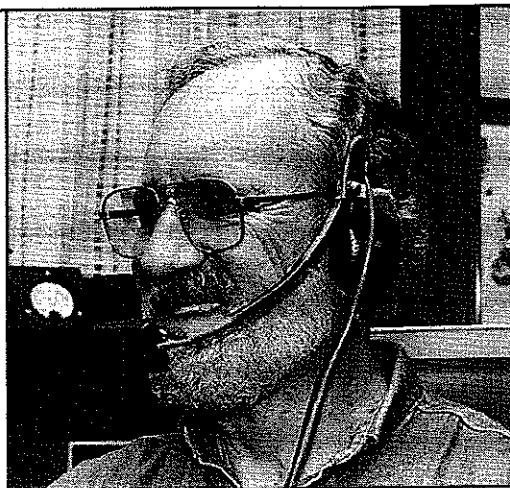


# Build Your Own Microphone Headset

Take a couple of hours this evening and build a high-quality microphone headset!



**M**ore and more, many of us are using our computers with our ham radios. Although I don't use mine for packet radio, which is probably the most common application, I do use it for contest logging and for SSTV (slow-scan television). If your situation is similar to mine, you're constantly dealing with the conflict between finding sufficient desk space for your microphone and computer keyboard. They always seem to be in each other's way! I can't type well unless the keyboard is directly in front of me, and I can't actuate the VOX (voice-operated switch) and modulate the transmitter unless I speak directly into the microphone.

What I needed was a headset with a built-in microphone. The advantages are that the keyboard can then be directly in front of me, and—no matter which way I turn my head—I am still speaking directly into the mike. I proceeded to query people on the air to determine which headset was best. Most people I talked to recommended headsets that cost well over \$100. This expenditure seemed redundant since, like many of us, I already had a couple of good sets of headphones. So, I decided to build my own headset, using headphones I already had. Like the commercial units, mine must: (A) be completely adjustable in terms of position, (B) be able to swing up out of the way when just the headphones are being used, (C) be lightweight and comfortable over long periods of operation, and (D) have very high transmit audio quality.

## Selecting the Mike Element

I had always enjoyed excellent audio reports with the Yaesu desk mike I used with my Yaesu transceiver. The *element* inside the Yaesu mike (the part of the microphone that actually changes sound into electrical impulses) seemed well tailored for my station and I didn't want to do anything that would reduce the overall quality. That means I couldn't use just any mike element. I ordered a Heil replacement element, the same one used in the top-of-the-line headsets. (Heil elements are stocked by most ham equipment distributors.)

There is a choice of two Heil elements available, the HC-4 and HC-5. The HC-4 was designed for contest and DX operators. It's high-pitched, with a fairly narrow frequency response of 500 to 3800 Hz with a 10-dB peak at 2000 Hz, and a sharp 12-dB-per-octave low-frequency roll off at 500 Hz. This is the element you should select if you want to break through DX pileups. The HC-5 is the element to select for typical rag chewing. It has very clean audio and will provide maximum voice clarity. Its wider frequency response is 350 to 4000 Hz, with a sharp low-frequency roll off under 300 Hz, a high frequency roll off above 3100 Hz, and a peak at 2100 Hz. Although I do a little DX chasing and a few

contests each year, I selected the HC-5 because I spend most of my time in ordinary conversation. Later on-the-air comparison tests between my old and new microphones showed that this was a good decision. My friends couldn't tell the difference.

## Which Headphones?

My other concern regarded which of my two excellent sets of headphones to select. They couldn't be more different. One was large, well padded, and had individual volume controls on each side. The other was much smaller and lighter weight, and didn't cover the entire ear. For comfort over long periods of operation, I chose the smaller pair. Not covering the entire ear is an advantage, since I like to know what is going on around me. (At least I can hear the telephone ring!)

An "arm" must be fabricated to hold the microphone in the proper position. One end, attached to the earphone, must be capable of pivoting up or down, and it has to be able to remain in position once it is set. The opposite end attaches to the microphone housing where the element resides. The arm must be flexible enough to be bent into the right position for locating the mike in front of your mouth, and, once bent, must stay in that position. To make the arm I used two 7-inch lengths of black insulated #14 solid copper wire. This came from a left-over length of house

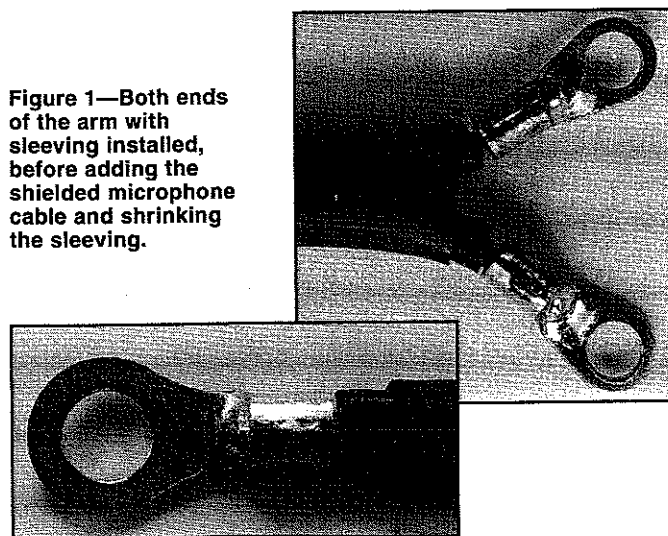


Figure 1—Both ends of the arm with sleeving installed, before adding the shielded microphone cable and shrinking the sleeving.

wiring, usually called "Romex." The reason for using two lengths rather than one is so that the arm can mount to the microphone housing at two corners and provide much more rigidity. I stripped and soldered one end of both lengths into a large lug with a 1/4-inch clearance hole. This provides the pivot at the earphone end. Smaller lugs with clearance for No. 6 machine screws are soldered to the other ends, providing the microphone mount. A length of shrink sleeving binds the two copper wires together. Figure 1 shows the ends of the arm, with the lugs and shrink sleeving installed. Don't shrink it until later, after the microphone cable is inserted.

### Working with Shrink Sleeving

Shrink sleeving (sometimes called "heat-shrinkable tubing") is wonderful stuff that permanently reduces its diameter when heated. It is very handy for binding cables. The best way to heat it is with careful application of a heat gun, which looks like an industrial strength hair dryer. If you don't own such a device, a lit match carefully run up and down along its length will work fine. Do not hold the match in one place too long or the sleeving will start to melt.

The neatest way that I've found to shrink the tubing is to support the arm on a couple of wood blocks in your oven and simply bake it at 200° F for a few minutes. I used this method, but added the microphone element later so that it would not be exposed to the heat. You should fasten the arm to the plastic microphone housing *after* this step, because the ABS plastic housing will melt. I learned it the hard way, and it meant another trip to the supplier!

Radio Shack stocks a package of assorted diameters of shrink sleeving in 6-inch lengths, which is exactly the correct length for this application. Not only did I use one piece for the arm, but I also used several concentric short lengths to build up the mike cable diameter at the connector end so that the strain relief clamp on the connector could grip the cable securely.

### Packaging the Microphone

Next, it was time to package the microphone. I found an ideal plastic enclosure, only 9/16 × 1 3/8 × 2 1/8 inches in size. I carefully drilled two holes about 1/4 inch in from the two corners, using a No. 27 drill bit (0.144 inches in diameter). These are for mounting the arm to the case, using 6-32 hardware as shown in Figure 2. To allow the sound waves of my voice to enter the microphone, I drilled a 3/8-inch hole in the cover of the case just in line with the opening in the element. Finally, a clearance hole was drilled in the end of the case for the microphone cable, which is routed inside the shrink sleeving and can also be seen in Figure 2.

The mike element is not mounted rigidly to the housing, but floats on foam plastic to avoid transmission of vibration, and because the manufacturer suggests a thin piece of foam in front to reduce breath blasts. I glued in a piece of black speaker grill cloth (any coarsely woven fabric will do), and then the foam plastic, to the front cover over the 3/8-inch hole. I glued another thin piece of foam to the rear cover, so that when the cover is closed, the element is sandwiched between the two foam plastic slabs and is securely held in place.

### Adding a PTT Switch

I added one additional component, which is optional. Although I usually use VOX operation, I like to have a push-to-talk (PTT) switch available. This is for those rare occasions when your VOX decides not to work properly, which has probably happened to us all. I mounted a miniature normally open momentary contact push-button on the top surface of the mike housing. Adding the button affects microphone cable selection. Without the PTT button, you can use small, flexible single conductor shielded microphone cable. With the addition of the push-button switch, two additional conductors are required, connecting to the proper pins on the mike connector for the PTT circuit. To avoid RF feedback, shielded cable is required. I used four-conductor cable that has both a foil

Figure 2—The inside (below) and the front (right) of the microphone housing.

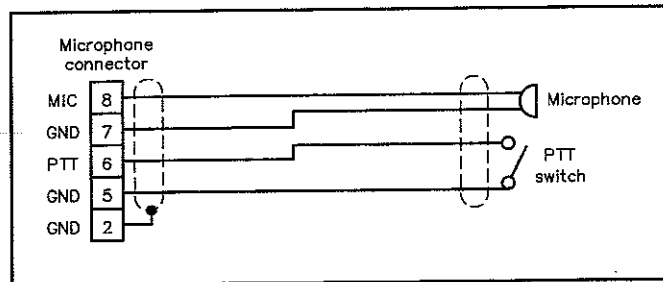
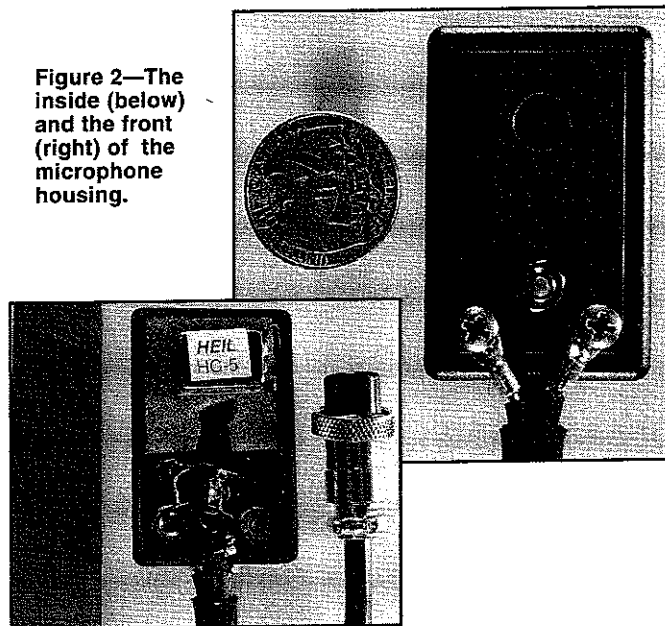


Figure 3—Headset wiring diagram.

Microphone element—Heil HC-5

The following are Radio Shack part numbers:

Microphone housing—270-288

Microphone plug, 8 pin—274-025

Shrink sleeving assortment—278-1627

Push-button switch, momentary contact, normally open—275-1571

and a braid shield. Many modern transceivers use the same 8-pin microphone connector, which is readily available and is shown in Figure 2 and on the parts list.

Figure 3 shows the headset wiring diagram. The pin numbers as shown are correct for my two Yaesu transceivers, but may or may not be correct for yours. Carefully check your transceiver manual before wiring. The cable you select should be as thin and flexible as possible, and about 4 feet in length.

### Attaching the Arm to the Headphones

One interesting challenge was mounting the arm to the headphones. After some experimentation, I chose the mounting configuration shown in Figure 4. It is mounted as low as possible on the headset, just above the left earphone. I used a Nylon cable clamp for mounting the arm, and 1/4-inch hardware holds everything together and also acts as a tension adjustment. The lug at the end of the arm is inserted *between* the two sides of the clamp as shown, and screw tension is adjusted so that the Nylon cable clamp acts as a brake and reliably holds it in the selected position, but also allows it to be rotated up and down. As shown in Figure 4,

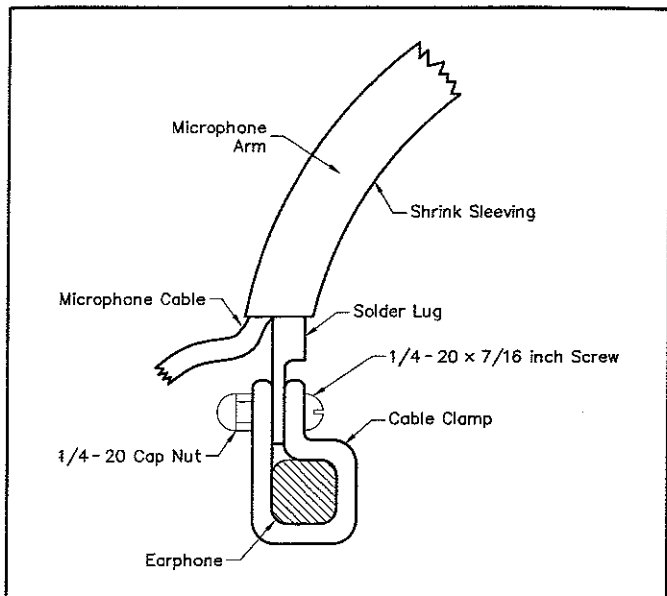


Figure 4—Microphone arm mounting configuration.

## New Books

### MORAN OF KATHMANDU

By Donald A. Messerschmidt

Published by White Orchid Press, 98/13 Soi Apha Phirom, Ratchada Rd, Chatuchak, Bangkok 10900, Thailand. Softcover, 5 1/2 x 8 1/2 inches, 314 pages with index, B&W illus, ISBN974-89271-6-4, \$23 (available from the publisher).

Reviewed by Chuck Hutchinson, K8CH  
Membership Services Manager

This book, subtitled *Priest, Educator and Ham Radio Voice of the Himalayas*, is the biography of Father Marshall D. Moran, a Roman Catholic Jesuit priest and a well-known amateur. Life for Moran began in Chicago on May 29, 1906, and ended nearly 86 years later at Holy Family Hospital, New Delhi, India on April 14, 1992. Father Moran invested more than 40 years of his life in Nepal and was widely known among hams as 9N1MM. Between 1960 and 1992, his voice was regularly heard on the 20-meter band where he handed out QSOs to DXers around the world. More than a DXer, Marshall Moran did his share of assisting in medical emergencies in Nepal, evacuations from ships at sea and relief to a storm-stricken expedition in Antarctica. One time, at the request of a Baptist minister, he delivered an Easter Sunday sermon by ham radio to a group in Antarctica.

The ARRL Board of Directors awarded Moran the 1987 ARRL International Humanitarian Award. They praised Moran as one "who, through amateur radio, [is] devoted to promoting the welfare of mankind" and as a man with "an indomitable spirit to learn as well as teach."

Moran became interested in radio as a seventh grader in 1918. He turned that interest into income by constructing receivers that he would sell to neighbors. After deciding to become a Jesuit priest and graduating from college, he set sail for mission service in India.

Twenty years later, in October of 1949, Moran visited Nepal, and just over a year later, the Nepalese government gave its approval for the Jesuits to start a school, which opened the following summer in Godavari (if you want to know about the leopard in the school yard, you'll have to read the book). The school became Moran's final resting place.

As the 1950s ended, Nepal upgraded its communication infrastructure by installing HF links at key points within the country. Amateur frequencies were used for equipment testing, and through that program, the call sign 9N1MM was issued to Father Moran. For the next 32 years, as 9N1MM, Marshall Moran became a ham radio legend.

I had the good fortune to meet Father Moran in 1988 when he visited

everything is held together with a chrome-plated 1/4-inch screw and capnut. You don't have to go to a hardware store, since these items are readily obtainable at any car parts store as license plate mounting hardware.

The microphone and earphone cables are tied together about every 6 inches with small, black plastic wire ties. The connectors neatly plug into my transceiver's microphone socket and earphone jack.

### Finished!

For a total expenditure of about \$40, I am very happy with my headset. The comfort and convenience, compared to my old setup, have exceeded my expectations, and I have audio quality equivalent to a much more expensive unit. This project doesn't take long, and you don't have to be a rocket scientist to do it. If you're running out of desk space as I was, this may be the solution to your problems.

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QST

ARRL HQ. He remembered me from the few QSOs we had enjoyed, but he was more interested in talking about technology. He was interested in satellites, and was fascinated by a project that I was working on using an MMIC. He may have been a priest, but he had a keen grasp of technology.

For many DXers, Moran was their first contact with Nepal. If you were one of them, you'll surely enjoy reading about the interesting life he led—much of the book is based on taped reminiscences of Moran himself. If you're not, you'll probably enjoy reading about this ham operator who made his mark not only on Amateur Radio, but also upon mankind.

### Father Moran Visits

The Connecticut DX Association twice hosted Father Marshall Moran, 9N1MM—in 1984 and again in 1988. During his 1988 visit, my family and I had the pleasure of having Father Moran stay at our home. I'll always remember the year because that year my first son, Ben, was born.

Father Moran talked about his life in Nepal. He told us how he received his Nepalese call sign, 9N1MM, from the king, and how he was able to get on the air. He told of his school and his students, of which he was very proud.

It was still dark the next morning when I heard loud foot steps in the hall. Father Moran wore heavy leather shoes, so I knew it had to be him, so I went to see if he wanted some breakfast. But, once in the hall, I saw that my shack door was closed. "Ah," I thought, "he must want to get on the air!" I knocked at the door and he said, "Come in." To my surprise Father was saying morning Mass at a makeshift altar right in my station! A candle stood atop my power supply, another on my tuner, and the cross of Jesus stood right in the middle. He asked me to join him, and I did, kneeling beside him as he said Mass. What a way to start the day!

Afterwards, he commented, "You should work plenty of DX from your station now."

After breakfast he went on the air from my station. "CQ, CQ, CQ, this is 9N1MM/W1," he called a couple of times. Wow! A hundred stations must have come back to him. I never generated that kind of pileup with my call sign.

Our visit with Father was short but left me lasting memories. We photographed Father Moran in the ham shack holding my infant son. I'll always cherish those. I was very saddened by his passing and will always remember his visit to my home and to my ham shack.—Peter Budnik, KB1HY

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