

GENERAL RADIO COMPANY

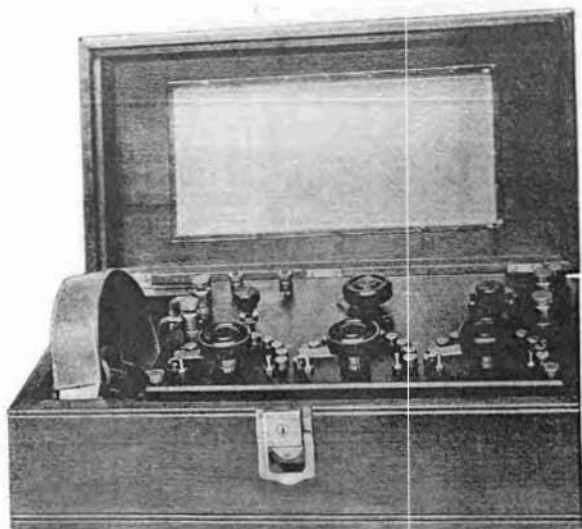
MANUFACTURERS OF

ELECTRICAL AND RADIO LABORATORY APPARATUS

CAMBRIDGE 39, MASSACHUSETTS

BULLETIN 409

AUGUST, 1924



TYPE 240

DIRECT READING CAPACITY METER

The Type 240 Capacity Meter meets the demand for a reliable direct reading capacity measuring instrument. It is especially adapted to general laboratory and commercial uses in obtaining capacity measurements ranging from .001 to 10 microfarads with an accuracy to one half of one per cent. Its simplicity of operation and general dependability make it invaluable in factory inspection work in measuring or comparing capacity values.

The instrument consists of a capacity bridge with variable resistances in the ratio arms and capacitances in the unknown and standard arms. A schematic diagram of the whole assembly is shown on page 437. The input is from a specially designed microphone buzzer supplied from a $4\frac{1}{2}$ volt dry battery contained in the case. Provision is also made for the use of an external battery.

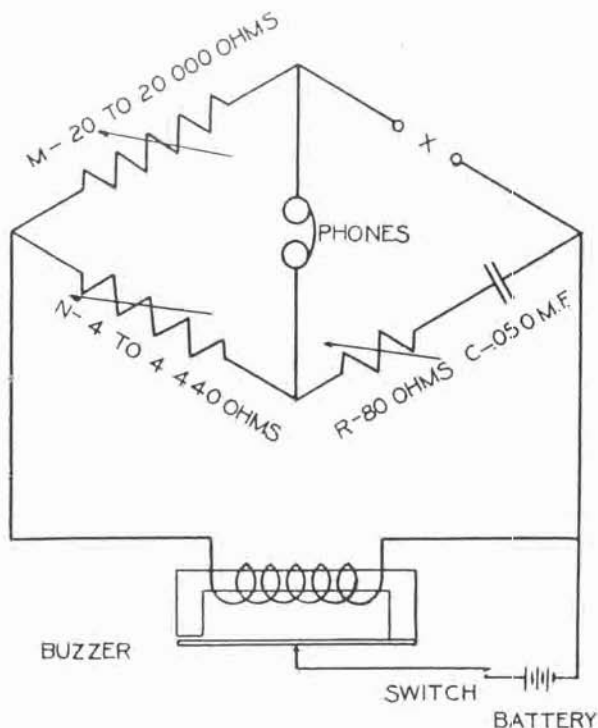
[Page 436]



The resistances M and N are wound on thin bakelite strips to reduce distributed capacity and inductance. R is a rheostat of 80 ohms resistance.

The standard condenser, C, is built up of heavy brass plates interspaced with mica dielectric, assembled under pressure and impregnated with paraffine. It is firmly clamped in a heavy aluminum frame.

The entire assembly is enclosed in a polished walnut cabinet fitted with nickeled lock. A substantial leather handle is provided on the



cover of the cabinet to make it easily portable. The panel is of polished hard rubber $\frac{3}{8}$ " thick carefully engraved with white enamel lettering. All metal parts are of highly polished nickel finish. The three resistance switches have double leaf blades and are so constructed as to wear the contact surfaces of the switch taps evenly, eliminating the tendency to groove the points. A pair of high resistance phones are furnished with the meter and are contained in a compartment in the cabinet.

OPERATION

Before operating the meter it is necessary to put the battery in place as follows: Remove the four screws at the corners and lift the panel out. The battery is then slipped under the steel holder so that the terminals make contact with the metal strips on the ends of the buzzer leads. The panel may now be put back in place and the instrument is ready for operation.

The unknown capacity is connected to the two clips (at X in the diagram). The three dials marked "Microfarads," "Tenths," "Hundredths," and the dial marked "Multiply By" are set approximately at the capacity to be measured if it is known. The buzzer switch is turned on and the dials are set, beginning with the dial marked "Microfarads" and adjusting the three lower dials in turn until the minimum sound is heard in the phones, then adjusting the dial marked "Power Factor in Per Cent" until the sound heard in the phones is still further reduced.

The capacity is read on the three lower dials, beginning at the left. The reading of the dials times the multiplier is the capacity in microfarads. The per cent power factor is read from the Power Factor dial. For greatest accuracy the multiplier dial should be set as follows: For capacities from:

1	to 10 M.F.	multiply by	1.
0.1	to 1 M.F.	" "	0.1
0.01	to .1 M.F.	" "	0.01
0.001	to 0.01 M.F.	" "	0.001

If the meter is to be stored or shipped the battery should be removed, otherwise the electrolyte in the battery may run out and damage the meter.

USES

The capacity meter is especially adapted to all uses where a convenient, rugged, and reliable instrument is desired for general laboratory and commercial use in measuring capacities. It is particularly suited to the use of manufactures of condensers for an inspection instrument whereby condensers may be quickly and accurately tested to a standard of capacity. When a condenser is being tested it is only necessary to vary the setting of one of the capacity switches within the limits of the tolerance allowed. The power factor dial offers a ready means of detecting condensers with high losses. Because of its simplicity of operation this instrument does not require a skilled operator and will not easily get out of order.

Type 290 Capacity Meter.....\$80.00

Dimensions 7" x 6" x 14½". Weight 10½ lbs.

Code Word: "CYNIC."

The products of the General Radio Company cover a complete line of radio and electrical laboratory apparatus. Information and bulletins of special apparatus will be sent on request. Our line includes the following:

Standards of Inductance	Thermo-Couples	Variometers
Standards of Resistance	Hot Wire Meters	Capacity Bridge
Standard Condensers	Galvanometers	Slide Wire Bridge
Variable Air Condensers	Vernier Condenser	Decade Bridge
Decade Resistance Boxes	Audibility Meters	Decade Condensers
Telephone Transformer	Wavemeters	Miscellaneous
		Apparatus

All prices in this bulletin are strictly net, subject to change without notice, F. O. B. Cambridge, Mass. Cash should accompany orders from persons or firms with whom we have not already opened accounts. Unless otherwise instructed we shall use our own judgment regarding method of shipment.



GENERAL RADIO COMPANY

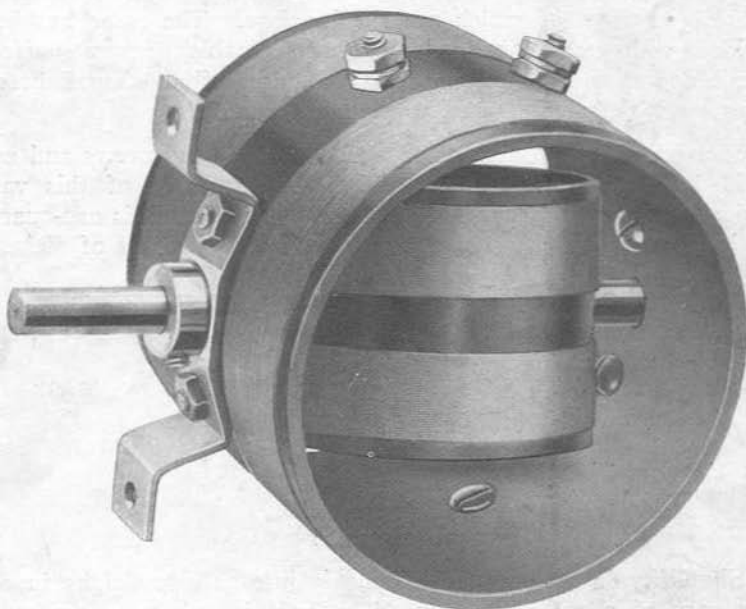
MANUFACTURERS OF

ELECTRICAL AND RADIO LABORATORY APPARATUS

CAMBRIDGE, MASSACHUSETTS

BULLETIN 917

MARCH 1924



Type 268

VARIO COUPLER

Broadcast reception is nearly all included by the wavelength band of 150 to 600 meters. The circuits designed for this class of reception nearly all require an efficient, compact vario coupler. Such an instrument is available in the Type 268.

Both the rotor and the stator forms are of moulded bakelite and are cylindrical in shape. A wide separation is provided between the rotor and the stator in order to permit the extremely loose coupling so often required. The windings are of green silk covered wire which, with the polished bakelite forms, gives the vario coupler an unusually attractive appearance. The metal parts are finished in nickel.

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It was formerly considered good practice to have a large number of taps in vario coupler primaries. In many recent receiving sets taps have been omitted entirely. With the condensers and circuits now in general use taps on a vario coupler are really of little importance. There are times, particularly in controlling regeneration, when a single center tap is an advantage. Thus to make this vario coupler efficient, yet simple in operation, a single center tap has been brought out on the stator.

Much of the success of a vario coupler depends on its mechanical features, foremost of which are the bearings. The rotor has been provided with exceptionally long bearings which insure uniform smooth operation over long periods of use. Star shaped bronze spring washers insure a perfect electrical contact.

Convenient brackets together with the mounting screws and nuts provided with each instrument makes the mounting of this vario coupler on a panel a very simple operation. The shaft is one-quarter inch in diameter and long enough to take nearly all types of dials.

Type 268 Vario Coupler\$3.50

Dimensions 4"x4"x2½". Weight 8 oz.

Code Word: "VALET."

Type 300 AMPLIFIER UNIT

Simplicity in an amplifying unit is just as essential as in any other part of a radio receiver. The experienced radio man now recognizes that best results are obtained consistently by the correct use of properly designed instruments.

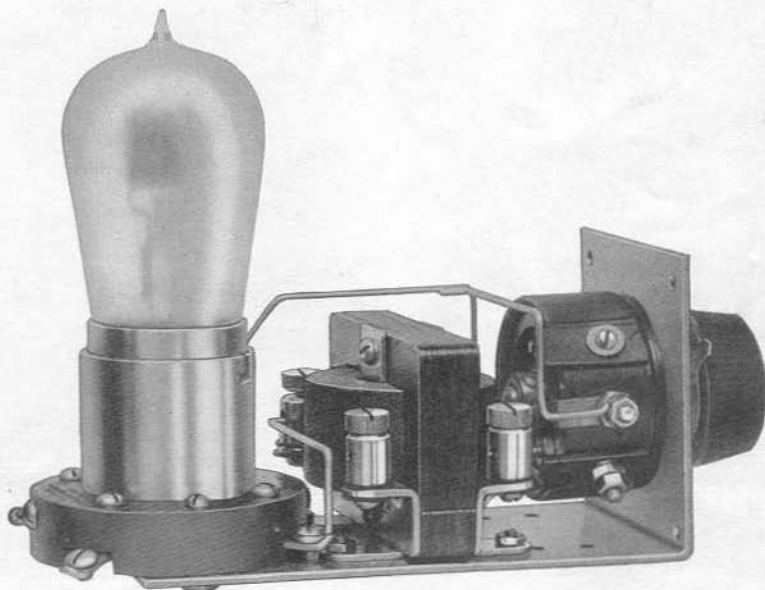
With this idea of simplicity we have developed a convenient and efficient audio frequency amplifier unit. This unit is self-contained except for the batteries and receivers. It is ready for connection to your detector set, and it may be used with crystal or tube detector with equal efficiency.

This unit is so arranged that it may be used on a table or mounted behind a panel. When mounted behind a panel, only the rheostat knob is visible in front of the panel. Convenient mounting holes are provided for either panel or table installation.

For persons building their own sets, these units are very convenient because of the panel mounting feature. As the bracket is

self-supporting, it is only necessary to screw the unit to the panel. Two or more of these units may be used to obtain multi-stage amplification.

The parts used in this unit are our standard instruments, a detailed description of which will be found in the following pages of this bulletin. All wiring except external connections has been provided. The mounting bracket is of heavy brass with a white nickel finish. With each unit there is supplied a sheet showing a wiring diagram and giving operating instructions.



This unit is made up in two models, 300-D for the standard base tubes, such as the UV-201A, and 300-C for the UV-199 tubes. The only difference is in the socket. Both of these tubes may be operated from dry cells.

When you amplify—simplify.

Type 300-C Amplifier Unit for UV-199 Tubes.....\$7.75

Dimensions $6\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2\frac{3}{4}''$. Weight $1\frac{1}{2}$ lbs.

Code Word: "ARROW."

Type 300-D Amplifier Unit for Standard Base Tubes.....\$8.00

Dimensions $6\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2\frac{3}{4}''$. Weight $1\frac{1}{2}$ lbs.

Code Word: "ARSON."

Tubes and batteries are not included in the above prices.

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Type 247 VARIABLE AIR CONDENSER

Experimental radio receiving sets require condensers high in quality and reasonable in price. It is easy to manufacture low-priced condensers as is evidenced by the large number now available. It is more difficult, however, to construct a condenser which is electrically and mechanically good, and yet at the same time to keep the cost of construction low.



For many years the subject of dielectric losses and condenser design has been studied in the Research Laboratory of the General Radio Company. This study has been carried on primarily in order to obtain data for the design of special condensers built to the exacting standards of scientific research work. With this information available, and with our experience in the design of laboratory instruments, we have been able to design a condenser of unusual merit for radio work and, at the same time, to keep its cost of construction remarkably low.

The value of a good condenser in a receiving set is not always fully appreciated. The dielectric losses of the condenser are equivalent to adding a series resistance in the oscillating circuit. To add a series resistance in the oscillating circuit means loss of energy which, in turn, means broad tuning and diminished signal strength. It is thus important that the dielectric losses in condensers be kept low. In this condenser these losses are kept low by using only a high-grade hard rubber for the solid dielectric. They are further kept low by using only a small quantity of this dielectric and so placing it with respect to the electrostatic field that the dielectric hysteresis losses are kept a minimum.

This is just one of the points which have received careful attention in the design of this condenser. Other important features include the following:

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CAPACITY SCALE: In addition to the regular degree graduations of the etched metal dial, this dial has marked on it a scale showing capacities in micromicrofarads. This is a unique and valuable feature for radio receiving condensers, and it enables the operator to know at all times just what capacity he is using.

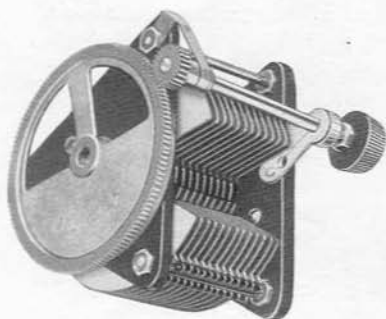
PLATES SOLDERED TOGETHER: In order that the plate resistance may be kept constant and that the capacity always will remain the same the plates of each unit of the condenser are soldered together.

HEAVY BRASS PLATES: The plates are of heavy sheet brass adequately spaced to prevent short-circuiting. Rugged plates of good conductivity are very desirable features in condenser construction.

BEARINGS: A special type spring bearing is used to insure good contact being made with the rotary plates. With this special type of bearing the tension always remains the same, and there is no chance for the rotary plate unit to loosen as the bearing wears. These bearings are so arranged that all the thrust is on one bearing, so that there is no danger of the condenser short-circuiting or changing its capacity if the distance between the bearings becomes changed.

LOW ZERO CAPACITY: The zero capacity of this condenser is approximately 20 micromicrofarads. This low value makes a wide range of wavelengths possible.

METAL CASE GROUNDED TO ROTARY PLATES: The condenser is mounted in a metal case finished with our black crystalline finish, the same as is used on our most expensive laboratory instruments. This case is grounded to the rotary plates, thus shielding the condenser and eliminating many of the disturbing effects due to bringing the hand near the condenser.



FINE ADJUSTMENT: The fine adjustment required in tuning to continuous wave and broadcasting stations has made some form of fine capacity adjustment necessary. The common method of connecting a second or vernier condenser of low capacity in parallel with the main condenser has the objection that two adjustments are required for each setting. We have overcome this objection and provided a positive control throughout the entire range of the condenser by attaching a gear and pinion.

SIZES: For nearly all work the 500 micromicrofarad size is to be preferred. In some circuits, however, a smaller condenser is required to give a finer adjustment. For these circuits the 250 micromicrofarad size is available.

USES: The low resistance feature of this condenser gives it a much wider range of uses than with the ordinary condenser. This condenser will be found especially valuable in tuning low resistance antenna circuits, in a loop receiver circuit, in a wavemeter and in a radio filter. Many of the advanced types of circuits such as the super-heterodyne will only work satisfactorily when good quality condensers are used. In addition to their use in receiving sets these condensers make satisfactory antenna series condensers in continuous wave transmitting sets. They will stand peak voltages of 1000.

Do not deny your receiving set the advantages of a scientifically designed condenser.

Type 247E 500 MMF. Mounted. Without gear.....	\$5.50
Dimensions 5"x5"x4½". Weight 1¾ lbs.	
Code Word: "COUPE."	
Type 247F 500 MMF. Panel Mounting. Without gear.....	\$3.25
Dimensions 4"x4"x4⅛". Weight 1 lb.	
Code Word: "COCOA."	
Type 247G 500 MMF. Mounted. With gear.....	\$7.25
Dimensions 5"x5"x5⅛". Weight 2 lbs.	
Code Word: "COLIC."	
Type 247H 500 MMF. Panel Mounting. With gear.....	\$5.00
Dimensions 4"x4"x4⅛". Weight 1⅛ lbs.	
Code Word: "COMIC."	
Type 247J 250 MMF. Mounted. Without gear.....	\$5.25
Dimensions 5"x5"x4½". Weight 1½ lbs.	
Code Word: "CANON."	
Type 247K 250 MMF. Panel Mounting. Without gear.....	\$3.00
Dimensions 4"x4"x4". Weight ⅞ lb.	
Code Word: "CARGO."	
Type 247L 250 MMF. Mounted. With gear.....	\$7.00
Dimensions 5"x5"x4½". Weight 1½ lbs.	
Code Word: "CAROM."	
Type 247M 250 MMF. Panel Mounting. With gear.....	\$4.75
Dimensions 4"x4"x4". Weight ⅞ lb.	
Code Word: "CIGAR."	
Knob and dial, without capacity graduations, and indicator button for use with unmounted condenser.....	\$0.50
Gear, pinion, pinion shaft and mounting supports, per set.....	\$1.75
The capacity of the condenser must be specified when ordering gear and pinion parts.	



Type 247W WAVEMETER AND FILTER

A very convenient direct-reading wavemeter, range 150 to 500 meters, is formed by a special Type 247 condenser connected to an inductance unit. A nearly uniform wavelength scale, etched directly on the condenser dial, results from the use of specially shaped condenser plates. The accuracy of calibration is 2%.

The selectivity of a receiving set is greatly improved by a Radio Filter. The Type 247W wavemeter is ideally adapted for this purpose, since it is provided with a variable coupling coil located beneath the wavemeter winding. This coil may be connected either in series or parallel with the receiving set.

A single interfering broadcasting station may be cut out by using the series connection. The parallel filter is used to reduce interference from spark stations, static, and similar sources. A full set of instructions accompany each instrument.

Type 247W Wavemeter and Filter.....\$10.00

Dimensions 5"x4½"x8". Weight 3 lbs.

Code Word: "WAGON."

When longer wavelengths are desired an additional combination filter and wavemeter coil so arranged that the wavelength readings on the condenser dial are doubled may be supplied. This coil has a range, accordingly, of from 300 to 1000 meters.

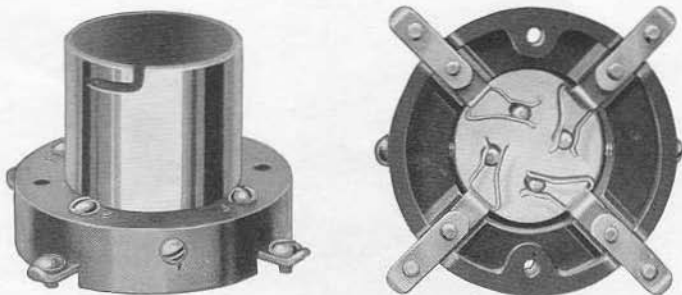
Type 247-W2 Extension Coil.....\$3.00

Dimensions 4"x4"x3". Weight 8 oz.

Code Word: "VOCAL."

VACUUM TUBE SOCKETS

A vacuum tube socket must be more than a tube mounting device. It not only must hold the tube securely to prevent vibration, but also must make firm electrical contact with the four tube prongs. The best features of socket design are incorporated in our vacuum tube sockets.



Type 156

Type 156 Socket

This socket is for the so-called standard American four-prong tubes. It fits such tubes as the UV-200, UV-201A, UV-202 and WD-12. The base is of heavy moulded bakelite providing adequate insulation. The springs are of bronze, nickel finished. They are so arranged as to make positive contact on the sides of the tube prongs. As a wiping, spring contact is made, a clean, positive connection is assured. The tube is of heavy brass with high polished nickel finish.

By loosening two screws and rotating the base this socket will fit the VT-2 tubes. Attention is called to the fact that not only will the socket fit the VT-2 tubes, but that the contact springs are heavy enough to carry, without arcing or heating, the heavy filament currents of these and other five-watt oscillator tubes.



Type 282

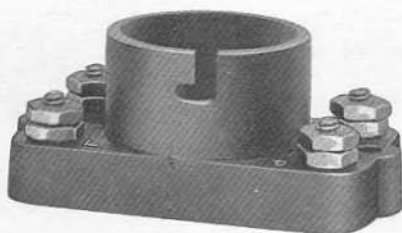
Type 282 Socket

The WD-11 tubes will not fit the standard socket. The use of an adapter is inconvenient and expensive. A socket designed to fit

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the tube is more satisfactory electrically and at the same time more economical.

The Type 282 socket is designed for use with the WD-11 tube. This socket is of moulded bakelite and is equipped with positive contact phosphor bronze springs. When the tube is inserted in the socket the springs make contact against the sides of the prongs and do not depend upon the downward pressure of the tube. The four connection terminals are plainly marked.



Type 299

Type 299 Socket

The UV-199 tube is similar to the WD-11 in that it requires a special socket. The current used in this tube is lower than that required by the other tubes. The prongs are shorter and the general dimensions smaller than on other tubes now available. These features have all been cared for in our Type 299 socket built for the UV-199 tube.

This socket is of moulded bakelite and has its terminals plainly marked. The springs are of phosphor bronze and are made rugged to insure good contact with the tube prongs.

The mounting holes of this socket are spaced the same as those of the 156 and 282 sockets. This feature makes it preferable to change the socket rather than to bother with an adapter when a permanent change in type of tube is desired.

Type 156 Socket	\$1.00
Dimensions $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times 1\frac{3}{4}''$. Weight 4 oz.	
Code Word: "SOBER."	
Type 282 Socket	\$0.60
Dimensions $2\frac{1}{2}'' \times 1\frac{3}{4}'' \times 1''$. Weight 2 oz.	
Code Word: "SOLID."	
Type 299 Socket	\$0.60
Dimensions $2\frac{3}{8}'' \times 1\frac{3}{8}'' \times 1''$. Weight 2 oz.	
Code Word: "STORY."	

Type 231A AMPLIFYING TRANSFORMER

The remarkable results obtained in long distance radio communication in recent years have been due largely to amplification made possible by the use of vacuum tubes. The simplest and most common type of amplification is that of the detected signals, and is commonly called audio frequency amplification.

In order to get the maximum of results with this type of amplification, the impedance of the grid circuit of the amplifier tube must be adjusted to the impedance of the previous detector or amplifier tube output circuit. This can best be accomplished by means of a suitably designed transformer. Our Type 231A transformer was built specifically to meet this situation. The primary receives the maximum amount of energy and delivers it undistorted in waveform and at the correct potential to the grid of the amplifying tube.



The core construction is such that there is little tendency for the setting up of external fields, with the resultant howling in the audio frequency circuit. The distributed capacity of the secondary is low, so that the maximum potential is obtained on the grid of the tube.

The primary has a direct current resistance of 1100 ohms, an alternating current resistance at 1000 cycles of 11,000 ohms, and a reactance at this frequency of 50,000 ohms. These figures for the secondary are 5500, 130,000, and 600,000 ohms respectively. These constants make the transformer particularly adapted to the UV-199, UV-201A, WD-11, WD-12 and tubes of similar impedance.

In order to obtain the best results from an amplifying transformer, certain precautions should be observed. Since what is wanted is the production of the maximum potential, or rather change of potential on the grid of the amplifying tube, it is best to connect the grid to the outside terminal of the secondary of the transformer. This is because the outer portion of the secondary has smaller capacity to

ground than the inner portion, due to the proximity of the latter to the primary winding, which is connected to the filament and other low potential parts of the circuit. This capacity effect increases with frequency and therefore reduces the intensity of high notes proportionately more than low ones, thus tending to cause distortion. Howling, or oscillation at audio frequencies, is caused by coupling (either electrostatic or magnetic) of the amplifier grid to some other part of the circuit, and is more troublesome with two or more stages of amplification than with one. If the electrostatic and magnetic couplings are made to oppose each other, the tendency to oscillate is minimized, and when a transformer is connected into a circuit it is worth while to reverse the leads to the primary to see which connection is better. In some cases, the oscillations are above audibility, but the strength of signals is reduced, nevertheless.

In an oscillating detector circuit the capacity of the telephone cords (which is of the order of 75 MMF.) is often sufficient to by-pass the radio frequency current around the high inductance of the phones, but when the primary of an amplifying transformer is substituted for the phones, it should be shunted with a condenser of a few hundred micromicrofarads or more.

Aside from its excellent electrical characteristics, this transformer is well designed mechanically. It is compact, and by means of the four projecting feet, each with a screw hole, may be mounted in any position. The core and coil are finished in black, while the brackets and binding posts are nicked. Particular attention is called to the accessibility of both the binding posts and the mounting brackets.

Every transformer is guaranteed.

Type 231A Amplifying Transformer\$5.00

Dimensions $2\frac{5}{8}$ "x $2\frac{1}{2}$ "x $2\frac{1}{2}$ ". Weight 1 lb.

Code Word: "TUTOR."

Type 231M MODULATION TRANSFORMER

This transformer is similar in general design to the Type 231A amplifying transformer, the only difference being in the winding. Its windings have been designed particularly for use with the Radiotron UV-202 five-watt transmitting tubes and other tubes of similar characteristics. To get the maximum modulation, the modulating device should have an impedance somewhat greater than the input impedance of the tube. This impedance is of the order of several hundred thousand ohms, while that of a telephone transmitter is but a few ohms. A modulation transformer serves to adapt the telephone transmitter impedance to that of the input circuit of the tube. The success of a radio telephone installation depends not only on the value of the antenna current, but also on how completely that current is modulated. Our Type 231M transformer has been designed to give the maximum modulation which is possible without distortion.

Type 231M Modulation Transformer\$5.00

Dimensions $2\frac{5}{8}$ "x $2\frac{1}{2}$ "x $2\frac{1}{2}$ ". Weight 1 lb.

Code Word: "TUNIC."

Types 214 and 301 RHEOSTATS AND POTENTIOMETERS

Rheostats used in vacuum tube circuits must be so constructed and the contact so arranged that there is no possibility of a momentary opening of the circuit, or a sudden change of resistance in the circuit. Either of these would result in an objectionable click in the telephone receivers. The resistance should also change uniformly throughout the entire range of the rheostat. This is necessary to secure the same degree of control for all working conditions of the battery. With the tubes now available, and with the gradual change of resistance provided by our Types 214 and 301 rheostats, no vernier attachments are necessary.



Type 214

The resistance units of both types of rheostats are tightly wound on specially treated fibre strips. Moulded bakelite, not an inferior substitute, is used for the base. The tapered moulded knob is provided with a pointer indicating the position of the contact arm. The shaft is $\frac{1}{4}$ " in diameter and is arranged to fit panels up to $\frac{3}{8}$ " thick.

Where the best in rheostat construction is desired, and for laboratory use, the Type 214 is recommended. This rheostat is made in two types, 214A for back of panel mounting and 214B for front of panel or table use.

Although smaller in size, the Type 301 rheostat is similar in general construction to the Type 214. It is a practical rheostat for general use.

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Many of the circuits now in common use require potentiometers to control the grid potential. Both the Types 214 and 301 are supplied with high resistance windings and a third connection to enable them to be used as potentiometers.

Type 214 Rheostat\$2.25

Dimensions 3"d.x2¼". Weight 7 oz.

CODE WORD

Resistance	Current	Type 214A	Type 214B
		Back of Panel	Front of Panel
2 ohms	2.5 amp.	RUDDY	RUMOR
7 ohms	1.5 amp.	RURAL	RUSTY
20 ohms	0.75 amp.	RAZOR	READY
50 ohms	0.5 amp.	RAPID	RAVEL

Type 214, 400 Ohm Potentiometer\$3.00

Dimensions 3"d.x2¼". Weight 7 oz.

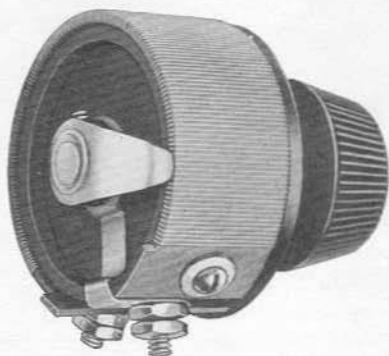
Code Word, Type 214A, Back of Panel Mtg.: "ROSIN."

Code Word, Type 214B, Front of Panel Mtg.: "ROWEL."

Type 301 Rheostat\$1.25

Dimensions 2"x1¾"x2⅛". Weight 4 oz.

Resistance	Current	Code Word
10 ohms	1.0 amp.	REMIT
30 ohms	0.5 amp.	RENEW



Type 301

Type 301, 200 Ohm Potentiometer\$1.25

Dimensions 2"x1¾"x2⅛". Weight 4 oz.

Code Word: "REBUS."

In ordering be sure to specify resistance desired.

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Type 127 HOT WIRE AMMETERS

The exacting requirements imposed on transmitting stations make it necessary that current measurements be made to insure operation at maximum efficiency. Since it is equally accurate on direct current or alternating current of any frequency a hot wire ammeter is the most convenient meter for this service. Not only may it be used for measuring radiation currents, but it may also be used to measure filament currents, storage battery charging rates, plate currents and for many other purposes. It is important that the meter should have low impedance, and it should be rugged and reliable. The Type 127 Hot Wire Ammeters are built to meet these requirements. During the recent war the U. S. Army and Navy used large numbers of these meters.



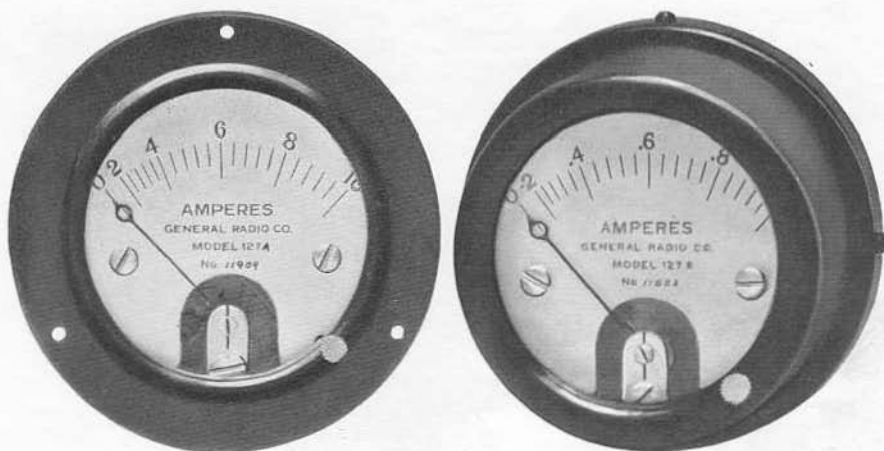
The expanding strip in these meters is of thin platinum, so as to prevent oxidation. It is so proportioned that it works at a low temperature and is of low resistance. These are two highly desirable features, since the former permits reasonable overloading without burning out, and the latter minimizes the losses.

The type of multiplying action is such that a more uniform scale is obtained than with many hot wire meters. These meters have been corrected for temperature so that there is very little shift of zero, and this is easily taken care of by the knurled adjusting screw.

These instruments are made in three types, the flush mounting for use on panels, the front-of-board mounting for use on switchboards,

and the portable type for general use. In mounting the flush type of meter an opening in the panel $2\frac{5}{8}$ inches in diameter should be provided.

In mounting the front-of-board type allowance should be made for a case 3 inches in diameter. The flush type meters are mounted in metal cases finished in black japan, while the front-of-board and portable types have cases of moulded bakelite.



Type 127A

	Range	Code Word	Case	Price
100	Milli-Amps.	MEDAL	Flush Mounting	\$9.00
250	Milli-Amps.	MERCY	Flush Mounting	7.75
500	Milli-Amps.	MERIT	Flush Mounting	7.75
1	Ampere	MERRY	Flush Mounting	7.75
1.5	Amperes	MINUS	Flush Mounting	7.75
2.5	Amperes	MINOR	Flush Mounting	7.75
5	Amperes	MINIM	Flush Mounting	7.75
10	Amperes	MINNY	Flush Mounting	7.75
	Galvanometer	MITER	Flush Mounting	7.25

Dimensions 3"d.x1½". Weight 9½ oz.

Type 127B

100	Milli-Amps.	MAYOR	Front of Board	\$9.00
250	Milli-Amps.	MADAM	Front of Board	7.75
500	Milli-Amps.	MAJOR	Front of Board	7.75
1	Ampere	MANOR	Front of Board	7.75
1.5	Amperes	MISTY	Front of Board	7.75
2.5	Amperes	MAPLE	Front of Board	7.75
5	Amperes	MATIN	Front of Board	7.75
10	Amperes	MAXIM	Front of Board	7.75
	Galvanometer	MAGIC	Front of Board	7.25

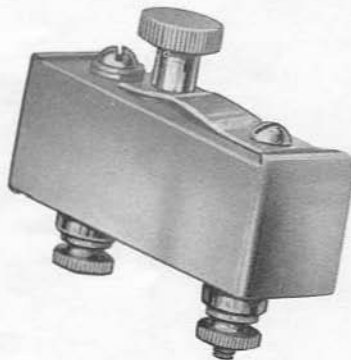
Dimensions 3"d.x1½". Weight 9 oz.

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Type 127C

Range	Code Word	Case	Price
100 Milli-Amps.	MUGGY	Portable	\$10.00
250 Milli-Amps	MOCHA	Portable	9.00
500 Milli-Amps.	MOGUL	Portable	9.00
2.5 Amperes	MOLAR	Portable	9.00
1 Ampere	MOTOR	Portable	9.00
5 Amperes	MUMMY	Portable	9.00
10 Amperes	MUSTY	Portable	9.00
Galvanometer	MOTTO	Portable	8.50

Dimensions 3"x4"x1½". Weight 10½ oz.



Type 178

HIGH FREQUENCY BUZZER

This buzzer has been designed for both laboratory and radio use. It combines pureness of tone, simplicity of adjustment and durability.

The frequency is approximately 800 cycles, but depends on the setting of the knurled adjusting screw. As the current required for the operation of the buzzer is approximately only 30 milli-amperes, it may be operated for long periods of time from small batteries. One dry cell will provide sufficient potential to operate this buzzer satisfactorily.

One of the noteworthy features of this buzzer is its freedom from sparking. This is important where pure tones are required. This feature makes the buzzer particularly adapted as a supply source for bridge measurements and for continuous wave telegraph modulation.

Type	Mounting	Code Word	Price
178A	Above Panel	BEFOG	\$2.00
178B	Below Panel	BEGET	2.00

Dimensions 2"x1¾"x1". Weight 3 oz.

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Type 260



Type 280

PORCELAIN INSULATORS

Porcelain, which has losses but one-tenth that of the usual moulded materials, is rapidly becoming the standard material for insulators.

For antenna insulation, correctly designed porcelain strain insulators are to be preferred to other commercial types. The Type 280 Strain Insulator, illustrated above, will be found particularly satisfactory. It is made of carefully glazed brown porcelain and will withstand severe weather conditions.

Type 280 Strain Insulator\$0.25

Dimensions $4\frac{1}{2}'' \times 1\frac{1}{8}'' \times 1''$. Weight 4 oz.

Code Word: "CRULLER."

Another convenient insulator is the Type 260, illustrated above. It may be used inside to support wiring or instruments, or may be used outside for supporting lead-in or ground wires. Two of these insulators with a threaded rod connecting them make an excellent lead-in combination. As they are also constructed of glazed brown porcelain they may be used either indoors or out. Each insulator is equipped with nuts and washers assembled, as shown in the cut. Three polished nickel mounting screws are also provided.

Type 260 Insulator\$0.25

Dimensions $2\frac{1}{8}'' \times 2\frac{1}{8}'' \times 2''$. Weight 4 oz.

Code Word: "CONIC."



STANDARD PARTS

Experimental work frequently requires that the experimenter build special pieces of apparatus in his own laboratory. When this apparatus is of a permanent or semi-permanent nature, it is desirable to have the binding posts, switches and other parts of the best quality, and to have them match instruments already installed. Consequently, we are now listing many of the standard parts used in the assembly of our own instruments.

BINDING POSTS

Type	Description	Diameter	Height	Screw Sizes	Price
138A	Insulated	$\frac{3}{4}$ "	$\frac{5}{8}$ "	10-32	\$0.25
138W	N. P. Brass	$\frac{7}{16}$ "	$\frac{1}{2}$ "	6-32	0.12
138Y	" "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	10-32	0.15
138Z	" "	$\frac{3}{8}$ "	$\frac{5}{8}$ "	6-32	0.10

SWITCHES AND PARTS

Type	Description	Price
139A	Multiple Leaf Switch $1\frac{3}{8}$ " Radius	\$0.95
171F	Single Leaf Switch $\frac{7}{8}$ " Radius	0.40
202	Low Contact Resistance Switch $1\frac{3}{8}$ " Radius	1.25
138C	$\frac{5}{16}$ " Contact for 139A or 202 Switches	0.05
138D	$\frac{3}{16}$ " Contact for 171F Switch	0.04
138Q	Switch Stop with Nut	0.05

DIALS AND KNOBS

Type	Description	Price
137D	Moulded Knob (same as used on 139A Switch)	\$0.30
137H	Moulded Knob (same as used on 246 Condenser)	0.75
137H	Knob and 4 inch Dial Mounted	1.50
137J	Moulded Knob (same as used on 301 Rheostat)	0.30
137K	Moulded Knob (same as used on 247 Vernier)	0.25

The types 137D and J Knobs are for $\frac{1}{4}$ " shaft, while the 137H may be supplied for either $\frac{1}{4}$ " or $\frac{3}{8}$ " shafts. The 137K Knob is tapped for a 10-32 thread.

The products of the General Radio Company include not only those listed in this bulletin, but also radio and electrical laboratory apparatus. Information and bulletins of special apparatus will be sent on request. These instruments include: Low Loss Variable Air Condensers, Precision Condenser, Vernier Condenser, Decade Condenser, Variometers, Standards of Inductance, Standards of Resistance, Decade Resistance Boxes, Impedance Bridge, Capacity Bridge, Slide Wire Bridge, Audibility Meter, Wavemeters, Ratio Arm Box, Galvanometer Shunt, Hot Wire Ammeters, Recorders, Amplifiers and Miscellaneous Apparatus.

All prices in this bulletin are strictly net, subject to change without notice, F. O. B. Cambridge, Mass. Cash should accompany orders from persons or firms with whom we have not already opened accounts. Unless otherwise instructed we shall use our own judgment regarding method of shipment.

This Bulletin replaces Bulletin 916

Standardize on General Radio Apparatus Throughout

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GENERAL RADIO COMPANY

MANUFACTURERS OF
ELECTRICAL AND RADIO LABORATORY APPARATUS
CAMBRIDGE, MASSACHUSETTS

BULLETIN 918

MAY 1924



Type 271

MEDIUM FREQUENCY TRANSFORMER

DESCRIPTION

The amplification of wavelengths of the order of 10,000 meters (30 K.C.) requires a transformer of design materially different from that required for short wave radio frequency or audio frequency amplification. As it falls between the ranges of these two types the usual tendency is to make it a modification of one of them. A transformer designed by such a method could not attain the same degree of efficiency as one designed to meet definite requirements.

The Type 271 M.F. transformer has been designed to meet the specific requirements of a medium frequency transformer for use in long wave reception and in superheterodyne sets. It is shielded both electrostatically and electromagnetically, making it possible to use several of these transformers in cascade with a separation as small as one inch. This shielding also makes it possible to operate the amplifying tubes at their full capacity.

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The working range is from 7,000 to 12,500 meters with a peak frequency of 10,000 meters. The turns ratio is 3.1:1. The core is of very thin silicon steel and of the shell type. It is so constructed as to give sufficient electromagnetic shielding and at the same time permits the use of only the small amount of steel that is required in a transformer of this type. The whole unit is enclosed in an attractively japanned metal case fitted with convenient terminal posts and mounting holes.

In Superheterodyne sets four of these transformers may be used with excellent results.

Type 271 Medium Frequency Transformer\$5.00
Dimensions 2½" x 2¼" x 1½". Weight 6 oz.
Code Word "TULIP"

The products of the General Radio Company cover a complete line of radio and electrical laboratory apparatus. Information and bulletins of special apparatus will be sent on request. Our line includes the following: Variable Air Condensers, Vernier Condensers, Standard Condensers, Decade Condensers, Variometers, Standards of Inductance, Standards of Resistance, Decade Resistance Boxes, Wavemeters, Decade Bridge, Capacity Bridge, Slide Wire Bridge, Audibility Meters, Hot Wire Meters, Galvanometers, Thermo-Couples, Telephone Transformers, Miscellaneous Apparatus.

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Standardize on General Radio Apparatus Throughout

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