

Noise Canceling with Electret Condenser Microphones

Reduce the transmission of background noise with a simple circuit and a pair of inexpensive microphone elements.

Are you tired of hearing complaints that you're transmitting more noise than voice? Do you want to avoid screaming into the microphone to make yourself understood? You can find a common cure for these problems with this simple noise-canceling technique.

With older dynamic microphones (which aren't polarity sensitive), noise canceling is easy: You simply mount the microphones mechanically back-to-back, wire each microphone's positive terminal to the other's negative terminal, then feed the combined output to the microphone amplifier. Because most ambient noise enters both microphones simultaneously (sound reflections from hard surfaces notwithstanding), the noise is canceled while the speech received by the microphone closest to the operator's mouth is unaffected by the other microphone. Electret condenser microphones are polarity-sensitive and no longer offer this wiring option, so the noise canceling must be achieved by other means.

Circuit Description

One way of achieving noise canceling with electret microphones is shown in Figure 1. Both electret microphone elements—standard types purchased at RadioShack (RS 270-090C)—are used. (Similar electret elements are available from other sources.) Because the microphone elements have an operating voltage of 1 to 10 V, I feed them via a 9-V regulator equipped with 0.01- μ F disk-ceramic capacitors on its input and output leads. Optionally, the microphones

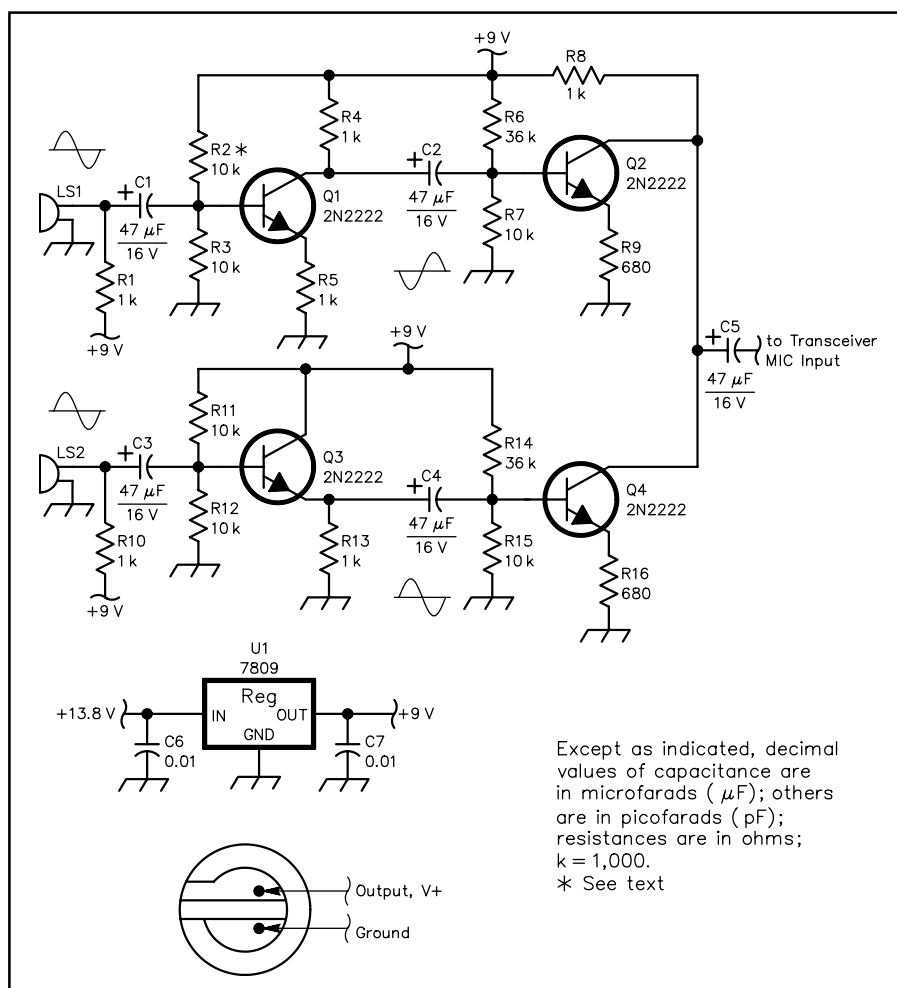


Figure 1—Schematic of the noise-canceling microphone circuit. Unless otherwise specified, resistors are $\frac{1}{4}$ -W, 5%-tolerance carbon-composition or metal-film units. RS and RSU numbers are RadioShack. Equivalent parts can be substituted; n.c. indicates no connection. Parts are available from several sources including: Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677; tel 800-344-4539, 218-681-6674, fax 218-681-3380; www.digikey.com; Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002; tel 650-592-8097, domestic fax, 800-237-6948, international fax, 650-592-2503; info@jameco.com; www.jameco.com; RadioShack—see your local distributor. RadioShack.com L. P., 300 West Third Street, Suite 1400, Fort Worth, TX 76102; www.radioshack.com and Tri-State Electronics, 200 W Northwest Hwy, Mt Prospect, IL 60056; tel 800-445-0896, 847-255-0600; www.tselectronic.com; sales@tselectronic.com.

C1-C5—47 μ F, 16 V or more (RS 272-1015)
C6, C7—0.01 μ F, 50 V disc ceramic (RS 272-135)
LS1, LS2—Electret microphone element (RS 270-090C)
Q1-Q4—2N2222 (RSU 11328499) or 2N2222A (RSU 11328507)
R1, R4, R5, R8, R10, R13—1 k Ω
R2, R3, R7, R11, R12, R15—10 k Ω ; R2

may be a 20-k Ω pot (RSU 11344132); see text.
R6, R14—36 k Ω
R9, R16—680 Ω
U1—7809 9-V, 1-A positive-voltage regulator (RSU 10911048); see text.
Misc: PC board (see Note 1), enclosure (see text), hardware

can be powered by a standard 9-V battery (as are the power microphones used by some CB operators). The only downside is that batteries tend to run out of juice at the worst possible moments—as when that rare DX station wants you to repeat your call sign for QSLing!

Q1 and Q3 provide the phase differential required for signal combination; Q2 and Q4 act as buffers. The output of the buffers is then combined and fed directly to your radio or to an amplifier if your radio needs a higher input level. You can replace R2 with a 20-k Ω pot to use as a **BALANCE** control in case the bias-resistor values of both branches are not close enough to provide optimal noise canceling when signals are added.

Assembly

A PC board for this project is available.¹ There are several ways to mount the electret elements. The easiest approach is

¹A PC board for this project is available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118-9269; tel 847-836-9148 (voice and fax). Price: \$4 plus \$1.50 shipping for up to four boards. Visa and MasterCard accepted with a \$3 service charge; www.cl.ais.net/farcir/.


to use the case of a surplus or discarded microphone, replacing the original internal components with the electrets. Or, you can mount the elements in a small metal box connected between your microphone and radio. Another alternative with which I'm experimenting is to put one electret element in a microphone housing and bring a connector out of the box for attachment of the second element. The second element can then be mounted at a convenient location. In a mobile environment, that spot might be the headrest of the driver's seat. This allows a mobile operator to use a small microphone.

I highly recommend the use of a grounded metal box, shielded and bypassed leads and filtered power-supply lines to house the circuit. Some of this may be overkill (depending on your environment), but it's cheap insurance against RF from your own radio getting into the audio section, or alternator whine and/or ignitions pops from your car. The medium- to high-impedance lines of microphones make great receiving antennas!

The circuit is designed to use standard components that can be obtained from virtually any electronic parts distributor; my favorites are Digi-Key Electronics,

Jameco Electronics and Tri-State Electronics.

This noise-canceling approach is useful whether you're operating mobile, combating indoor noise from washing machines, dishwashers and kids, or outdoors participating in events such as Field Day. Developing and using gadgets such as these can be as much fun as operating!

Klaus Spies, WB9YBM, became interested in Amateur Radio during his last year in junior high school in the mid '70s, when he received his license with the help of the school's Vice Principal. His initial interest was CW, but that got put on hold when his interest in homebrewing became predominant. When he gets caught up with a few more projects, he plans to return to more active CW work. Klaus' work career has paralleled his ham career. He received an associate degree in electronics, worked at Motorola in the corporate research department as a laboratory technician performing design work and obtained a commercial radio license. Klaus currently works as a draftsman in the computer field. He is the trustee of W9CYT, the Weathersfield Radio Club, which promotes homebrewing. You can contact Klaus at 815 Woodland Heights Blvd, Streamwood, IL 60107; wb9ybm@juno.com. 

NEW PRODUCTS

BENCHER SKYHAWK YAGI SALES RESUME

◇ Bencher Inc has released a redesigned version of their Bencher Skyhawk 3×10 triband Yagi antenna.

The Skyhawk covers three bands—20, 15 and 10 meters—and consists of 10 full-sized elements. The antenna includes three elements for 20 meters, three elements for 15 meters and 4 elements for 10 meters all mounted on 2-inch diameter 24-foot boom. The weight is specified at 75 lbs and the turning radius, 22 feet.

The antenna had been withdrawn from the market earlier this year due to a potential patent problem with the feed arrangement. A new feed system that directly feeds each of the driven elements from a single coax feed line—replacing the previously used open-sleeve feed—has been designed and implemented.

As with the previous version, the manufacturer states that the antenna can be used on 12 and 17 meters, but the performance is "limited."

For further information on the Bencher

Skyhawk visit your favorite Amateur Radio products dealer or contact Bencher Inc, 831 N Central Ave, Wood Dale, IL 60191; tel 630-238-1183; fax 630-238-1186; bencher@bencher.com; www.bencher.com.

NEW HIGH VOLTAGE SWITCHABLE CURRENT REGULATORS


◇ IXYS Corporation has recently released a new 900 V current regulator.

Typical applications include over-voltage and over-current protection, inrush current limiters, soft start systems and adjustable current regulators.

The device is available in two different packages. The IXCY10M90S is in a TO-252 package; the IXCP10M90S is in a TO-220 package.

The current regulator is normally on and requires a negative bias voltage of 5 V to turn it completely off. A current limit of 1 to 100 mA can be set either by the gate voltage or by placing a resistor in series with the cathode. The device is capable of maintaining the current up to 900 V—subject to the temperature and power limitations of the silicon chip and package (40 W at T_C = 25°C). The dynamic resistance is 100 k Ω and the current regulation is $\pm 5\%$ from 25°C to 125°C.

IXYS Corporations offers a wide range of power semiconductors, including power MOSFETS, IGBTs, ultra-fast reverse recovery diodes, thyristors, rectifiers, multichip modules, DCB ceramic substrates and power interface integrated circuits.

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