the GENERAL RADIO **Experimenter**

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Since 1915 — Manufacturers of Electronic Apparatus for Science and Industry

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A NEW, HIGH-SENSITIVITY ELECTROMETER

Also IN THIS ISSUE

The new TYPE 1230-A D-C Amplifier and Electrometer is basically a high-resistance millivoltmeter. Voltage, current, and resistance is indicated on a panel meter and can also be indicated on a recorder.

Because of its high sensitivity and excellent stability, this instrument has a wide range of applications in science, engineering, and industry. Typical examples include the measurement of:

Ionization currents, photo currents, grid currents in electron tubes, and time-current curves of capacitors during charge and discharge.

Piezo-electric potentials, bioelectric potentials, contact potentials, electrostatic field potentials, and pH indications.

Silicon-diode back resistance, interconductor resistance of cables, insulation resistance of electrical equipment and voltage coefficient of resistance.

The amplifier in this instrument is strictly direct coupled. It uses neither the relatively low input-resistance chopper system nor the high-cost vibrating capacitor system. Its stability is due to excellent supply regulation, shock mounting, liberal use of wire-wound resistors at the important places, and adequate aging of both tubes and com-

Figure 1. Panel view of the Type 1230-A D-C Amplifier and Electrometer.

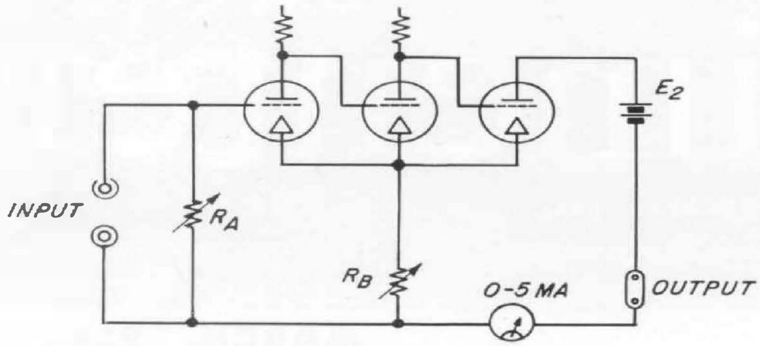


Figure 2. Elementary schematic of the Electrometer. The circuit is, fundamentally, a cathode follower in which the "tube" is a 3-stage, direct-coupled amplifier. The magnitude of the cathode resistor, R_B, determines the voltage sensitivity.

ponents. As a consequence, drift after warm-up is normally less than 2 millivolts per hour.

Grid current at the input of the 3-tube direct-coupled amplifier is negligible, because the tube in the first stage is an electrometer type. The input resistance is determined by the setting of a switch that provides resistance standards in decimal steps from 10 kilohms to a hundred thousand megohms (10^{11} ohms).

The ability to measure from 30 millivolts full-scale to 10 volts full-scale, coupled with the wide range of resistance standards, permits current measurements from one milliampere full scale to 0.3 micro-microampere (3×10^{-13} amp.) full scale at an effective "ammeter" resistance appreciably less than the value of the resistance standard.

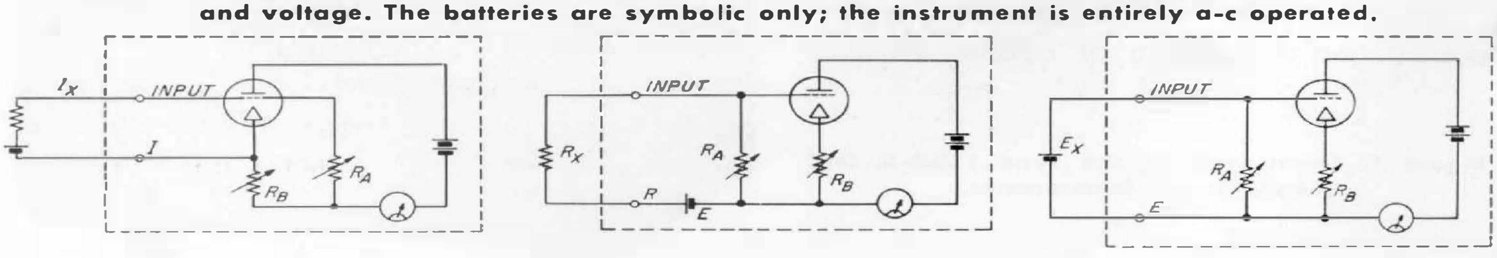
An internal stabilized-voltage source permits direct-reading resistance measurements from 300 kilohms to ten mega-megohms at full scale (5×10^{14} ohms at the smallest meter division). Through use of the most sensitive voltage range and readily available external batteries, the resistance range can be extended by a factor of two hundred or more.

Circuit

Fundamentally, the circuit is a simple cathode follower where the "tube" is a three-stage amplifier as shown in the elementary schematic of Figure 2. Figure 3 shows the elementary circuit for each type of measurement. The effective transconductance is the product of the trans-conductance of the third stage and the voltage gain of the first two stages. The result is a transconductance in the millions of micromhos. Consequently, the input voltage is duplicated within a few microvolts across the cathode resistor, and excellent linearity is obtained even at the 30-millivolt scale. Voltage ranges are selected by changing the value of the cathode resistor.

The first two stages of the amplifier use sub-miniature tubes with ten-milliampere filaments. The filaments are in a resistor chain fed from a doubly stabilized voltage-regulating system. The plate and screen voltages of the first stage, as well as the screen voltage of the second stage, are obtained from this same highly stabilized supply. As a consequence of the great care used for stabilization, line voltage fluctuations have a negligible effect on performance. Balanced amplifier systems were tried but more reliable results were obtained by using the fully stabilized supply rather than the balancing method, which depends on perfect matching for adequate results.

Figure 3. Elementary schematics, showing, left to right, the circuits for measuring current, resistance, and voltage. The batteries are symbolic only; the instrument is entirely a-c operated.



High Input Resistance

The input resistance of the amplifier is about 10^{14} ohms when the input-resistance switch is at the open position. This extremely high resistance level is due not only to the use of an electrometer tube but also to unusual construction features. Every effort was made to obtain reliable operation under high humidity conditions. The glass envelope around the grid lead is treated with silicone. The resistance-standard selector switch uses switch contacts that are mounted on individual teflon bushings set in a metal base that connects to a guard point.

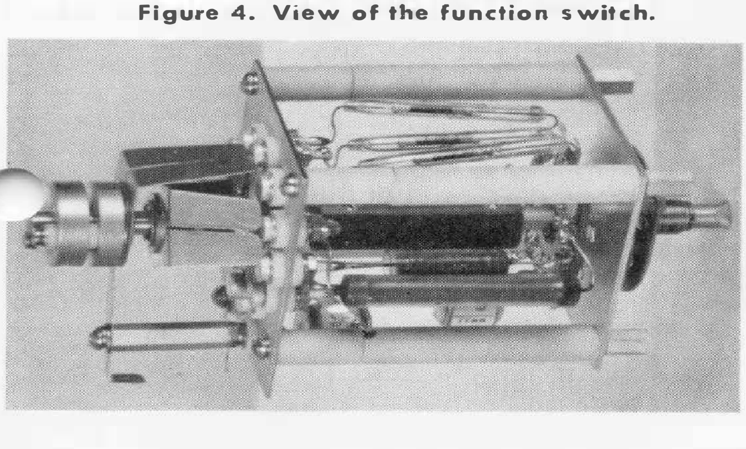
Internal Standards Calibration

To permit checking the high-resistance internal standards in terms of the low-resistance wire-wound standards, a check position is provided on the function switch. This has meant further elaboration of a switch already unusual in construction to meet the requirement of excellent performance at a 10^{14}-ohm level under adverse humidity conditions. The effort is well repaid in the ease with which the resistance of even the 10^{11}-ohm standard can be checked. A photograph of the switch is shown in Figure 4.

No Switching Transients

A switch is provided for readily disconnecting the unknown from the input without otherwise disturbing either

Figure 4. View of the function switch.



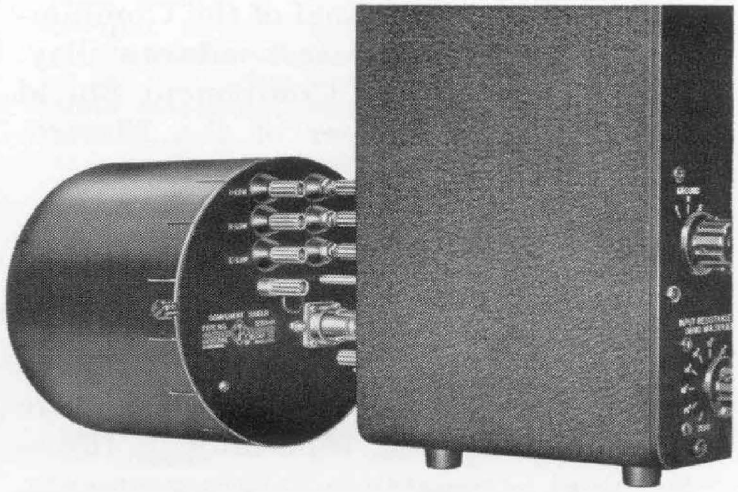


Figure 5. View of the Type 1230-P1 Component Shield plugged into the rear of the Electrometer.

the unknown circuit or the electrometer input circuit; to accomplish the switching without causing an electrostatic surge (due to friction of metal on dielectric) and without causing a change in capacitance with resultant voltage surge due to redistribution of charge, the contactor is raised by a teflon button with a metal rim in permanent contact with one of the blades.

Shielding

Complete shielding of the shock-mounted electrometer stage is important to eliminate grid currents due to ambient light, to prevent dust from entering and affecting the high resistance, and especially to isolate the input from random electrostatic potentials that are not usually noticed, but that become obvious at resistance levels in excess of 10^9 ohms.

The input connection is through a teflon-insulated coaxial terminal, and available accessories permit extension of the complete shielding to the unit under test. In particular, the Type 1230-P1 Component Shield provides a fully-shielded compartment within which components under measurement can be quickly and easily connected. The ground and guard terminals are duplicated on the panel of the Component Shield for greatest adaptability. Figure 5 shows the Component Shield plugged into the rear of the Electrometer.

Guard Terminals

While most measurements can be made by connecting the unknown (voltage, current or resistance) from the high input terminal to ground, there are some applications, especially in three-terminal resistance measurements, where guard points are necessary. Accordingly, the Type 1230-A Amplifier is provided with three guard terminals which can be grounded or not as desired. This arrangement is shown in Figure 6.

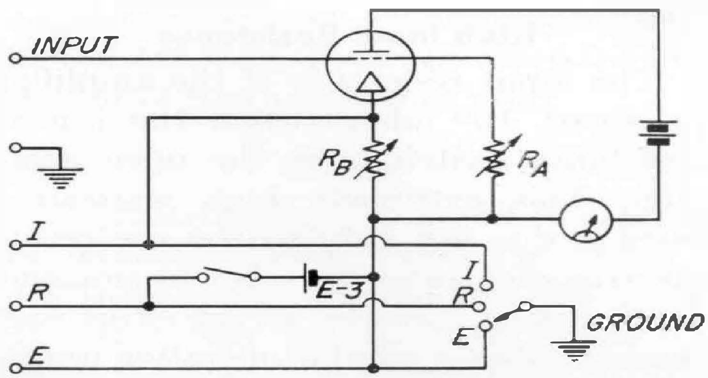


Figure 6. The I, R, and E terminals add appreciably to the versatility of the instrument. Any one of the three terminals can be used as a guard point (as in 3-terminal resistance measurements) and can be grounded by a panel switch.

Output

The output system comprises a 0–5 milliampere panel meter and a pair of terminals in series with the meter. The panel meter has two scales calibrated in volts and two scales calibrated in ohms so that both have two ranges per decade. Any external meter or recorder at the output terminals can have as much as 1500 ohms resistance without affecting performance. Thus, either the 5 ma or the 1 ma Esterline-Angus recorder can be connected to obtain permanent recordings of results. The amplifier is an ideal companion instrument to this Graphic Recorder since it can be mounted in the same type of case. The dynamic output resistance of the amplifier is but a fraction of an ohm; therefore, it is well adapted for operation with most recorders.

Applications

This latter feature adds appreciably to the long list of uses for the amplifier (see page 1). The leakage resistance of capacitors, as well as time-current curves under charge or discharge conditions, are readily obtained. This Electrometer is well suited to the measurement of the high back resistance of silicon-junction diodes, because the potential applied to the unknown resistance is only 9.1 volts, which is within the safe operating range of the diode.

— A. G. Bousquet

SPECIFICATIONS

Voltage Ranges: ± 30, 100, and 300 millivolts, ± 1, 3, and 10 volts, dc, full scale. Accuracy is ± 2% of full scale on the five highest ranges; ± 4% of full scale on the 30-mv range.

Current Ranges: ± 1 milliampere d-c (10^{-3} amp.) full scale to ± 300 milli-micromicroamperes (3×10^{-13} amp.) full scale, in twenty ranges (two per decade). Accuracy is ± 3% of full scale from 10^{-3} amp to 3×10^{-9} amp; ± 10% of full scale from 10^{-10} amp to 3×10^{-13} amp.

Resistance Ranges: Direct reading in resistance from 300 kilohms to 10 mega-megohms (10^{13} ohms) at full scale (5×10^{14} ohms at smallest meter division). There are sixteen ranges (two per decade). At full scale (low-frequency end) accuracy is ± 3% from 3×10^5 ohms to 10^{10} ohms; ± 8% from 3×10^{10} ohms to 10^{13} ohms. The voltage across the unknown resistance is 9.1 volts.

The resistance range may be extended considerably, and voltage coefficients of resistors determined, by the use of external batteries. With a 300-volt battery, the highest resistance range is 10^{15} ohms full scale (6×10^{16} ohms at the smallest meter division). The full battery voltage appears across the unknown resistance.

Resistance Standards: 10^4, 10^5, 10^6, 10^7, 10^8, 10^9, 10^{10}, and 10^{11} ohms. The switch also includes "zero" and "infinity" positions. The 10^4- and 10^5-ohms resistors are wire wound and are accurate to ± 0.25%. The 10^6-, 10^7- and 10^8-ohm resistors are of deposited-carbon construction and are accurate to ± 1%. The 10^9, 10^{10} and 10^{11} resistors are carbon, have been treated to prevent adverse humidity effects and are accurate to ± 5%. A switch position permits quick checking of the higher resistance standards in terms of the wire-wound units.

Input Resistance: The input resistance is determined by the setting of the resistance standards switch. In the infinity position, it is approximately 10^{14} ohms.

Drift: Less than 2 mv per hour after one-hour warmup.

Output: Voltage, current and resistance are indicated on a panel meter. Terminals are available for connecting a recorder (such as the Esterline-Angus 5-ma or 1-ma graphic recorder). The recorder can have a resistance of up to 1500 ohms.

Frequency Characteristic: With a 1500-ohm load at the OUTPUT terminals, the frequency characteristic is flat within 5% from zero to 10, 30, 100, 300, 1000 and 3000 cycles at the 30-, 100-, 300-millivolt, 1-, 3-, and 10-volt ranges respectively.

Terminals: The input is connected through an 874-type coaxial terminal assembly. In addition, there are three "low" terminals to provide versatility in guard and ground connections, as required, for example, in three-terminal network measurements.

Input Switch: A panel switch permits disconnection of the unknown without transient electrical disturbances in either the unknown or the measuring circuit.

Input Insulation: Entirely teflon or silicone-treated glass.

Temperature, Humidity, Line Voltage Effects: Negligible.

Tube Complement: One 5886 electrometer, one CK6418, one 6AN5, one 6AL5, one 6627, and three 0B2.

Accessories Supplied: One Type 874-411 Adaptor, one Type 1230-P1-300 Panel Adaptor Assembly, two Type 274-MB Plugs, one Type 274-SB Plug, spare fuses and Type CAP-35 Power Cord.

Accessories Available: Type 1230-P1 Component Shield.

Mounting: Aluminum front and rear panels finished in black-crackle lacquer and encased in an aluminum black-wrinkle-finished sleeve-like cabinet. The instrument is also available mounted inside a recorder case.

Power Supply: 105 to 125 (or 210 to 250) volts, 50 to 60 cycles. Power input is approximately 35 watts at 115 volts.

Dimensions: (height) 13¼ × (width) 7⅝ × (depth) 9 inches, over-all.

Net Weight: 15¼ lbs.

Type		*Code Word*	*Price*
1230-A	**D-C Amplifier and Electrometer**	MASON	**$440.00**
1230-AE	**D-C Amplifier and Electrometer in Esterline-Angus Case**	MISTY	**502.00**
1230-P1	**Component Shield**	MANOR	**40.00**

A LOW-COST MICROWAVE SIGNAL SOURCE

One of the most frequently needed instruments in the electronics laboratory is a simple, convenient, and inexpensive signal source. General Radio Unit Oscillators were developed in answer to this need, and their constantly increasing popularity is conclusive evidence of how well they perform their tasks.

Unit Oscillators have been available

Figure 1. Panel view of the Type 1220-A Unit Klystron Oscillator with a Type 1201-A Unit Regulated Power Supply.

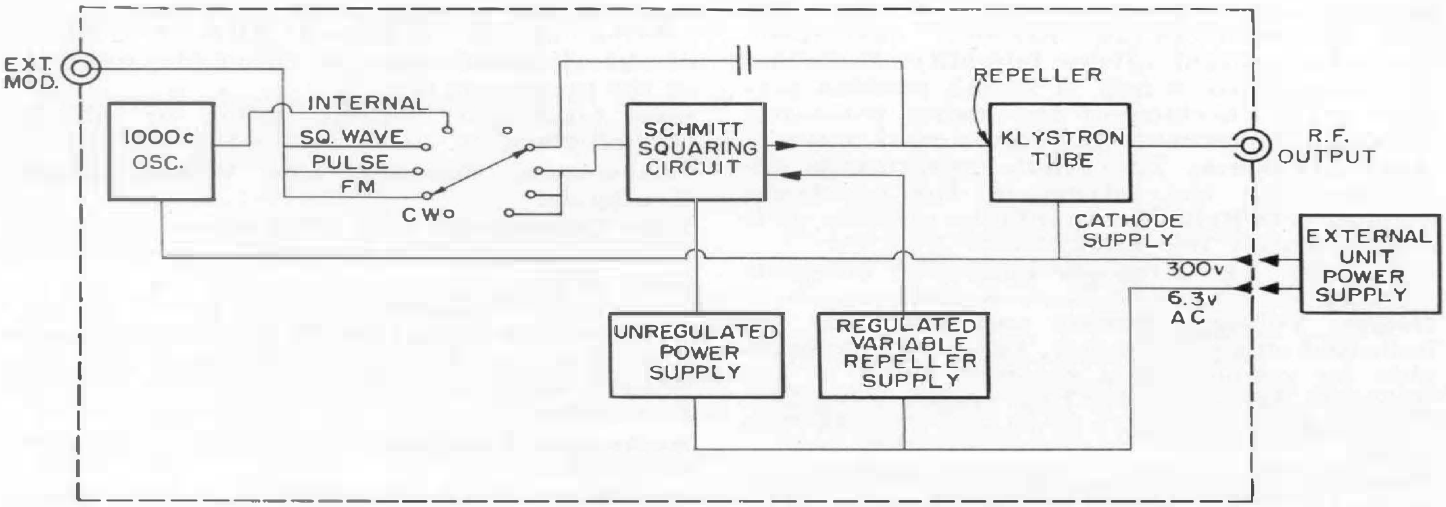


Figure 2. Block diagram showing the elements of the oscillator.

covering all frequencies from 20 cps to 2000 Mc, but there has been an obvious need for a unit to operate at still higher frequencies. The new TYPE 1220-A Unit Klystron Oscillator shown in Figure 1 meets this need for applications where frequent changes in frequency are not required.

It produces a c-w, square-wave-, pulse-, or frequency-modulated signal at frequencies between 2700 and 7450 megacycles by means of eight plug-in reflex klystrons. Each tube has a self-contained resonant cavity, which can be tuned over a range of the order of 500 megacycles. Tube changing can be accomplished quickly and simply. The oscillator is available either without tubes or with any number of the tubes in the available series.

Tuning is accomplished by flexing a copper diaphragm in the resonant cavity by means of a screw which is accessible from the rear of the instrument.

For testing on the production line, for measurements in the laboratory, and for demonstrations in the classroom, the TYPE 1220-A Unit Klystron Oscillator offers the advantages of low cost, small size, and convenient adaptability to the problem at hand.

Circuit

As shown in the block diagram of Figure 2, the TYPE 1220-A Unit Klystron Oscillator contains a variable regulated voltage supply for the repeller electrode of the klystron, a Schmitt squaring circuit for square-wave and pulse modulation of the repeller, a power supply for the Schmitt circuit, a 1000-cycle R-C oscillator, and a socket and output connections for the reflex klystron tube.

The cathode current for the klystron is supplied by an external Unit Power Supply. For maximum frequency stability, a TYPE 1201-A Unit Regulated Power Supply is recommended, although in less critical applications a TYPE 1203-A Unit Power Supply can be used. For field work, where only 6 or 12 volts d-c power is available, the instrument can be operated from a Type 1202-A Unit Vibrator Power Supply.

Klystron Oscillator

The reflex klystron is an excellent microwave oscillator. It produces a substantial amount of r-f power, operates on reasonably low voltages and can be modulated easily. Klystrons used in this instrument are completely self-contained oscillators and are similar in appearance and size to conventional metal-shell receiving tubes. The tuning ranges for the various tube types are given in the specifications at the end of this article.

As shown in Figure 3, the tubes plug into an octal socket in the instrument and the repeller voltage connection is made by means of a grid cap at the top of the tube. The r-f output lead from the tube is a coaxial line which extends through the tube socket and connects to the Type 874 Coaxial Connector on the panel of the instrument by means of a short length of coaxial cable with an adaptor for the tube line on one end.

Tuning is accomplished by means of a tuning screw, permanently attached to the side of the metal envelope, which controls the flexing of one end of the resonator and thus changes the capacitance across the resonant cavity in the oscillator. A special tool is supplied for making tuning adjustments through a hole in the back of the dust cover. The frequency thus can be adjusted without removing the dust cover, although no frequency calibration is provided.

Since the diaphragm will not stand an indefinite number of flexings without fatiguing, these tubes are not recommended for applications where continual frequency changing is required.

The repeller voltage must also be set at a level which produces oscillations at the resonant frequency of the cavity. For this purpose a calibrated repeller voltage control is provided on the front panel.

One of these tubes, Type 6043 Klystron, covering frequencies between 2950 and 3275 Mc, differs physically from all the other tubes. Its output connection is made near the top of the tube and tuning is accomplished by adjusting a series of screws in the outer wall of the cavity. This tube can be tuned indefinitely without damage but the dust cover must be removed to make the tuning adjustments. A special output lead is supplied for use with this tube. Both types of output lead are supplied with each instrument.

R-F Output

The power output obtainable varies from tube to tube and over the frequency range of each tube. The average power output for all tubes into a 50-ohm load is of the order of 75 milliwatts. A table showing the average power output of each tube type is included in the specifications appearing at the end of this article. This figure is the average of the power output over the frequency range for a typical tube. The output is usually a maximum at the center of the tuning range.

In most applications an isolating pad should be used between the oscillator and the load. One of the following pads is recommended:

Type 874-G6	6 db Pad
Type 874-G10	10 db Pad
Type 874-G20	20 db Pad

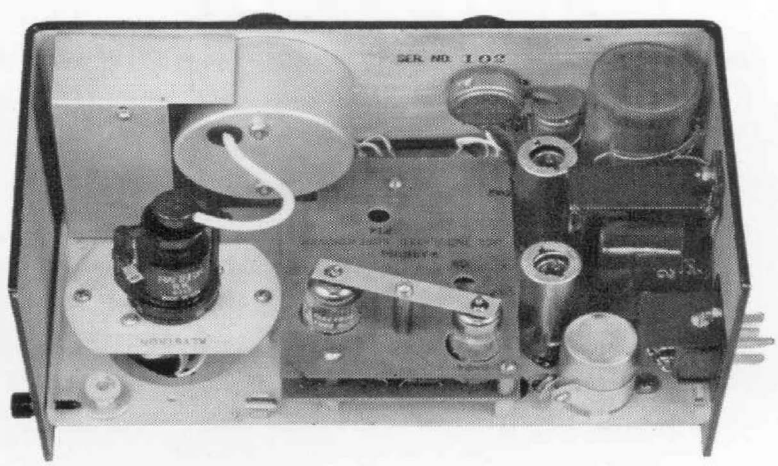


Figure 3. Top view of the oscillator with shield cover removed, showing the klystron tube.

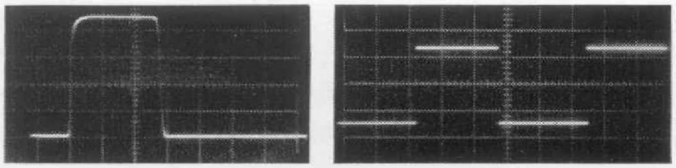


Figure 4. Oscillograms of modulation waveforms at 3800 Mc, as recovered by a Type 874-VR detector. Left, 1-μ sec pulse: right, 1000-cycle square wave.

Modulation

The klystron can be square-wave, pulse, or frequency modulated by modulating the repeller voltage. The Schmitt squaring circuit provides a voltage which switches the repeller voltage between the normal oscillating level and a non-oscillating level for 100% amplitude modulation. In order to make the klystron oscillate at exactly the same frequency when modulated as when unmodulated, the Schmitt circuit is d-c coupled to the repeller, and the whole circuit floats at the repeller potential. Since the klystron oscillates when the output stage of the Schmitt circuit is cut off, the repeller voltage (and hence the oscillating frequency) in the modulated condition is the same as the frequency in the unmodulated condition. A modulation voltage control is included in the plate circuit of the Schmitt circuit so that the klystron can be prevented from oscillating in other modes on the off part of the modulating cycle.

The Schmitt squaring circuit can be driven by a sine-wave, square-wave, or pulse signal. An internal R-C oscillator is provided for producing a 1000-cycle signal for square-wave modulation. The frequency of this oscillator is adjustable to any frequency between 985 and 1015 cycles so that maximum sensitivity can be obtained when very sharply tuned 1000-cycle amplifiers are used in the detector circuit. Square-wave modulation at frequencies between 50 cycles and 200 kc can be obtained from external sine- or square-wave sources, producing inputs of at least 15 volts rms. The Type 1210-B Unit R-C Oscillator is a satisfactory external modulator.

The klystron oscillator can be satisfactorily modulated by an external pulse generator with pulses having lengths from 1 μs to 10,000 μs and repetition rates between 50 cycles and 200 kc. The peak input voltage should be at least 25 volts. The rise and decay times of the r-f pulses are less than 0.2 μs. The Type 1217-A Unit Pulser is an excellent modulator.

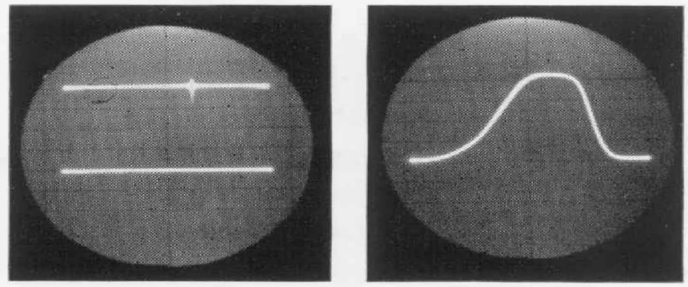


Figure 5. Left, frequency modulated output of the klystron; total swing, 8Mc; modulating frequency, 60 cycles; carrier, 3800 Mc. The marker pip was introduced by an external oscillator. Base line added.

Right, band-pass characteristic of an f-m receiver with signal shown at left applied to receiver input. Signal was recovered from second detector.

Frequency modulation can be produced by the application of a small modulating voltage to the repeller electrode. The frequency deviation obtainable varies from tube to tube, but at least a 15 Mc total excursion is obtainable with a maximum change of 3 db in amplitude of the r-f signal. The amplitude variation decreases rapidly as the excursion is decreased. Provision is made for applying a frequency-modulating voltage from an external source. Approximately 10 volts, rms, across 47 kilohms is required for maximum frequency modulation.

Power Supply

The cathode current for the klystron is obtained from a Unit Power Supply. The Type 1201-A Unit Regulated Power Supply is recommended for maxi-

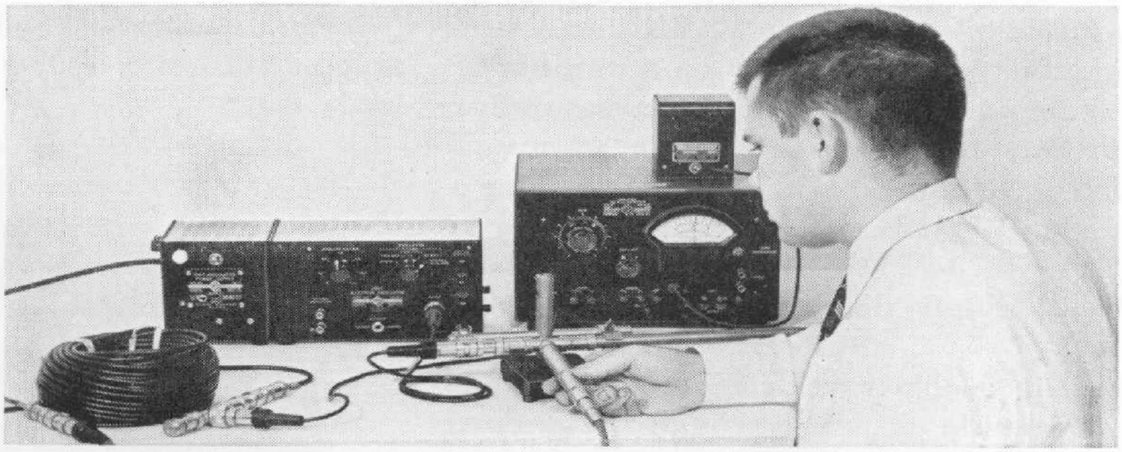


Figure 6. Unit Klystron Oscillator and Type 874 Coaxial equipment set up for the measurement of cable attenuation at 3000 megacycles.

mum frequency stability. A jack is provided for measuring the current and a rheostat is included for adjusting it.

The repeller voltage is obtained from a well-filtered, regulated, internal power supply derived from the 6.3v a-c output of the Unit Power Supply. A calibrated potentiometer, adjustable from the panel, is used to control the voltage from 30 to 300 volts below the cathode potential.

The power supply for the Schmitt circuit is also derived from the 6.3 a-c volt input from the Unit Power Supply.

Typical Applications

The Type 1220-A Unit Klystron Oscillator is well adapted to measurement applications in which the frequency does not have to be changed frequently.

On the production line, these relatively inexpensive units can be set up for measurements at specified frequencies on impedance, VSWR, attenuation, bandwidth, for adjusting circuits to a specified frequency, and for many other types of measurements.

In the laboratory the unit is a suitable signal source for driving a slotted line.

In the classroom, the low cost, small size, ruggedness, and high power output makes the oscillator ideal for supplying r-f power for various classroom demonstrations and student exercises.

Cable Attenuation Measurements

The oscillator is an excellent source of r-f power for making attenuation measurements on coaxial cable at the 3000 Mc frequency specified in Military Specification JAN C17A. One method of making this measurement is described in an article by W. R. Thurston entitled "The Measurement of Cable Characteristics." Figure 6 shows a typical setup for this measurement.

Measurement of VSWR of Fixed Attenuators at 4000 Mc

The klystron oscillator makes a good

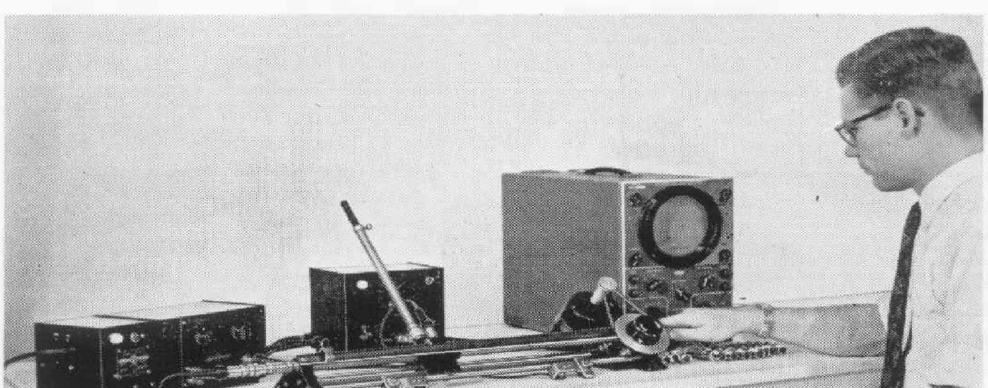


Figure 7. Unit Klystron Oscillator and Type 874-LBA Slotted Line with Motor Drive, set up for measurements of standing-wave ratio on coaxial attenuators.

source of power for VSWR measurements at one frequency on a number of elements. Figure 7 shows a setup for VSWR measurements on a group of fixed Attenuators at 4000 Mc, using a TYPE 874-LBA Slotted Line with a TYPE 874-MD Motor Drive and an oscilloscopic display of standing-wave ratio.

The oscillator can be used to excite waveguide circuits through a standard waveguide-to-coaxial adaptor. Adaptors to connect between the TYPE 874 output connector of the oscillator and the waveguide adaptor (and to other types of connectors) are listed in the price table.

— BENEDICT O'BRIEN
— R. A. SODERMAN

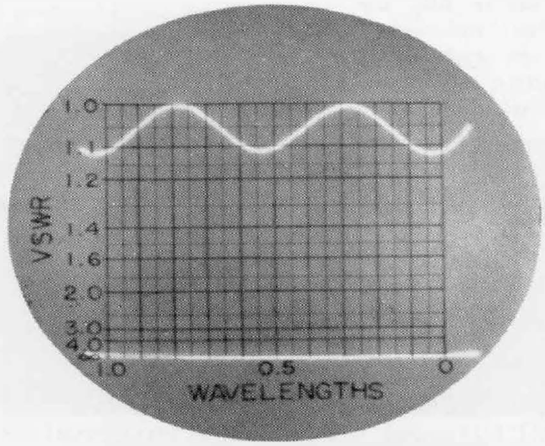


Figure 8. Oscilloscope display of VSWR of a Type 874-G20 Coaxial Attenuator at 4000 Mc, as measured with the equipment shown in Figure 7.

SPECIFICATIONS

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

Frequency Calibration: None

Modulation:

Internal 1-kc square wave, adjustable ± 15 cycles.

External

Square wave, 50 c to 200 kc; sine or square-wave modulating signal of at least 15v, rms required — TYPE 1210-B R-C Oscillator recommended modulator.

Pulse, 1 to 10,000 μs duration, less than 0.2 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.

Frequency Modulation, at least 15 Mc excursion obtainable with less than 3 db change in output — at 60 c, an rms input of the order of 10 v is suitable.

Output Connector: 50-ohm TYPE 874-Coaxial Connector. Adaptors to other connector types available.

Tube Complement: Klystron, as specified, for TYPES 1220-A1 through A-8; one 6AB4, one 5963, two OA2.

Accessories Required: Unit Power Supply; see price table below.

TYPE 1201-A Unit Regulated Power Supply recommended for high stability and minimum incidental fm.

TYPE 1203-A Unit Power Supply, for less critical applications where cost is an important factor.

TYPE 1202-A Unit Vibrator Power Supply, for use in the field from 6 v to 12 v, d-c power.

Accessories Recommended: Fixed attenuator pad for isolating oscillator from load; adaptors to other coaxial connectors. See price table below.

Dimensions: 9⅞ × 5¾ × 6¼ inches, not including plugs, knobs, and terminals.

Net Weight: 6 pounds, with klystron.

Type	*Klystron Oscillator with klystron, for*	*Nominal Power Output in Milliwatts*	*Code Word*	*Price*
1220-A1	2700–2960 Mc.........	100	KAWUN	$254.65
1220-A2	2950–3275 Mc.........	90	KATOO	272.90
1220-A3	3400–3960 Mc.........	90	KATRE	265.75
1220-A4	3840–4460 Mc.........	75	KAFOR	312.15
1220-A5	4240–4910 Mc.........	100	KAFIN	261.45
1220-A6	5100–5900 Mc.........	80	KASIX	301.45
1220-A7	5925–6450 Mc.........	100	KASET	272.90
1220-A8	6200–7425 Mc.........	90	KAL●C	272.90
1220-A	Without Tube.........		KANOT	205.00

ACCESSORIES

KLYSTRON TUBES

Type		Code Word	Price
726-C	Klystron, 2700–2960 Mc	KLYSTRONAY	$49.65
6043	Klystron, 2950–3275 Mc	KLYSTROBEE	67.90
2K29	Klystron, 3400–3960 Mc	KLYSTROSEE	60.75
2K56	Klystron, 3840–4460 Mc	KLYSTRODEE	107.15
2K22	Klystron, 4240–4910 Mc	KLYSTRONEE	56.45
6115	Klystron, 5100–5900 Mc	KLYSTRONEF	96.45
QK404	Klystron, 5925–6450 Mc	KLYSTROGEE	67.90
5976	Klystron, 6200–7425 Mc	KLYSTROJAY	67.90

The following klystron tubes can also be used in the instrument, but are not stocked by the General Radio Company: 2K25 (8500-9660 Mc), 2K26 (6250–7060).

All klystron tubes in these oscillators except for the 6043 are designed for relatively infrequent tuning.

POWER SUPPLIES (One required)

Type		Code Word	Price
1201-A	Unit Regulated Power Supply	ASSET	$80.00
1203-A	Unit Power Supply	ALIVE	40.00
1202-A	Unit Vibrator Power Supply	AURAL	125.00

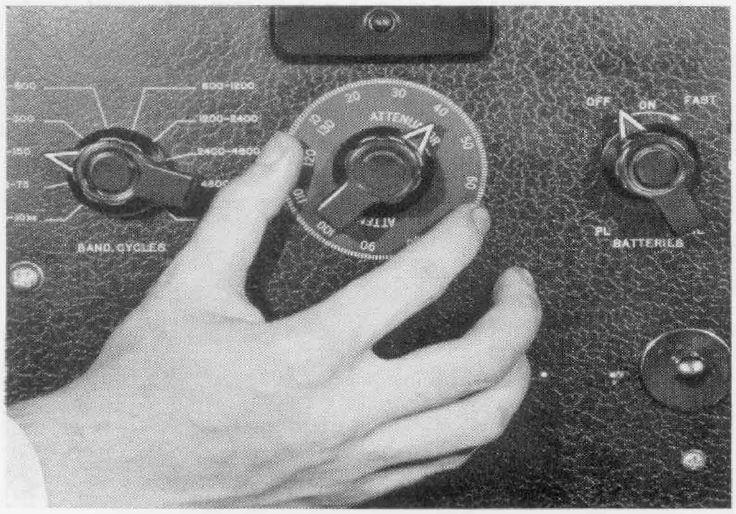
PADS

Type		Code Word	Price
874-G6	Attenuator Pad, 6 db	COAXNODDER	$25.00
874-G10	Attenuator Pad, 10 db	COAXBELLER	25.00
874-G20	Attenuator Pad, 20 db	COAXNEPPER	25.00

ADAPTORS

Type	Contains Type 874 Connector and	Fits	Code Word	Price
874-QBJ	Type BNC Jack	Type BNC Plug	COAXBOGGER	$4.75
874-QBP	Type BNC Plug	Type BNC Jack	COAXBUNNER	4.75
874-QCJ	Type C Jack	Type C Plug	COAXCOGGER	4.75
874-QCP	Type C Plug	Type C Jack	COAXCUFFER	6.25
874-QHJ	Type HN Jack	Type HN Plug	COAXHAWSER	6.50
874-QHP	Type HN Plug	Type HN Jack	COAXHANGER	6.50
874-QLJ	Type LC Jack	Type LC Plug	COAXLITTER	17.50
874-QLP	Type LC Plug	Type LC Jack	COAXLUGGER	17.50
874-QNJ	Type N Jack	Type N Plug	COAXNAGGER	3.75
874-QNP	Type N Plug	Type N Jack	COAXNUTTER	4.50
874-QUJ	Type UHF Jack	Type UHF Plug	COAXYUNDER	4.00
874-QUP	Type UHF Plug	Type UHF Jack	COAXYUPPER	4.25

NEW DIAL BRINGS NEW CONVENIENCE TO OCTAVE-BAND NOISE MEASUREMENTS



A user of the TYPE 1550-A Octave-Band Analyzer recently suggested that the speed and convenience of noise measurements could be increased by the use of an adjustable dial on the attenuator control. This dial has been designed and is available to all users of the analyzer.

The dial covers the panel engraving behind the attenuator knob, and carries a new number scale so that the Octave-Band Analyzer is direct reading, thus avoiding the mental computations (and possible sources of error) previously necessary. For example, in the measurement of octave-band pressure levels greater than 70 db, where the Octave-Band Analyzer is used directly with a microphone, the system can be calibrated with the TYPE 1552-B Sound-Level Calibrator to be direct reading on the 20c-to-10kc range (overall sound-pressure level), whereupon the system is automatically direct-reading in octave-band pressure levels.

To achieve the same result where the Octave-Band Analyzer is used in conjunction with the TYPE 1551-A Sound-Level Meter, it is necessary only to position the new dial and to adjust the "gain" control so that the Octave-Band Analyzer in its 20c-to-10kc position reads the same as the Sound-Level Meter on its "C" weighting network.

One of these dials will be sent, free of charge, to the owner of each TYPE 1550-A Octave-Band Analyzer who writes us, giving his name and address, and the serial number of the instrument. This new dial is now shipped as standard equipment with each new Octave-Band Analyzer.

— J. J. FARAN, JR.

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