

HAM TIPS



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THE MAKE-YOUR-OWN MICROPHONE

High Quality, High Output with a Transistorized Microphone

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During the design of a mobile rig the author was recently confronted with the problem of finding a suitable microphone. A carbon microphone, although high in output, is noisy and of relatively uneven frequency response. A crystal microphone has good frequency response but is low in output and has the additional disadvantage — for mobile use especially — of temperature limitations.

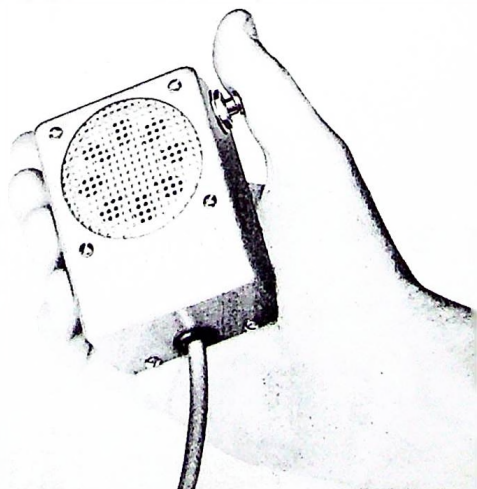
An attempt was made, therefore, to construct a microphone that would have good audio quality, be fairly high in signal output, be rugged enough for mobile ham use, be insensitive to unwanted electrical pickup, and still be within the price range of the average ham. This article describes the result; a surprisingly simple build-it-yourself microphone that meets all the given requirements.

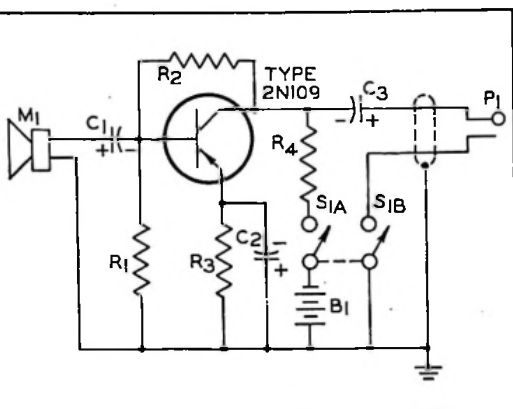
Because of the abovementioned limitations of carbon and crystal microphones, they were discarded in favor of a dynamic "mike." The motor chosen for the microphone is the new RCA 239S1 2 1/8" miniature PM speaker. The motor works into a one-stage, transistorized amplifier. Both motor and amplifier are contained in a small metal box that fits the hand comfortably.

The output of the microphone's built-in amplifier ranges between 0.75 v and 1.0 v measured across a load of 20,000 ohms or more. The audio quality of this microphone surpassed all expectations; in fact, for voice use it compared favorably with a so-called broadcast-quality crystal microphone. The

total cost of the home-made "mike" (exclusive of the metal case, which was formed from sheet aluminum) was less than \$10.00!

Figure 1 is a schematic diagram of the microphone. An RCA-2N109 p-n-p junction transistor is connected in a common-emitter, base-input amplifier circuit. Degeneration, provided through R_b , stabilizes the transistor against the effects of temperature variations. Push-button switch S_1 serves two functions: one pole (S_{1A}) energizes the transistor amplifier; the other pole (S_{1B}) can be used to control the transmitter.





B ₁	Transistor battery, 9 v (RCA VS300, or equivalent).
C _{1, 2}	50 μ f, 12.5 v.
C ₃	2.5 μ f, 25 v.
M ₁	Microphone, RCA 239S1 2 $\frac{1}{8}$ " miniature PM speaker.
P ₁	Male plug, 2-contact (Amphenol 80-MC2M, or equivalent).
R ₁	10,000 ohms, $\frac{1}{2}$ -watt.
R ₂	68,000 ohms, $\frac{1}{2}$ -watt.
R ₃	1,200 ohms, $\frac{1}{2}$ -watt.
R ₄	8,200 ohms, $\frac{1}{2}$ -watt.
S ₁	Switch, push-button, double-pole single-throw, non-locking.

RCA-2N109 Transistor.

Figure 1: Schematic diagram and parts list.

Construction

The microphone is assembled in an aluminum box 3" L by 2 $\frac{1}{4}$ " W by 1 $\frac{1}{2}$ " H. At W2YM the box was made by folding a sheet of aluminum cut to the proper pattern, welding the corners, and applying a coat of paint to the outside. If no welding equipment is available, the aluminum may be bent to form lips that may be bolted together. The box may also be formed from brass or copper, in which case the edges can be soldered together.

A 2-inch hole is cut in the front of the box to accommodate the 239S1 speaker. A piece of Reynolds "Do-It-Yourself" perforated aluminum is placed over the hole, inside the box, to serve as a protective screen for the speaker.

The transistor, its socket, and the associated small components for the amplifier were mounted on a strip of lined bakelite. Any good insulating material, however, can be used for the mounting board. Even cardboard should be suitable.

The leads of the components are passed through #60 holes drilled through the mounting board. Where the leads come through the holes at the back of the mounting board they are bent into small hooks with a pair of long-nosed pliers. These hooks in the leads hold the components to the mounting board and also make for easy connection to the leads. Caution: be sure to observe polarity when connecting the capacitors.

The mounting board is held in place inside the box by two of the screws that fasten the speaker. These two screws should be long enough so that the mounting board can be held above the speaker by two $\frac{5}{8}$ "-long, $\frac{1}{4}$ "-wide spacers.

If the transistor battery is placed in the position shown in Figure 3 before the mounting board is fastened into place, it should be found that the mounting board—when finally fastened down—will serve to hold the battery in place. It might be wise, however, to stick a small piece of insulating tape on the inside of the box near where the negative terminal of the battery will be located. This precaution will remove any chance of the battery accidentally shorting to the box.

The bass response of the microphone can be adjusted by damping the miniature speaker. To obtain suitable damping, cover nine holes in the rear housing of the 239S1 with felt. The felt may be held in place with ordinary household cement. The tenth and last hole in the rear of the housing should be covered with a piece of fiber or cardboard that has a 1/32" hole drilled through for pressure release. Another pressure-release hole, this one $\frac{1}{8}$ " in diameter, is drilled in the back cover plate of the microphone case. With this construction, the frequency response of the microphone is smooth through the range of 400 to 4,000 cps. Response, particularly at the low end, falls off rapidly beyond these limits—a desirable feature for a communications microphone.

Actual construction time for this microphone should be no more than a few hours. The author believes that the finished product is the best microphone for amateur communications now available. Try it and you'll agree.

The author wishes to thank J. Owens, W. Davies, F. Boryszewski, F. Wenzel, and J. Preston for their valuable aid or suggestions during the construction and testing of this microphone.

Figure 2: All components of the microphone and transistor amplifier. Note felt strips and fiber strip with small hole that are placed over the rear-housing holes of the speaker. Brackets to right of center are made from angle brass stock and are used to mount back cover on the case. One bracket has been cut away to clear grammet at bottom of case.

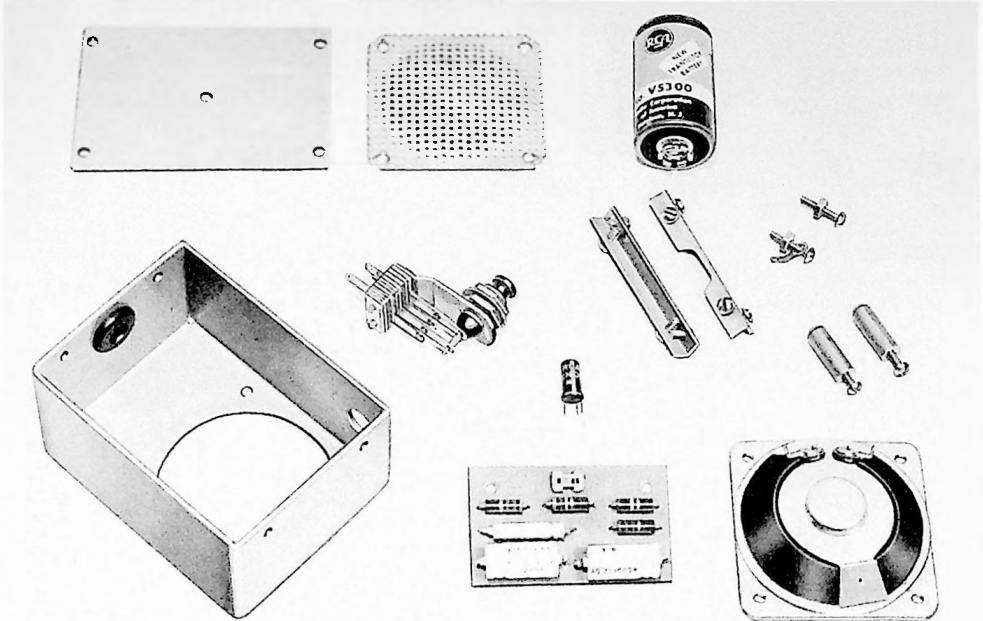
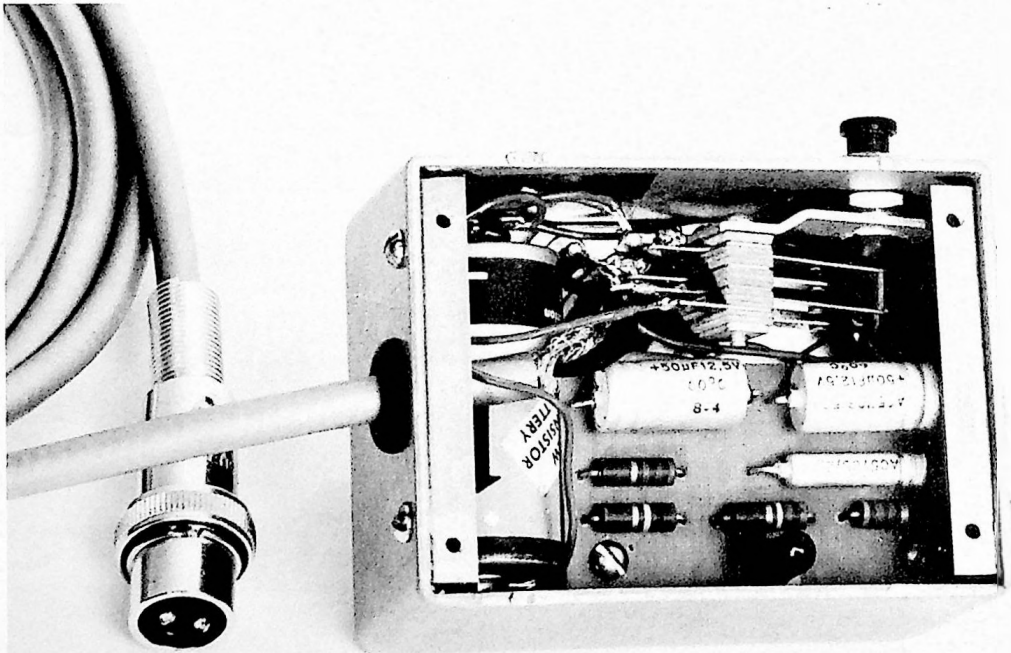


Figure 3: Microphone case with rear cover removed. The terminal board also holds the transistor battery in place.





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New Technical Manual on RCA Transmitting Tubes

Every ham will want a copy of *RCA Transmitting Tubes*, a 256-page manual published by the RCA Tube Division. A companion to the famous *RCA Receiving Tube Manual RC-17*, this new transmitting tube manual contains up-to-date comprehensive and authoritative technical data on 112 types of power tubes — including every “ham type” power tube in the RCA line, as well as tubes with plate-input ratings up to 4 Kw. Included in the manual are maximum ratings, operating values, characteristic curves, outline drawings, and socket-connection diagrams.

This manual contains 16 circuit diagrams showing the use of RCA tubes in representative transmitting and industrial applications. These circuits include a VFO for 3.5-4.0 Mc; crystal oscillators for both fundamental and harmonic output; amplifiers for Class C Telephony Service and for Class C Plate-Modulated Service; modulators; an electronic bias supply; transmitters for operation at 2 meters, 10 meters, and 462 Mc; and oscillators for dielectric and induction heating.

Covering basic theory of power tubes and

their application in an easy-to-understand style, *RCA Transmitting Tubes* also contains valuable information for hams on generic tube types; tube installation and application; rectifier circuits and filters; interpretation of tube data; and the step-by-step design of af power amplifiers and modulators, rf power amplifiers, frequency multipliers, and oscillators. Simple calculations are given for determining proper operating conditions for tubes in class C telephony service, plate-modulated class C telephony service, frequency multipliers, and class AB and class B af amplifiers.

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A reference work that belongs in every ham shack, *RCA Transmitting Tubes* (Technical Manual TT4) may be obtained from your RCA tube distributor, or by sending \$1.00 to Commercial Engineering, RCA Tube Division, 415 South 5th Street, Harrison, New Jersey.