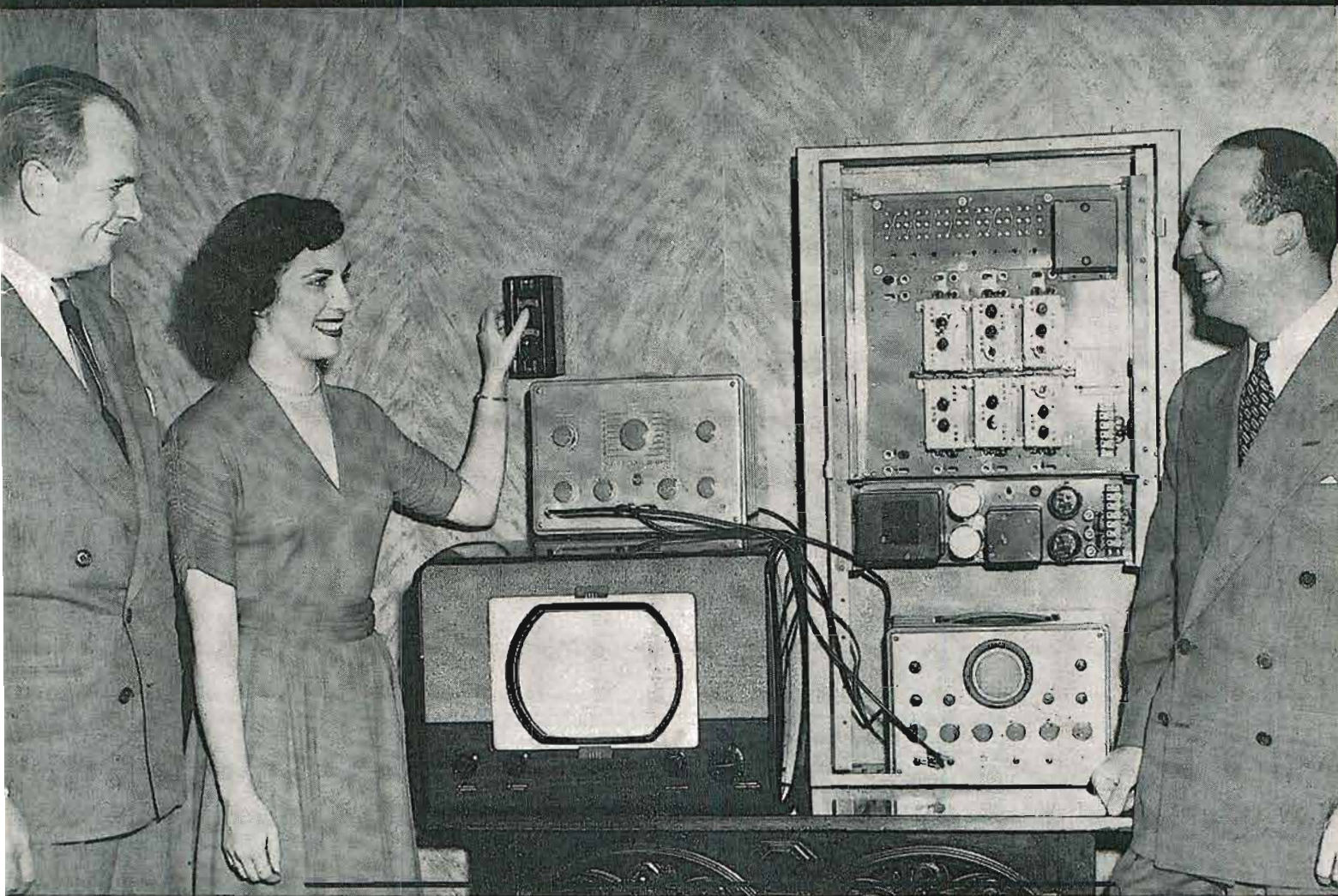


COMMUNICATIONS

INCLUDING "RADIO ENGINEERING" AND "TELEVISION ENGINEERING"

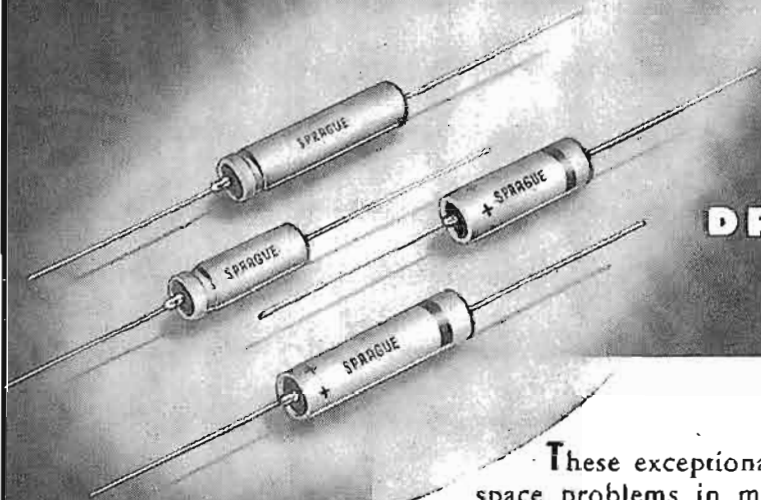


DECEMBER

- ★ ANNUAL INDEX FOR 1949
- ★ REMOTE TURNTABLE APPLICATIONS
- ★ MICROWAVE COMMUNICATIONS FOR POWER SYSTEMS

1949

SPACE SAVERS *de luxe*



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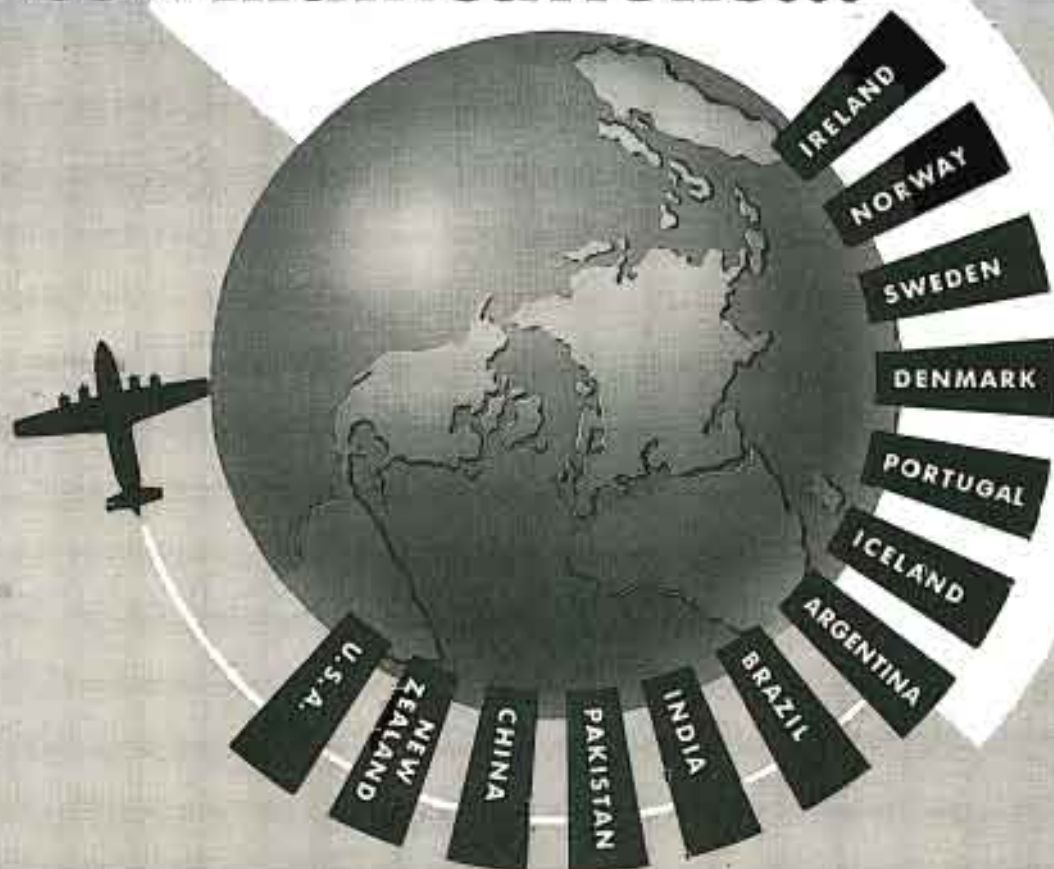
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COVER ILLUSTRATION

Six-channel amplifier and test equipment setup used for a TV motor-antenna system recently installed in the Shelton Hotel in New York City. Signals from six antennas, mounted on the thirty-second floor of the hotel and beamed to each station in the metropolitan area, are led to outlets in most of the rooms in the building. Viewing and testing the equipment are (left to right): Cathy Mastice, TV singing star; B. T. Davey, manager of the Shelton Hotel, and Irving Kram, president of the Tele-Ho-Tele Corporation, installers and operators of this system.

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MAGNETIC TAPE

Broadcasting Recorder

One-Man Unit, Weighing Twelve Pounds, Found Ideal for Remotes, Permitting 15 Minutes Recording at 7½ Inches per Second and 7½ Minutes Recording at 15 Inches per Second.

by CLIFFORD C. HARRIS

Chief Engineer
WIP, Philadelphia

been found to last about five to six hours, while the B battery is good for ten hours or more.

The amplifier, itself, is removable as a unit for servicing. A head-phone jack on the front of the case permits checking bias voltage to the recording head and will measure approximately 50 volts ac. Excessively low voltage at this point indicates weak batteries or a deficient bias oscillator. The jack may also be used with high impedance headphones for a rough check on the proper functioning of the system. However, headphones must be removed while recording because loading this circuit will impair the quality of the recording. There is no volume control on the amplifier. Instead, circuit constants were selected to provide sufficient gain for all usual conditions and the limiting factor in general is the external background noise level.

The unit normally operates at a tape speed of 7½" per second. However, a removable capstan, which slips over the regular capstan, is provided to permit recording at 15" per second. This makes for flexibility in playback since both speeds are frequently used for studio work.

The recorder has a flat response between 100 and 5,000 cycles with less than 3% total harmonic distortion. No detectable wow and flutter have been noticed on voice recording. The noise level is 35 db or more below the signal and has been found entirely adequate for interview work. Playing time is 15 minutes at 7½" per second and 7½ minutes at 15" per second. In spite of the fact that a flea-power motor is used to drive the tape, the

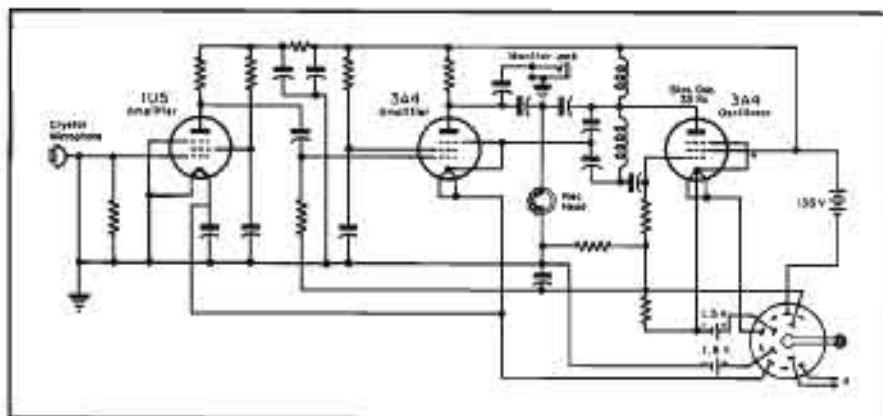
speed is held within very close limits and thus we have had no difficulty in playing back on normal equipment.

Missie, our pet name for the item, received her first assignment a few months ago when the studio received word that a man in Camden, N. J., had run amok and was engaged in shooting practically everyone in sight. *Missie* was dispatched to Camden and our reporter secured actual accounts of the killings from some of the eyewitnesses, one of whom saw his mother and father killed by the madman. In about 3 hours, 13 persons were killed before police, using tear gas and rifles, finally captured the killer, who was taken to Police Headquarters, where our first *failure* took place. Our reporter proceeded to headquarters hoping to get an interview with the killer himself. As he stepped off the elevator at Police Headquarters,

he was suddenly confronted by the killer surrounded by police. Our reporter, tongue-tied by the horrors he saw and heard that morning, was unable to speak. By the time his voice returned, some forty seconds later, the elevator arrived and it was too late.

Probably our prize faux pas and our second and last *failure* occurred when the writer demonstrated *Missie* to the general manager of the station. *Missie* was unveiled on his desk and, after much talk regarding how to operate, all of which was recorded, the tape was rewound and then placed on a regular tape machine for playback. Much to the writer's chagrin, not a word was on the tape. You see, *Missie* uses a permanent magnet for erasing and, of course, works equally well in either direction. We speak of this type of error as due to incompetent help.

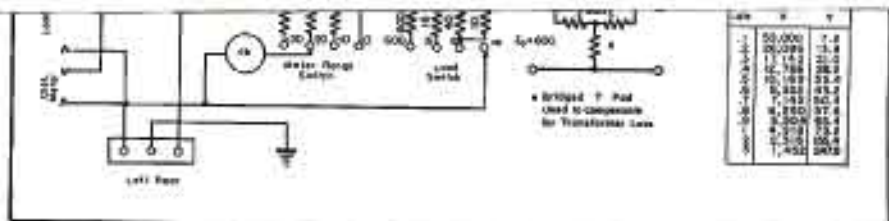
Circuit diagram of the magnetic tape recorder. Leads at A are connected to the drive motor and battery; twenty-four flashlight batteries are connected in series with the motor and switch.



COMMUNICATIONS FOR DECEMBER 1949 • 7

*Zero level, on the multiplier resistors used for the 300 db meter, were marked as 3.5 Ω across a 600-ohm line, corresponding to 7.78 mv above the standard level of 1 milliwatt. Therefore, when the exact level must be expressed in mv, this value can be added to the indicated attenuator settings. Since gain and frequency response of an amplifier can be expressed in db it will not be necessary to make this correction in most cases.

*Canon.



Custom-Built

ON MANY occasions it is necessary to build an amplifier for a special field or



The WDTV mobile cruiser during a stopover in Texas. Left to right: Robert Cavanaugh, assistant to the director of research, Allen B. DuMont Laboratories; Willis I. McCord; Benford Jester, Governor of the State of Texas and L. Carlton McKinney, southwestern district rep for the Flexible Cash Company.

TV Vans, Serving as a Control Room, from Which Video, Audio, Picture Relay and Phone Communications Are Coordinated, Involve Careful Consideration of a Variety of Physical and Electrical Conditions Encountered in Fixed and Mobile Applications.

by WILLIS I. McCORD

Manager, TV Specialties Department
Allen B. DuMont Laboratories, Inc.

Design, Development and

BROADCASTING of television programs, which originate at points remote either from the studio or transmitter site, poses many problems.

The prime requisite of successful remote TV operations is good equipment, selected to handle your needs. Personnel well chosen and thoroughly trained are then necessary to operate the equipment. Transporting of this equipment and personnel to the program pick-up point is the next consideration. This requires a vehicle designed to accommodate the equipment and transport it in a manner so that it will not be damaged by rough road conditions. Emphasis must be placed on simplifying as much as possible the setting up of this equipment so as to save time, labor and unnecessary handling. In fact, the unit must be constructed in such a way that the equipment is mounted and transported ready to operate. Then it is only necessary to place the cameras on their tripods and connect cables to complete the hookup.

It should be possible to move quickly from one program site to another so that a single unit can handle several remotes in the course of a day's programming. The vehicle in fact becomes a mobile control room from which the video, audio, picture relay and phone communications are coordinated. In mobile operations, the program director is quite a key man

since it is up to him to view the action on the camera monitors in the control room section and select the best picture for his program. The signals are then fed to the microwave relay transmitter or the phone line, whichever is being used.

Plans of some stations permit driving of a mobile unit into a court or garage adjoining the studio, so that all studio shows can be controlled from that point. This allows the equipment to serve a dual purpose. Maintenance time is thus greatly reduced and damage, due to needless handling, minimized. With a well trained crew the setup of a three-camera show can be accomplished in approximately one hour's time, the cameras can be replaced in the vehicle after the show and the unit ready to roll in about the same amount of time.

Coverage of spontaneous on-the-spot news pickups such as fires, other emergencies or events of public interest require that a mobile unit be self-sufficient and equipped with the necessary parts and tools to guarantee continuous operations for extended periods of time without interruption due to equipment failure. It is desirable that personnel or crew members be transported in the vehicle; therefore provision must be made for their comfort while riding as well as during operations.

Many broadcasters who are going

to operate a number of TV stations will find it advantageous to have their mobile equipment dispatched from one station to another to obtain maximum usage. Therefore, the unit must be capable of covering long distances at as rapid a speed as possible. A nucleus crew could be assigned to the unit and accompany it on such trips, supplementing their number with personnel from the station where they are to operate to serve as camera men and audio men. The nucleus crew can handle the video operation and the relay transmitter operation. Incidentally, the man in charge of the video relay transmitter must have a commercial operator's license. A trained crew, with each man having specific duties to perform in much the same manner as a well drilled gun crew, has been found to assure smooth and efficient operation.

In a van designed for WDTV, these points were carefully weighed and the best compromise between ideal conditions and programming requirement affected.

A standard 25-passenger type coach¹ powered by a 144-hp Buick engine was selected as the base unit. The spacious interior of this van was found ideal for working arrangements, providing ample storage space for all necessary equipment. The coach has a speed on the highway comparable to a passenger

Control desk with triple camera chain. This desk supports three camera control units (one for each camera) and a mixer amplifier monitor for selecting pictures. Synchronizing generator and power supply units are mounted on the floor racks below the desk. They can be rolled out for servicing work. On panel above the camera control units appear control unit of microwave relay transmitter, line or off-the-air monitoring receiver with a 12" picture tube, scope for video signal, and electric clock for program timing.



Operation of a TV MOBILE UNIT*

car and thus could be readily dispatched from one station to another.

The interior of this van was divided into three compartments with accommodations in the forward compartment for the driver and four additional crew members. Two leather-covered reclining bus seats were installed in this compartment for the comfort of these crew members, which on location could serve as an announcer's booth. A folding-type door was included to separate this compartment from the adjacent section.

Provision was also made for a monitor receiver to be mounted in this section for the announcer, who could view the action through a large clear-view windshield and announce the show alive instead of off the picture tube.

Behind this compartment we included the control room section, where the camera control men, audio man and the director perform their duties. Ample operating desk surface was provided to support all essential control equipment at a convenient operating height from the floor. The operating desk, extending crosswise of the vehicle, supports three camera control monitor units and the switching unit or mixing monitor. These units were

all mounted on vibration-dampening shock mounts, a quick releasing mechanism making possible their removal from the table when necessary. The units were spaced far enough apart to facilitate the changing of tubes and making of such adjustments that might be necessary while in operation. Below this desk were located the power supply units and synchronizing generator, also shock mounted and attached to a ball-bearing type drawer slide, permitting them to be pulled forward and out from under the desk surface so that they could be serviced or removed completely.

Storage cabinets, divided into three sections, were also provided for the camera, view finders, lenses and camera auxiliary units. This equipment was arranged in such a manner so that each item had a specific space allotted to it. A complete camera unit can be included in any one section so that it can be removed from the vehicle and set up on a tripod for operations. The units were mounted on shock-mount-

ed shelves and strapped to these shelves for transporting. Special compartments were provided for the lens turrets, view finder visor, panning handle and focusing handle and all other small parts, permitting a rapid inventory when storing equipment away.

In this section we included a picture distribution amplifier for the output of the camera chain, which provides eight output channels that can be used to feed the monitor units, the relay units and other lines which might be desired, such as feeding the video signal to other mobile vehicles on a pooled pickup. The video patch panel provides distribution of the video signal throughout the unit to the announcer's position, the monitor receiver and the microwave relay control unit, and to connectors on the exterior of the bus. The antenna signal from the antenna on the mobile unit was also terminated in this patch panel, so that it could be fed to lines or to the various monitor positions.

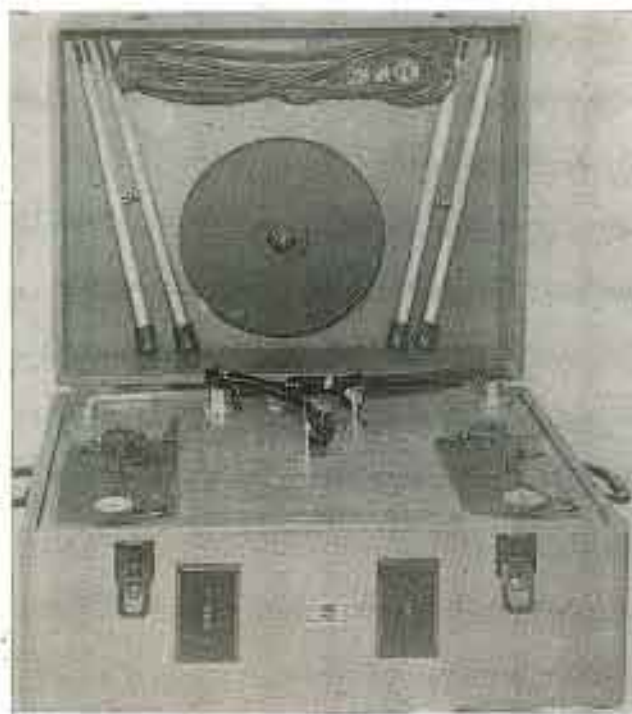
Desk space was provided for the audio man and from this position visual contact with the announcer in the front compartment is possible. Amplifier and power supply were located on

(Continued on page 28)

*From a paper presented at the Third Annual NAB Broadcast Engineering Conference.

†Flexible Coach Company, Loudonville, Ohio.

Disc Jockey



Converted turntable case equipped with dual speed motors, slow speed pickup heads, portable leg mounts, etc.

WITH THE DISC jockey interest at a peak, time sales of record-type shows have been increasingly easy to make. However, clients have expressed a desire for some variety in the presentation, which, on one occasion at our station called for a remote disc-jockey setup. Our sales department indicated that there would be no problems with such a show, none whatsoever, they emphasized. All we had to do was set up the equivalent of a broadcast studio weekly on the stage of a local department store. This was done, in quite a laborious manner during the first ten weeks, but it became apparent that the trucking of heavy turntables was quite a dangerous, troublesome and expensive chore, even if spares were available. It was decided that some alternate means was necessary, with perhaps a remote affair. After a bit of experimentation such a unit was developed, with a war surplus turntable trunk¹ serving as the housing.

New Motor Board Built

A new motor board of $\frac{3}{8}$ " plywood was cut to fit the trunk and two 12"

dual speed turntables² were mounted in the motor board. Two flush mercury toggle switches were then mounted on the front side of the trunk for operating convenience as illustrated.

Use of Microgroove Cartridges

Broadcast-type pickup assemblies³ were equipped with microgroove cartridges and connected to one stage preamps mounted in the trunk. At the sides of the turntable output receptacles we placed switches to operate pads, which were inserted in the respective outputs. Connecting cables were made ten feet long with plugs on each end.

Trunk Support

To support the trunk at the remote location we designed a set of four legs

using half-inch pipe. These were screwed into flanges mounted on the bottom of the trunk. One end of each leg was threaded for two inches so that the leg could be shortened or lengthened for levelling. The other end of each leg was covered by a rubber chair leg tip.

Storing Facilities

When the machine is to be stored or carried between remotes, the cables can be fastened into the lid by means of cleats. The turntable platters are removed and fastened to the lid by means of a bolt and wing nut. The feet fasten similarly into the lid. The pickup arms are secured in their rests by means of holders made from cartridge clamps. Spare microgroove or regular head cartridges are kept on the rear of the motor board by screwing on the plastic containers in which they are sold.

Standby Application

For standby purposes, a duplicate unit was constructed using other turn-

¹BCA M1-32800B.
²Alliance IND
³Zenith Cobras.

REMOTE TURNTABLE

Remote turntable container with leg mounts in position.



Turntable Trunk Case, Refitted With Dual-Speed Turntables, Microgroove Cartridge Pickups and Preamps, for Field and Standby Service.

by WILLIAM MARSH

Chief Engineer
WHHM, Memphis, Tenn.

tables* and pickup arms* which were around the transmitter house.

Experiences with Standby Unit

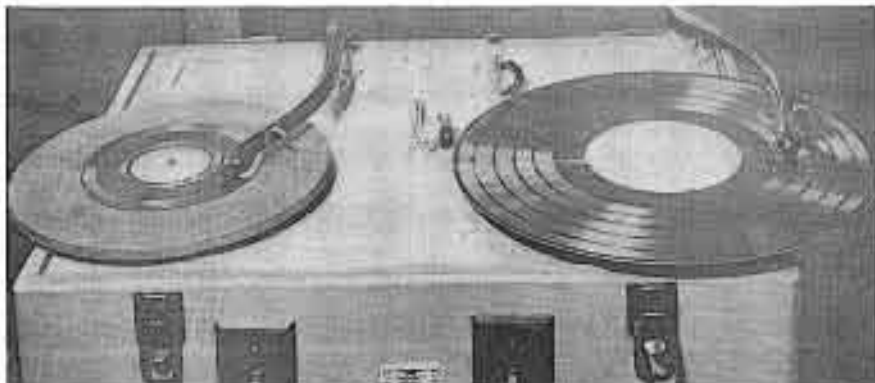
The standby, kept at the transmitter, proved its value during a power failure. It actually saved two hours of broadcast time during the middle of the day. A major sub-station power failure had thrown most of the down-

town area, including the studio, into darkness. Announcers and transcriptions were dispatched to the transmitter house, and business went on as usual.

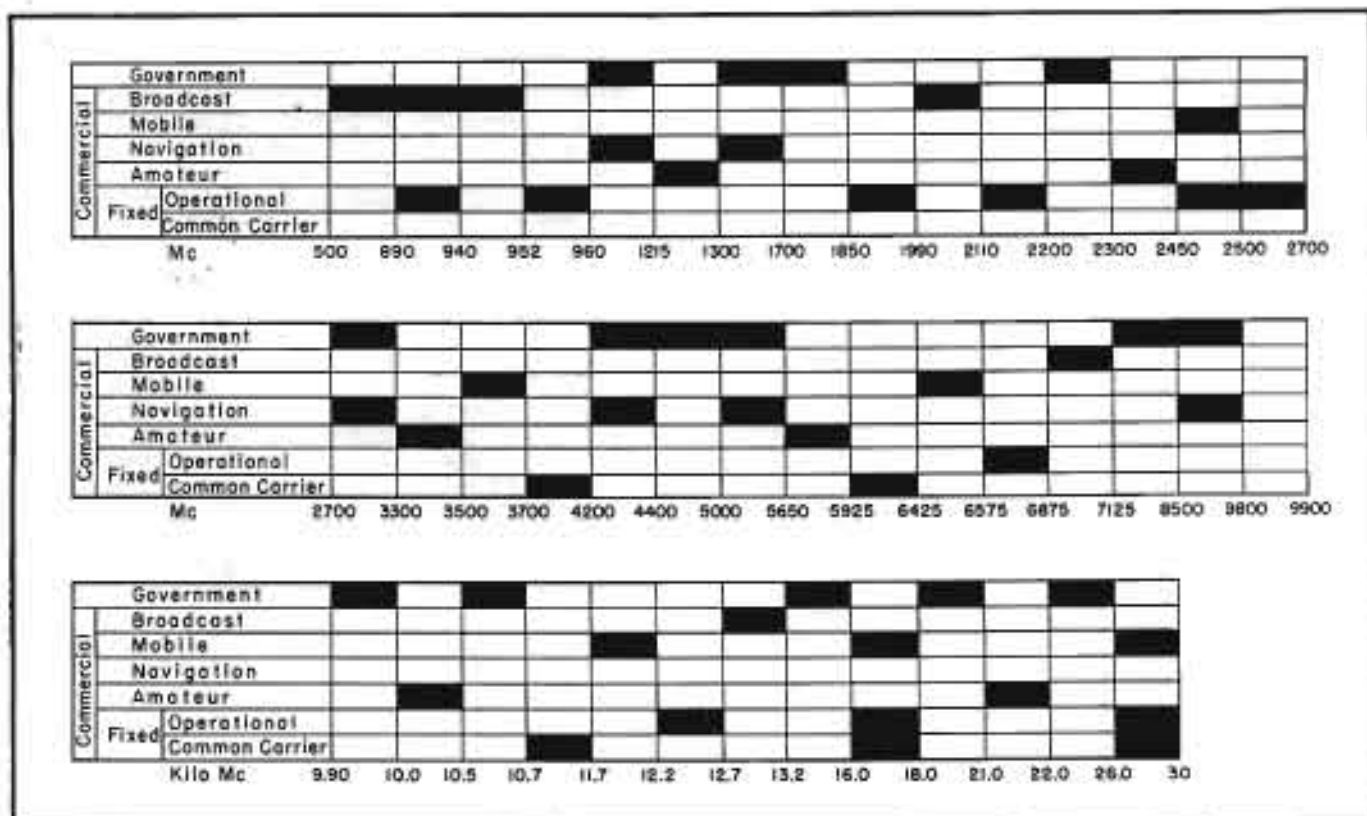
*General Industries.
*RCA.

Although this equipment will not provide the high fidelity or low rumble usually associated with broadcast turntables, listening tests and some months of satisfactory sponsored time have proved that the portable turntable does render adequate *studio quality*.

Turntables with microgroove setup in remote equipment.



MICROWAVE Equipment for Power



Frequency assignments for the microwave bands. Broadcast allocations cover TV, TV studio-transmitter-link, FM studio-transmitter-link, TV relay and TV pickup. The mobile allocations cover mobile stations and associated land facilities. In the fixed category, operational facilities cover fixed point-to-point services not for hire, while the common carrier are for fixed point-to-point services for hire.

THE GROWTH of power systems during the last few decades has been prodigious. This growth has been accompanied by an enormous expansion of the communications facilities required to supervise and control the complex systems in order that the public may be best served. In the past, these operations were detailed over power line carrier, pilot wires and private or leased telephone lines. Present demands, however, are rapidly using up these available channels.

The *uhf* area, with its additional channels and reliability characteristics, has been found to be the solution to the problem, affording an ideal means for point-to-point transmission of supervisory control, telemetering, voice communications and protective relaying.

The wide bandwidths in the ultrahigh channels make it possible to transmit extremely large quantities of information over a single channel, there-

by reducing the cost per circuit, particularly for parts of a power communications system where the traffic is high.

Freedom from interference in the higher bands add to the value of the ultrahighs for power work.

The relatively short ranges over which *uhf* transmission could be obtained when the line-of-sight require-

ment is met appeared to be a serious limitation to the application of microwave equipment to power systems. However, a study carried out a few years ago by sampling approximately 25 per cent of the power lines in the country, including typical companies, revealed that the results obtained were very satisfactory; table II.

Table I
Elevation required for different transmission distances, assuming a spherical earth.

Transmission Distance (Miles)	Elevation Required for 50' Clearance (Feet)
10	67
20	116
30	199
40	314
50	462

Voltage Class (Kv)	Percentage Under 35 Miles Long	Percentage Over 35 Miles Long	Average Length (Miles)
60	50	10	17
110	75	25	28
132	50	50	35

Table II

The relatively small antennas with their high gain and small beam, which can be used for *uhf* work, simplify matters considerably. The gain of the parabolic type antenna used at *uhf* is

COMMUNICATIONS

System Applications

directly proportional to the area of the aperture of the reflector and inversely proportional to the square of the wavelength. The gain that can be expected from antennas used at 1,000 mc are given in table III.

Antenna Diameter (Feet)	Power Gain	Gain (db)
3.5	56	17.5
4	79	19
6	200	23
10	555	27.4

Table III

The effect of antenna gain on the design of a microwave system can be well appreciated when we consider that the radiated power in the desired direction is equal to the transmitter output power multiplied by the antenna gain. For instance, a 5-watt, 1,000-mc output power multiplied by the antenna transmitter using a 6-foot dish will have an effective power of 1,000 watts. This power gain is realized again at the receiver location if we use a similar antenna there, effectively increasing the sensitivity of the receiver. Stated in another way, the use of parabolic reflectors reduces the loss in the transmission path between a transmitter output and a receiver input. The larger the antenna the greater is this loss reduction.

Analyzing the foregoing factors in a prelude to setting up a developmental program, it became obvious that for completely satisfactory performance, the equipment must operate over line-of-sight distances of at least 35 miles. In addition, the transmitter should be capable of handling up to seven voice frequency channels or equivalent tone telegraph circuits with signal-to-noise ratios corresponding to good commercial practice on wire lines.

The first major consideration in our developmental program was the choice of band. The 940-960 mc band was chosen as most desirable for six reasons:

- The band near 1,000 mc is low enough in frequency to permit the economical use of circuits which were known to be familiar to the prospective customers from their experience with 40 and 150 mc equipment, thus reducing maintenance costs.
- As we go higher in frequency,

Facilities, Operating in the 952-960 Mc Band, Use a 5-Watt Transmitter With Planar Electrode Type High-Transconductance Triodes, Dipole Fed Parabolic Reflector, Phase-Modulated Oscillator, and a Double Superhet Receiver With a Double-Tuned Cavity Preselector.

by M. H. WOOD and F. B. GUNTER

Westinghouse Electric Corporation

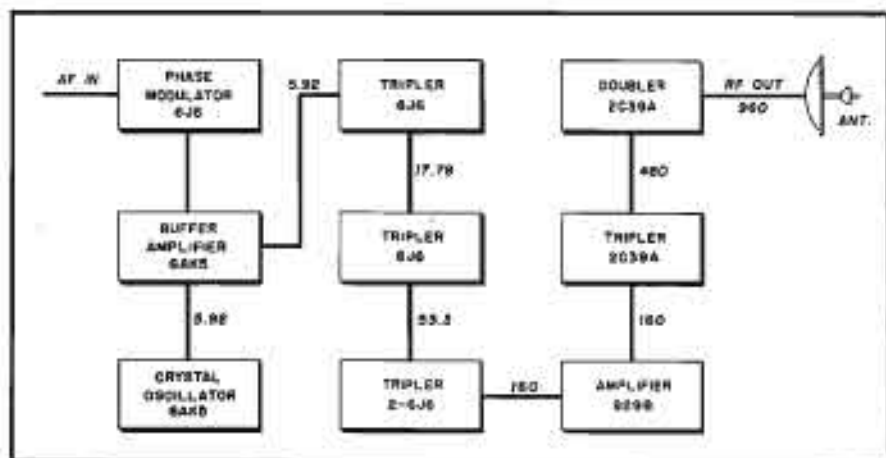
there are the advantages of increased available bandwidth, smaller antenna for a given gain and reduction of the number of tubes and circuits in the rf portion of a transmitter. At the same time, however, we must accept the additional complexity of auxiliary equipment necessary to stabilize frequency, to modulate over the wide bandwidths and to get the rf energy to the antenna. In many cases, this auxiliary equipment can cost more than the savings in the rf portions of the transmitter.

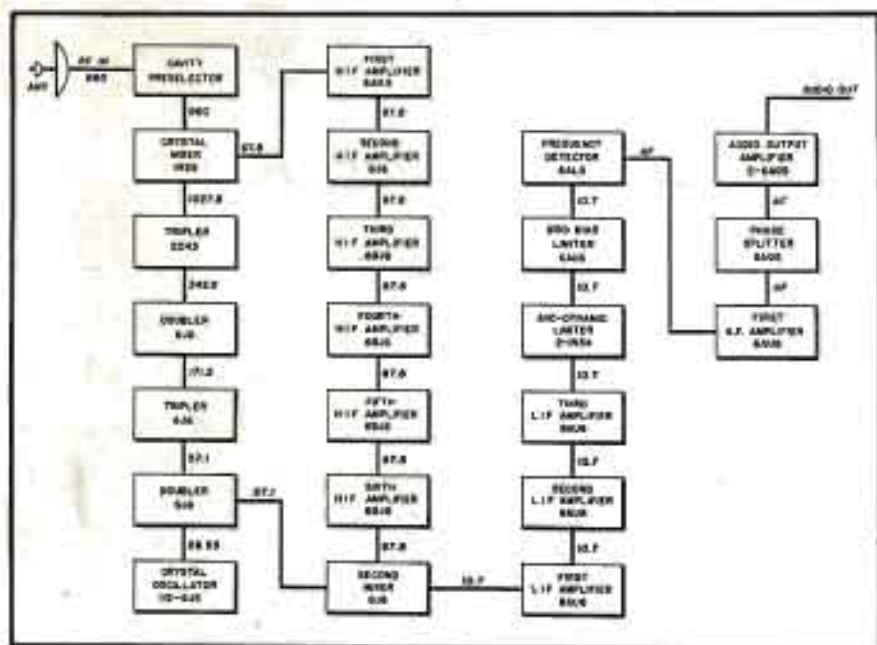
- The relatively low loss in flexible coax lines at 1,000 mc and the relatively higher power obtainable from 1,000-mc tubes

now available permit the transmitters and receivers to be separated from the antennas. Where towers must be constructed to obtain line-of-sight transmission paths, this fact reduces tower cost since no provisions must be made on the tower for shelters for equipment and protected areas for maintenance personnel. Transmitters and receivers in many locations may be separated sufficiently far away from antenna sites to enable existing shelters to house the equipment.

- The fading of transmitted signals over a given path increases with operating frequency. Experiments at four frequencies carried out by Bell Telephone Labs over a 40-mile path re-

Block diagram of the transmitter.





Block diagram of the receiver.

vealed vibrations from 12.8 to 18.2 db; table IV.

Frequency (MC)	Fading (DB)
714	12.8
3000	17.2
4601	17.5
9375	18.2

Table IV

- (e) At frequencies below 6,875 mc, there is no appreciable loss due to rainfall over the transmission path. At higher frequencies the effect of rainfall attenuation is serious and increases with increasing frequency.
- (f) While the bandwidth allowed in the 952-960 mc range does not permit such services as television and television telemetering, it does provide facilities for most power service fixed station applications. Assuming a required bandwidth of 500 kc and a channel spacing of one mc, there can be placed at a single power sub-station eight microwave transmitters each capable of transmitting seven voice frequency circuits. This will provide at a single point, up to 56 one-way voice frequency circuits.

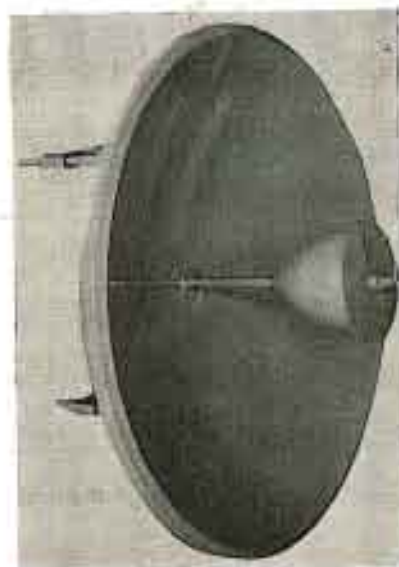
Having selected the frequency band, a study of tubes available for use in the output led to the choice of the 2C39-A, a planar electrode type high-transconductance triode, designed for operation at frequencies up to approximately 2,000 mc. To increase life, the

transmitter circuits were designed to give a rated output of 5 watts, which was well below the rating of the tube.

In the microwave transmitter we included a phase-modulated oscillator followed by several multiplier stages. A crystal-controlled oscillator at 5.92 mc, phase modulated by an audio signal up to 30,000 cycles wide, provided a phase modulated signal multiplied 162 times in the succeeding multiplier stages resulting in a 960-mc output signal. The output of the transmitter was designed for a 52-ohm coaxial cable. A dipole fed parabolic reflector, with the feed element enclosed in a waterproof cover, served as the transmitting dish.

The Receiver

The microwave receiver, a double superheterodyne type, features a double-tuned cavity preselector. The local oscillator source, a crystal oscillator, operates at about 28.5 mc, the output of which is multiplied to obtain frequencies of 57.1 and 1,027.8 mc. The 1,027.8-mc signal is mixed with the incoming signal from the preselector to obtain the input signal for a 67.8-mc *if* strip. The *if* strip has a low noise input circuit and an overall gain from the crystal input to the input of the second detector of 90 db. The second detector mixes the 67.8-mc signal from the first *if* strip with a 57.1-mc signal from the local oscillator to obtain the input to a 10.7-mc *if* strip. The overall gain of the 10.7-mc *if* strip is approximately 75 db. Amplitude varia-



The dipole-fed parabolic reflector.

tions in the signal are removed by a two-stage limiter before it is applied to the detector. The output is fed in a three-stage audio amplifier, featuring a push-pull circuit and a means for balancing cathode currents to reduce harmonic distortion.

Receiver Sensitivity Features

The receiver sensitivity is such that it will operate satisfactorily with a path loss from transmitter output to receiver input of approximately 125 db.

Operational Installations

Two installations employing the *uhf* receivers and transmitters have been installed on the property of the Pennsylvania Electric Company near Johnstown, Pennsylvania. These are operational installations which will be typical of power systems applications.

Future Tests

Tests to be run over approximately one year have been scheduled for these installations to provide operational experience. The tests will include an investigation of the possibilities using a passive reflector to get signals to points outside a line-of-sight path.

As a companion piece of equipment, there is under development a multiplexing setup which will permit initially four and eventually seven voice channels to be stacked to modulate a single microwave carrier.

Before Any Other Consideration

Integrity of Circulation



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COMMUNICATIONS

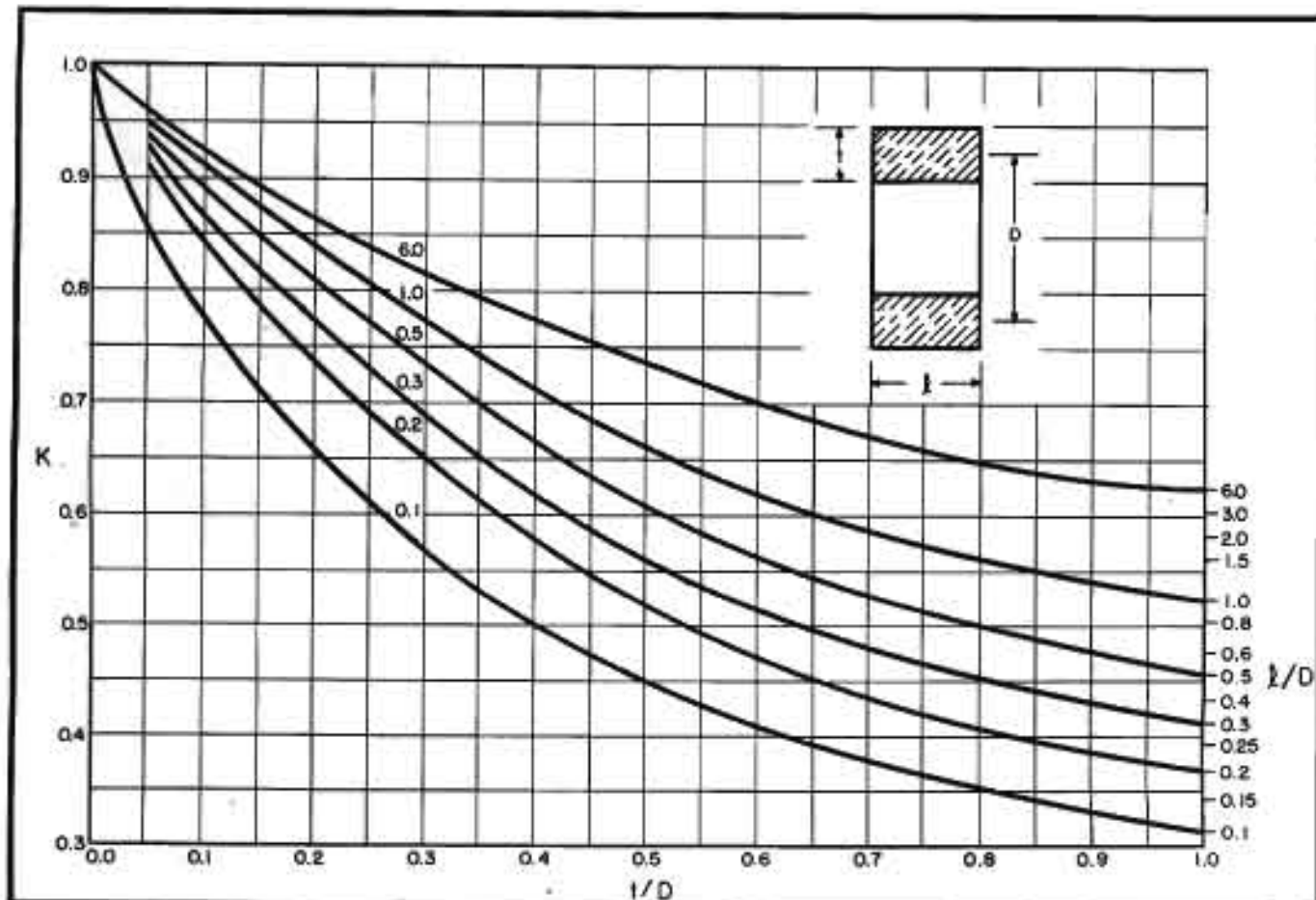
Multilayer Coil Inductance Chart

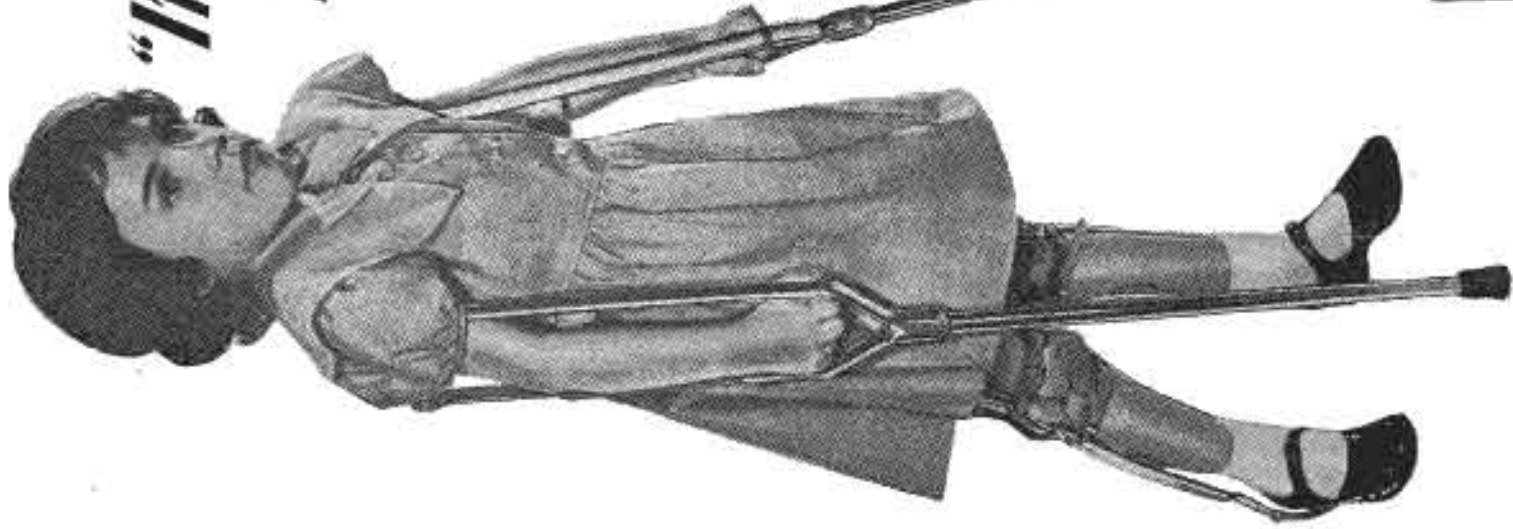
Chart Permits Determination of Inductance of Multilayer Circular Coil of Rectangular Crosssection in Terms of an Equivalent Current Sheet Solenoid.

by **SAMUEL SABAROFF**

Consultant
Barker and Williamson

The inductance chart with $L = KL_0$, where L is the inductance of the multilayer coil; L_0 is the inductance of the equivalent current sheet solenoid of the same turns, length, and mean diameter, and K is the correction factor. The term l represents the depth of winding and D is the mean diameter, with L equaling the coil length. These terms are shown on the abscissa and ordinate (right) and also in the drawing in the upper right. All dimensions are entered as ratios and thus may be expressed in any set of units. Example: Assume $N = 100$ turns, $D = 1"$, $l = 1"$, $t = 0.5"$. Then $l/D = 1$ and $t/D = 0.5$. The current sheet inductance of a solenoid with the same turns, length and mean diameter, as determined by means of lightning calculator, is 170 microhenries. The actual inductance is, therefore, 0.66 (correction factor K , provided by chart) \times 170 or 112.2 microhenries, which compares with the calculated value of 114.6 microhenries.





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Personals

VVOA DIRECTOR and life member Capt. Fred Muller, in a note to ye secretary, reports that he is feeling much better and hopes that . . . "I'll be seeing you one of these days. Meanwhile good health, good luck, and good cheer to those of the old gang who may not be fairing so well these days." FM will soon leave for Florida for the winter. Good luck to you from all. . . . E. N. Pickerill, VVOA director, was unable to appear at the recent meeting of the board of directors because of an engagement at the hospital to undergo an operation. Do hope you will be okeh soon. . . . Oldtimer Herman Zimmerman has written us to ask how many VVOA members have had an *Operator's Certificate of Skill in Radiocommunication (Wireless)*, which was issued around 1910-12. HZ received one back in those days, about the time Pickerill operated old WA at the Waldorf-Astoria in N. Y. and when the New York *Herald* news station OHX started operating in the Battery. HZ lives at 165 Lyons Road, Scarsdale, N. Y., and would welcome correspondence from those who might recall those days. . . . We are glad to welcome an oldtimer, John V. L. Hogan, who has rejoined our ranks. He has sent in a few items about his early experiences which began in '06. JVLH, now associated with Roscoe Kent in promoting Hogan Laboratories, reports that some of his early days were spent at Brant Rock and Arlington. . . . Ludwig Arnson, president of Radio Receptor Co., has notified us that he has moved his business from New York City to 84 N. Ninth Street, Brooklyn. . . . W. A. Knight has left Jacksonville, Fla., and moved to Riverhead, L. I. . . . C. C. Rich Richelieu, now a resident of Gardner, Mass., notes that he enjoys the VVOA column very much providing news of many old friends he does not see very often. Rich, now general sales manager of the Simplex Recorder Co., spent several years working at RMCA stations WGO, WBL and WRL, and was in CAA engineering for thirteen years. . . . Another of the early wireless boys, Jonathan Eddy, who spends most of his working days at 63 Park Row, actually lives at Chestertown, Md. Jon started seeing the world long before he became a wireless operator, having attended school in Boston, Grand Junc-



George Clark and Orrin Dunlap, who have been named to head the history and publicity committees, respectively, of VVOA for 1950.

tion, Colo., and London (England). He got his first ticket as a ham in '15, and a first class commercial operator's license when he was but 14. He began his brass pounding on the Great Lakes during vacations. He remembers working WSL with a spark transmitter and a galena detector, with no *rf* or *af* amplification, from off the West Coast of Central America, a distance of around 2,800 miles. During his ham work he has been identified as 2JE, 2AKN, 3FS and 8NI. He has worked for the N. Y. *Times* and *Daily News*, and was the first executive vice president of the American Newspaper Guild. At present he is president of the Standard News Association, a private organization covering local news for New York papers. . . . R. L. Fischer is now stationed at the Brooklyn Navy Yard as an Assistant Electronics Officer for Naval Reserve, in charge of the electronics installations at many Naval Reserve training centers and all volunteer units. . . . Due income has come in from F. J. Grimm, R. S. Henry, R. H. Hersey, R. J. Higgins and J. A. C. Kavanah. . . . At a recent meeting in New York City, the board of directors nominated members for election to office and to serve on the board of directors for the year 1950. Officer nominations included: for the office of president, Wm. J. McGonigle; 1st vice president, Arthur J. Costigan and Paul F. Godley; 2nd vice president, E. N. Pickerill and Haraden Pratt; secretary, Roscoe Kent and Wm. C. Simon; assistant secretary, R. J. Iversen and R. H. Pheysey; treasurer, C. D. Guthrie

and John A. Lohman. One is to be elected to each office. For the board of directors, the following were named, with eight to be elected: A. Barbalate, RCA Communications; Rodney Chipp, director of engineering of Dumont Network; George H. Clark, retired from RCA; Arthur J. Costigan, vice president of Radiomarine Corp. of America; Paul F. Godley, consulting radio engineer; C. D. Guthrie, retired from U. S. Maritime Commission; Henry T. Hayden, Ward Leonard; R. J. Iversen, *New York Times*; Roscoe Kent, in private business; John A. Lohman, Mackay Radio and Telegraph Co.; Wm. J. McGonigle, N. Y. Telephone Co.; Capt. Fred Muller, USN retired; Frank Orth, Columbia Broadcasting Co.; Robert H. Pheysey, Tropical Radio Telegraph Co.; E. N. Pickerill, RCA Communications; Peter Podell, in private business; Haraden Pratt, vice president and chief engineer of Mackay Radio and Telegraph Co.; E. H. Rietzke, president of Capitol Radio Engineering Institute; Wm. C. Simon, Tropical-United Fruit; and George E. Sterling, FCC Commissioner. . . . Ye proxy named twelve to serve as committee chairman: *advertising*, Wm. J. McGonigle; *awards*, John A. Lohman; *chapters*, E. C. Cochrane; *finance*, V. P. Villandre; *history*, George H. Clark; *membership*, Henry T. Hayden; *memorial*, Brig. Gen. David Sarnoff; *publicity*, Orrin E. Dunlap; *reception*, W. C. Simon; *scholarship*, Jack R. Poppele; *tickets*, A. J. Costigan; and *ways and means*, Edward Dros.

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The Industry Offers



MEASUREMENTS CORP. UHF OSCILLATOR

A uhf oscillator, model 112, covering the range of 400 to 1,000 mc, has been announced by Measurements Corp., 116 Monroe St., Bonton, N. J. Frequency calibration is said to be accurate to $\pm 0.5\%$.

Employs the same type oscillator used in Measurements model 84 standard signal generator. Provision has been made for the use of a dc power source when maximum stability is required.

Has a maximum output voltage, varying with frequency, between 0.3 and 3 volts. Output voltage is not calibrated in absolute value. However, an output dial, calibrated in db, makes possible relative voltage measurements.

...

SOLA TRANSFORMER

A transformer, type CVE, with $\pm 3\%$ voltage regulation, has been announced by Sola Electric Co., 4633 W. 16th St., Chicago 50.

Provides high voltage plate and filament windings (6.3 and 1 volt) on the same core.

Bulletin P-109 CVE-138 provides technical and dimensional data and shows curves comparing the CVE stability of output against the conventional power transformer output when primary voltage varies between the levels of 100-130 volts.

...

C-D VIBRATOR CONVERTERS

A line of vibrator converters, designed specifically for railroad communications and power conversion requirements, and available for operation on 22, 54 and 120 v ac input has been announced by Cornell-Dubilier Electric Corp., 2900 Columbia Ave., Indianapolis, Ind. Units have an output rating of 115 v ac 60 cycles at 275 volt-amperes.

Converters are mounted on specially designed racks, and are removable by releasing two bolts.

...

ASTRON METALLIZED PAPER CAPACITORS

Midsize self-healing metallized paper capacitors, Metallite type MQ, in both hermetically sealed and cardboard tubular designs, have been announced by Astron Corp., 900 Passaic Ave., East Newark, N. J.

Capacitors are available in voltage ratings up to 600 volts and are supplied with glass-to-metal hermetic terminal seals.

Officers of the company include Joseph Frank, president; John H. Fisher, chief engineer; and Irving Black, production director and vice president, all former Solar Mfg. Corp. employees.

SYLVANIA TRANSMITTING TUBES

Five types of transmitting tubes for amateur, mobile and portable applications have been announced by Sylvania Electric Products, Inc. Tubes in this group include two power triodes, a kly beam power amplifier, pentode power amplifier oscillator and miniature beam pentode.

The power triode, type 811A, is said to be suitable as a class B *af* power amplifier and modulator; for plate modulated *rf* power amplification in class C telephony; as a self-rectifying amplifier; and as a class C amplifier. Maximum ratings include dc plate voltage 1,500, and plate current 17 milliamperes; signal input 240 watts; plate dissipation 63 watts; grid to plate capacitance 5.6 mmfd; and driving power of approximately 12 watts. The 811A will deliver rated output at frequencies up to 30 mc and may be operated at reduced rating at frequencies up to 100 mc.

The power triode, type 808, has been designed for use as an *af* power amplifier and modulator, class B; for plate modulated *rf* power amplification in class C telephony; and as an *rf* power amplifier and oscillator in class C telegraphy. Maximum ratings include 2,600 volts dc on plate; 150 milliamperes plate current; 300 watts signal plate input; 75 watts plate dissipation; grid-to-plate capacitance of 2.8 mmfd; and maximum driving power of 10.5 watts. The 808 will deliver full rated power at frequencies up to 30 mc and may be operated at reduced ratings at frequencies up to 130 mc.

The kly beam power amplifier, type 2E24, can be used as a plate modulated *rf* power amplifier in class C telephony and as an *rf* power amplifier and oscillator in class C telegraphy. Maximum ratings include 500 volts dc on plate; 85 milliamperes plate current; 40 watts plate input; 11.5 watts plate dissipation; 0.11 mmfd grid-to-plate capacitance; and 0.31 watt driving power. The 2E24 may be operated at full rating at frequencies up to 125 mc and at reduced rating at frequencies up to 175 mc.

Type 2E22 pentode power amplifier oscillator is suitable for class C *rf* amplifier or oscillator service and as a suppressor modulated class C amplifier. Maximum ratings include 750 volts dc on plate; 110 milliamperes plate current; 30 watts plate dissipation; 0.2 mmfd grid-to-plate capacitance; and maximum driving power of approximately 0.6 watt.

The miniature beam pentode, type 2E30, is suitable for use as a class A1, AB1 or AB2 *af* power amplifier and modulator; *rf* power amplifier and oscillator in class C telegraphy; and as an *rf* power amplifier in class C telephony. Maximum ratings include 275 volts dc on plate; 50 milliamperes plate current; 15 watts plate input; 10 watts plate dissipation; 0.5 mmfd grid-to-plate capacitance; and approximately 0.2 watt driving power. May be operated at full ratings at frequencies up to 165 mc.

...

GATES STUDIOETTE

A medium size studio control console, the model 52-CS, Studioette, that may be used for AM-FM or TV in main or sub-studio service, has been announced by the Gates Radio Co., Quincy, Ill. Has self-contained speech input system, with provisions for four microphones, two transcription turntables, network and remote lines. Provided with preamplifiers for microphones plus line and monitoring amplifiers for the high level circuits.



PROCTOR SOUNDEX PLAYBACK

A Floating Disc Drive playback unit, which consists of a flexible aluminum drive disc, shock mounted at the center to the turntable shaft, has been announced by the Proctor Soundex Corp., 133 N. Smith Ave., Mt. Vernon, N. Y. Drive disc and turntable shaft are isolated from direct contact and the drive disc is held free by the shock mounting so that it is self-aligning with two drive rollers that it passes between.

Position of the drive rollers along the radius of the drive disc control the speed setting, which is continuously variable 30-110 rpm.

Pickup arm has a self-contained stylus pressure scale on a bracket with a zero-setting indicator and a control knob which can set pressure 0-25 grams. Arm uses interchangeable cartridge carriers which are said to permit instant substitution of various type cartridges.

...

RCA DUAL CHANNEL CONSOLETTA

A program consolette for medium-size sound systems, designed to permit dual programming of radio or recorded programs or special announcements to loudspeakers in as many as 50 locations, has been announced by the RCA Engineering Products Department.

Consolette (type MI-12780) provides nine input circuits and facilities for simultaneous transmission of two different programs in different areas, or transmission of a single program, with the second channel reserved for intercommunication with any location.

Equipment features provision for both visual and audio monitoring of the programs, and provision for attaching a separate record player, transcription turntable, and radio tuner.

...

G. E. TV CAMERA ELECTRONIC VIEWFINDER

An electronic viewfinder for television studio cameras has been announced by G. E.

Viewfinder is said to be capable of giving 500 lines definition; uniform video response to 1 mc within ± 0.5 db.

...

SPRAGUE AC ELECTROLYTICS

Electrolytic capacitors, type 11A, for 115-volt continuous duty ac service have been announced by the Sprague Electric Company, North Adams, Mass.

Capacitors are said to be suited for across-the-line power factor improvement at low voltages, particularly with appliances and light industrial equipment. They may be used in applications where starting voltage surges across capacitors may exceed rated voltages by as much as 50% for a maximum of two seconds.

Engineering bulletin 301, available on company letterhead request, gives complete standard ratings.



CLARKE PHASE MONITOR

A phase monitor, model 109, for measuring phase relations at radio frequencies, has been announced by the Clarke Instrument Corp., 910 King St., Silver Spring, Md. Instrument is said to have an absolute accuracy of $\pm 1^\circ$ and resolution and repeatability of $\pm 0.1^\circ$. Phase is read directly from two dials calibrated in 0.1° increments.

Instrument continuously and automatically indicates the phase difference. Provision is made to indicate antenna current in the various towers of a directional array, as well as to indicate the phase relations.



LEAR VHF/LF TRANSMITTER-RECEIVER

VHF/LF transmitter-receivers, model LTEA-5, have been announced by Lear, Inc., 110 Ionis Ave., N.W., Grand Rapids 2, Mich.

Features four receivers, providing reception of all vhf facilities, low frequency radio ranges, 75 mc marker beacon and entertainment broadcast, plus a 2-watt vhf transmitter.

DUMONT 3" OSCILLOGRAPH

A 3" oscillograph, type 292, has been announced by the instrument division of Allen B. Du Mont Laboratories, Inc., Clifton, N. J.

Unit uses the new Du Mont JRP-A 3" CRT with its short overall length of 9 1/2". The instrument, which supercedes the 164-E, features an increased sensitivity of the deflection amplifiers, so that input signals of 0.4 rms volt and 0.56 rms volts will produce 7" deflection on vertical and horizontal axes, respectively. Owing to the flat face of the JRP-A tube, optical distortion is said to be kept at a minimum. X-axis and Y-axis amplifiers employ their respective pairs of deflection plates with voltages that are 180° out of phase. This balanced deflection is said to virtually eliminate astigmatic defocusing and trapezoidal distortion which are unavoidable with unbalanced deflection. The gas-triode linear time-base generator provides recurrent sweep frequencies from 5 to 30,000 cps, synchronized with either the vertical amplifier or some external source.



G.E. FM/TV MINIATURE PENTODE

A sharp cutoff miniature pentode, 6BC5, designed primarily for use as rf and af in television and FM receivers is now in production at the Owensboro, Ky., plant of G. E.

The 6BC5 is said to represent an improved version of the 6AG5 and is interchangeable with that tube. The chief difference is an increased transconductance.

For example, with a plate voltage of 250 volts and a screen voltage of 150, the transconductance is said to be raised from 5000 to 5700 micromhos.

THOSE WHO DEMAND THE BEST IN TELEVISION DEFLECTION YOKE SLEEVES USE "CLEVELAND" . . .

Cosmalite* spirally laminated paper base phenolic tubes. These are furnished in sizes and with punching, notching and grooving that meet each customer's individual needs.

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* * *

Ask about our kindred products that are meeting both new and established needs in the electronic and electrical fields.

*Reg. U. S. Pat. Off.

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PLANTS AND SALES OFFICES at Plymouth, Wis., Chicago, Detroit, Dapinsburg, N.Y., Amherst, N.J.
 ARRASIVE DIVISION at Cleveland, Ohio
 CANADIAN PLANT: The Cleveland Container, Canada, Ltd., Pascoff, Ontario

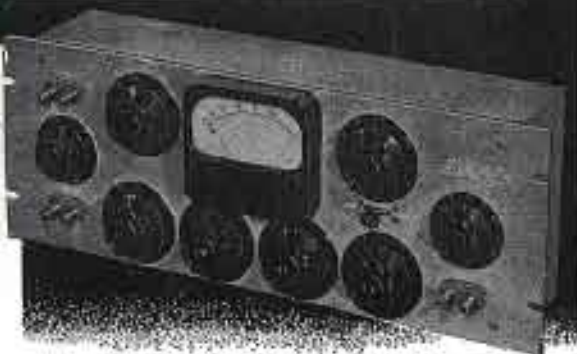
REPRESENTATIVES

CANADA	W. T. BARRON, EIGHTH LINE, RR 11, OAKVILLE, ONTARIO
METROPOLITAN	E. T. MURRAY, 214 CENTRAL AVE., EAST ORANGE, N. J.
NEW YORK	E. P. PACK AND ASSOCIATES, 968 FARMINGTON AVE., WEST HARTFORD, CONN.

NEW... Improved Wiring Eliminates Leakage

TYPE 12AT & TYPE 12ATK (KIT) TRANSMISSION MEASURING SET

Range: 111 db. in 0.2 steps.
Frequency resp.: 0.1 db. from 0 to 20 kc.
Accuracy: 0.1 db.
Impedance, load section: 4, 8, 16, 50, 150, 200, 500, & 600 ohms.
Impedance, trans. sect.: 50, 150, 200, 500 & 600 ohms.
Reference level: 1mw. into 600 ohms.
Circuit: "T", unbalanced.
Attenuators: 10x10, 10x1 & 5x0.2 db.
Load corr. cap.: Transm. sect. 1 w. Load section 10 w.



A precision Gain Set with specially developed wiring that permits no troublesome leakage and provides improved frequency characteristics. Available completely assembled, or in kit form—which permits the sale of a high accuracy instrument at a low price.

WRITE FOR DESCRIPTIVE BULLETIN



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• PUBLIC ADDRESS

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- Shout right into the new Amperite Microphone—or stand 2 feet away—reproduction is always perfect.
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- Guaranteed to withstand more "knocking around" than any other type mike.

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Models
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RBHG—Hi-imp.
List \$42.00



"Kontak" Mikes
Model SKH, list \$12.00
Model KKH, list \$18.00

AMPERITE Company, Inc.

561 BROADWAY · NEW YORK 12, N. Y.

In Canada: Atlas Radio Corp., Ltd., 560 King St. W., Toronto

TV Mobile Unit

(Continued from page 11)

this desk and a 24-position patch panel provided for use in handling the program sound, the cueing, private phone lines and the microphones. There are four microphone inputs, one on either side of the unit, one at the roof level and one in the announcer's compartment.

Either commercial land power source may be used with provision being made to adapt for single-phase two-wire, single-phase three-wire, 115-230 volts or 3 phase four-wire source. In addition, a small motor generator rated at 3 kw with a current capacity of 32 amperes was installed so that a dual camera chain may be operated independent of any outside power source. This unit starts automatically when a 60-watt load is applied.

Power Distribution

Power is distributed from the control room by means of circuit breaker switches to the various receptacles and outlets placed throughout the unit. In most instances provision was made for either twist lock or parallel receptacles. Each of the three camera chains was supplied with a separate 30-ampere circuit and a 20-ampere variac in each line to compensate for voltage drop. A voltmeter with a 3-position switch and three ammeters were provided for use in balancing the load on the power line.

To supply power for triple camera units and for lights used in night pickups a 15-kw motor generator, mounted on a separate truck unit, is used.

Air Conditioning

The total operating power input is 6 kw, of which a large percentage can be dissipated as heat. To maintain comfortable operating temperature, two large exhaust fans capable of removing 800 cubic feet per minute were included. However, in some climates it might be desirable to add some air conditioning. This can be done with a small unit which will provide partial cooling or a large unit which will be adequate to maintain a temperature of 70° under any extreme heat conditions.

INDUSTRIAL DEVICES PLUG-IN VOLT-AMP TESTER

A general-purpose volt-ampere checker, model 900, that plugs in between line and connection cord, and provides simultaneous voltage and amperage readings directly off two dials, has been announced by Industrial Devices, Inc., Edgewater, N. J.

Employs two neon indicators which extinguish at the voltage and amperage readings indicated by the adjustable knobs. A multiplying switch provides for the expansion of the range indicated on the ammeter scale. The tester distinguishes between ac and dc, and is intended for 60-cycle ac for accurate amperage readings.

Tester measures $3\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2}$ " and weighs 26 ounces.



SPRAGUE CAPACITOR CODE INDICATOR

A capacitor code indicator for deciphering molded paper tubular capacitor color readings, has been prepared by Sprague Products Company, 61 Marshall St., North Adams, Mass. Indicator consists of a pocket-size plastic device with rotating dials printed in color. When flicked to the proper color bands, the dials indicate capacitance, tolerance and rated working voltage.

Available for 15c, either direct or through Sprague capacitor distributors.



NEWCOMB REMOTE CONTROL UNIT

A portable remote control unit for the custom K series amplifiers, which makes it possible to mix and fade individual microphones and photograph from distances up to 2,000 feet, has been announced by Newcomb Audio Products Co.

AEROVOX MINIATURE ELECTROLYTICS

Miniaturized tantam-type electrolytics, type SRE, have been announced by Aerovox Corp., New Bedford, Mass.

Capacitors are hermetically-sealed in tubular aluminum cases, and have wafer-impregnated cardboard insulating jackets. No. 18 gauge tinned-copper leads said to assure positive mechanical and electrical contacts even with smallest units.

UNIVERSITY DUPLEX SPEAKER CROSSOVER NETWORK

A filter network model 440, of the LC type for use with coaxial or duplex loudspeaker systems, has been announced by University Loudspeakers, Inc., 80 South Kenilworth Ave., White Plains, N. Y.

Said to provide a proper attenuation rate at a crossover of 600 cycles. Housed in a cast aluminum container. External high frequency attenuator may be added for proper balance of low and high frequencies. Filter was designed primarily for use with high-frequency tweeters and is particularly efficient when used with University Tweeters, models 440B and 440C.

IT'S KINGS FOR CONNECTORS

Pictured here are some of the more widely used R. F. co-axial, U. H. F. and Pulse connectors. They are all Precision-made and Pressurized when required. Over 300 types available, most of them in stock.



Backed by the name **KINGS**—the leader in the manufacture of co-axial connectors.

Write for illustrated catalogs, Department "T"



Manufacturers of Radar, Whip, and Aircraft antennas
Microphone Plugs and Jacks

Radar Assemblies, Cable Assemblies, Microwave and
Special Electronic Equipment

PERSONALS

Albert E. Ketcher, Jr., is now manager of Raychem's mobile radiophone sales.

Harvey J. Klumb, of the Rochester Gas and Electric Company, received the annual award plaque of the Radio Fall Meeting, sponsored jointly by the engineering department of RMA and IRE, which was held at Syracuse this year.

Erig. General David Sarnoff, chairman of the board of RCA, was awarded recently a United Nations citation for his "notable cooperation in the development of public understanding of the work of the United Nations and for his contributions in the field of human rights through advocacy of concepts of Freedom to Listen and Freedom to Look as fundamental expressions of Freedom of Information." Presentation of the citation to General Sarnoff took place during a telecast from Carnegie Hall, New York, by NBC.

LITERATURE

The Mica Fabricators Association, 420 Lexington Ave., N. Y., has published a 16-page Handbook on Fabricated Natural Mica, with data on natural sheet and block mica.

Polytechnic Research and Development Company, Inc., 332 Tillary Street, Brooklyn 1, New York, have released a catalog describing an expanded line of microwave test equipment. Among the products described is a series of E/H tuners providing coverage of the 12.4 to 48 kmc band. These matching transformers consist of hybrid tee junctions in which movable choke-type shorts are placed in the shunt and series arms.

The Janette Manufacturing Company, 556 W. Monroe St., Chicago, Ill., have released a bulletin (No. 13-29) describing rotary converters for converting dc to ac.

MEASUREMENTS CORPORATION
Model 59

2.2 mc.
to
400 mc.



MEGACYCLE METER

Radio's newest, multi-purpose instrument consisting of a grid-dip oscillator connected to its power supply by a flexible cord.

Check these applications:

- For determining the resonant frequency of tuned circuits, antennas, transmission lines, by-pass condensers, chokes, coils
- For measuring capacitance, inductance, Q, mutual inductance.
- For preliminary tracking and alignment of receivers.
- As an auxiliary signal generator; modulated or unmodulated.
- For antenna tuning and transmitter neutralizing, power off.
- For locating parasitic circuits and spurious resonances.
- As a low sensitivity receiver for signal tracing.

TELEVISION INTERFERENCE

The Model 59 will enable you to make efficient traps and filters for the elimination of most TV interference.

Write for Special Data Sheet, 56TVI

SPECIFICATIONS:
Power Unit, 3 1/4" wide; 6 1/4" high, 7 5/8" deep.
Oscillator Unit, 3 1/4" diameter, 7" deep.

FREQUENCY:
2.2 mc. to 400 mc.; seven plug-in coils.

MODULATION:
CW or 120 cycles; or external.

POWER SUPPLY:
110-120 volts, 50-60 cycles; 20 watts.

MEASUREMENTS CORPORATION
BOONTON NEW JERSEY

Iron-Core Inter-stage-Output Transformers

Part III . . . Characteristics of Cores Selected for Transformers.

by I. F. DEISE and L. W. GREGORY

Westinghouse Electric Corp.

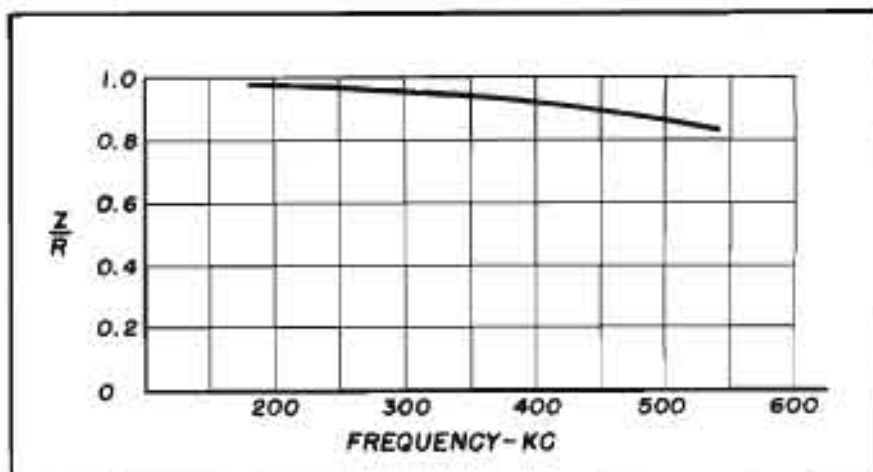
IN DEVELOPING the iron-core transformers for the *mf* transmitters, the core-loss problem was studied closely. Core loss generally determines the maximum operating flux density, and where an appreciable amount of power is to be handled, the core loss is usually limited by the permissible temperature rise in the transformer. The choice of core material is therefore of prime importance. The core material used must have low loss so that it can be operated at relatively high flux density. This low loss permits the use of few turns and small core size which makes it possible to meet the leakage inductance and distributed capacitance requirements. The core must also

have sufficient permeability to provide the open circuit inductance required to pass the lowest operating frequency. Cores that give the best results at power and audio frequencies will be found to have such high loss and low permeability at several hundred kilocycles that they are practically useless at these higher frequencies.

Output Transformer Design

The output transformer used in this transmitter was designed to provide an untuned output for the transmitter over the 250 to 540-kc range. The secondary supplies 3.2 kw into a 51.5-

Plot of the output transformer variation of impedance with frequency. With this impedance variation the plate current will be approximately 10% higher at 540 kc than at 200 kc for the same output, and thus the efficiency will be slightly lower at the high frequency.



BIRTCHEK STAINLESS STEEL - LOCKING TYPE TUBE CLAMPS

Stainless
Steel

Corrosion
Proof



83 VARIATIONS

Where vibration is a problem, Birtcher Locking TUBE CLAMPS offer a foolproof, practical solution. Recommended for all types of tubes and similar plug-in components.

More than three million of these clamps in use.

FREE CATALOG

Send for samples of Birtcher stainless steel tube clamps and our standard catalog listing tube base types, recommended clamp designs, and price list.

THE BIRTCHEK CORPORATION
5937 HUNTINGTON DR. LOS ANGELES 32

ohm load. With this secondary impedance the primary provides the proper load to the power amplifier tubes for class B, push-pull operation.

Core Characteristics

This transformer uses a core made of .002-inch thick *Hiperasil*, or grain oriented steel. This is a type C core, in which the thin steel strip is wound on a mandrel, impregnated with a bond, and cut in two to permit assembly with the coils. This thin gauge material has both higher permeability and lower losses than thicker gauge steel in the frequency range in which this transformer operates. Even with this thin gauge steel the core loss limits the flux density to very much lower values than are common practices at lower frequencies.

Winding Structure

To keep the primary to secondary leakage inductance as low as possible

this transformer is made as a core type with the secondary interleaved between two primary sections on each leg. Each primary is wound one-half as the inner winding on one coil and one-half as the outer winding on the other coil. As the two coils are identical in construction this causes each primary to have the same average mean turn and therefore the same leakage inductance with respect to the secondary.

Capacitance Problems

While the core-type construction with interleaved input and output windings produces the lowest leakage inductance it tends to produce high internal capacitance. The effect that any particular capacitance has on the circuit is dependent on the percentage of the total *rf* voltage that appears across the capacitance and varies as the square of this voltage. In the output transformer this principle is used to keep the total effective capacitance low by making the capacitance a minimum where the *rf* voltage difference is a maximum. The inner section of each primary is at low *rf* voltage and the spacing between this section and the secondary is made small, the spacing here being mainly determined by voltage insulation requirements. On the other hand, the outer section of the primary is at high *rf* potential with respect to the secondary, and the spacing between these winding sections is made much larger to decrease the effective capacitance. Increased spacing between windings of course means increased leakage inductance. A proper balance between leakage inductance and distributed capacitance in relation to the load impedance is necessary to obtain the best response and least variation in tube load impedance over the operating range of frequencies.

Application Possibilities

High-power, broad-band, *rf* transformers could be used in many applications to simplify tuning and save space. The limiting factor in the development of these transformers is the core. As core materials are improved to give lower losses without sacrificing permeability it appears likely that this type of transformer will be more widely used.

MORE CANNON PLUGS

FOR THE RADIO TECHNICIAN

TYPE DP

Rack & Panel type connectors with a variety of standard and coaxial contacts.



LABORATORY AND SWITCHBOARD

Connectors for experimental switchboards and testing equipment; 1 to 4 contacts; 75-amp.

TYPE AP

Seven different insert arrangements same as Type "P" 30 and 16-amp. rating, but with heavier shell, gasketed for weather resistance; coupling nut extraction means; cable clamp plug entries.



TYPE XK

Same inserts as Type "X" -1, 3 and 4 contacts; for No. 14 and 16 wire; coupling nut extraction means.

TYPE O

Latchlock sound-microphone series with oval shell; 3 contacts for No. 16 wire, 30 amperes.



AND 8 OTHER MAJOR TYPE SERIES—More than 400 radio parts distributors in the USA handle Cannon Plugs... twenty-six representatives located in principal cities are at your service. Or write direct to factory for new C-48 Condensed General Catalog, 32 pages of data and prices.

Cannon Electric also manufactures signal equipment for hospitals, industrial plants, schools, institutions, and many other electrical specialties such as conduit fittings, D. C. Solenoids, fire alarm relays, cable terminals, indicator and pilot lights, etc., etc.

Address Cannon Electric Development Co., Division of Cannon Manufacturing Corporation, 3209 Humboldt St., Los Angeles 31, Calif. Canadian office and plant: Toronto, Ontario. World export: Fraxer & Hansen, San Francisco.

1949
CANNON ELECTRIC

Last Minute Reports . . .

ONE OF industry's old oldtimers, Raymond F. Guy, whose brass pounding days date back to 1911, has been elected IRE proxy for 1950. Guy, who became a member of the staff of WJZ in 1921, is now manager of radio and allocation engineering for NBC. Sir Robert Watson-Watt, governing director of Sir Watson-Watt and Partners, Ltd., will serve as vice president of the Institute. . . . Herbert DuVal, Jr., formerly with General Electric and recently vice president of WPTR, Albany, New York, is now with Airborne Instruments Laboratory, Inc., Mineola, New York, as technical assistant to H. F. Skifter, president. . . . WHO, Des Moines, will soon install a Westinghouse 50-kw FM and AM transmitter. . . . WOAI-TV, San Antonio, Texas, and WBBF-TV, Binghamton, New York, have become members of the ABC-TV network. . . . The State Engineering Experiment Station of the Georgia Institute of Technology have published the proceedings of the recent broadcast engineering conference which was sponsored by the Institute, IRE and the Georgia Association of Broadcasters. The proceedings were edited and compiled by Professor M. A. Honnell. Fourteen papers are covered in the report. . . . The first annual Kansas City section IRE technical conference featuring papers on antennas attracted an audience of over three hundred at the Hotel President in Kansas City, Missouri. Fourteen papers were offered covering such topics as slot antennas, microwave antennas, airborne antennas, directional arrays, and fringe area receiving antennas, prepared by ye editor. . . . The RCA theatre equipment sales division has released a sixteen-page booklet covering theatre television. . . . The fourth annual spring technical conference of the IRE Cincinnati section will be held on April 29, 1950. . . . Ray A. Ruge is now chief engineer of Lear, Inc., Grand Rapids, Michigan. . . . Canadian Marconi Company of Montreal will represent DuMont exclusively in Canada in the sale of television broadcasting equipment. . . . KEYL, San Antonio, Texas, will soon install a Dumont TV transmitter. . . . R. T. Capodanno is now director of engineering at Emerson Radio and Phonograph Corp. . . . First of a series of papers covering design notes on the resistance-capacity oscillator circuit appears in the third issue of the *HP Journal* published by Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, Calif. . . . Audivox, Inc., has been formed to take over the activities of the Western Electric hearing-aid division. . . . Frank W. Taylor Co., 4508 East Genesee St., De Witt, N. Y., has been named to represent Cannon Electric Development Co. connector lines in Schedule A in the New York counties north of Ulster, Sullivan and Dutchess. . . . The airlines electronic and engineering committee of Aeronautical Radio, Inc., met recently at the Carlton Hotel, Washington, D. C., to discuss specifications for new equipment and components, particularly for *vhf* application. . . . Dr. Alexander Ellett has been named vice president in charge of research of Zenith Radio Corp. . . . A text entitled, *Fundamentals of Radio Valve Technique*, by Jan Deketh, has been published by the Phillips Technical Library of Eindhoven and is available from the Elsevier Publishing Co., 215 Fourth Avenue, New York 3.

Designed for



Application



The No. 69040 Series of PERMEABILITY TUNED CERAMIC FORMS

In addition to the popular shielded plug-in permeability tuned forms, 74000 series, the 69040 series of ceramic permeability tuned unshielded forms are available as standard stock items. Winding diameters and lengths of winding space are $\frac{1}{8}$ x $2\frac{1}{2}$ x $\frac{3}{8}$ and $\frac{1}{2}$ x $1\frac{1}{2}$ for the 69041, 69043 and 69045 respectively. Nos. 69043 and 69046 have powdered iron slug while Nos. 69041 and 69045 have copper slug.

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INSURE Proven Quality with JONES PLUGS & SOCKETS



P-306-CCT — Plug
Cable Clamp in cap.

S-306-AB — Socket
with Angle Brackets.

Series 300 Small Plugs & Sockets for 1001 Uses

Made in 2 to 33 contacts for 45 volts, 5 amps, for cap or panel mounting. Higher ratings where circuits permit. All plugs and sockets polarized. Knife switch socket contacts phosphor bronze, cadmium plated. Engage both sides of flat plug—double contact area. Bar type plug contacts hard brass cadmium plated. Body molded bakelite.

Get full details in Catalog 17. Complete Jones line of Electrical Connecting Devices, Plugs, Sockets, Terminal Strips. Write today.

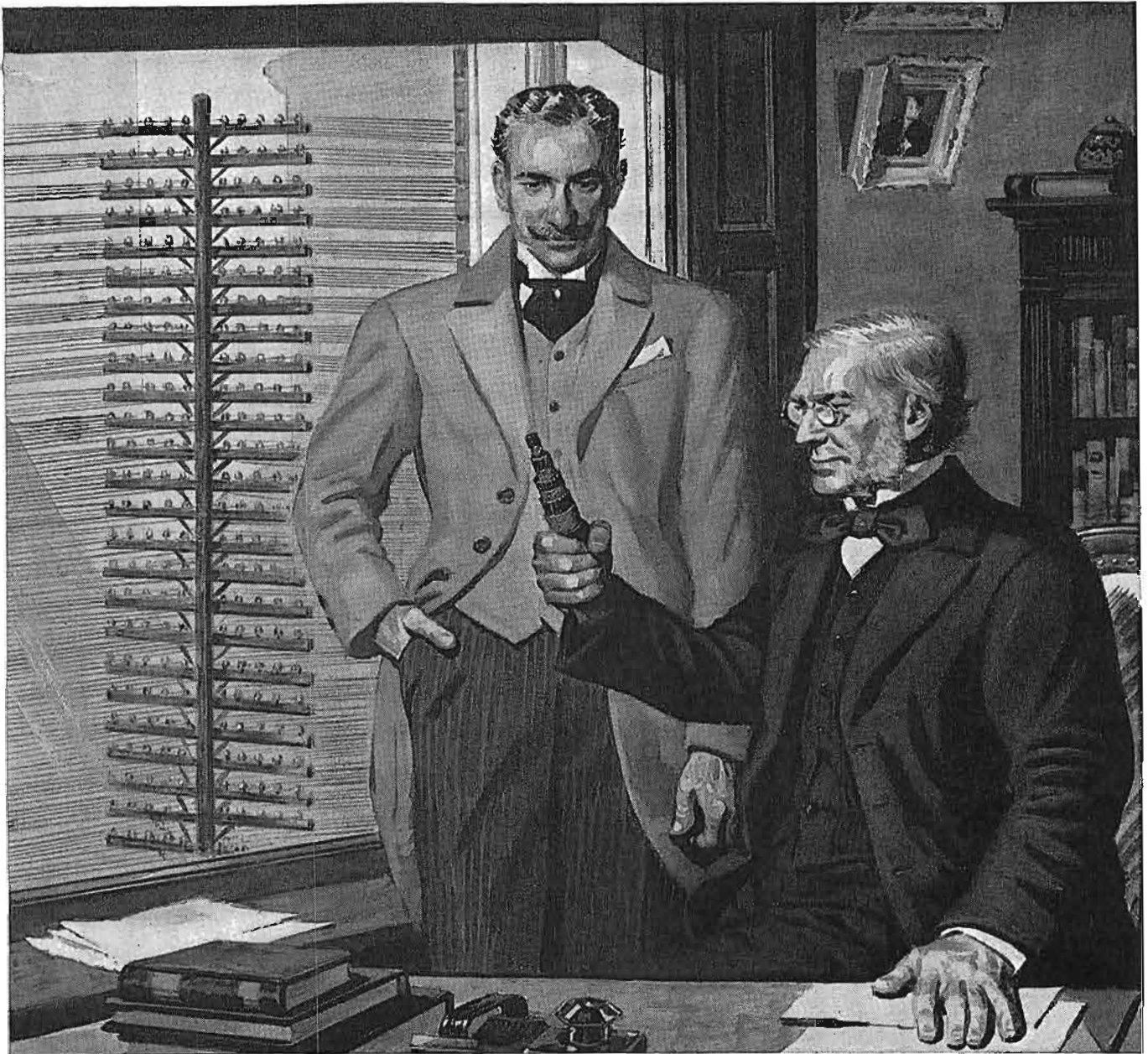


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They Packed a Pole Line Into a Pipe

Back in the eighties, telephone executives faced a dilemma. The public demanded more telephone service. But too often, overloaded telephone poles just couldn't carry the extra wires needed, and in cities there was no room for extra poles. Could wires be packed away in cables underground?

Yes, but in those days wires in cables were only fair conductors of voice vibrations, good only for very short distances. Gradually cables were improved; soon every city call could travel

underground; by the early 1900's even cities far apart could be linked by cable.

Then Bell scientists went on to devise ways to get more service out of the wires. They evolved carrier systems which transmit 3, 12, or even 15 voices over a pair of long distance wires. A coaxial cable can carry 1800 conversations or six television pictures. This is another product of the centralized research that means still better service for you in the future.



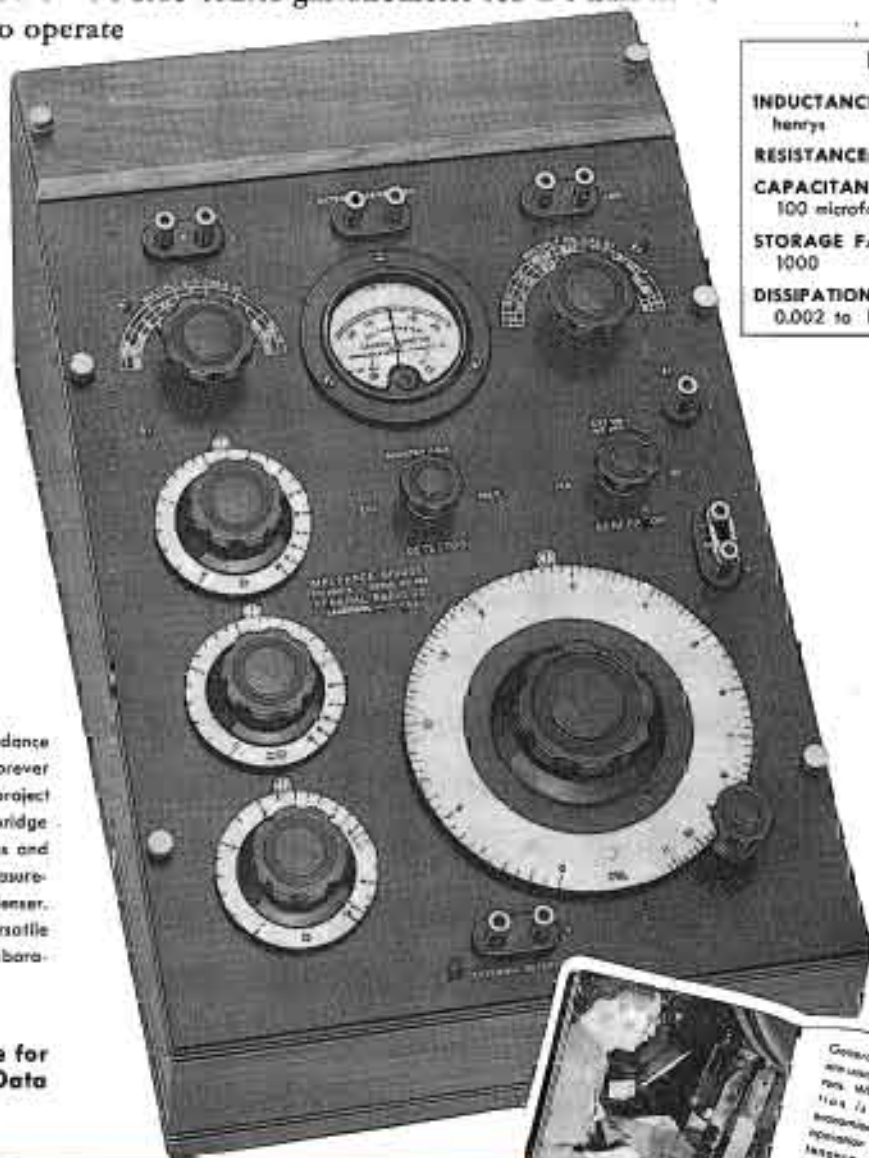
BELL TELEPHONE LABORATORIES EXPLORING AND INVENTING,
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Here's the handiest piece of equipment for any laboratory where electrical components are used.

- It is completely self-contained except for headset for a-c measurements
- It measures the basic quantities of Inductance — Resistance — Capacitance — over very wide ranges
- Its accuracy is high enough for most routine measurements of these quantities
- It has built-in standards
- It contains both d-c and a-c power sources
- It has a panel-mounted d-c zero-center galvanometer for d-c null indication
- It is very simple to operate



RANGES	
INDUCTANCE:	1 microhenry to 100 henrys
RESISTANCE:	1 milliohm to 1 megohm
CAPACITANCE:	1 micromicrofarad to 100 microfarads
STORAGE FACTOR (X/R):	0.02 to 1000
DISSIPATION FACTOR (R/X):	0.002 to 1

With the G-R Type 650-A Impedance Bridge you have for once and forever abolished the time-consuming project of assembling a makeshift bridge from an oscillator, detector, arms and power source for routine measurements of an unknown coil or condenser. That's why thousands of these versatile instruments are daily in use in laboratories throughout the world.

**TYPE 650-A
IMPEDANCE
BRIDGE:
\$240.00**

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Complete Data



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