

An Up-to-the-Minute High-Frequency Pack for Use With The Phono-Radio Reproducer



Here are the complete constructional details for an inexpensive yet highly efficient two-valve, high-frequency amplifier and detector, designed particularly for use in conjunction with the new electrical pick-up units and low-frequency amplifier packs that were described in POPULAR RADIO in the series of articles on combining the phonograph and the radio. The complete ensemble, such as is pictured above, should give broadcast and recorded reproduction of such variety and outstanding quality as to satisfy even the most exacting taste in aural home entertainment.

By JAMES MILLEN

COST OF PARTS—Not over \$42.00

HERE IS A LIST OF PARTS FOR BUILDING THIS UNIT—

- | | | |
|---|---|---|
| <p>A and K—General Radio UX sockets;
B—9 by 13-inch bakelite sub-panel;
C1—Sangamo mica condenser, .00025 mfd.;
C2—Tobe condenser, 1 mfd.;
C3—Precise midjet condenser, 50-150 mmfd., No. 940;
C4—General Radio neutralizing condenser;</p> | <p>C5—Sangamo mica condenser, .001 mfd.;
RFC—Samson RF choke, No. 85;
R1—Carter 20-ohm switch-rheostat, type M-20-S;
R2—Lynch equalizer and mounting, No. 2;
R3—Lynch metallized filament resistor, 2 meg., and mounting;</p> | <p>R4—Lynch 1,000-ohm suppressor and mounting;
T1 and T2—National Uni-Control B-D tuning unit complete with illuminated dial;
P—7 by 14-inch bakelite panel;
7 Eby binding posts.</p> |
|---|---|---|

A NEW trend in radio receiver design that is receiving considerable attention at present is the separation of the low-frequency amplifier from the receiver proper, as in the new LC-28.

As a result, the complete receiver may be considered as two separate components—the high-frequency amplifier and detector, and the combination low-frequency amplifier and power-pack. The phonograph pick-up, of course, may be substituted at will for the high-frequency amplifier and detector, so that either radio programs or phonograph records may be reproduced at the turn of a switch.

In the preceding issue of POPULAR RADIO, the writer described a combination low-frequency amplifier and power-pack designed for just such use.

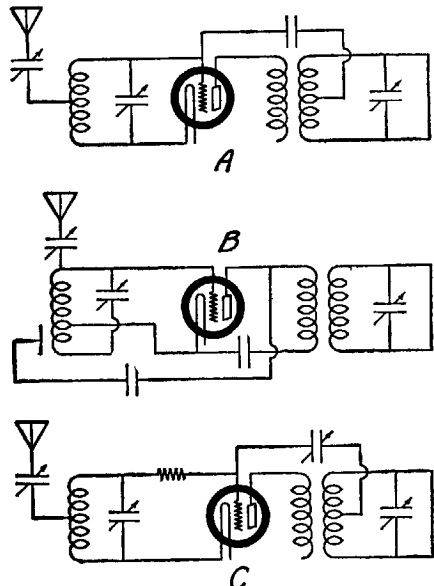
This article gives the constructional details for a high-frequency broadcast pick-up for use with this amplifier.

In selecting the circuit for the receiver, simplicity of construction, general availability of the essential parts, stability of operation, ease of control, and high sensitivity (for the number of valves employed) were given careful consideration. It was finally decided to employ the new Uni-Control National B-D tuning unit, in a circuit of a revised type of design.

This new tuning unit consists of a standard B-D antenna inductance and high-frequency transformer mounted on a two-gang condenser of unique design. Instead of directly connecting the shafts of the two condensers together as a single unit, they are joined through a system of friction-driven

planetary gears of the type used in the well-known National vernier dials which were so popular a few years ago. The shaft of the first condenser is hollow and through its center passes another shaft which is connected to a small knob located at the center of the main tuning dial. When the main dial is turned, both condensers rotate. When the small knob is rotated, a vernier adjustment of the antenna tuning capacity may be made without changing the setting of the other condenser.

In the past it has always been necessary either to use a separate condenser for tuning the antenna circuit, or else, if the antenna condenser were ganged to another condenser, to employ a separate "trimming" condenser. With the new arrangement, however, these difficulties are overcome and at



HOW THE B-D CIRCUIT DEVELOPED

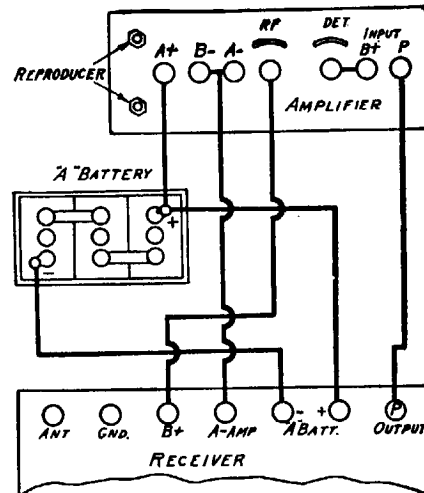
FIGURE 1: At the top is the simplified schematic circuit of the original Browning-Drake circuit. At B is a modification of this circuit which has become known as the "Official" Browning-Drake circuit. At C is a further modification used in the unit described in this article.

the same time vernier reduction mechanisms are furnished to facilitate the adjustment of either the main or auxiliary knobs. As a rule, the small auxiliary knob need only be used when tuning for distant stations.

In many of the earlier receivers constructed and described in the various radio magazines, a circuit comprising one stage of high-frequency amplification of the type developed by Prof. Hazeltine was employed in connection with a regenerative detector. This circuit is shown at A in Figure 1.

With this circuit arrangement, however, it was usually necessary to employ one of the small UX-199 valves as a high-frequency amplifier rather than the more reliable UX-201-a. When the larger valve was used, it was found almost impossible to neutralize the receiver.

At B in Figure 1 is another circuit which was used by Browning and described by him in an article in the April, 1927, issue of POPULAR RADIO. This circuit, when used with the B-D tuning units, has become known as the "Official" Browning-Drake circuit. A small



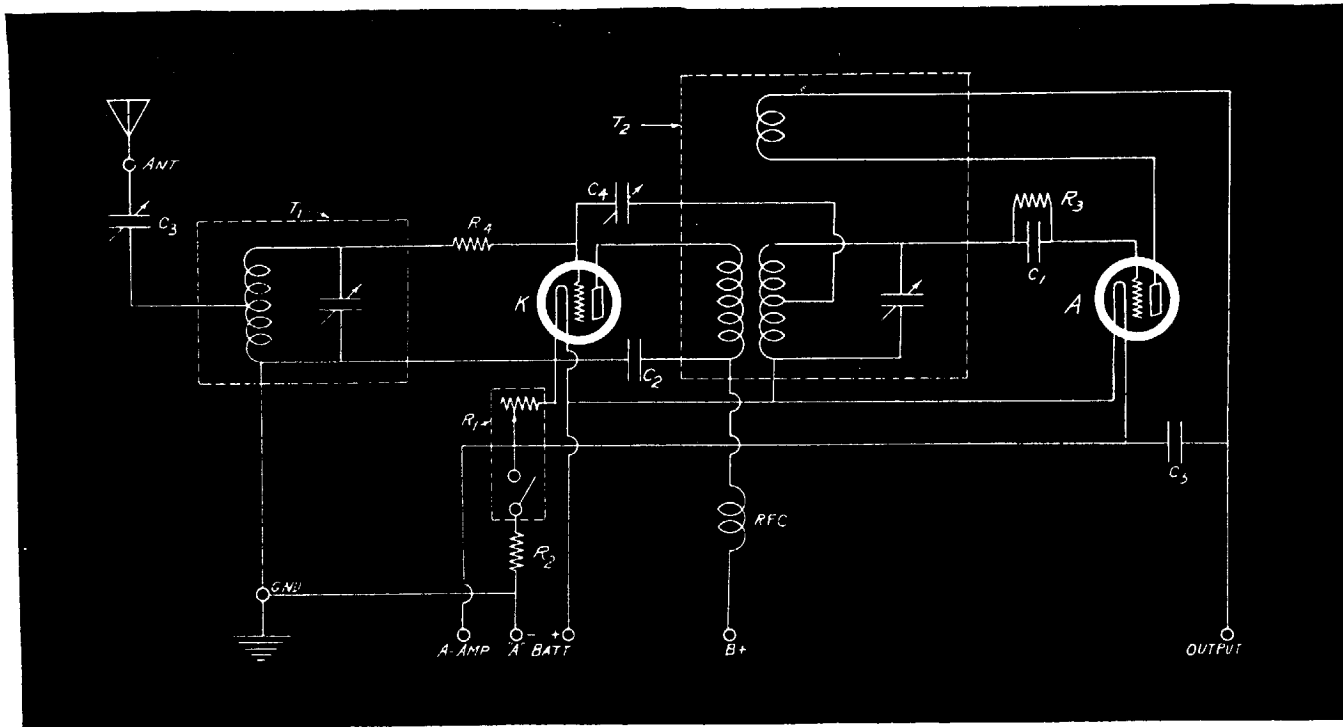
THE BATTERY HOOK-UP

FIGURE 2: This diagram shows the proper connections to be made for operating the high-frequency pack with the power-pack amplifier described in the October number of POPULAR RADIO.

valve was also found necessary for proper operation.

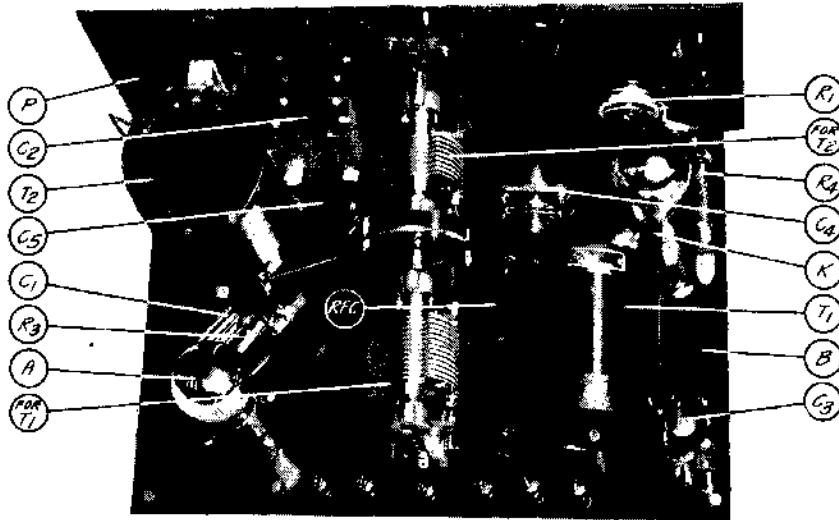
Recent experiment, however, has shown that if a suitable resistance be

The list of parts given in this article includes the exact instruments used in the apparatus from which these specifications were made up. The experienced amateur, however, will be able to pick out other reliable makes of instruments which have been approved by POPULAR RADIO and which may be used with good results. If instruments other than the ones listed are used, the only change that will be necessary will be the use of different spacings for the holes that are drilled in the sub-base for mounting the instruments. To any reader who has difficulty in obtaining any of the parts which are necessary in making up these model receivers and power units, POPULAR RADIO SERVICE BUREAU, 119 West 57th Street, New York City, will gladly assist in seeing that his requirements are promptly supplied.



THE SCHEMATIC WIRING DIAGRAM OF THE UNIT

FIGURE 3: The lettering in this diagram corresponds to the list of parts and the constructional data in the text. As the wiring of the unit is quite simple, there should be no difficulty in doing it from this diagram.



THE SUB-PANEL VIEWED FROM ABOVE

FIGURE 4: This view shows clearly the mounting positions of the B-D tuning unit with its gang condenser, the two valve sockets and the other instruments.

placed in the grid circuit of the first valve of the B-D circuit, as shown in Figure 1 at C, then no trouble will be had in neutralization when a UX-201-a type of valve is employed in place of the UX-199 type. As a result, the overall performance and reliability of the receiver is materially improved. In fact, it is possible, when employing such a grid resistor, to go even a step further and employ one of the new 5-volt, high-mu, high-frequency amplifier valves, such as the CeCo type K.

As the grid resistor is not located in the tuned circuit, it has no detrimental effects upon the selectivity of the receiver.

How to Construct the Receiver

As will be seen from Figures 4 and 5, the actual construction of the receiver is quite simple. Figures 7 and 8 give the layouts for the front panel and the sub-panel. Upon careful examination of Figures 4 and 5, it will be noticed that the resistor clips and socket contacts used by the writer in the construction of his receiver, were fastened directly onto the sub-panel. It is believed, however, that the average constructor will find it easier to obtain the standard resistor mountings and sockets, as specified in the list of parts, and to mount them in the conventional manner. The dimensions given in Figure 6 are for the Lynch mountings and General Radio sockets.

After preparing the panels, mount all the essential parts on the sub-panel and complete all wiring, as shown in Figure 3, except those connections to the dial light and switch-rheostat, R1, before mounting the front panel. If most of the wiring is run under the sub-panel

the appearance of the completed receiver will be considerably enhanced.

Upon referring to the circuit diagram, in Figure 3, it will be noticed that there are two "A" negative (—) terminals. The extra one is added so that the switch on the panel of the receiver may also be used to control the filaments of the valves in the externally connected low-frequency amplifier. The rheostat is so located in the circuit as to control only the high-frequency amplifier valve and thus serve as a volume control.

The equalizer, or automatic filament-control resistor, R2, takes care of the detector valve and also prevents more

than the rated 5 volts being applied to the high-frequency valve, even when the rheostat is set for minimum resistance.

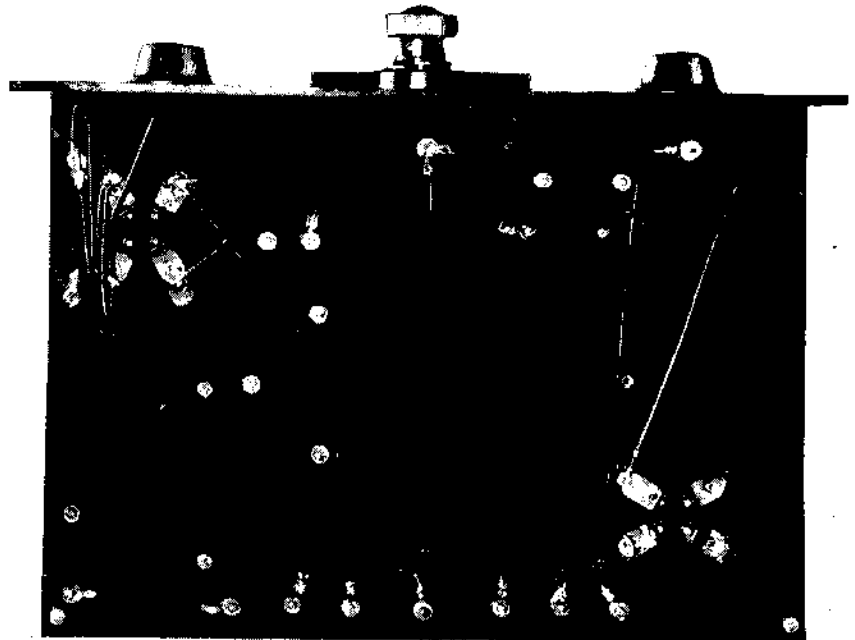
When completed, the receiver may either be placed in a small 14-inch cabinet, and the low-frequency amplifier and power-pack located in some out of the way place, or else the entire outfit may be installed in a console type of cabinet.

How to Install the Receiver

It is most important that the antenna used with this receiver be not over about fifty feet in length. In fact, most excellent results are generally obtained with but a short length of wire run around the room in which the set is located. Should such an indoor antenna be employed, however, care must be used to see that it does not run close to any lamp cords or other AC lines not covered with a grounded shield such as the standard BX Cable. If such precaution is not taken a slight AC hum may be heard in the reproducer.

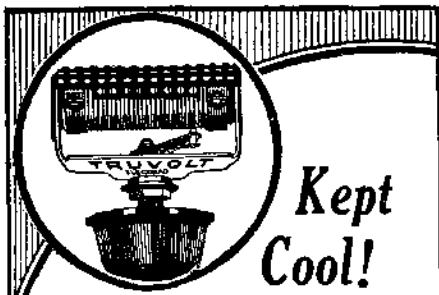
When everything has been connected up as shown in Figure 2, tune in a local station by means of the main tuning control. Then adjust the small compensator knob located in the center of the dial until the station is tuned in fully. The neutralizing condenser should then be adjusted. Generally the proper position will be with the plates interleaved about $\frac{1}{4}$ of the way. The antenna series condenser should be so adjusted (with plates about $\frac{3}{4}$

(Continued on page 360)



THE UNDER SIDE OF THE SUB-PANEL

FIGURE 5: The manner of wiring the unit may be seen in this view. Insulated bus wire, such as Celatsite, is convenient to use.



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Type	Ohms Resistance	Milliamperes Current
T-5	0 to 500	224
T-10	0 to 1,000	158
T-20	0 to 2,000	112
T-50	0 to 5,000	71
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T-250	0 to 25,000	32
T-500	0 to 50,000	22.5

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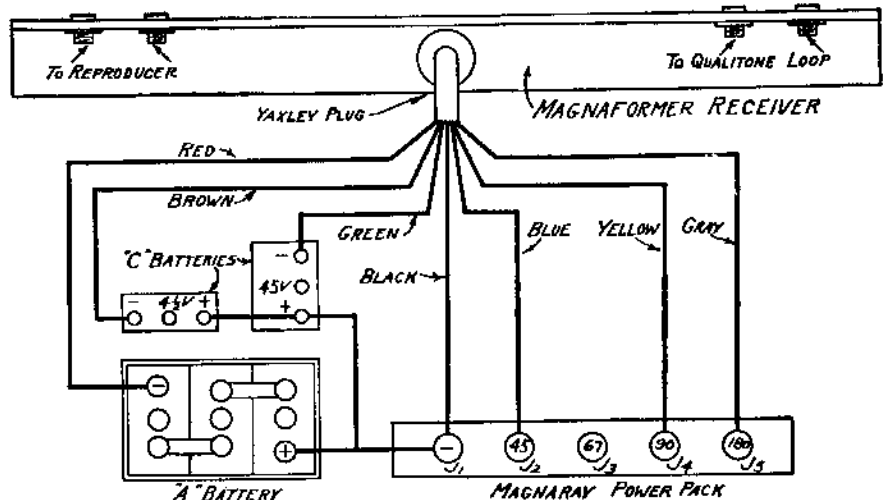
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ELECTRAD

The MagnaRay Power-Pack

(Continued from page 331)



HOW TO HOOK UP THE MAGNARAY

FIGURE 3: The connections to be made between the Magnaformer, the MagnaRay and the "A" and "C" batteries are clearly shown in this diagram. The Yaxley plug and cable come with the Magnaformer receiver.

has been mounted. Wires should be connected up from binding posts J1, J2, J3, J4 and J5 to the cable furnished with the Magnaformer. The connections should be made as shown in Figure 3. A storage battery may be used as indicated in the diagram. Preferably a unit equipped with a trickle charger such as the Westinghouse, the World Storage Battery Co. unit, or the Fansteel "A" Power, may be used.

A Raytheon BH rectifier valve should be used in socket D and a Raytheon R regulator valve should be placed in socket E, with the proper connection made to its shell for the starting electrode.

When the complete unit has been hooked up with the Magnaformer receiver, and the loudspeaker and Qualitone loop have been connected, the switch on the receiver should be turned to the "on" position. The plug on the cable connected to the power transformer, A, of the MagnaRay power-pack should be inserted in the socket

and the house lighting current turned "on."

The receiver is now ready for operation and the voltages applied will remain perfectly constant irrespective of the lighting voltage variation in the house-lighting lines.

The regular operation of the Magnaformer 9-8 receiver may be carried out in exactly the same manner, from this point on, as described in the October issue of POPULAR RADIO, in the article on the construction and operation of the Magnaformer.

The complete unit will, from this time on, be automatic in operation and need no further adjustment or attention outside of filling the "A" battery with distilled water as it becomes necessary. This may be done at intervals of about four months.

The MagnaRay Power-Pack will maintain, at all times, efficient operation of the set, and enable the user to get the highest amount of satisfaction with the least worry and bother.

The Phono-Radio Reproducer

(Continued from page 336)

of the way "in") so that any of the local stations may be tuned in by the main control knob without resorting to the use of the correction adjustment each time.

On the panel of the power-pack amplifier will be found both a detector and a high-frequency amplifier "B" voltage adjustment device. Both of these levers should be moved until the best setting is found. With a receiver of the type described in this article, the optimum detector adjustment will most likely be at the center of the available voltage range, while the optimum high-frequency "B" voltage ad-

justment will most likely be the minimum voltage obtainable.

The "B" negative and "A" negative terminals on the amplifier should be connected together as shown in Figure 2.

In order to secure the full value of the excellent reproduction possible from a receiver employing a combination low-frequency amplifier and power-pack, such as the National, it is most essential that a high-grade reproducer be employed. The exponential horn type or the better grade of cone type, or a panel type such as the Lata balsa wood, are all satisfactory.