power provided by the TYPE 1203-A Unit Power Supply. The output circuit is coupled inductively to the oscillator tuned circuit and includes a voltage divider as output control.

An audio oscillator can be connected to terminals in series with the plate supply for direct amplitude modulation of the oscillator. A convenient audio source is the TYPE 1214-A Unit Oscil-

lator which yields about 25 per cent modulation at 400 or 1000 cycles. The envelope distortion at this modulation level is around two to four per cent, depending on the carrier frequency.

Since modulation is accomplished directly in the oscillator circuit, some unwanted frequency modulation is unavoidable. Amplitude modulation practically free of frequency modulation can be obtained at carrier frequencies above 10 Mc by using the TYPE 1000-P6 Crystal Diode Modulator.

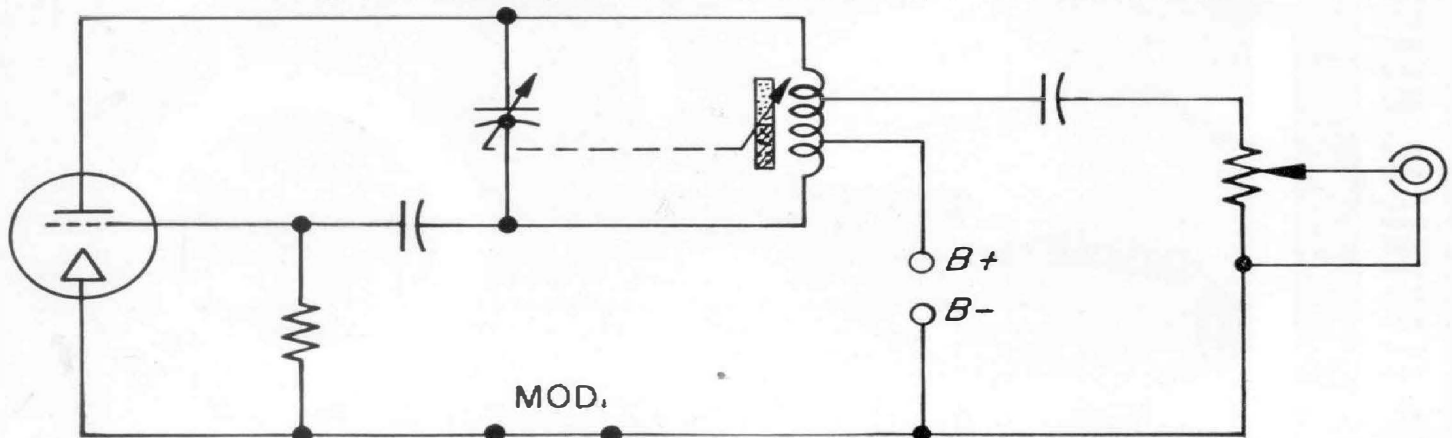
Construction

The oscillator circuit is assembled on an aluminum casting with filtering components mounted within the casting. A spun-aluminum cylindrical cover completes the shielding much more effectively than would a conventional rectangular dust cover. The output control and the coaxial output connector are at the rear of the cover; the entire assembly is mounted on an L-shaped panel and base.

The tuning capacitor and the switch contacts are the same as those used in the TYPE 1001-A Signal Generator and TYPE 1330-A Bridge Oscillator.

The 0.5- to 5-Mc and the 5- to 50-Mc oscillator coils are arranged in a plane perpendicular to the tuning capacitor shaft, and range selection is obtained by switching in the appropriate coil by means of a rocker arm on the panel. The

Figure 2. Elementary Schematic Diagram of the Type 1211-A Unit Oscillator.





frequency ranges are engraved at the arm extremities, and the main frequency dial shields one end of the arm so that only the range selected is indicated.

The core assembly, which helps to produce the wide frequency span, is concentric with the coils and is mounted to turn with the capacitor shaft. This assembly consists of a dust core and an aluminum core, both of a sickle shape, to produce a smooth transition from full iron-dust core for maximum inductance through a minimum of core to a full aluminum core for minimum inductance. The cores and the tuning capacitor plates are shaped to yield an approximate logarithmic response of frequency with angular rotation over the 10-to-1 frequency span. (See Figure 3.) The iron-dust core increases the circuit Q , while the aluminum core reduces it.

Features

The major features of this oscillator are the compact unit design, the 10-to-1 frequency range for each switch position, and the approximately logarithmic frequency response of the main dial with a smaller auxiliary dial indicating frequency increments of 0.2% per division. The 874-type coaxial output system and the effective shielding add appreciably to the usefulness of the instrument. All power leads are carefully filtered, and the dial shaft is enclosed within a

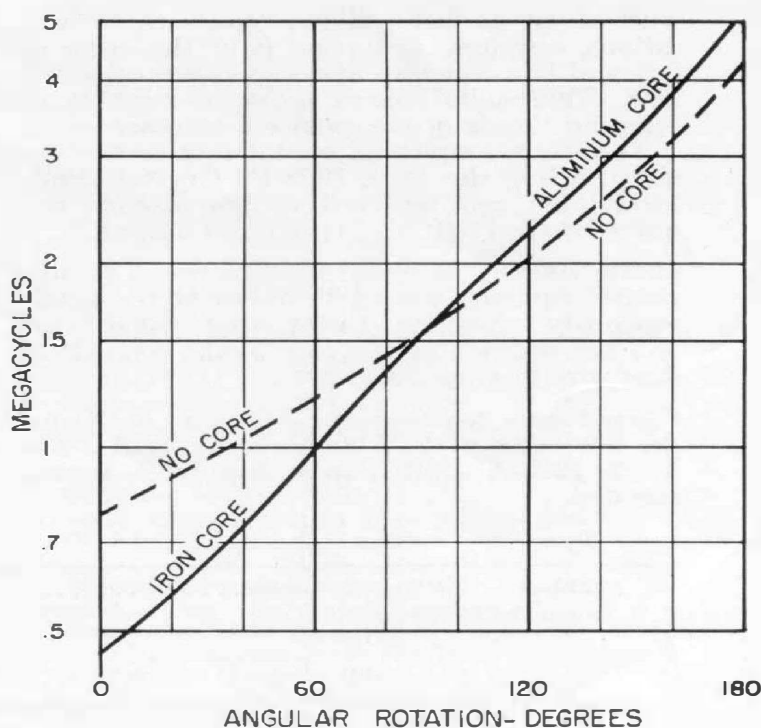


Figure 3. Frequency versus rotation angle showing the effect of the metal cores.

grounded capsule inside the main knob.

The shielding is entirely adequate for use of the oscillator as a power source in bridge measurements. The 874-type coaxial output connector permits extension of the shield system to the bridge.

Since all leads to the power unit are carefully filtered, batteries can be used as the power supply for field applications. For general laboratory operation, the TYPE 1203-A Unit Power Supply is recommended.

— A. G. BOUSQUET

SPECIFICATIONS

Frequency Range: 0.5 to 50 Mc in two ranges.

Frequency Calibration Accuracy: 2% at no load.

Frequency Controls: A two-position range switch. A 6-inch dial with calibration approximately logarithmic against angular rotation. A slow-motion vernier dial to indicate frequency increments of 0.2% per dial division.

Output System: The oscillator output is available at a coaxial connector at the rear of the instrument. An adjacent ground terminal also permits connection by means of a TYPE 274-M

Plug. The output is controlled by a small dial calibrated in arbitrary units.

Output Power: At least 200 milliwatts into a 50-ohm load at any frequency within the range. For the 0.5-5 Mc range, the output power is of the order of 2 watts.

Modulation: Direct amplitude modulation over the audio-frequency range can be obtained with an external audio oscillator. The impedance at the modulation terminals is about 8000 ohms, and 25% modulation is obtained



with about 45 volts audio. Under these conditions, envelope distortion is of the order of 3% and is a function of carrier frequency setting. The audio source must be capable of carrying the dc of the carrier oscillator.

To obtain amplitude modulation free of incidental f-m, the TYPE 1000-P6 Crystal Diode Modulator can be used at the carrier frequencies above 10 Mc, at reduced output.

Circuit: Hartley oscillator coupled direct to output. Frequency tuning is obtained by simultaneously changing the tuning capacitance and the position of the core in the coils (iron-dust core to aluminum core).

Power Supply Requirements: 300 volts at 50 ma dc, 6.0 volts at 0.75 amperes ac or dc. The TYPE 1203-A Unit Power Supply is recommended.

Tube: TYPE 5763 Miniature VHF Beam Power Amplifier, which is supplied with the instrument.

Mounting: The oscillator is mounted on an aluminum casting and is shielded with a spun-aluminum cover. The assembly is mounted on an L-shaped panel and chassis, finished in black-crackle lacquer.

Accessories Supplied: TYPE 874-R21 Patch Cord, TYPE 874-Q2 Adaptor and TYPE CDMS-466-4 Multipoint Connector.

Accessories Available: TYPE 1000-P6 Crystal Diode Modulator, TYPE 1214-A Unit Oscillator, TYPE 1203-A Unit Power Supply, TYPE 1204-B Unit Variable Power Supply, and the TYPE 874 Coaxial Elements.

Dimensions: 7 x 8 x 12 inches over-all.

Net Weight: 11½ pounds.

Type	Code Word	Price
1211-A Unit Oscillator.....	ATLAS	\$295.00

U. S. Patents 2,125,816 and 2,548,457.

INDEX

TO GENERAL RADIO EXPERIMENTER

Volumes XXVI and XXVII, June, 1951, through May, 1953

INDEX BY TITLE

- ACCESSORIES, THE VACUUM-TUBE BRIDGE AND ITS (A. G. Bousquet: September, 1952)
- ACCESSORIES — ADAPTORS, LINE STRETCHER, COMPONENT MOUNT, BALUN, TERMINATIONS AND INSERTION UNIT, NEW COAXIAL (October, 1952)
- ADAPTORS, NEW COAXIAL ACCESSORIES (October, 1952)
- ADAPTORS, "UNIVERSAL" COAXIAL (February, 1953)
- AIR CURRENTS MADE VISIBLE (January, 1953)
- AMPLIFIER CIRCUIT, A NEW PUSH-PULL (A. P. G. Peterson: October, 1951)
- AMPLIFIERS, A MULTIRANGE FILTER FOR AUDIO AND ULTRASONIC (Horatio W. Lamson: June, 1951)
- ANALYZER FOR NOISE MEASUREMENTS, AN OCTAVE-BAND (A. P. G. Peterson: September, 1951)
- AUDIO AND ULTRASONIC AMPLIFIERS, A MULTIRANGE FILTER FOR (Horatio W. Lamson: June, 1951)
- AUTOTRANSFORMERS, PORTABLE TEST (R. F. Bennington: March, 1953)
- AUTOTRANSFORMERS—VARIAC® WITH DURATRAK, A NEW STANDARD OF RELIABILITY IN VARIABLE (G. Smiley, Ivan G. Easton: April, 1953)
- BALUN, NEW COAXIAL ACCESSORIES—(October, 1952)
- BASIS FOR FIELD CHECKING SOUND-METER CALIBRATION, THE (W. R. Thurston: November, 1952)
- BRANCH PLANT, NEW (December, 1952, and January, 1953)
- BRIDGE AND ITS ACCESSORIES, THE VACUUM-TUBE (A. G. Bousquet: September, 1952)
- BRIDGE DOUBLES AS LABORATORY STANDARD, VERSATILE RESISTANCE LIMIT (W. M. Hague, Jr.: January, 1952)
- BRIDGE FOR THE RAPID TESTING OF COMPONENTS, A NEW COMPARISON (M. C. Holtje: December, 1952)
- BRIDGE, A 1-MEGACYCLE SCHERING (Ivan G. Easton: February, 1952)
- BRIDGE, TRANSISTOR MEASUREMENTS WITH THE VACUUM-TUBE (A. G. Bousquet: March, 1953)
- CABLE CHARACTERISTICS, THE MEASUREMENT OF (February, 1953)
- CALIBRATION-CHECK SERVICE FOR SOUND METERS (W. R. Thurston: November, 1952)
- CALIBRATION, THE BASIS FOR FIELD CHECKING SOUND-METER (W. R. Thurston: November, 1952)
- CAPACITANCE BRIDGE, A GUARD CIRCUIT FOR THE (Ivan G. Easton: August, 1952)
- CAPACITANCE MEASURING ASSEMBLY, TYPE 1610-A (August, 1952)
- COAXIAL ACCESSORIES — ADAPTORS, LINE STRETCHER, COMPONENT MOUNT, BALUN, TERMINATIONS, AND INSERTION UNIT, NEW (October, 1952)
- COAXIAL ADAPTORS, "UNIVERSAL" (February, 1953)
- COAXIAL CONNECTORS FOR RG-58/U AND OTHER CABLES (April, 1952)
- COMPARISON BRIDGE FOR THE RAPID TESTING OF COMPONENTS, A NEW (M. C. Holtje: December, 1952)
- COMPONENT MOUNT, NEW COAXIAL ACCESSORIES (October, 1952)
- CONDENSER MICROPHONE SYSTEM, TYPE 1551-P1 (E. E. Gross, Jr.: May, 1953)
- CONNECTORS (PART I), STANDARDIZED TERMINALS AND (H. C. Littlejohn: June, 1952)
- CONNECTORS (PART II), STANDARDIZED TERMINALS AND (H. C. Littlejohn: July, 1952)
- CRYSTAL OSCILLATOR — A SIMPLIFIED FREQUENCY STANDARD FOR THE SMALL LABORATORY, THE UNIT (Robert B. Richmond: February, 1952)
- CURRENTS MADE VISIBLE, AIR (January, 1953)
- DECADE RESISTORS, THE NEW TYPE 1432 (Ivan G. Easton: June, 1951)
- DELIVERY SCHEDULES (September, 1952)
- DIELECTRIC MATERIALS, A SAMPLE HOLDER FOR SOLID (Ivan G. Easton: August, 1951)



- DURATRAK, A NEW STANDARD OF RELIABILITY IN VARIABLE AUTOTRANSFORMERS—VARIAC® WITH (G. Smiley, Ivan G. Easton: April, 1953)
- ELECTRICAL NOISE, A GENERATOR OF (A. P. G. Peterson: December, 1951)
- EXPANDED REPAIR SERVICES (April, 1953)
- FIELD CHECKING SOUND-METER CALIBRATION, THE BASIS FOR (W. R. Thurston: November, 1952)
- FILTER FOR AUDIO AND ULTRASONIC AMPLIFIERS, A MULTIRANGE (Horatio W. Lamson: June, 1951)
- FILTER, TYPE 1212-P1 HIGH-PASS (February, 1953)
- FILTER, TYPE 1951-A (February, 1953)
- 500-VOLT MEGOHMMETER FOR INSULATION TESTING, A (A. G. Bousquet: November, 1951)
- FREQUENCY STANDARD FOR THE SMALL LABORATORY, THE UNIT CRYSTAL OSCILLATOR — A SIMPLIFIED (Robert B. Richmond: February, 1952)
- GENERATOR OF ELECTRICAL NOISE, A (A. P. G. Peterson: December, 1951)
- GERMANIUM CRYSTAL DIODES, HARMONIC GENERATION IN THE U-H-F REGION BY MEANS OF (Frank D. Lewis: July, 1951)
- GOOD CAUSE, A (August, 1952)
- GRAPHIC RECORDER PLOTS LEVEL IN EITHER POLAR OR LINEAR COORDINATES (January, 1952)
- GUARD CIRCUIT FOR THE CAPACITANCE BRIDGE, A (Ivan G. Easton: August, 1952)
- HANDBOOK OF NOISE MEASUREMENT (April, 1953)
- HARMONIC GENERATION IN THE U-H-F REGION BY MEANS OF GERMANIUM CRYSTAL DIODES (Frank D. Lewis: July, 1951)
- HIGH-PASS FILTER, TYPE 1212-P1 (February, 1953)
- HIGH-POWER TOROIDAL OUTPUT TRANSFORMER, A (Horatio W. Lamson: November, 1951)
- INDUCTORS, A NEW SERIES OF STANDARD (Horatio W. Lamson: November, 1952)
- INSERTION UNIT, NEW COAXIAL ACCESSORIES — (October, 1952)
- INSTRUCTION MANUAL FOR SLOTTED LINE, NEW (April, 1953)
- INSULATION TESTING, A 500-VOLT MEGOHMMETER FOR (A. G. Bousquet: November, 1951)
- LIMIT BRIDGE DOUBLES AS LABORATORY STANDARD, VERSATILE RESISTANCE (W. M. Hague, Jr.: January, 1952)
- LINE STRETCHER, NEW COAXIAL ACCESSORIES — (October, 1952)
- MEASUREMENT OF CABLE CHARACTERISTICS, THE (February, 1953)
- MEASUREMENTS ON TRANSFORMER OIL, TEST CELL FOR POWER FACTOR (January, 1953)
- MEASUREMENTS WITH THE VACUUM-TUBE BRIDGE, TRANSISTOR (A. G. Bousquet: March, 1953)
- MEGOHMMETER FOR INSULATION TESTING, A 500-VOLT (A. G. Bousquet: November, 1951)
- METERS, A CALIBRATION-CHECK SERVICE FOR SOUND (W. R. Thurston: November, 1952)
- MICROPHONE SYSTEM, TYPE 1551-P1 CONDENSER (E. E. Gross, Jr.: May, 1953)
- MORE USEFUL VARIAC CIRCUITS (November, 1952)
- MULTIRANGE FILTER FOR AUDIO AND ULTRASONIC AMPLIFIERS, A (Horatio W. Lamson: June, 1951)
- NEW BRANCH PLANT (December, 1952 and January, 1953)
- NEW COAXIAL ACCESSORIES — ADAPTORS, LINE STRETCHER, COMPONENT MOUNT, BALUN, TERMINATIONS, AND INSERTION UNIT (October, 1952)
- NEW COMPARISON BRIDGE FOR THE RAPID TESTING OF COMPONENTS, A (M. C. Holtje: December, 1952)
- NEW INSTRUCTION MANUAL FOR SLOTTED LINE (April, 1953)
- NEW PUSH-PULL AMPLIFIER CIRCUIT, A (A. P. G. Peterson: October, 1951)
- NEW SERIES OF STANDARD INDUCTORS, A (Horatio W. Lamson: November, 1952)
- NEW STANDARD OF RELIABILITY IN VARIABLE AUTOTRANSFORMERS — VARIAC® WITH DURATRAK, A (G. Smiley, Ivan G. Easton: April, 1953)
- NEW 2-AMPERE VARIAC, A (G. Smiley: May, 1953)
- NEW TYPE 1432 DECADE RESISTORS, THE (Ivan G. Easton: June, 1951)
- NEW UNIT INSTRUMENTS POWER SUPPLIES — MODULATOR (July, 1951)
- NEW UNIT OSCILLATOR — 50 to 250 Mc, A (A. G. Bousquet: January, 1953)
- NOISE, A GENERATOR OF ELECTRICAL (A. P. G. Peterson: December, 1951)
- NOISE MEASUREMENT, HANDBOOK OF (April, 1953)
- NOISE MEASUREMENTS, AN OCTAVE-BAND ANALYZER FOR (A. P. G. Peterson: September, 1951)
- NOISE, PULSED SIGNALS IN (June, 1952)
- NULL DETECTOR, TYPE 1212-A UNIT (R. B. Richmond: February, 1953)
- OCTAVE-BAND ANALYZER FOR NOISE MEASUREMENTS, AN (A. P. G. Peterson: September, 1951)
- OIL, TEST CELL FOR POWER FACTOR MEASUREMENTS ON TRANSFORMER (January, 1953)
- 1-MEGACYCLE SCHERING BRIDGE, A (Ivan G. Easton: February, 1952)
- OSCILLATOR — 50 to 250 Mc, A NEW UNIT (A. G. Bousquet: January, 1953)
- OUTPUT TRANSFORMER, A HIGH-POWER TOROIDAL (Horatio W. Lamson: November, 1951)
- PORTABLE POWER DISTRIBUTION PANEL FOR TELEVISION STUDIOS, A (January, 1952)
- PORTABLE TEST AUTOTRANSFORMERS (R. F. Bennington: March, 1953)
- POWER DISTRIBUTION PANEL FOR TELEVISION STUDIOS, A PORTABLE (January, 1952)
- POWER FACTOR MEASUREMENTS ON TRANSFORMER OIL, TEST CELL FOR (January, 1953)
- PULSED SIGNALS IN NOISE (June, 1952)
- PUSH-PULL AMPLIFIER CIRCUIT, A NEW (A. P. G. Peterson: October, 1951)
- QUIET SHIP (September, 1952)
- RECORDER PLOTS LEVEL IN EITHER POLAR OR LINEAR COORDINATES (January, 1952)
- REPAIR SERVICE TO WEST COAST CUSTOMERS, WESTERN INSTRUMENT CO. OFFERS (May, 1952)
- REPAIR SERVICES, EXPANDED (April, 1953)
- RESISTANCE LIMIT BRIDGE DOUBLES AS LABORATORY STANDARD, VERSATILE (W. M. Hague, Jr.: January, 1952)
- RHEOSTAT BURNOUTS?, WHY (P. K. McElroy: August, 1951)
- SAMPLE HOLDER FOR SOLID DIELECTRIC MATERIALS, A (Ivan G. Easton: August, 1951)
- SCHERING BRIDGE, A 1-MEGACYCLE (Ivan G. Easton: February, 1952)
- SERVICE FOR SOUND METERS, A CALIBRATION-CHECK (W. R. Thurston: November, 1952)
- SIGNALS IN NOISE, PULSED (June, 1952)
- SIMPLE HARMONIC MOTION, VARIAC® SPEED CONTROL HELPS TO DEMONSTRATE (January, 1953)
- SINGLE-ENDED PUSH-PULL AMPLIFIER (see: New Push-Pull Amplifier Circuit, A)
- SLOTTED LINE, NEW INSTRUCTION MANUAL FOR (April, 1953)
- SOUND-LEVEL METER, TYPE 1551-A (E. E. Gross, Jr.: March, 1952)
- SOUND-METER CALIBRATION, THE BASIS FOR FIELD CHECKING (W. R. Thurston: November, 1952)
- SOUND METERS, A CALIBRATION-CHECK SERVICE FOR (W. R. Thurston: November, 1952)
- SOUND-SURVEY METER, THE (Arnold Peterson: April, 1952)
- SPEED CONTROL HELPS TO DEMONSTRATE SIMPLE HARMONIC MOTION, VARIAC® (January, 1953)
- STANDARD INDUCTORS, A NEW SERIES OF (Horatio W. Lamson: November, 1952)
- STANDARDIZED TERMINALS AND CONNECTORS (PART I) (H. C. Littlejohn: June, 1952)
- STANDARDIZED TERMINALS AND CONNECTORS (PART II) (H. C. Littlejohn: July, 1952)
- TELEVISION STUDIOS, A PORTABLE POWER DISTRIBUTION PANEL FOR (January, 1952)
- TERMINALS AND CONNECTORS (PART I), STANDARDIZED (H. C. Littlejohn: June, 1952)



- TERMINALS AND CONNECTORS (PART II), STANDARDIZED (H. C. Littlejohn: July, 1952)
- TERMINATIONS, NEW COAXIAL ACCESSORIES (October, 1952)
- TEST CELL FOR POWER FACTOR MEASUREMENTS ON TRANSFORMER OIL (January, 1953)
- TESTING OF COMPONENTS, A NEW COMPARISON BRIDGE FOR THE RAPID (M. C. Holtje: December, 1952)
- THREE-QUARTER HORSEPOWER VARIAC® MOTOR SPEED CONTROL, A (W. N. Tuttle: May, 1952)
- TOROIDAL OUTPUT TRANSFORMER, A HIGH-POWER (Horatio W. Lamson: November, 1951)
- TRANSFORMER, A HIGH-POWER TOROIDAL OUTPUT (Horatio W. Lamson: November, 1951)
- TRANSISTOR MEASUREMENTS WITH THE VACUUM-TUBE BRIDGE (A. G. Bousquet: March, 1953)
- TWELVE TONS OF SALT AND AN IMPEDANCE BRIDGE DETECT LEAK IN PIPE LINE (June, 1952)
- 2-AMPERE VARIAC, A NEW (G. Smiley: May, 1953)
- TYPE 700-P1 VOLTAGE DIVIDER (December, 1951)
- TYPE 1212-A UNIT NULL DETECTOR (Robert B. Richmond: February, 1953)
- TYPE 1212-P1 HIGH-PASS FILTER (February, 1953)
- TYPE 1551-A SOUND-LEVEL METER (E. E. Gross, Jr.: March, 1952)
- TYPE 1551-P1 CONDENSER MICROPHONE SYSTEM (E. E. Gross, Jr.: May, 1953)
- TYPE 1610-A CAPACITANCE MEASURING ASSEMBLY (August, 1952)
- TYPE 1951-A FILTER (February, 1953)
- U-H-F REGION BY MEANS OF GERMANIUM CRYSTAL DIODES, HARMONIC GENERATION IN THE (Frank D. Lewis: July, 1951)
- ULTRASONIC AMPLIFIERS, A MULTIRANGE FILTER FOR AUDIO AND (Horatio W. Lamson: June, 1951)
- UNIT CRYSTAL OSCILLATOR — A SIMPLIFIED FREQUENCY STANDARD FOR THE SMALL LABORATORY, THE (Robert B. Richmond: February, 1952)
- UNIT INSTRUMENTS POWER SUPPLIES — MODULATOR, NEW (July, 1951)
- UNIT NULL DETECTOR, TYPE 1212-A (Robert B. Richmond: February, 1953)
- UNIT OSCILLATOR — 50 to 250 Mc, A NEW (A. G. Bousquet: January, 1953)
- "UNIVERSAL" COAXIAL ADAPTORS (February, 1953)
- USEFUL VARIAC CIRCUIT, A (August, 1952)
- USES OF VARIACS IN ELECTRICAL ENGINEERING POWER LABORATORIES (Abraham Abramowitz: May, 1952)
- VACUUM-TUBE BRIDGE AND ITS ACCESSORIES, THE (A. G. Bousquet: September, 1952)
- VACUUM-TUBE BRIDGE, TRANSISTOR MEASUREMENTS WITH THE (A. G. Bousquet: March, 1953)
- VARIABLE AUTOTRANSFORMERS VARIAC® WITH DURATRAK, A NEW STANDARD OF RELIABILITY IN (G. Smiley, Ivan G. Easton: April, 1953)
- VARIAC® CIRCUIT, A USEFUL (August, 1952)
- VARIAC® CIRCUIT, A MORE USEFUL (November, 1952)
- VARIAC® MOTOR SPEED CONTROL, A THREE-QUARTER HORSEPOWER (W. N. Tuttle: May, 1952)
- VARIAC®, A NEW 2-AMPERE (G. Smiley: May, 1953)
- VARIAC® SPEED CONTROL HELPS TO DEMONSTRATE SIMPLE HARMONIC MOTION (January, 1953)
- VARIAC® WITH DURATRAK, A NEW STANDARD OF RELIABILITY IN VARIABLE AUTOTRANSFORMERS (G. Smiley, Ivan G. Easton: April, 1953)
- VARIACS IN ELECTRICAL ENGINEERING POWER LABORATORIES, USES OF (Abraham Abramowitz: May, 1952)
- VERSATILE RESISTANCE LIMIT BRIDGE DOUBLES AS LABORATORY STANDARD (W. M. Hague, Jr.: January, 1952)
- VOLTAGE DIVIDER, TYPE 700-P1 (December, 1951)
- WESTERN INSTRUMENT COMPANY OFFERS REPAIR SERVICE TO WEST COAST CUSTOMERS (May, 1952)
- WHY RHEOSTAT BURNOUTS? (P. K. McElroy: August, 1951)



INDEX BY AUTHOR

- ABRAMOWITZ, ABRAHAM
Uses of Variacs in Electrical Engineering Power Laboratories (May, 1952)
- BENNINGTON, R. F.
Portable Test Autotransformers (March, 1953)
- BOUSQUET, A. G.
A 500-Volt Megohmmeter for Insulation Testing (November, 1951)
A New Unit Oscillator—50 to 250 Mc (January, 1953)
Transistor Measurements with the Vacuum-Tube Bridge (March, 1953)
The Vacuum-Tube Bridge and Its Accessories (September, 1952)
- EASTON, IVAN G.
A Guard Circuit for the Capacitance Bridge (August, 1952)
A New Standard of Reliability in Variable Autotransformers — Variac® with Duratrak (April, 1953)
The New Type 1432 Decade Resistors (June, 1951)
A 1-Megacycle Shering Bridge (February, 1952)
A Sample Holder for Solid Dielectric Materials (August, 1951)
- GROSS, JR., ERVIN E.
Type 1551-A Sound-Level Meter (March, 1952) Type 1551-P1 Condenser Microphone System (May, 1953)
- HAGUE, JR., W. M.
Versatile Resistance Limit Bridge Doubles as Laboratory Standard (January, 1952)
- HOLTJE, M. C.
A New Comparison Bridge for the Rapid Testing of Components (December, 1952)
- LAMSON, HORATIO W.
A High-Power Toroidal Output Transformer (November, 1951)
A Multirange Filter for Audio and Ultrasonic Amplifiers (June, 1951)
A New Series of Standard Inductors (November, 1952)
- LEWIS, FRANK D.
Harmonic Generation in the U-H-F Region by Means of Germanium Crystal Diodes (July, 1951)
- LITTLEJOHN, H. C.
Standardized Terminals and Connectors (Part I) (June, 1952)
Standardized Terminals and Connectors (Part II) (July, 1952)
- MC ELROY, P. K.
Why Rheostat Burnouts? (August, 1951)
- PETERSON, A. P. G.
A Generator of Electrical Noise (December, 1951)
A New Push-Pull Amplifier Circuit (October, 1951)
An Octave-Band Analyzer for Noise Measurements (September, 1951)
The Sound-Survey Meter (April, 1952)
- SMILEY, G.
A New Standard of Reliability in Variable Autotransformers — Variac® with Duratrak (April, 1953)
A New 2-Ampere Variac (April, 1953)
- RICHMOND, ROBERT B.
Type 1212-A Unit Null Detector (February, 1953)
The Unit Crystal Oscillator — A Simplified Frequency Standard for the Small Laboratory (February, 1952)
- THURSTON, W. R.
The Basis for Field Checking Sound-Meter Calibration (November, 1952)
A Calibration-Check Service for Sound Meters (November, 1952)
- TUTTLE, W. N.
A Three-Quarter Horsepower Variac® Motor Speed Control (May, 1952)



INDEX BY INSTRUMENT TYPE NUMBER

- TYPE V-2 VARIAC**
A New 2-Ampere Variac (G. Smiley: May, 1953)
- TYPE V-20HM VARIAC**
Portable Test Autotransformers (R. F. Bennington: March, 1953)
- TYPE 200-B VARIAC**
A New 2-Ampere Variac (G. Smiley: May, 1953)
- TYPE 214 RHEOSTATS**
Why Rheostat Burnouts? (P. K. McElroy: August, 1951)
- TYPE 274 CONNECTORS**
Standardized Terminals and Connectors (Part I) (H. C. Littlejohn: June, 1952)
Standardized Terminals and Connectors (Part II) (H. C. Littlejohn: July, 1952)
- TYPE 561-D VACUUM-TUBE BRIDGE**
The Vacuum-Tube Bridge and Its Accessories (A. G. Bousquet: September, 1952)
Transistor Measurements with the Vacuum-Tube Bridge (A. G. Bousquet: March, 1953)
- TYPE 650-A IMPEDANCE BRIDGE**
Twelve Tons of Salt and an Impedance Bridge Detect Leak in Pipe Line (June, 1952)
- TYPE 700-P1 VOLTAGE DIVIDER**
Type 700-P1 Voltage Divider (December, 1951)
- TYPE 716-CS1 CAPACITANCE BRIDGE**
A 1-Megacycle Schering Bridge (Ivan G. Easton: February, 1952)
- TYPE 716-P4 GUARD CIRCUIT**
A Guard Circuit for the Capacitance Bridge (Ivan G. Easton: August, 1952)
- TYPE 740-BG CAPACITANCE TEST BRIDGE**
Test Cell for Power Factor Measurements on Transformer Oil (January, 1953)
- TYPE 759 SOUND-LEVEL METER**
The Basis for Field Checking Sound-Meter Calibration (W. R. Thurston: November, 1952)
- TYPE 838 CONNECTORS**
TYPE 838-K TEST LEAD KIT
Standardized Terminals and Connectors (Part II) (H. C. Littlejohn: July, 1952)
- TYPE 874 ADAPTORS**
New Coaxial Accessories — Adaptors, Line Stretcher, Component Mount, Balun, Terminations, and Insertion Unit (October, 1952)
"Universal" Coaxial Adaptors (February, 1953)
- TYPE 874 CONNECTORS**
Standardized Terminals and Connectors (Part I) (H. C. Littlejohn: June, 1952)
Standardized Terminals and Connectors (Part II) (H. C. Littlejohn: July, 1952)
New Coaxial Accessories (October, 1952)
- TYPE 874 TERMINATIONS**
- TYPE 874-LK CONSTANT-IMPEDANCE ADJUSTABLE LINE**
- TYPE 874-M COMPONENT MOUNT**
- TYPE 874-UB BALUN**
- TYPE 874-X INSERTION UNIT**
New Coaxial Accessories (October, 1952)
- TYPE 874-LB SLOTTED LINE**
New Instruction Manual for Slotted Line (April, 1953)
- TYPE 938 BINDING POSTS**
Standardized Terminals and Connectors (Part I) (H. C. Littlejohn: June, 1952)
Standardized Terminals and Connectors (Part II) (H. C. Littlejohn: July, 1952)
- TYPE 938 CONNECTORS**
Standardized Terminals and Connectors (Part II) (H. C. Littlejohn: July, 1952)
- TYPE 942-A OUTPUT TRANSFORMER**
A High-Power Toroidal Output Transformer (Horatio W. Lamson: November, 1951)
A New Push-Pull Amplifier Circuit (A. P. G. Peterson: October, 1951)
- TYPE 1203-A UNIT POWER SUPPLY**
New Unit Instruments Power Supplies — Modulator (July, 1951)
- TYPE 1204-B UNIT VARIABLE POWER SUPPLY**
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- TYPE 1209-A UNIT OSCILLATOR**
Harmonic Generation in the U-H-F Region by Means of Germanium Crystal Diodes (Frank D. Lewis: July, 1951)
- TYPE 1212-A UNIT NULL DETECTOR**
Type 1212-A Unit Null Detector (R. B. Richmond: February, 1953)
- TYPE 1212-P1 HIGH-PASS FILTER**
Type 1212-P1 High-Pass Filter (February, 1953)
- TYPE 1213-A UNIT CRYSTAL OSCILLATOR**
The Unit Crystal Oscillator — A Simplified Frequency Standard for the Small Laboratory (February 1952)
- TYPE 1214-A UNIT OSCILLATOR**
New Unit Instruments Power Supplies — Modulator (July, 1951)
- TYPE 1215-A UNIT OSCILLATOR**
A New Unit Oscillator — 50 to 250 Mc (A. G. Bousquet: January, 1953)
- TYPE 1231-P5 ADJUSTABLE FILTER**
A Multirange Filter for Audio and Ultrasonic Amplifiers (Horatio W. Lamson: June, 1951)
- TYPE 1262-A POWER SUPPLY**
Type 1551-A Sound-Level Meter (E. E. Gross, Jr.: March, 1952)
- TYPE 1304-A BEAT-FREQUENCY OSCILLATOR**
Graphic Recorder Plots Level in Either Polar or Linear Coordinates (January, 1952)
- TYPE 1390-A RANDOM-NOISE GENERATOR**
A Generator of Electrical Noise (A. P. G. Peterson: December, 1951)
Pulsed Signals in Noise (June, 1952)
- TYPE 1432 DECADE RESISTOR**
The New Type 1432 Decade Resistors (Ivan G. Easton: June, 1951)
- TYPE 1482 INDUCTORS**
A New Series of Standard Inductors (Horatio W. Lamson: November, 1952)
- TYPE 1532-B STROBOLUME**
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An Octave-Band Analyzer for Noise Measurements (A. P. G. Peterson: September, 1951)
- TYPE 1551-A SOUND LEVEL METER**
Type 1551-A Sound-Level Meter (March, 1952)
The Basis for Field Checking Sound-Meter Calibration (W. R. Thurston: November, 1952)
- TYPE 1551-P1 CONDENSER MICROPHONE SYSTEM**
Type 1551-P1 Condenser Microphone System (E. E. Gross, Jr.: May, 1953)
- TYPE 1552-A SOUND-LEVEL CALIBRATOR**
A Calibration-Check Service for Sound Meters (W. R. Thurston: November, 1952)
The Basis for Field Checking Sound-Meter Calibration (W. R. Thurston: November, 1952)
- TYPE 1555-A SOUND-SURVEY METER**
The Sound-Survey Meter (April, 1952)
Quiet Ship (September, 1952)
A Calibration-Check Service for Sound Meters (W. R. Thurston: November, 1952)
- TYPE 1604-A COMPARISON BRIDGE**
A New Comparison Bridge for the Rapid Testing of Components (M. C. Holtje: December, 1952)
- TYPE 1610-A CAPACITANCE MEASURING ASSEMBLY**
Type 1610-A Capacitance Measuring Assembly (August, 1952)
- TYPE 1652-A RESISTANCE LIMIT BRIDGE**
Versatile Resistance Limit Bridge Doubles as Laboratory Standard (January, 1952)
- TYPE 1690-A DIELECTRIC SAMPLE HOLDER**
- TYPE 1690-P2 ADAPTOR ASSEMBLY**
A Sample Holder for Solid Dielectric Materials (Ivan G. Easton: August, 1951)
- TYPE 1702-A VARIAC® SPEED CONTROL**
A Three-Quarter Horsepower Variac® Motor Speed Control (W. N. Tuttle: May, 1952)
- TYPE 1862-A MEGOHMMETER**
A 500-Volt Megohmmeter for Insulation Testing (A. G. Bousquet: November, 1951)
- TYPE 1951-A FILTER**
Type 1951-A Filter (February, 1953)

**GENERAL RADIO AT N. E. C. 1953**

General Radio products will be on display in Booths 87 and 88 at the National Electronics Conference to be held in the Hotel Sherman, Chicago, September 28, 29, and 30.

Among the General Radio instruments shown will be:

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Type 1000-P7 Balanced Modulator — a crystal-diode modulator designed to operate on the output of standard-signal generators to produce 100% amplitude modulation without incidental frequency modulation. Carrier frequency range is 60 to 2500 megacycles, and modulating frequencies up to 20 megacycles can be used. Pulse modulation

can also be applied, with rise times as short as 0.02 microsecond.

Limit bridges for measuring d-c resistance and for comparing resistors, capacitors, and inductors at audio-frequencies.

Sound-measuring equipment — a complete line of sound-level meters, analyzers, and accessories for the measurement of noise and other sounds.

Type 1602-B U-H-F Admittance Meter, with a full line of accessories, set up to measure television transmitting antennas.

Variac[®] autotransformers with General Radio's new Duratrak contact surface that stands up under punishing overloads — an outstanding development that makes the variable autotransformer as durable as a fixed-ratio transformer.

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