Build this easy tag-along PA

A tiny amplifier, a mini microphone and a loudspeaker. Put 'em together and you've got your own inexpensive carry-around public address system.

by Fred Blechman

If you, or your club or organization, sometimes need a voice amplifier for large rooms, small auditoriums or outdoor gatherings, you can build the basic mini-PA for under $25, not including the microphone. It uses two six-volt lantern batteries and a small kit amplifier, and is built into a pre-assembled bookshelf cabinet that comes complete with a five-inch speaker. It weighs less than seven pounds, including batteries, and can be used anywhere with an external microphone. It even has a carrying handle. The maximum slightly over one watt output is loud enough to boost your voice to be heard by groups of some 100 people, especially if you're competing with background air-conditioning or traffic noises.

Fran Vitrano shows how the home-made portable PA, built into a small speaker cabinet works. Although not the equal of commercial PA systems, it will save wear and tear on your voice when you address more than a handful of people. A chrome cabinet door handle available from any hardware store, adds to the portability.

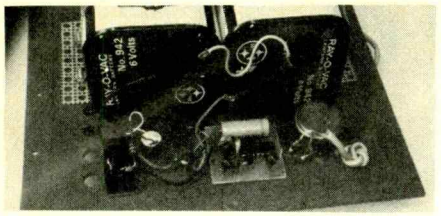
The heart of the unit is a Ramsey Electronics BN-9 *Super-Snoop amplifier* that sells in kit form for $4.95. It uses an LM380 integrated circuit linear amplifier and a transistor pre-amp stage for very high sensitivity (gain is almost 3000). The amplifier is so sensitive that I couldn't find any microphone that would allow me to advance the volume control all the way without overloading it.

The microphone input from jack J1 is reduced by potentiometer R1 and fed to the input of the unmodified BN-9 amplifier. The output of the BN-9 goes to the speaker that is already built into the cabinet specified in the parts list. Phono jack J2 and terminal screws TS1 and TS2 are also provided in this cabinet, in case you want to connect an external eight ohm speaker to operate in parallel with the cabinet speaker, for greater sound coverage. Switch S1 allows the batteries to power the amplifier.

Meter M and dropping resistor R2 are optional, and are used to monitor battery voltage under load. A full-scale meter reading, using the meter specified in the parts list, is approximately 12 volts, with half-scale at about nine volts. When the meter needle drops below this point, be prepared to change the batteries soon, since distortion will start to become noticeable below about eight volts. The battery drain is about 100 milliamperes at 12 volts at typical voice levels (about 10 milliamps when not speaking). This will give you approximately 50 hours of voice use until the batteries are down to eight volts, for an operating cost of under 10 cents an hour.

Ready to build

The unit I built uses a microphone permanently wired into the circuit. I quickly found that this was not a good idea, since I needed to add brackets to the back of the unit to hold the microphone and its cable. Messy! Instead, I later added the microphone jack shown in the schematic, and I now can use *any* microphone leaving the back of the unit uncluttered. By using a standard one-quarter inch phone jack for the microphone input, the unit will accept many microphones directly, and most others



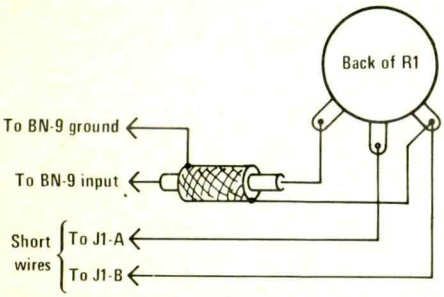
The amplifier board, batteries and other parts can be mounted directly on the speaker cabinet's rear panel.

with the optional adapter in the parts list.

The layout I used has a particular advantage—all the new parts are mounted on the cabinet's rear panel, which is easily removed. Only two wires go from the rear panel to the speaker, and they have clip ends for easy connection to the speaker terminals.

A bracket, made from decorative punched aluminum sheet, holds the batteries against the panel with four screws and nuts. Two small right-angle brackets are used as shelves for the batteries to rest on.

The BN-9 amplifier kit is assembled according to the instructions that come with it, with no modifications. Since a printed circuit board is included, it only takes about 20 minutes to assemble the



The wires from the volume control, R1, to microphone jack must be kept as short as possible. Use shielded wire to the amplifier board.

BN-9. It is held to the back panel with double-sided foam tape, commonly found in hardware stores. The drawing shows how to wire the potentiometer to the amplifier and jack so that clockwise rotation of the pot will increase the volume. Place the jack close to R1, and use regular wire to connect them; but use shielded wire (or two wires twisted together) between the pot and the input to the amplifier. Otherwise, there's a chance of inducing hum through this short, but high-impedance, connection.

Use lantern cell batteries with binding posts rather than spring terminals. Wire the batteries in series with a short piece of wire, positive terminal of one battery to the negative terminal of the other battery. Then wire the remaining positive terminal to the amplifier positive input. The remaining negative battery terminal goes to either terminal of the switch. The other switch terminal is wired to the amplifier ground connection.

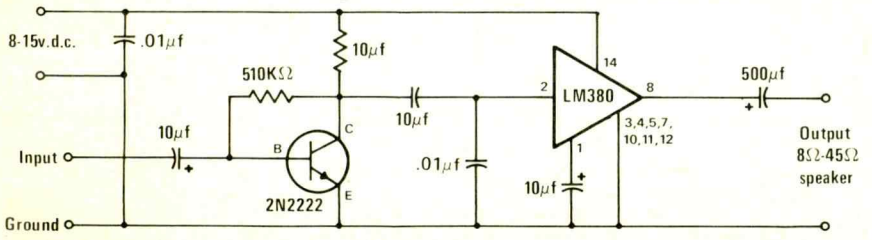
A typical hardware store cabinet handle is added by drilling holes in the top of the cabinet. For best balance, place the handle slightly toward the rear of the cabinet, instead of dead-center, since the rear-mounted batteries make the unit heavier in the back.

Now you're ready to test the mini-PA. Turn on the switch. After about five seconds the speaker will hiss slightly. This is normal, and reminds you the unit is on—so you won't need a pilot light. The hiss should not be affected by the setting of the volume control. Now, turn the volume control setting all the way counter-clockwise and plug in a microphone. A 600 ohm dynamic or electret microphone will sound the best, but practically any microphone will work. A crystal mic will have lots of gain but sounds tinny. Radio Shack's 33-1034 pencil type dynamic mic ($5.99) sounds fair, but their more expensive 33-1050 electret mike ($17.95) sounds much better. Try all the microphones you have available, and use the one that sounds best. In all cases, when you advance the volume control past a certain point, you'll get feedback howl. This can be eliminated in several ways: reduce the volume control setting slightly; move the microphone farther from the mini-PA speaker; use a cardioid or noise-cancelling directional microphone.

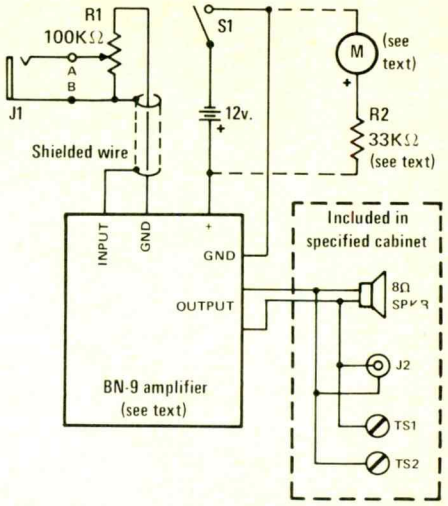
Many microphones have on-off switches using additional wires in the mic cable. Don't try to turn the amplifier on and off with this switch, since the amplifier is so sensitive the microphone leads will pick up the power fluctuations in the power leads of the mic cable and you'll get distortion. Use a separate panel power switch instead.

Possible substitutions

The only critical part is the BN-9 amplifier. Any eight-ohm speaker able to handle at least one watt can be used.



If you're into making your own printed circuit boards, or prefer to hand wire, here's the diagram of the BN-9 amplifier. If you're not experienced at scratch building, you'll be wise to use the Ramsey Electronics kit.



This portable PA really contains only a handful of parts. The battery-check meter is optional. J1 can be eliminated if you wire your microphone permanently into the PA circuit.

You can build your own cabinet. Six or eight D cell batteries can be used as a power supply, or you can plug the unit into your car cigarette lighter for 12 volts. The switch and potentiometer may be almost any type, but avoid subminiature sizes. Any milliameter will work, but the value of resistor R2 would have to be changed to show full-scale at maximum battery voltage.

Parts List

BN-9 Super Snoop Amplifier Kit ($4.95 Ramsey Electronics, P.O. Box 4072 Rochester, NY 14610. Add 75¢ for orders under $10. NY residents add 7% tax)

R1—100K potentiometer (Radio Shack 271-092 99¢)

S1—SPST panel switch (Radio Shack 275-602 79¢)

Minimus-3 Cabinet and Speaker (Radio Shack 40-913 $10.95)

Knob—for potentiometer (Radio Shack 274-407 2 for 99¢)

Batteries—two six-volt lantern cells (Radio Shack 23-066 $2.39 each)

Microphone—your preference

Miscellaneous—Carrying handle, double-stick foam tape, scrap sheet metal, screws, nuts, wire.

Optional Parts

M—500 uA sub-mini panel meter ($1.20 Formula International, Inc., 12603 Crenshaw Blvd., Hawthorne, CA 90250. Minimum order is $10. Write for catalog)

R2—33K ¼W carbon resistor (Radio Shack 271-1300-33K 5 for 39¢)

J1—¼" phone jack, open circuit (Radio Shack 274-260 59¢)

Adapter—⅛" miniature phone jack to ¼" phone plug (Radio Shack 274-325 99¢)

The mini-PA won't substitute for a professional public address system, but it will allow you to have an inexpensive, portable amplifier that will save your voice while providing pleasant listening for your audience.