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SUBSTITUTION BOXES
HOW ERIE UPPED SALES
FM DISCRIMINATOR CIRCUIT
VEE-d-x TELEVISION ANTENNA
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RADIO SERVICE DEALER • SEPTEMBER, 1947
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EDITORIAL

Dick Tracy Sets

Comic strip addicts know the inimitable Dick Tracy has for many months used a two-way receiver-transmitter radio of wrist-watch size. Recently Dick started to use a camera the size of a finger ring. Will he soon have a radio that tiny?

We mention this because several set manufacturers plan production of home model radios smaller than any made prewar, and some of them are tiny enough. A trend towards smaller receivers for home use is unjustified. Such sets afford interior performance; sell at prices that provide profits too low for all concerned; and worst of all, place a severe burden upon the very people who are ultimately called upon to repair them. Customers feel that service fees should be low in proportion to the original cost price of their set. The time spent in servicing tiny sets is more difficult and time-consuming than comparable work on large sets.

We favor portable radios, particularly tiny personal battery-operated types. All families should own several of them. But, for home use, we say, make radios big and fine. The finer the better! By the way, we hear a leading set-maker will soon announce a portable radio-camera combination. Pugs Mr. Tracy!

“Ham” Set Servicing

John F. Rider, manual publisher, asked in his May house organ the interesting question, “Can the serviceman serve the Ham?” – repairing amateur receivers—and then, in practical manner, he shows how a skillful, well-equipped radio-shop is supposed to render and thus they often unintentionally do an inferior repair job and earn the disrespect of “hams”.

Appreciating the “ham” market as being a fine potential source of income for Service Dealers, we checked with several leading amateur equipment manufacturers. All opine that as a rule servicemen fail to do satisfactory repair job because they work on a communications receiver in the same manner as they would an ordinary home set. The correct servicing a communications receiver is this: tune it, align it, and make it function exactly the way it did when it left the factory. The work must be done to manufacturer’s standards, not to ordrainy service shop standards. “Ham” receivers are made to exacting standards and must be worked on as such.

Profits can be made from servicing “ham” equipment. Service Dealers in parts of the country where “ham” gear is not made and where no factory service branch is adjacent should take the necessary specialized training courses required and then the should set up their own factory service branch for leading types of “ham” sets. Manufacturers favor the idea and “hams” would undoubtedly respond favorably too.

S. R. COWAN, Publisher

SANFORD R. COWAN
Editor & Publisher

SEPTEMBER, 1947

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COWAN PUBLISHING CORP.
Arcturus Plans Telesets

Television receivers that embody departures from present constructions and styles in the popular-priced fields are now in the process of completion by Arcturus Radio & Television Corporation, a newly-formed associate company of Standard Arcturus Corporation of Newark, N. J. The offices and plant of the new company will be located at 19 Newbitt Street, Newark, N. J.

James R. Donahue, formerly sales manager of Standard Arcturus, has been elected president of Arcturus Radio & Television Corporation. Mr. John V. Rice, formerly associated with National Union Radio Corporation, sales manager of the Tube Division of Standard Arcturus, is formulating plans for an extensive program of jobber promotion of the Arcturus line.

New G-E Displays Rooms

General Electric Company, which moved its Chicago offices recently into the Merchandise Mart, plans one of the most complete radio display rooms in the country for its full line of radios and television receivers, according to Fred A. Parvill, advertising and sales promotion manager of the Receiver Division.

Service Notes Issued

Service Notes covering the first of the new line of Stromberg-Carlson home radio receivers are being mailed to radio dealers from coast to coast, according to F. Leo Granger, radio service manager of the 53-year-old communications firm. Included in the mailing is a copy of the new Stromberg-Carlson "broad-warranty" Radio Service Policy and a set of Service Notes covering the company's new model 1101 series.

The new service notes embody a number of "first" features which make the serviceman's job easier and simpler. These "first" features include: gain-per-stage measurements, complete trimmer chart, voltages at tube terminals, and color schematic drawings to enable servicemen to trace and locate trouble in receiver circuits. Mr. Granger said that service notes covering other models are in preparation.

Concord Issues New Supplement

Keeping pace with the rapid changes and new developments in the radio, electronics and sound equipment field, Concord Radio Corporation, of Chicago and Atlanta announces the issue of a new, up-to-the-minute catalog supplement, featuring new 1947 prices on Radio Sets, Parts, Electronic Equipment, Record Players, Changers, Sound Equipment, Ham Gear, Test Equipment, etc.

Of special interest is the sound equipment section which offers a complete selection of sound equipment needs from accessories to complete sound systems for any size installation. A free copy of the new Concord Catalog supplement may be obtained by writing the Concord Radio Corporation at 501 West Jackson Blvd., Chicago 7, Illinois or 265 Peachtree Street, Atlanta 3, Georgia.

Westinghouse Price Policy

The Westinghouse Electric Corporation announced that while some lines of apparatus will require some price increase due to recent wage increases, no price advance on home appliances is contemplated at this time.

Coin Operated Sets

Hoffman Radio Corp., Los Angeles, is now providing some B-309 AC-DC table model receivers with a coin operated device for use in hotels, motels, public places and other rental units.

The device may be locked, is tamper proof, allows continuous or intermittent playing, includes a rejection slot for slugs and defective coins and takes four coins at a time.

Kits For Radio Education

Radio receiver construction kits for radio education applications in schools and colleges have been made available by the Specialty Division of General Electric Company's Electronics Department. Designed to illustrate all the principles involved in modern radio receiver construction, the new kits are similar to the type used extensively in the radio and electronic training courses conducted during the
The great feature thousands are asking for...

Strobo-Sonic Tone

—only Stewart-Warner has it!

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Stewart-Warner

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Men of vision choose . . . THE VEE-D-X!
MEASURE THESE IMPORTANT FEATURES
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Distributors’ Territories Still Open—Write to
LA POINTE-PLASCOMOLD CORP.
Unionville, Conn.

war by the Army and Navy.
The radio kits include all the parts necessary to build a complete 5-tube superheterodyne receiver, a punched chassis, tubes, loop antenna, five-inch loudspeaker and specially-written instructions and diagrams. Students may perform many instructive experiments such as studies of rectifiers, filters, amplifiers, oscillators, etc., according to E. C. Hovey, head of the division’s educational section.

Further information on the newly-available radio receiver construction kits may be obtained by writing the educational section, G-E Electronics Department, Wolf Street Plant, Syracuse, N. Y.

Guarantees 1947 Prices
Emerson Radio and Phonograph distributors have been informed that existing prices on Emerson radios were guaranteed for the remainder of the year by Mr. Benjamin Abrams, president. The guarantee covers inventory purchased between the dates of April 15, 1947 and December 31, 1947.

Belt Sales
Mr. Julius Finkel, president of the JFD Manufacturing Company of Brooklyn, New York, disclosed that over 2,500,000 JFD radio dial belts were sold during the past year. He attributed this outstanding record to the increased popularity of the line and to the JFD jobber’s display stands and wall racks of belts which the firm has been distributing to the trade.

Radio Prices Are Lower
Average retail price per set has declined from $55.70 in 1936 to $54.52 in 1946.

Last year the average retail price of a home radio was less than it was ten years ago, according to Frank W. Mansfield, director of sales research for Sylvania Electric Products Inc. During the same period, he said, the average weekly wages of factory workers have more than doubled so that while 2.56 weeks earnings were required for a radio in 1936, only 1.25 weeks were required last year.

In 1936 the average retail price of a radio was $55.70. In 1946 the price of radios declined to $54.52. Low point in average retail price of sets was $29.70 in 1940 when 1.18 weeks wages were required for set purchase.

RCA Appoints Shaffer
Kenneth B. Shaffer, formerly renewal sales field representative for the RCA Tube Department in Cincinnati, has been transferred to the Har-
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Send ... PHORFACT Volume No. 2 (including Sets Nos. 11 through 20) in DeLuxe Binder, $10.29.

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CHARACTERISTICS AND SPECIAL FEATURES

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A new push-pull deflection circuit provides clearer patterns, less distortion and more gain.
Observation of a wider variety of phenomena is made possible by the addition of a Z axis input for intensity modulation. This feature is useful in studying pulses and portions of cycles, and leads to many applications in industry.
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DIRECT: Vertical 15 volts rms per inch peak to peak deflection.
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Input Impedance
AMPLIFIERS: Vertical .5 megohm; 26 mmfd.
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DIRECT: Vertical and Horizontal 3.9 megohms; 20 mmfd.
INTENSITY MODULATION: .5 megohm; 30 mmfd.

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See your RCA distributor today about these quality speakers—and also learn how you can make extra profits from RCA Television Parts and Accessories and the RCA Magic Tone Cell Phonograph Modernization Kits.

Other Members of RCA's Growing Family of Standard Parts and Accessories

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.
Many radio service dealers have reported lately that sets come in for repairs with resistors so badly burned that the color coding is completely obscured. They also report occasionally finding damaged capacitors which either are not coded or labeled at all, or else seem to have a "private" coloring marking or manufacturer's type number that is so much Greek to the trouble shooter. If the exact circuit diagram in which all components are labeled with their exact electrical values is not available; the problem is doubly vexing, because the service dealer then must draw upon a reserve of circuit design knowledge (which he possibly may not possess) or else he must resort to costly, inefficient cutting and trying until he hits the right values of components. Unfortunately, some of the new receivers have posed this type of problem.

When complete circuit data is not at hand, the only rapid way to determine the value of a component needed is to apply an adjustable, clip-in substitution unit which may be varied quickly to the value which will give best results. For example: A cathode resistor of unknown value has burned open. A continuously variable resistance-substitution unit is clipped to the terminals formerly connected to the cathode resistor. The substitution unit then is varied until the proper value of cathode voltage is developed. The required resistance value then is read from the dial of the substitution unit, and a fixed resistor of this value (or the nearest commercial value) is soldered in place in the circuit. The same procedure may be followed with a calibrated capacitor substitution unit.

Both capacitance and resistance substitution units may be clipped quickly into a receiver circuit and may be adjusted just as rapidly. Thus, they are indispensable in one of the most puzzling varieties of trouble shooting. Substitution units may be made direct reading (in ohms or microhms) so as to eliminate all unprofitable guessing, estimating, guessing, and fumbling. The author has, on other occasions, pointed out the efficiency of these units for rapid trouble shooting by bridging burned-out component.

Factory-made substitution boxes are not easily obtainable at this time. Consequently, the service dealer either must build his own (a simple job, if he has the time) or he must have them built by some other technician. However obtained, these units are well worth the investment and will take their place at once with other important capital equipment in the shop or laboratory.

Because most technicians will have to construct their own substitution boxes, we are presenting in this article complete technical data concerning both capacitance and resist-

---

**Figure 1. Low-powered resistance substitution box**
ance units. The electrical values chosen are the result of a complete study of the situation, and will be applicable to the wide range of conditions arising in trouble shooting.

Resistance Substitution Boxes

Early resistor substitution boxes employed rheostats or potentiometers fitted with dials graduated directly in ohms. A calibrated variable resistor of this type provide a smooth, stepless variation of resistance. A very real drawback of this device, however, is the fact that fraction of the resistance winding, corresponding to the various lower-resistance settings, are not able to handle as much wattage as the full winding. The operator of the calibrated rheostat accordingly must continually be on the alert when using the lower-resistance settings, to prevent burning out the instrument. Even the high-wattage rheostats are limited in their application.

The author has found it much better to employ the decade box scheme. In this well-known arrangement, separate resistors of the same value are used in conjunction with an 11-point switch. Several such decades may be connected in series in one box to cover accurately a wide resistance range in small steps that rival the action of a rheostat. The resistors usually are all of the same wattage. 1- or 2-watt units are employed in a low-powered box (used to substitute for voltage divider sections, etc., in which the currents will be large).

Descriptions of practical resistor substitution boxes follow:

Low-Powered Box.

The circuit schematic for this unit is given in Figure 1. A single-pole, 11-position, non-shorting rotary selector switch and ten 2-watt resistors of the same value comprise each decade. Decades are provided for megohms, hundred thousands, ten thousands, thousands, hundred, and units of ohms. The power handling capability of this box varies from 2 watts for any single resistor to 70 watts for all six decades in series.

The low-powered box covers resistance values from 1 ohm to 11,111,110 ohms in steps as low as 1 ohm each—a range of over 11 million to 1. The resistance setting is read directly from the settings of the various decade switches. Thus; the switch positions in Figure 1 are 2 megohms, 7 hundred thousands, 5 ten thousands, 3 thousands, 0 hundred, and 3 units—or 2,753,093 ohms.

The low-powered substitution box will function in lieu of all cathode plate, screen, grid, and similar resistors in r-f amplifier, oscillator, i-f amplifier, detector, discriminator, AVC, AFC, and low-powered audio circuits. It may be used also to determine the proper resistance for volume controls, tone controls, and similar rheostats and potentiometers, and to determine resistance values in such experimental circuits as multivibrators, photocell devices, and test instruments.

Electrostatic shielding is not necessary in the low-powered resistance substitution box. Any instrument case the builder has available will suffice to house this unit. Wiring between switches must be made with heavy bus bar. Resistors are soldered directly to switch contacts, as indicated in Figure 1.

The resistors should be selected with reasonable care. Naturally, the accuracy of the substitution box will be enhanced by close tolerance of the individual resistors.

The input terminals of the substitution box should be connected by the shortest possible leads to the appropriate points in the circuit under test. Heavy, flexible, insulated wire should be used. It is desirable to provide the best power-handling combination, resistance values should, whenever possible, be selected with the box in such a way that as many decade resistors as possible are included in series with the input terminals. For example, instead of selecting 100 ohms with the HUNDREDS decade in its no. 1 position, set the TENS decade to its no. 10 position. This latter setting gives the same 100 ohms, but with ten 2-watt resistors in series.

High-Powered Box.

The low-powered box will, in general, not be satisfactory for high-current substitutions, such as in power supply voltage dividers, output amplifier cathode bias circuits, and similar positions where the power-handling capability must be comparatively large.

A second resistance substitution box is recommended for higher-powered applications, and is illustrated by Figure 2. Since power resistors in

Figure 2. High-powered resistance substitution box
in the capacitance boxes, in order to minimize stray circuit capacitance and to take full advantage of the individual accuracy of the component capacitors. For the same reasons, it is mandatory that lead wires from the input terminals of the substitution box to the circuit under test be not only as short as possible but also rigid. All wiring inside the box must be done with heavy bus bar.

As with resistance boxes, the capacitance substitution box is read directly from the dial setting of the decade switches. For example; the switches in Figure 3 are set at four 0.1's (0.4), six 0.01's (0.06), seven 0.001's (0.007), and three 0.0001's (0.00003)—or a total of 0.4673 ufd.

**High-Capacitance Substitution Box**

Beyond about 1 microfarad, capacitor decade boxes become rather bulky in size. For this reason, a separate capacitance substitution box is recommended for capacitances in the large-size by-pass and filter categories. The circuit schematic for a box of this type is shown in Figure 4.

The electrical arrangement of this box is somewhat different from that of the low-capacitance unit. Here, for example, each capacitor is connected to a toggle switch. If only one switch is closed, its companion capacitor is the only one that is in the circuit. When two or more switches are closed, however, all of the capacitors associated with these particular switches are connected in parallel by that operation, and the total capacitance in the circuit is the sum of the individual capacitances that have been switched-in. For example: if switches 1, 7, 8, and 13 in Figure 4 are closed, the total capacitance is 1+1+1+40 ufd.—or 43 microfarads.

The substitution box covers the capacitance range from 1 ufd to 159 ufd, in steps as small as 1 ufd each.

Since electrolytic capacitors are employed in the 10-, 20-, 30-, 40-, and 50-ufd. positions, it is imperative that the input terminal connected to the positive terminals of these capacitors be plainly labeled + or positive, as shown in Figure 4.

The operator of the high-capacitance substitution box must be careful to observe the working voltages of the capacitors switched into the circuit. The 1-microfarad units (C1 to C0) will operate safely at 600 volts d. c., while three of the electrolytics (C6, C7, and C8) are rated at 450 volts, one of the remaining ones (C9) at 250 volts, and the last (C10) at 50 volts. The dial plate of the switches may be marked with these voltages, as a guarantee of indication.
How Erie Upped Sales

by WALTER RUDOLPH

Erie Radio, always a pace-setter in the merchandising of radios and appliances in Erie, Pa., recently opened the eyes of folks in their community by adding two definite merchandising aids, and all of which are paying off.

"Perhaps the most outstanding innovation to our business," commented Donald M. Rosenthal, owner-manager of the store, "has been the construction of what we believe to be the largest single show window area in the city, measuring about 300 square feet and powerfully lighted at night.

"Another improvement in our overall merchandising plan has been the adaption of a concertine, far-reaching advertising schedule which is efficient and time-saving, while being comparatively easy on the budget.

Taken in order, the first change was a "national" that was planned some months ago when the terrific post-war sales possibilities in the radio and appliance field were sensed. This change is simple in concept, but curtailment of building supplies, electrical fixtures, etc. was a big handicap to putting the idea into operation.

It consisted in raising "the floor", as it were, immediately in front of the plate show windows which bound the Erie Radio sales room on its corner location at one of the city's busiest downtown intersections. This elevation to knee-height makes scores of appliances and radios on display visible from cars passing on the street as well as bringing these products closer to the eyes of sidewalk passersby.

"Then, in cooperation with the local Pennsylvania Electric Co. office, we planned to make this window stand out at night, gleamingly attractive and a merchandising aid while the store was closed," stated Harold Alfran, general service manager at Erie Radio. "And it might come as a revelation to those who hesitate to add more light because of increased overhead, that the powerful lighting which we now have costs us three dollars first per month than we formerly paid.

"That's a fact—the bill for the first month after the installation of the new lighting units over our revamped show windows was $3.10 below the preceding month," he continued. "Of course, our original installation cost of about $500, including a third more new lighting units installed elsewhere than in the windows, is a sizeable item, but we figure that the numerous comments and compliments we have received on the show windows at night indicate that our radio and appliance sales will go zooming when we have the merchandise to display and sell. Already we have realized a quickening in sales of what we have."

Installation was done by Erie Radio personnel during working hours and during a few evenings, taking three days altogether. Aside from slight angles and cutting in around the dimensions of the window area as it now is laid out, the new flooring for actual window display measures about 10X28' and by the time this is read will be covered with custom-laid battleship linoleum, with a dark border and an attractive design through its middle.

The lighting units themselves, along the top edges of the large areas of plate glass (but hidden from street view by darkened areas of glass,) consist of 19 Sylvania commercial fluorescent fixtures containing two 40-watt tubes each. The $500 installation cost given above included conduits, wire, clamps and labor, besides the lighting units.

Advertising Plays A Part

The advertising program at Erie Radio, heretofore rather on the catch-as-catch-can side, has been streamlined into a single, carefully drawn-up black booklet which contains copy and rates for daily advertising, week after week, in systematic order. This schedule in booklet form can be turned over to the newspaper wherein the advertising is to be carried, and the advertiser can practically forget about advertising, as such.

Compiled by the Modern Publicity Co.
New York, this form of advertising eliminates the periodical “pester ing” by local advertising salesmen, as the program for months ahead is already planned and awaiting chronological execution.

“Our particular advertising needs are served,” explained Allamon, “because the form we have chosen gives us a few square inches of promotion, hammering day after day, within a set symbol or physical outline. This symbol is an eight-pointed star, so to speak—two squares, one superimposed upon the other, —with our firm name beneath, and this will be in practically the same spot in the daily newspaper, day after day.

“We believe readers will come to recognize this symbol, and sort of look forward to the change of message it will bring. For although the symbol remains the same, the message will read differently from week to week, $2 changes in all.

“These messages run something like: ‘We can make your radio sing,’ or, ‘Complete appliance servicing, and economy, too.’ They are designed to be glanced at and swallowed at one bite, or without any great study, and they keep our name in the mental foreground of the appliance and radio users and buyers.”

Looking toward the future, toward the bonanza of radio and appliance sales that is sure to come to the merchant who is ready and prepared for attracting and holding customers, Erie Radio has in the blueprint stage plans for one of the most modernistic stores in the city. Departmentalization, a wealth of lighting, acoustical background under a false ceiling down one side of the large sales floor where floor model radios will be aptly demonstrated, and other features are forthcoming.

AN OLD BUS became a successful SERVICE SHOP

by STEPHEN PORTER LATHROP

When James E. Wright, owner of the Wright Electric Co. of Decatur, Ala., had to seek a new location for his radio repair shop he found that none was available in that city. He spent six months looking over the city, investigating locations, but without results. Finally one day he was down at the city bus line garage and saw, off to one side, a discarded city bus with the wheels removed. He inquired about it and found that it could be purchased reasonably. He bought it.

The owner of a filling station on one of the side business streets of the city and only one block from the main business street gave Mr. Wright permission to park the discarded city bus on one side of the filling station in a spot where it would not be in the way. The bus was then hauled to this spot and set up. Mr. Wright painted it and fixed up the inside as a repair shop with handy work benches. A telephone was installed and electric light connected. An outside antenna was put up to aid in testing radios after they were serviced.

In the place where the name of the bus line is generally found, Mr. Wright put up a sign with the name of his firm. And in the two head lights, small signs were placed advertising the business. The light behind each of these signs was connected with blinkers so that when one light was on the other was off which proved attractive eye-catching advertising at night.

A 30,000 watt space heater was installed, connected with a thermostat which was kept on all winter and it kept the place warm.

The novelty of the whole thing has paid off. In fact what began as a makeshift has proven so satisfactory that Mr. Wright had given up all ideas of looking for another location even when they become available.
A Television Antenna System

ONE of today's major problems, for tenant and landlord alike, is that of providing satisfactory television reception in large apartment houses. Some apartment complexes consist of three or more units, each unit housing from 50 to 150 or more families.

The problem that exists begins to unfold itself in its proper magnitude when we consider installing the antennas for a dwelling consisting of from 50 to 150 living units, such a building being made up of 3 or 4 building units. To be sure, each and every apartment in each unit may not plan on having a television receiver, but there is no known formula for determining how many will, and which apartments they will be. However, considering any reasonable distribution of television receivers during the next few years, even if only 50% of the tenants of any large apartment building install television receivers, the resultant antenna situation is, to say the least, a "mare's nest".

Not only from the standpoint of building disfigurement is this situation bad, but also from the standpoint of satisfactory reception for even a small portion of those installing receivers. First, there are usually not over one or two "choice" antenna locations on an apartment roof. If these are "grabbed off" by the installation men making the first installations in the block, as they naturally would be, later purchasers have to be satisfied with less desirable antenna locations with the resultant poorer and poorer reception as each less desirable location is utilized. Also as more new antennas are erected considerable interference with existing installations may result. Secondly, the indiscriminate location of antenna after antenna within the restricted area of the block is bound to result in the partial absorption or reflection of signals from those antennas which were originally located in the "choice" spots; and still more annoying may result in the creation of "images" or "ghosts" due to the various reflections involved. Such "ghosts" are difficult enough to eliminate in many locations where "home-off" from nearby buildings and objects occurs because of their peculiar location and proximity, without adding to the problem by the addition of some 50 or 150 other ob-jects (antennas being resonant devices make excellent reflectors) to further complicate the problem. Thirdly, there is the problem of lead-in cables. This in itself may seem small, but when the total number of lead-in cables is considered and the mechanical phases of their installation are taken into consideration it is not difficult to conjure in the mind what a complex jargon of wiring would result. Also with such indiscriminate routing of lead-in cables, resulting from each installation man's endeavor to give his customer the best possible reception, there is bound to be considerable damage to existing installations and also to the building itself.

Therefore, with the foregoing factors, disadvantages and what-have-you in mind it would appear that an antenna system that would eliminate a majority of these undesirable features, would be welcomed with open arms by set owner and building owner alike. A description of such a system, "one of the things to come", is presented herewith.

This system consists of five major elements as follows:

1. Antennas—(note the plural)—a separate antenna, properly located and oriented for each television channel.
2. An individual band pass amplifier for each antenna.
3. A mixing system for combining the outputs of the above mentioned amplifiers and placing their outputs (combined) on to a distribution system.
4. A distribution system covering every apartment in the block and terminating in each apartment in such a fashion that any receiver may be connected to the distribution system through a matching network.
5. A matching network, so designed that the input impedance of any receiver is accurately matched to the distribution system. This matching network also to provide adequate isolation between receivers to prevent radiation from local oscillators (through the system) from interfering with reception on another receiver. A block diagram encompassing all of these elements appears in Figure 1.

With the five elements of the system identified, let's have a more or less detailed description of each.

Antennas

Inasmuch as we are going to have one and only one antenna for each television channel on the roof, it stands to reason that this antenna should be of the best construction possible and located and oriented for the best possible reception on the channel for which it was designed. Two types of construction lend themselves readily to roof mounting, the dipole and the folded dipole. Inasmuch as the efficiency of each is nearly the same, the greater mechanical rigidity obtainable from a folded dipole makes it a heavy favorite. The folded dipole itself should be constructed of tubing, not less than 3/4" and preferably 3/4" in diameter and rigidly mounted on a rugged metal upright with a clear line of sight to the transmitter location. This is, however, not always possible and, in any event, the criterion is, that location and orientation

A practical idea that may be the answer to one of Television's biggest problems

by ALBERT H. CARR

Figure 1—Basic System
for Multiple Unit Dwellings

which gives maximum signal from the particular station for which it was designed, free from “ghosts”, “images”, etc.

A suitable matching device to match the balanced 300-ohm dipole to an unbalanced 52-ohm concentric cable must be provided. This may take the form of a matching transformer, a “bazooka” or any one of a number of similar devices. One antenna suitably located for each channel is led through its individual lead-in cable to a central point on the floor below the roof where the cabinet containing the amplifier units may be suitably located. Inasmuch as the FM broadcast band is located adjacent to the high frequency television channel and considering that most television receivers provide for FM reception, it is considered advisable to use an antenna and broad band amplifier tuned to cover the FM band and also pass this through the common distribution system, obviating the necessity of another separate FM antenna for each tenant. At the present time in New York with three television stations operating on regular schedules this will indicate a total of four antennas.

Amplifiers

The amplifiers are wide band devices with high gain and remarkable stability. The gain of each is individually controllable so that the amount of signal from channel #1 may appear on the distribution system in the same magnitude as that from channel #4 or #5, etc., thus assuring within reasonable limits the same satisfactory reception on all channels. A schematic of an individual stage of one of these amplifiers appears in Figure 2. A maximum gain of 60 db per amplifier is considered sufficient to insure proper distribution level and although in the metropolitan area it is seldom that this amount of gain will be required, it is available for those locations in which the strength of an incoming signal is of very low intensity. This amount of gain is easily obtained in an amplifier employing seven stages such as are illustrated in Figure 2 in cascade.

The band pass characteristic of the amplifiers should be within less than 1/2 db over a 6 mc channel width. This is readily obtainable through suitable i-f transformer design and proper choice of plate loading. The response at the extremes of 10 mc bandwidth should be at least 30 db down. This figure apparently gives sufficient attenuation to prevent cross modulation or other interference from adjacent channels. Inasmuch as it is desirable to maintain constant values of all signals at all times, a well regulated power supply is a must if changes in line voltage are not to affect the proper operation of the amplifiers. Design considerations of the amplifiers include careful selection of the value of components used in the input circuit in order that the various values of bias applied to the input stage do not change its input impedance sufficiently to cause improper termination of the transmission line. Such a mismatch invariably results in a high standing wave ratio and manifests itself in the form of ghosts in the presentation.

Unified Distribution Feeder

One of the main objectives of the system being the elimination of a number of cables running hither and yon, it is mandatory that all signals be fed to each receiver location by means of a single cable if this objective is to be realized. This is accomplished by means of a mixing and matching network system whereby the output of each amplifier is fed into a suitable network which presents the proper load to each amplifier and in turn imposes its output onto a 52-ohm cable in common with the output of the other amplifiers for distribution. It is also a function of this network to provide sufficient isolation between the outputs of the various amplifiers to prevent any interaction and, or cross modulation between them. The values of L, C and R in this network are critical and are to a large extent dependent upon the value of load chosen for the last stage in each amplifier.

The distribution system is simplicity itself, consisting merely of standard 52-ohm cable going progressively from one outlet to another in a continuous string. (As to how many outlets this may be has not yet been accurately determined, but the best available estimate is that from 50 to 100 outlets may be used from a single group of amplifiers). In practice it would appear desirable to so plan an installation that each feeder would take the form of a vertical riser serving apartments located one above the other and possibly serving two apartments on the same floor if their locations were such that very short horizontal runs could be obtained. The wisdom of this method becomes obvious when one considers the difference in cost in running all outlets from a single vertical riser as compared to lengthy, expensive horizontal runs. It also insures much more uniform and accurate impedance matching between the distribution system and the individual loads.

Shielding

The termination of the distribution system at each outlet is in such form that some 30 db of attenuation is introduced between the distribution system and each receiver. This attenuation, which is fixed, accomplishes two things: First—it brings the signal level down to a proper value to feed the receiver without danger of overloading the input circuits and; Second—by providing 30 db of attenuation between cable and receiver, effectively provides 60 db of attenuation between any two receivers insuring as transmission of any radiation from one receiver to another is concerned. The advantage of transmitting as high a value of signal voltage on the distribution line is obvious. (see page 39)

Figure 2—Typical Amplifier Stage

Figure 3—Terminal Connections
**Circuit Court**

**Magnavox CR-198 Series**

This 10 tube receiver employs a special type of i-f transformer between the 6SA7 mixer and the first i-f tube, a 6SK7. The purpose is to provide adequate selectivity for short wave and distant reception, and make available expanded band-pass for local high-quality stations.

Partial circuit of Magnavox CR-198

The result is accomplished by an additional winding on the i-f transformer. In the sharp position it will be found the usual tuned primary and secondary. These coils will have a degree of coupling which provides reasonable bandwidth, say out to 5,000 cycles.

In the broad position the additional winding is connected in series with the secondary, but coupled to the primary. In this way the circuits are overcoupled and serve to pass a much wider range of audio frequencies. The switch S. is mechanically coupled to the high frequency tone control. When this control reaches the end of its usual range it operates the switch and the high-frequency condition results.

Another feature of the i-f stage is the dual cathode bias resistors. On the broadcast band, where maximum sensitivity is not needed, the total value is 2670 ohms. In the short-wave, the 2200-ohm section is shunted by a section of the range switch. Maximum power is then available for reception of weak signals. This switch is indicated by S. in the partial schematic.

**RCA 6BR Series**

An interesting method of switching from FM on the new band to Standard Broadcast is employed in the RCA 6BR instruments. A partial diagram showing the pertinent circuits is illustrated.

A 6BE6 miniature pentagrid converter tube is used in each stage. In the case of the FM mixer, a tuned-grid coil is fed a signal from the dipole terminals by a coupling coil. A built-in dipole serves for local reception. The oscillator circuit is the usual tapped-coil Hartley type. The cathode and one side of the heater is provided with an r-f choke to maintain it at the cathode potential for oscillator frequencies. In the plate circuit appears the primary of a 10.7 mc i-f transformer.

The AH mixer is similar to the one just described except that the broadcast band loop constitutes the inductance in the signal grid circuit, and provision is made for an external antenna by inclusion of a coupling transformer. The plate connects to the primary of a 455 kc i-f transformer. Conventional treatment is given the heater.

The secondaries of the 10.7 mc and 455 kc i-f transformers are series connected and feed a 6B:66 i-f stage. Switching between bands is done simply by applying plate voltage to the primary of the i-f transformer in the desired mixer plate circuit. Neither mixer has a-v-c voltage applied.

**Phono switching section of Magnavox CR-198**

Phono switching section of Magnavox CR-198. This instrument has wide-band audio system and over-coupled i-f system which provides exceptionally wide frequency response. During radio reception it is necessary to provide a method of suppressing the 10 kc beat which appears as a result of the beat between the carrier of the desired station and one or both adjacent carriers.

The suppression is accomplished by the use of a parallel-tuned L-C circuit in the audio lead between the 6SN7 stage and the 6LG output stage. It will be seen in the partial schematic that the grid of the phase inverter section of the 6SN7 receives its excitation from a voltage divider in the grid of the 6LG, subsequent to the insertion of the 10 kc filter.

Provision is made on the range-function switch to short out the filter when the instrument is in the phono position, thus making available the full audio range...
**Block Diagrams**

Block diagrams quickly give experienced technicians the essential functions of each stage of a complex receiver circuit. This block diagram concerns the G-E Model 417.

This 10-tube instrument incorporates broadcast, two short-wave and two FM ranges as well as phonograph reproduction. In the block diagram the tube function line-up has been shown for each type of operation. Electrical push-button tuning is used on the broadcast band, in addition to provision for dial tuning.

Considering the FM performance first, we find a type 6AK5 miniature pentode used as a tuned r-f amplifier. Switching is used in the grid circuit to select either the old or new bands. This stage is impedance coupled to another 6AK5 tube used as a mixer. Grid injection is used from a triode connected 6AK5 high frequency oscillator.

The 10.7 mc i-f resulting from the mixer operation is passed to an i-f system employing a 6S7 and a 6S7V in that order. The transformers are in series with the AM coils and switching is done in the grid of the 6S7 stage.

Following i-f amplification, the signal passes through a limiter stage (to remove any AM components) employing a 6SH7 tube. The FM output of the limiter is coupled by the last 10.7 mc transformer to the diode of a 6SQ7 which constitute the discriminator.

The a-f signal supplied by the discriminator is amplified by the triode elements of the 6SQ7 and then drives the single 6V6GT output tube. Inverse feedback is incorporated in the audio stages to improve performance.

In the normal—tuning broadcast position and AM short-wave bands, all the tubes used on FM serve the same functions as outlined above, except as follows: the I.F. is switched to 455kc, the 6SH7 tube performs as second detector and a-v-c source and the diode section of the 6SQ7 is unused.

Push-button tuning on the broadcast band only provides for selecting two circuits as the r-f stage (first 6AK5) is by-passed, the signal being fed from the antenna directly to the mixer.

Photograph reproduction is obtained from a low-output pickup and additional amplification is needed. A cascade connected 6S7G, dual triode, raises the output of the pickup to a level where the 6S7Q (triode section) and 6V6 stages provide normal output. A 2Y5 rectifier completes the tube compliment.

**Bendix Improves Models**

"Three changes have been made in Bendix Radios that were the subject of information given out in September," writes sales promotion manager J. L. J. O'Connor. "We are pleased to notify you and ask you to correct this information, because it represents increased quality in each instance."

"Model 474-B: An AM-FM console with automatic phonograph reproduction incorporates the same change as above. This model now becomes 847-A."

"Model 474-A: 6AK5 Mixer, 6S7G I.F. Limiter, 6S7Q Dual Triode, 6V6 Output."

"Model 474-C: 6AK5 Mixer, 6S7G I.F. Limiter, 6S7Q Dual Triode, 6V6 Output."

"Model 417: This 10-tube instrument incorporates broadcast, two short-wave and two FM ranges as well as phonograph reproduction."

It will be observed that the iron core input and output transformers are connected conventionally except that the screen receives its d-c voltage via an additional winding in the output transformer. The action here is to make use of some of the signal which appears on the screen, if it is not by-passed at the tube socket. Up to the point where instability sets in, making use of this permits increased gain from the stage.

Note that the d-c voltage applied to the screen is only 34 volts. It is important that this be near the indicated value to realize the required gain and prevent instability.

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**Partial schematic of RCA Model 65BR9**

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**Block diagrams of the 3 sections of G-E Model 417**

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**www.americanradiohistory.com**
THE DISCRIMINATOR CIRCUIT

a. The discriminator (see Fig. 1) is a device which changes frequency variations into a varying audio voltage. This varying audio voltage corresponds to the sound being transmitted by the FM station.

b. In the Westinghouse Model H-119 and in many other FM circuits a more or less conventional center-tapped i-f transformer and a 6H6 tube comprise the discriminator. This circuit utilizes the phase shift between the primary and secondary voltages across the i-f transformer to produce a differential audio voltage.

c. The step by step operation of the H-119 discriminator is as follows:

1. The i-f signal voltage appears across the tuned primary of the discriminator transformer (condition A).
2. An induced voltage is produced across the secondary winding. This voltage is 180° out of phase with the primary voltage (condition B).
3. At resonance the induced secondary voltage causes an in-phase current to flow through the coil and its tuning condenser (condition C).
4. This in-phase current flows through the coil and produces a reactive voltage drop across the coil and condenser. This reactive voltage is out of phase with the secondary current by 90° (condition D).
5. If the resistance of the secondary winding is low, the reactive voltage drop across the secondary tuning capacitor will be many hundreds of times greater than the induced voltage due to transformer action. This "gain" is similar to that of an ordinary TRF stage when it is tuned and for all practical purposes, we can forget the induced secondary voltage and assume that the secondary voltage is equal to the reactive voltage drop across the coil and condenser.
6. The current through the secondary winding may be assumed to flow from bottom to top of the coil. One half of the reactive voltage drop appears between the center tap and the bottom of the coil; the other half appears between the center tap and the top of the coil. For purposes of explanation, referring to Fig. 1, we will designate the upper half of the voltage drop as "minus" Es/2 and the lower half as "plus" Es/2.
7. The primary voltage is also coupled to the center-point of the secondary winding through the capacitor C64. This voltage appears across resistor R17, and is the same as that across the primary winding.
8. The resultant signal voltage which appears at diodes No. 1 or No. 2 is the vector sum of the series voltage drop across R17 plus the upper half of the secondary voltage, or the vector sum of the series voltage plus the lower half of the secondary voltage.
9. When the signal voltage frequency is equal to the resonant frequency of the tuned primary and secondary discriminator transformer circuits, the signal voltages appearing at the two diode plates are equal, and equal and opposite rectified voltages will appear across resistors R16 and R17 (condition E).
10. The audio frequency output under the conditions just mentioned, will be zero. This would be a condition of no modulation at the FM transmitter.
11. As the frequency varies with modulation, the voltages applied to the two diodes become unequal.
12. At frequencies higher than the resonant frequency of the tuned circuits, the secondary winding presents an inductive reactance causing the current to lag the secondary voltage. As a result the voltage at diode No. 1 is greater than at diode No. 2 (condition F).
13. Diode No. 1 passes current which flows from the cathode mid-point connection through R16. The voltage drop across R16 is now greater than the drop across R17. The voltage output at the discriminator test jack will be equal to the algebraic difference between the voltage drops across R16 and R17 and will have a definite polarity, plus or minus, with respect to ground.
14. At frequencies below resonance, 

This chapter covers the Discriminator Circuit and the Deaccentuation Network

PART III

![Discriminator Circuit Diagram](image)

Fig. 1—Westinghouse Model H-119 Discriminator & De-accentuator network

* Several paragraphs devoted to vectors such as these (E, F, G, H, etc.) appeared on page 34, July 1947 issue of RADIO SERVICE DEALER in the article "Using A Conventional Signal Generator for FM Alignment."
SPRAGUE TRADING POST

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23
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ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO
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As surely as the "gasoline buggy" replaced the horse-drawn carriage, the Miniature Selenium Rectifier—an original Federal development—is destined to take the place of the rectifier tube in AC-DC receivers. Already, more and more manufacturers are building it into their radio sets—and more and more maintenance shops are installing it in the sets they service.

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Available through major jobbers from coast to coast—complete with detailed instructions.

Federal Telephone and Radio Corporation

RADIO SERVICE DEALER • SEPTEMBER, 1947
MAJESTIC Models 5A445, 5A445R, Chassis 4506

This service note by Majestic may be adapted to all receivers where hum from the signal generator makes it almost impossible to proceed with their alignment. Make a two or three turn loop about 12 inches in diameter, connect to output terminals of the signal generator. Place this loop in a plane parallel to the receiver loop antenna and about a foot away from the receiver loop. IMPORTANT: When making r-f adjustments, the receiver loop antenna should be spaced from the chassis exactly as when the receiver is in the cabinet.

EMERSON Models FU 421, FU 427, FU 428

Repeated burnouts of 1A7GT and 1N5 (I.F.). This is caused by a completely or partially open cathode bypass condenser in the output tube of these receivers. Since the filament wires of the tubes constitute the bias resistor of the power tube, they are subjected to audio signal variations if the cathode bypass is defective. See Fig. 1. The tube that burns out most often is the 1A7GT.

VIEWTONE Model VP101A

The following additional data has been made available on the Viewtone television receiver: using the new R-F amplifier and tuner assembly illustrated in Fig. 2. Wl.en aligning this receiver the procedure is as follows:

1. Set signal generator to 115 mc (audio modulated) and feed its output to grid of 6AC7-3rd i-f amplifier tube. Adjust 4th P1x I.F. for maximum output. Maximum output is easily observed on picture screen.

2. Set signal generator to 120 mc and feed its output to grid of 6AC7-2nd i-f tube. Adjust 3rd P1x I.F. for maximum output. There are two slugs on this transformer. The one on top is 6th i-f transformer slug, and the one on bottom is the wave-clip slug. In this operation the slug on top is adjusted to maximum.

3. Now set the signal generator to 825 mc and adjust the bottom slug for minimum output.

4. Set signal generator to 103 mc and feed its output to the grid of the 6AC7-1st i-f amplifier tube. Adjust 2nd P1x I.F. (top slug) for maximum output.

5. Set signal generator to 825 mc and adjust bottom slug (sound I.F.) to maximum output.

6. Set signal generator to 9.3 mc, and feed its output to grid of 6AC7-converter tube. Adjust 1st P1x I.F. for maximum output.

7. Adjust oscillator slugs and r-f trimmers on each band for maximum output.

Note: When aligning i-f slugs two peaks will be obtained, the first with the slug out, and the second with the slug in. Use the peak with the slug out.

ADMIRAL Models 7T06, 7T12, Chassis 481

Admiral service notes gives the following on oscillation in the 481 chassis. Occasionally, audio oscillation may occur in the receiver with the volume control in an intermediate position. If this trouble is encountered, first adjust the leads of the primary of the output transformer or ground speaker frame to the chassis. The speaker leads and the grid lead of the 1H5 should be kept as far as possible from the 3Q5 output tube.

Indistinct Tube Markings on Glass

Sometimes the number on a tube's glass envelope becomes too dim to read. When blowing one's breath on it or rubbing it with a little ammonia will not restore it, we have obtained excellent results by placing a drop of thin oil on it and then gently rubbing the glass over one's shirt sleeve or coat sleeve. The number becomes plainly visible when the light shines on it from the proper angle. Try it.

Submitted by: R. G. Jolly
Jolly Radio Service

PHILCO 46-1209 — Early Models

Poor tone and choky operation. Replace resistor (See Fig. 3) R-300, 4700 ohms, with a 50,000-ohm 1 watt resistor. Later models come through with this change.

Submitted by: E. N. Christner
Christner's Radio Service

R. C. A. Models 4E, 45E-M 45E-W

This receiver occasionally develops oscillation, particularly with the volume control in some position other than maximum. Excellent results have been obtained by making the following changes. See Fig. 4.

G.E. Model LB 530

This receiver contains four bias cells arranged in a cardboard container so that each cell is connected in series with each other. Corrosion of the cell terminals causes poor contact between cells with consequent intermittent and distorted operation of the receiver.
5 WORDS that assure ACCURACY, DEPENDABILITY and VALUE in all SILVER test instruments

You... and every serious service technician... have long dreamed of your shop equipped with the same caliber of laboratory instruments found in the factories making the radios you must service. Today’s complex AM, FM and Television receivers can't be efficiently serviced by anything less.

Under war pressure McMurdo Silver devised new techniques to lift the manufacture of laboratory-type instruments out of the costly model-shop. He discovered how to put them on the low-cost, high-volume production line. The result is instruments of laboratory precision, accuracy, dependability... at prices far below what you'd expect to pay. These are the same identical Laboratory Caliber Electronic Test Instruments the big manufacturers, universities and the government select.

Can you afford less than the best — when the best costs you less?

MODEL 906 FM/AM SIGNAL GENERATOR: 8 ranges calibrated ±1% accurate, 90 kc thru 210 mc; 0.1% variable 400’-AM; 0.500 kc variable FM sweep built-in. Metered microvols; variable 0.1 volt. Strays lower than $500 laboratory generators. Only $99.50 net.


MODEL 904 CONDENSER/RESISTANCE TESTER: Measures accurately 1/4 mfd. thru 1,000 mfd.; 1/4” thru 1,000 mega; internal 0.500 V. variable d.c. polarizing voltage. Measures condensers with rated d.c. volts applied. Only $49.90 net.

MODEL 905 "SPARX" SIGNAL TRACER: Visual and audible tracing; also tests phone pickups, microphones, speakers, PA amplifiers. Is your shop test-speaker, too. 20" thru 200 mc; PM speaker; mains-insulated transformer power supply. Only $39.90 net.
TELEVISION, a major achievement of the present generation, has come into its own. As time goes on it will become an essential part of the everyday life of the average person and influence him as possibly no other medium of communications has in the past decade.

Under average conditions, the generally accepted radius for satisfactory television has previously been limited to approximately 35 to 40 miles. While this, no doubt, covers a large portion of the population in the areas in which transmitters are located, it nevertheless deprives those on the fringe areas and those locations between 45 to 100 miles from the transmitter from the obvious benefits, both personal and commercial, which might be realized were they able to satisfactorily receive television. With this in mind, it became apparent that something must be done to extend this radius.

Television sets have a limiting factor where gain is concerned, due to noise both internal and external. Boosters to be inserted between the antenna and set frequently have the limitation of destroying picture quality and definition in order that adequate gain may be secured. It therefore became essential that an antenna system be used which would combine the broad band response necessary by multi-channel reception of television signals as well as substantial gain or pick-up in one direction, and the attenuation of signals in other than the desired direction as a means of helping eliminate interference.

Television Received DX

With these thoughts in mind the present Vee-d-x antenna was developed and has proven extremely satisfactory. Consistent reports made over a period of time from installations varying from 90 to 125 miles from the transmitter have indicated that while reception may not be a solid 100% at all times due to atmospheric conditions, sunspots, etc., reliable reception is now the less secured an average of 80 to 90% of the total time that the system is used.

The Vee-d-x antenna system has a high forward gain thus giving maximum pick-up in one direction while having minimum pick-up from the sides and rear, thus helping to eliminate interference. The incorporation in the Vee-d-x antenna of a matching section provides a convenient and accurate method for matching the impedance of the transmission line which may be from 50 to 600 ohms to that of the antenna, thus helping to prevent ghosts and other undesirable characteristics caused by mis-matching.

While the Vee-d-x antenna is fundamentally broad band in its characteristics it may be adjusted in those areas wherein more gain is desired at some slight decrease in band width. (for example in outlying areas where there is only one station operating) so that the desired station may be received somewhat better than in the normal broad band position of the antenna.

Connections to the Vee-d-x antenna are made by means of suitable coaxial connectors or screw terminals depending upon the type of transmission line used. The entire unit may be easily assembled by one person without technical knowledge, in about a half hour, by following the detailed instructions which accompany each antenna. The entire assembly weighs only about 20 lbs., and may be mounted on the end of a short length of 2" pipe or other structure which may be in turn affixed to the house or mounting pole. It does not require guy wires of any type placed on the antenna proper, as even under severe weather conditions the antenna has ample mechanical strength.

The mechanical construction of the antenna incorporates aluminum castings at all points of strain, aluminum tubing for the elements and an insulating material with excellent mechanical and electrical properties at the frequencies for which the system is designed. The antenna has extremely low wind resistance, good mechanical rigidity and pleasing appearance so that it becomes not only an object of extreme utility but a worthy addition to any television set owner's home or location.

[Complete technical data now being assembled will be published in this journal very soon.]

RADIO SERVICE DEALER • SEPTEMBER, 1947
and now the NEW PRECISION

Electronamic* Test Master

SERIES 10-20

Combination, Master Lever operated, Tube PERFORMANCE Tester, Battery Tester and 34 range, PUSH-BUTTON operated, AC-DC Circuit Tester.

*An amplifying tube tested for just one selected characteristic does not necessarily reveal its overall performance capabilities. Electronic tube circuits look for more than just Mutual Conductance or other single factor. In the Precision MASTER Electronamic Tube Test Circuit, the tube under test is subjected to appropriately phased individual element potentials and is electro-dynamically swept over a complete Path of Operation, on a sinusoidal time base, encompassing a wide range of plate family characteristic curves. This complete Path of Operation is automatically integrated by the indicating meter in the direct and non-confusing terms of Replace-Weak-Good.

THE NEW SERIES 10-20 TEST MASTER is a complete, rugged service laboratory incorporating the exclusive "Precision" ELECTRONAMIC Tube Performance Tester, combined with full 1000 ohms per volt A.C. and D.C. Multi-Range features; plus a complete radio A, B and C Battery Tester which reveals battery condition under dynamic load test. Ideally suited and particularly engineered for general-purpose radio-electronic and industrial-electronic maintenance, service and installation. Tests all modern standard receiving and low power transmitting tubes, including facilities up to twelve individual element prongs; dual-capped H.F. amplifiers, 5 & 7 pin acorn types, Noval 9 pin tubes, etc.

*Affords highest practical order of obsolescence insurance thru use of the Precision 12 station Master Lever Element Selector System.

CIRCUIT TESTING FEATURES

★ Six A.C., Six D.C. and Six Output Voltage Ranges: 0-6-12-60-300-1200-3000 volts
★ Four Self-Contained Resistance Ranges: 0-1000-100,000 ohms; 0-1-10 megohms (No A.C. power required)
★ Six D.C. Current Ranges: 0-600 microamperes 0-6-60-300-1200-3000 microamperes
★ Six Decibel Ranges from -90 to +64 DB
★ All standard functions available at only two polarized tip jacks
★ Automatic interlocking push-button range selection.
★ 1%; wirewound and matched metalized resistors.
★ Large easy reading 600 microamperes, 4½" meter.
★ All ranges self contained, without any additional panel controls.
★ All circuits insulated from power line.

Ask to see the "Precision" Master Electronamic Test Instruments now on display at all leading radio parts and equipment distributors, or write directly for the new Precision 1948 catalog fully describing the Precision Electronamic tube performance testing circuit.

MODEL 10-20-P: in sloping portable hard-wood case with tool compartment and hinged, removable cover. Size 13½" x 17¾" x 6½" $109.10

MODEL 10-20-C: in modern, chrome trimmed, counter cabinet; line dull black ripple finish on heavy gauge steel. Size 17½" x 7½" $111.10

MODEL 10-20-PM: mounted onto 17½" x 19" steel panel with rear enclosing dust cover. For standard rack mount. $109.10

All models include test leads and ohmmeter batteries.

PRECISION TEST EQUIPMENT

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ELMHURST 8, NEW YORK

Export Division: 458 BROADWAY, NEW YORK CITY, U.S.A. • Cables: MORHANEX

RADIO SERVICE DEALER • SEPTEMBER, 1947

www.americanradiohistory.com
New G. E. Television Tube

A new 10" television tube Type 10FP4 employing magnetic focusing and deflecting is announced by G.E. Co. The tube has an aluminum-backed direct-view screen which prevents ion spots and intercepts cathode glow. Ratings: anode, 10,000 volts; accelerating electrode, 410 volts; control electrode minus 125 volts; 7-pin duodecap base; overall length 18"; maximum deflecting angle 50 degrees. Further information may be obtained from the Tube Div., G.E. Electronics Dept., Schenectady, N. Y.

Outdoor Dynamic Mike

A new dynamic microphone suitable for outdoor use is now available in chrome finish. Range is 40-9,000 cps. Variable impedance output ad-jutable to 200,000 or high. Further details from St. Louis Microphone Co., Inc., 2726 Brentwood Blvd., St. Louis 17, Mo.

Crosley's Table Model Teleset

Crosley announces its first table model television receiver, Model 307TA. It covers 13 television channels, has 27 tubes plus 3 rectifiers; 7 front panel controls; operates on 105-125 volts; has 5 inch speaker, provides a 6¾ by 8½ inch picture. The picture tube face is protected by safety glass. AFC on horizontal synchronizing circuits and multistage sync separators assure steady pictures.

New Dipole Antenna Line

Camburn, Inc., 32-40 57th St., Woodside, N. Y., announces four new "Featherlite" television, FM and "ham" antennas. The line includes the Single Dipole, the Dipole and Reflectors, the Folded Dipole and the Folded Dipole and Reflector. Complete technical details contained in a new brochure which is available upon request.

Filters For Lamps Improve Displays

A light-weight color clip consisting of a holding-ring and color filter which clamps snugly over the end of any R40 reflector bulb is announced by Sylvania Electric Products, 500 Fifth Ave., New York City. Sixteen color filters available when used on reflector type lamps simply and effectively change the entire color display of windows or showcases, create seasonal backgrounds or spotlight special merchandise. Further details from manufacturer.

Portable Volt-Ohmmeter

Model 214 Electronic Volt-Ohmmeter, completely self-contained, battery operated, is announced by Hickok Elec. Instru. Co., 10553 DuPont Ave., Cleveland 8, Ohio. It is suited for applications requiring resistance measurements and voltage measurements at high impedance—15 million ohms constant. Not requiring A-C power, can be used in rural areas or for making check in the field. For resistance and voltage tests, receivers need not be removed from autos or aircraft. No warm-up period is required. Meter is electronically protected against burnout. Characteristics: Power supply, 2 "C" flashlight cells; 1 miniature type 45 v. "B". Ranges: Volts, AC and DC: 0-12, 30, 120, 300 and 1200; Ohms: 1 to 1000 megohms in 6 ranges. Input impedance: AC 10-20,000 megohms, DC-15 megohms.

New Rechargeable Battery

There will soon be available the new Vitamite Flyweight rechargeable wet battery which is said to be smaller than 2 pecklight dry cells and delivers more wattage than 2 class "C" dry cells upon a single charging. The unit is housed in a 1-piece molded plastic case which is spill and leak proof. It weighs 1 ounce. The battery will retain its original charge until put into use. Full particulars supplied by the manufacturer, Vitamite Co., 227 W. 64th St., New York, N. Y.

New Amperite Ribbon Mikes

Designed for quality reproduction; does not become "boomy" even when talked into closeup. Frequency range 10 to 14,000 cps. Has wide pickup angle of 120° front and back. Low feed-back claimed as the microphone has no peaks. Standard equipment includes a switch, 25 feet of cable and connector. Further details
THE servicing shop of Francis Reese in Olean, N.Y., has been the subject of several success stories recently published in radio magazines. Shops so featured are significantly distinguished by a better-than-average profit and a complete set of Rider Manuals. Thus, at Reese you will find all volumes, kept conveniently handy for ready reference. For, no other single source of information supplies the essential data contained in Rider Manuals, and nowhere but in the first fourteen volumes can you find the material you must have to service 80% of the receivers now in American homes. (Those issued from 1920 to 1942.)

To those shops repairing any and all makes of receivers, sets of all ages, this pre-war data is absolutely essential for profitable operation.

—And, Rider Manual data is reliable; the OFFICIAL, AUTHORIZED servicing data right from the service departments of the companies that make the sets. No one knows better than the manufacturer what procedures are best for his products. This is the basis for the authority and success of Rider Manuals.

Volume XVI will be at your jobbers in October; order it today. Remember, Rider Manuals are investments; they keep pouring out profits for you. Copies of Volume I, bought over seventeen years ago, are still benefiting their owners. So, be sure your shop has the sign of successful servicing—be sure it has all sixteen Rider Manuals.

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RIDER MANUALS
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RADIO SERVICE DEALER • SEPTEMBER, 1947

PLACE YOUR ORDER TODAY
The New Callmaster

The new '47 Callmaster intercom features attractive high-luster mahogany plastic cabinets, improved sensitivity and power output. The Model CM-10 shown is a master and sub combination allowing 2 way communications from each unit. Sold as a 2-unit "package", they are easily installed by the user. Full details may be had from the manufacturer, Lyman Electronic Corp., 12 Cass St., Springfield, Mass.

RCA FM Table Model

The first of RCA Victor's table model receivers incorporating FM as well as standard broadcast reception. The set, having 7 tubes plus rectifier is 12 1/2" high, 17" wide, and 91/2" deep, is finished in walnut veneer. Its grille cloth is a deep brown with a golden stripe effect. The model has

Sine or Square Wave at the Flick of a Switch!

Now—the General Electric Sine-Square Wave Generator YGA-2 provides you with greater facilities for better, more efficient service work. A top quality equipment, it incorporates two units in one; a high quality, stable oscillator and a square wave generator. It features a low distortion sine wave, stable RC oscillator and instantly available square waves.

SINE WAVE APPLICATIONS
Testing and adjustment of audio amplifiers, transformers, phase inverters, audio filters, etc.

SQUARE WAVE APPLICATIONS
Two point testing of response and characteristics in audio devices. Checking frequency response of wide band amplifiers. Determination of phase shift, distortion and high frequency peaks in audio equipments.

For complete information on the Sine-Square Wave Generator and other General Electric Service Test units write today to: General Electric Company, Electronics Park, Syracuse, N. Y.

GENERAL ELECTRIC

PORTABLE RECORD CHANGER

A new portable record changer Model 65 is announced by Webster-Chicago Corporation, Chicago 39, Ill. It consists of Model 56 record changer in a burgundy leatherette covered luggage case with the turntable and changer in matching color. It can be used with either radio or external speaker system and plays a full stack of twelve 10" or ten 12" records with the cover closed. The cover, however, is removable. Weighting 24 pounds; both power and pick-up cords are supplied with the unit. The changer operates on 105-125 volts, 60 cycle current and may be easily converted for 50 cycle operation.

NEW PRECISION TESTER

Series 658 Multi-Master, is a supersensitive, 20,000 ohms per volt tester covering 54 AC and DC ranges for measurements of modern electronic circuits. It features the "Precision" Multi-Master Automatic Push Button range and function selection system. One row of 5 buttons selects all functions such as volts, ohms, mil, decibels, amperes and microamperes. The other row of 6 buttons selects all ranges. 54 ranges, to 6,000 volts, 600 megohms, 12 amperes, 70 DB and 60 microamperes, 20,000 and 1,000
AUDIO ENGINEERING SUPREMACY

is built into every RACON Sound Reproducer

ACOUSTIC & STORMPROOF MATERIAL

Only RACON makes speakers with RACON Acoustic Cloth which is processed by a patented method which gives a non-vibratory wall, thereby increasing the output of the horn without loss due to wall vibration. Supplied as a part of all re-entrant horns, and on all straight horns when so ordered. Stormproof types are guaranteed for life in all kinds of weather and temperature, regardless of climatic conditions.

ADVANCED ENGINEERING & DESIGN

RACON'S leadership in sound reproducer engineering has been recognized for almost three decades. RACON driver units have a rated output for peak and continuous performance far in excess of any other brands — continuous operating capacity 30 watts, peak capacity 60 watts. RACON speakers and driving units require less energy input yet they deliver more efficient sound reproduction output. All claims made by RACON as to cutoff frequencies and acoustic lengths of speakers, power handling capacity, efficiency and frequency range of driver units are substantiated by tests made at laboratories recognized as the foremost in the industry.

COMPLETE LINE TO CHOOSE FROM

There is a RACON driving unit, trumpet or speaker for every conceivable sound application — also the accessories (brackets and housings) that may be required for special purposes. Soundmen know that it pays to choose and use a speaker line that is complete. Yes — RACON makes every kind of sound reproducer from the giant 7 foot length auditorium horn down to the small 4 inch intercom cone speaker — from the super giant P.M. driving unit to the tiny driver for paging horns.
BURGESS IS THE LINE THAT SELLS'

This Fall and every season means battery business for Burgess dealers. And Fall means these two big battery markets:

1. Farm Battery  2. Portable Radio Battery

The Farm Market:
Recognized quality makes Burgess a favorite on farms—for radium, flashlights, lanterns. Get stock in now on all these popular items.

The Portable Radio Market:
Back to school means more portable radio battery sales outdoors—at the game, on the picnic—the portable radio goes along in the Fall. Be sure your stock of portable batteries is complete for this Fall trade.

National Advertising to over 40 million battery buyers in national and farm magazines; prompts YOUR CUSTOMERS to buy Burgess.

Promotional Helps: window and counter display material, enclosures, newspaper mats are available.

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ohms per volt DC, 1,000 ohms per volt AC.

Specifications follow:
8 DC voltage ranges to 6,000 volts at 20,000 ohms per volt. Initial range 0-3 volts. 8 DC voltage ranges to 6,000 volts at 1,000 ohms per volt. 8 AC voltage ranges to 6,000 volts at 1,000 ohms per volt. 8 DC current ranges to 12 amperes. Initial range 0-60 microamperes. 6 ohmeter ranges to 600 megohms. Initial range 0-6,000 ohms with 35 ohms center scale. 8 decibel ranges from -26 dB to +70 dB. 8 output ranges to 6,000 volts.

For additional information write direct to Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.

Free Poster Offered by Olson

A 17" by 22" comic poster in two colors which is ideal for hanging on the wall of a store, and which humorously explains how electrolytic condensers are made and how they work, is offered free, along with a parts catalog, to any Service Dealer who writes requesting same from Olson Radio Warehouse, Inc., 73 East Mill St., Dept. "RDP", Akron 8, Ohio.

FREQUENCY MODULATION
[from page 22]

the conditions are the direct opposite of those just described. The tuned circuit now presents a capacitive re-

SOLDERING IRONS

FOR service men, mechanics of all types and "handy" men who want quality tools... GE Calrod Soldering Irons meet every requirement.

CALROD ELEMENT
Cartridge type, insulated with highly compacted magnesium oxide which maintains full insulation properties and dependably protects against grounding. The Calrod element conducts heat so rapidly that there is little temperature drop from the resistance wire. High efficiency and quick recovery per mit last work with minimum loss of time.

CALORIZATION
Much longer life can be expected from the calorized tip. CalORIZATION also makes tip removal easy and prevents "freezing in". Corrosion of the tip is greatly retarded by calORIZATION.

HEAT RESERVOIR
An ample heat reservoir is provided by a calorized copper heat conductor which also serves as the tip holder.

STAINLESS STEEL BARREL
There is very low heat loss through the barrel because stainless steel has less than half the conductivity of plain steel. The barrel will withstand extremely hard usage without ill effects.

COOL HANDLE
The smooth, plastic handle remains cool to the touch. The heat is in the working tip where it belongs.

For complete information write: General Electric Company, Electronics Department, Syracuse 1, N. Y.
actance, the secondary current leads the voltage and the voltage at diode No. 2 is now greater than that at diode No. 1 (condition G).

15. Diode No. 2 accordingly passes current which flows from cathode midpoint connection through R17 causing a greater voltage drop across that resistor.

16. As the frequency swings from one side of resonance, through resonance and to the other side of resonance, the audio voltage output from the discriminator, will decrease to zero, reverse polarity and rise to a peak. If the voltage values appearing across R16 and R17 are plotted against the impressed frequency, a curve such as that shown in Fig. 2 will be obtained. The straight portion of the curve must, at least, extend over the bandwidth covered by the FM signal.

DEACCENTUATION NETWORK

The a-f accentuator is used at the FM transmitter network to raise the amplitude of the audio frequencies in the upper range. At 10,000 cycles the amplitude of the audio signal is up to 15 db. The actual signal, as taken from the discriminator output is therefore distorted. It is necessary to utilize this arrangement in order to prevent the transmission of noise from the FM transmitter.

At the receiver, the a-f amplifier must be designed to present a response the direct opposite of that at the transmitter. This means that the a-f amplitude at 10,000 cycles must be down 15 db in order to realize reproduction of the original sound. This is accomplished by the insertion of a network of resistance and capacitance at the input of the a-f amplifier. The time constant of this network is from 70 to 100 micro-seconds and the values are quite critical. When replacing these components, be certain that the values are identical with those specified by the manufacturer.

---

**Figure 2**

---

**Now Small Size, Heavy Duty, Trouble-Free**

**5 WATT VITROHM**

Wire Wound Fixed Resistors

Now ... for extra reliability in many installations ... for longer service and steadier performance ... you can use this compact, low-voltage Type 5F resistor. Resistance wire is insulated and protected by WARD LEONARD'S own Green Vitreous Enamel of exclusive formula developed in the WL laboratories. Tough, hard, moisture and acid resistant. Quickly conducts away generated heat. Easily mounted by its wire leads.

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Send for Catalog D-2

Gives helpful data and information on the wide variety of WARD LEONARD Resistors and Rheostats.

**Smooth Power COMBINATION RECORD-CHANGER•RECORIDER**

Automatically plays twelve 10" or ten 12" records

Cuts records up to 10'

One simple lever adjustment

Your customers will like the simplicity and fine performance of this unique combination Smooth Power unit.

They'll enjoy the ease of operation with one simple lever for quick changing from one size record to another, to remove records or to set for manual operation and recording. They'll appreciate the smoothness and quietness of the record-changer. They'll admire the brown iridescent finish and streamline plastic trim on self-indicating "Reproducer" and "Recorder" arms.

And, of course, they'll value the quiet, vibration-free operation of the Smooth Power Motor.

Send for details. Ask us for complete information on this popularity-building combination that can add new sales appeal to your products ... and on the complete line of Smooth Power Phonographs and Recorders.

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**THE GENERAL INDUSTRIES CO.**

DEPT. MS. •ELYRIA, OHIO
IN AND AROUND THE TRADE [from page 6]

Cement

KX Alignment Kit
Spray Kit — Chemical Lab.

G-C RADIO SERVICE CEMENT
Best cement for speaker and radio work. Ideal for cementing replacement cones and re-covering tweeters and horn cones. Waterproof, fast-drying. No. 30-2. 2 oz. bottle with brush. List 59c

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Ideal for experimenters. Supplies you with 15 different bottles of chemicals, 6 bright, 3 dull, each 2 oz. $3.50

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RADIO DIVISION — DEPT. 1

GENERAL CEMENT Mfg. Co., Richford, Ill., U.S.A.
Manufacturers of over 3,000 products
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Matched, aluminum test units with all miniature tubes.

Blue-gray Hammerthrone finish. Uniform size—10 1/4 x 10 1/4 x 5 1/2.

SIGNAL GENERATOR
Wide Range Fm-Am Television
Model 701
Range: 170 K.C. to 115 M.C.—all fundamentals.
Crystal calibrated, low loss permeability tuned coils. Internal 400 cycle sine wave modulation—100%. Follow-up shorting. Turret coils with no dead spots. Tubes: 6C4, 6A26, 6X4.

$74.95 Net

AUDIO OSCILLATOR
Sine Wave—Square Wave
Model 710
Range: 20 to 24,000 Cycles. Oscillator: RC type.
Sine or square wave through-out range by rotating panel switch. High impedance output. 2", accuracy over all bands. Three color, completely enclosed 9" dial for use in reading.

Tubes: 6X4, 6A05, 6A16, A4522, 6S17.

$89.95 Net

DELUXE TEST SPEAKER
And Universal Substitutor
Model 721
Eliminates need for removing set speaker from radio for servicing.
Provides substitution for choke, electro-lytic and by-pass condensers, coupling, and a wide range of resistors.
Field substitutes: 600, 1000, 1500, and 2000 Ohms.
Voice coil connection permits substitution of sample tube and entire output transformer. 6" P.M. dustproof. $29.95 Net

All prices slightly higher in Eastern States

Combination Signal Tracer and Electronic Volt Ohm Meter with Germanium Crystal Probe

Model 730
Range: AC-DC 1v to 300v (7 bands)
Zero center scale for P.M. alignment. Ohm Scale: 10 Ohms to 10 Megohms. Frequency Range: Audio to 110 MC. Input: 100 Megohms AC or DC. Tubes: 6X4, 6A2, 6A05, 2-2AU7, 2-4A32.

High gain Signal Tracer with enclosed speaker. No amplification needed in receiver—no hum. 8" Illuminated dial. $89.95 Net

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RADIO SERVICE DEALER • SEPTEMBER, 1947

TRADIO — TRIED, TESTED, PROVEN
TRadio has pioneered in this new and fast growing industry. Get in on the ground floor and assure yourself of financial independence for life.

ONLY SMALL INVESTMENT NEEDED

Thousands of others all over the country have learned that "TRadio Pays While it Plays.

Send for complete information today!

Write To Dept. Q-9

IN AND AROUND THE TRADE

[Continued on page 7]
Home Instrument Department, it was announced by Henry G. Baker, General Sales Manager of the department. Mr. Williams was formerly advertising manager of the RCA Victor Record Department.

RCA Intercom System
An intercommunication system, newly designed and engineered, with compact speaker stations as small as an ordinary desk clock, has been announced by the RCA Sound Equipment Section. A "two-station" intercom, the system is designed with amplifier and speaker station in separate units, permitting off-the-desk location of the amplifier at any out-of-the-way point and reducing speaker-station size to a minimum. Conversation may be carried on over the new intercom at normal voice level with a flick of the two-position switch. Releasing the switch returns it to "listen" position. A three-inch speaker is used in the speaker station.

Especially designed for such two-station use as communication between executive and secretary, theatre box-office and manager's office, or doctor and receptionist, the system consists of two speaker stations, separate amplifier, and 100 feet of interconnecting wire. It is easily installed and plugs into any 110-volt AC or DC outlet. If desired, additional stations up to five can be connected to the amplifier.

The new intercom, which is immediately available, will be distributed through RCA Sound Equipment distributors.

H. C. Handwerger Upped By Motorola
Howard C. Handwerger, has been appointed to the position of Assistant Sales Manager for the Motorola Home Radio, Car Radio and Car Heater. It was announced by W. H. Kelley, General Sales Manager.

St. Louis Mike Co. Moves
St. Louis Microphone Co. has been incorporated under the laws of the State of Missouri, with an authorized capital of $100,000. The company recently moved into its new building which has just been completed, at 2726-28 Brentwood Blvd., St. Louis 17, Missouri, where a complete line of the new St. Louis Dynamic Microphones are now being manufactured. Catalogs of these new units are now available.

Aero Needle S. M.
E. Ralph Haines has been appointed sales manager of the Aero Needle Company, Chicago, according to an announcement by Burton Browne, president. The firm manufactures long life Aeropoint phonograph needles. For

Great, New, Complete Concord Radio Catalog
160 value-packed pages of Radio Parts • Radio Sets Ham Gear • Amplifiers Testers • Electronic Equipment MAIL COUPON FOR FREE COPY Ready now—the greatest, most complete presentation of radio, electronic and television equipment and supplies in Concord history! Packed from cover to cover with thousands of items—Radio Parts, Radio Sets, Amplifiers, Sound Systems, Test Equipment for every purpose, Record Players, Record Changers, Television Equipment, Ham Gear, Receivers, Transmitters—160 pages of everything and anything in Radio and Electronics, and featuring a special bargain section of hundreds of money-saving values in top quality, standard-make parts, including scores of new items from nationally-famous makers. Immediate shipment from CHICAGO OR ATLANTA. Write for your FREE copy at once.

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This campaign, in the Saturday Evening Post and leading newspapers, is convincing millions of present and prospective FM and Television receiver owners that a good outdoor dipole antenna is a necessity. As a result: The more money selling "Magic Wand" FM and Television Aerials... and be able to promise, and deliver, finest reception no matter where your customers live. You'll make added profit from aerial installations, too. See your Ward distributor for details on how to assure your full share of the benefits of this major FM and Television Aerial campaign, or write.

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eleven years, Haines was formerly with Raytheon Manufacturing Co., producers of radio tubes. As distributor sales executive, he made his headquarters in the firm's main office in Newton, Mass. Prior to going to Raytheon he was with R C A Radiotron Co., and E. T. Cunningham, Inc., in New York City.

Why Cement-Coated Power Resistors?
The characteristics of cement coating for power resistors are dealt with in a bulletin "Why Cement-Coated Power Resistors?" just issued by Clarost Mfg. Co., Inc., 130 Clinton St., Brooklyn 2, N. Y. Simple tests to determine overload capacity, heat shock immunity, through-coating leakage, corrosion elimination and other advantages of cold-setting cement coating, are illustrated and described in this informative bulletin available to anyone on request.

Free Display Piece
General Cement Manufacturing Company of Rockford, Illinois, announces that their new metal display which demonstrates their well-known "SPEEDEX" Wire Stripper is now available to jobbers without charge.

Perkins Promoted By G-E
G. S. Perkins has been appointed sales manager of General Electric's deluxe line of receivers, the Musaphonic, according to Paul L. Chamberlain, manager of Receiver Division sales in the company's Electronics Department.

He will have his headquarters at the G-E Bridgeport, Conn. plant until the Receiver Division moves into its new location at Electronics Park, Syracuse, N. Y., later in the year.

Test Equipment
Three attractive new bulletins describing electronic test instruments manufactured by the Electronics Division and distributed by the Radio Tube Division of Sylvania Electric Products Inc. are now available on request to the company at Emporium, Pennsylvania. Instruments described include Sylvania Tube Testers, Type T-711 and T-712; Type 134 Polymeter; and Type X-T018 Modulation Meter.

The tube testers are supplied in both counter and portable models for testing all elements of electron tubes used in broadcast, FM and television receivers and many other types of electronic apparatus in which receiving type tubes are used. Design of the testers features ease of operation, simplified controls and facilities to test standard, miniature, acorn and other types of tubes which may be accommodated by provision for extra sockets.

The Sylvania Polymeter is a combination instrument for effective trouble-shooting and checking of electronic circuits. It embodies all the features of a sensitive and accurate vacuum tube voltmeter and also provides a wide range of measurement of resistance and current. Accessory equipment provided with each instrument includes unusually compact plug-in vacuum tube probe and flexible shielded transmission line for use at frequencies up to 300 mc.

The Sylvania Modulation Meter has been designed to provide an accurate, direct-reading instrument independent of vacuum tubes or external power supply. It provides a means of monitoring the percentage of modulation produced by an amplitude-modulated radio transmitter to prevent under-modulation or over-modulation in amateur, police, marine, forestry and other radio telephone services operating at frequencies up to 54 megacycles. Carrier shift and audible quality of transmission may also be checked.

Stewart-Warner Correction
Stewart-Warner's Radio Division Service Manager N. J. Cooprider advises that the mandatory fee for installing S-W television receiver models T-711, T-711M and T-712 is $64 and $55 as reported here last issue. However, as other S-W television models are introduced in the near future the installation fees applying to them may vary.
MULTIPLE DWELLING TELEVISION ANTENNA

[from page 19]

bution system as possible is obvious when considering noise pickup in the cable from elevators and other electrical devices located in close proximity to both cable and junction boxes. The practical limitation on this level is the approach to the point where cross-modulation occurs. As for attenuation of radiation from the local oscillator, it is effective only insofar as transmission of such radiation through the system is concerned. It obviously will not attenuate "direct" radiation from the oscillator itself through space. This condition usually results from unshielded or poorly shielded oscillator circuit components and of course the only remedy for such a situation is to install proper shielding.

The termination network provides for matching the input impedance of the receiver to the distribution network, provided that 72-ohm unbalanced feed or 300-ohm balanced feed being provided. Inasmuch as the vast majority of manufacturers have conformed to one or the other of these two T.B.A. recommended input impedances, the equipment as supplied will take care of the great majority of installations. However, lately one or two "renegade" input impedances have appeared in some of the newer sets on the market. It is, however, a simple matter to make changes in the termination facility to allow for matching to any input impedance value. The termination connection itself fits into a shallow 3" receptacle box and is equipped with a three-connection polarized socket. As supplied by the manufacturer, the termination set is for 72 or 300 ohms merely by proper selection of terminals. A diagram of the termination connection appears in Fig. 5.

Cost Vs. Results

One other very important consideration in connection with a system of this type is cost—cost to the set owner and cost to the apartment owner. When it is considered that the average single antenna installation costs the individual receiver owner between $50 and $200, depending upon the policy of the set manufacturer or the installation outfit involved, and that the set owner has purchased one antenna whose orientation and location have not been chosen for maximum results on any one particular station, but rather, a compromise orientation and location which will give the best possible results on all or nearly all stations. Frequently in a given location it is impossible to obtain satisfactory reception on all stations in a given area and in order to achieve satisfactory reception on one or two stations, any possibility of reception on other stations is sacrificed.

The multi-unit antenna system eliminates this possibility, plus providing an antenna designed for maximum efficiency on each particular frequency involved. In addition, an auxiliary advantage of pre-amplification is obtained by or near the antenna with its attendant gain in signal-to-noise ratio. As to costs of this system—obviously it lends itself best to new construction and when so installed, should reduce the actual cost per-antenna, per-receiver to a fraction of that now charged per individual installation. Where this system is installed in existing construction, again its simple construction and consequently reduced numbers of components and cables involved should result in a greatly reduced cost per unit. Obviously if installed in a multi-unit dwelling it must be installed in each and every apartment so that a lower cost per unit may be realized. However, if the project is undertaken by the apartment owner there is no reason why the expense of same cannot be amortized by means of an increase
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in the rental of each dwelling unit. Such rental increase should provide for
the amortization of the installation cost over a period of three or
four years. This fact plus the improved appearance of the dwelling,
plus the improved reception possible serve to make a system of the type
described here the answer to the apartment owner's and dweller's
prayer.

As to space requirements, the entire unit consisting of four (or six)
ampifiers, matching network and power supply occupies a space ap-
proximately 24' high by 18' wide by 12' deep. It is commonly adapted
for wall or floor mounting and all units are readily accessible for
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(I SEE PAGE 27)

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