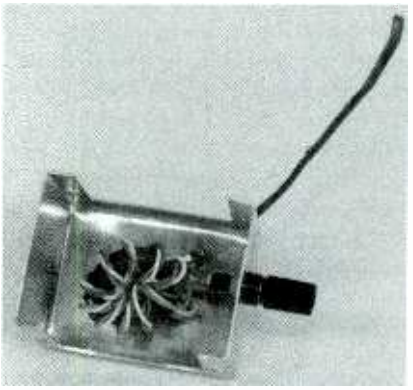
The Back Yard Beverage



The broadband transformer is three wires twisted together and then wrapped around a toroid core. Connection to the receiver lead in is via the coaxial connector. The end of the Beverage antenna connects to the binding post, while the ground lead from the housing connects to the ground stake.

By Douglas A. Blakeslee, N1RM

Listening for high frequency (HF) signals on the lower shortwave bands, 2.3 and 5 MHz, is not for the faint of heart. Weak signals, lightning crashes, and — on nights with good reception — a panoply of interfering signals are the lot of all listeners. At these low frequencies, the only simple way to make a major improvement in reception is with an appropriate antenna. For most of this century the simple antenna of choice has been the Beverage.

H. H. BEVERAGE

Some famous pioneers of radio techniques are remembered because their inventions still carry their names. For example, oscillator configurations are named for Colpits, Hartley and Clapp. Howard H. Beverage, W2ML, tried a number of antennas for reception of transatlantic telephone circuits. While working for RCA, he experimented at 1.2 MHz — what is now the center of the AM broadcast band. He found that very long wires close to the ground produced excellent results, including low noise reception and good directivity.

Because of the proximity to the ground, the antenna is not efficient and thus not suitable for transmitting. Efficiency in reception is not a requirement at the frequencies of interest, as most signals are too strong, not too weak. The problem is sorting the ones of interest from the rest.

BEVERAGES FOR AMATEURS

An important challenge for amateurs, after the shutdown of operation during World War I, was to get signals across the Atlantic. In 1921 the fledgling American Radio Relay League (ARRL) in 1921 sent Paul Godley, 2ZE, to a beach in Scotland with modern (for then) receivers to listen for amateur signals from North America. His antenna of choice was the Beverage. Godley filled half a logbook page with reception reports. When the accomplishment was reported in ARRL's monthly magazine, *QST*, it said, "Get out those exclamation points Mr. Printer, *because we got across!*" This story was recently retold in *QST*.[1]

Radio amateurs moved to higher frequencies, driven away by commercial interests who wanted uncontested access to the lower frequencies. So, amateurs went up the radio spectrum, only to find that long distance (DX) communication was easier the higher the frequency, especially with smaller antennas and low power. The shortwave revolution was under way.

At the higher frequencies the Beverage antenna had no advantage, so the design was largely forgotten. For years after World War II, amateur operation of the 160-meter (1.8-MHz) band was restricted because of the Loran (long range navigation) system that operated within these channels. Once the Loran restrictions were removed, operation again became popular on 160, which also resulted in a new search for DX contacts.

Then, ARRL announced a new operating award, Five Band DXCC, for communicating with 100 different countries on five bands. Probably the most difficult aspect of the new award was the requirement for communication on 3.5 MHz, the 80-meter ham band. For both applications, reception from long distances brought the Beverage back to preeminence for reception.

SIMPLE OR COMPLEX?

John Devoldere, ON4UN, in his excellent book *Low Band DXing*,[2] describes a number of Beverage designs, from simple to reversible to balanced wires thousands of feet long. For those who don't have a farm or a back yard the size of multiple football fields, most of these antennas are impractical. However, John also mentions a simple Beverage that resembles an inverted V of wire, low to the ground at the high point and descending to ground level at either end. The V provides a configuration that does not allow much stray pickup on the downlegs of the antenna, enhancing directivity. Does it work? You bet!

This writer built a field of Beverage antennas atop one high point in the seven-mountain range in central Pennsylvania. The results of these long, single-wire antennas were outstanding. The easy test was to monitor the broadcast band. At the flick of a switch, different stations from different directions could be heard on the same frequency, with little or no interference to each other.

A change in employment led to a move first to Minnesota and then to Wisconsin. Reception was bad to impossible on the lower HF bands with regular wire antennas. The land available was way too short to accommodate even ON4UN's shortest design. The question became, could a very short Beverage be useful and effective? A search of literature came back with a resounding "no." But then, there was also no indication that anyone had ever tried.

With a number of trips to South America scheduled for business purposes, this writer thought it would be useful to listen to broadcasts from various countries in the region to listen to local language usage. The Latin band of 4.8 to 5.1 MHz was the place to listen (from Wisconsin). But, something better than a long wire antenna would be needed.

FIG. 1

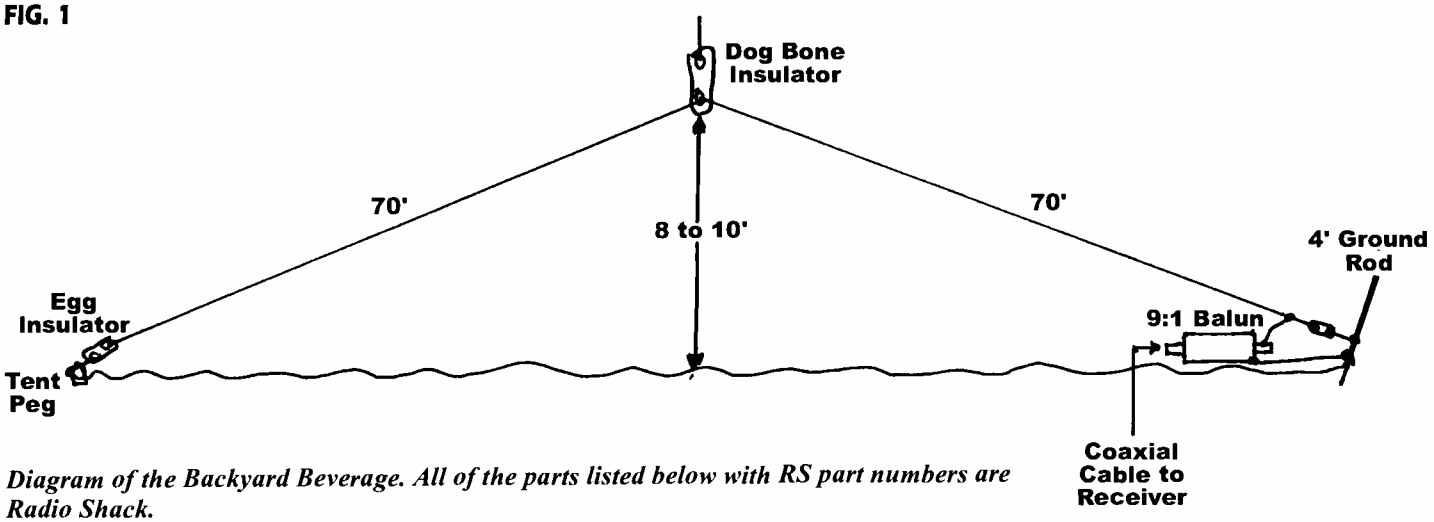


Diagram of the Backyard Beverage. All of the parts listed below with RS part numbers are Radio Shack.
1 — Stranded antenna wire, 70 ft, two needed (RS 278-1329)
2 — Egg antenna insulators, kit of two, (RS 278-1335), used at the ends of the antenna.
3 — Dog bone insulator (RS 278-1136) used to insulate the high point of the antenna.
4 — 4 foot ground stake (RS 15-530).

A BEVERAGE FOR THE BACK YARD

The antenna that evolved in shown in Fig. 1. The size was determined by the space surrounding the house and the components available from Radio Shack. The center point is suspended from a corner of the house, some 8 to 10 feet above ground. The two ends droop to ground level. One end is held in place by a tent peg. The other requires a ground connection, which is provided by a short ground stake.

The feed end of the Beverage has a broadband transformer to match the impedance of the antenna (typically 400 to 500 ohms) to 50- or 72-ohm coaxial cable that provides connection to the receiver. The construction of this transformer is given in Fig. 2. Three wires are twisted together with five turns per inch. The wires must be color coded in some way so that the individual conductors can be identified for connection once the transformer is fabricated. Your author used hookup wire with different colors. An alternative is to employ enamel-coated wire color coded with fingernail polish or any other color source.

Once the wire bundle is wound around the toroid core, the end connections should be soldered together in the pattern shown in Fig. 2. In this implementation, the transformer is built into a small aluminum box. Another version was just soldered together including the feed cable and the ground connection, which was then covered with RTV silicone sealer. Either method works, although the latter is less expensive and avoids the problem of weatherproofing the box. For the box, a plastic freezer bag sealed with freezer tape will last one winter season. The coaxial connector should still be coated with silicone sealer to prevent moisture damage.

In this design, the far end of the Beverage is unterminated, which means that the antenna will exhibit a bidirectional characteristic. For most monitoring purposes, this is not a problem, especially if there won't be a lot of strong signals from the back side. In this case, the rear of the antenna was going to be aimed at Siberia, not a hotbed of activity on the Latin band.

Terminating the Beverage at the far end with a 420-ohm carbon resistor will provide more unidirectional reception — with emphasis toward the terminated end. However, the grounding required at both ends of the antenna becomes more extensive — almost impossible over relatively nonconductive soil. Try the terminated version if you wish, but don't expect too much.

AIMING

A very short Beverage has a wide coverage pattern off both ends (if unterminated). However, it is directional with good nulls (i.e. no reception) off the sides. Thus, it is vital to get the wire oriented in the correct direction. Your writer has found that local maps can be unreliable to determine north; a compass is usable if you have an accurate instrument, and if it is not surrounded by a lot metallic objects such as house wiring, power and telephone lines.

You also need to determine the difference between magnetic north and true north for your location. These data are available, but there is a simpler method. Watch your local TV or the weather TV channel and determine sunrise and sunset for your area. Divide the times by two to find local "high noon." At that time, on a sunny day, drive a stake into the ground and note the shadow that results. It points very close to true north.

Once you have north determined, a protractor on the ground can show the offset needed for your wire antenna. In my case I wanted 25 degrees offset from the north/south line.

RESULTS

For those who have never tried a Beverage, the first evening of monitoring will be nothing like what you have heard before. If you have another antenna, make sure to use an antenna switch so that you can do a quick comparison. Both the comparison between antennas and what you will hear on the Beverage will convince you that the small investment in the simple wire antenna was well worth the expense.

A good first check of the antenna is always on the AM broadcast band. With a copy of the *World Radio-TV Handbook*[3] in hand, check the stations that have near clear channels around the U.S. (Sad to say, there are not any "true" clear channels any more.) A first check from Wisconsin showed excellent reception from broadcasters in Lexington, Memphis, and Atlanta — just the correct direction for a path across to South America. Then, on to monitoring the Latin band.

If you listen every night for several hours,

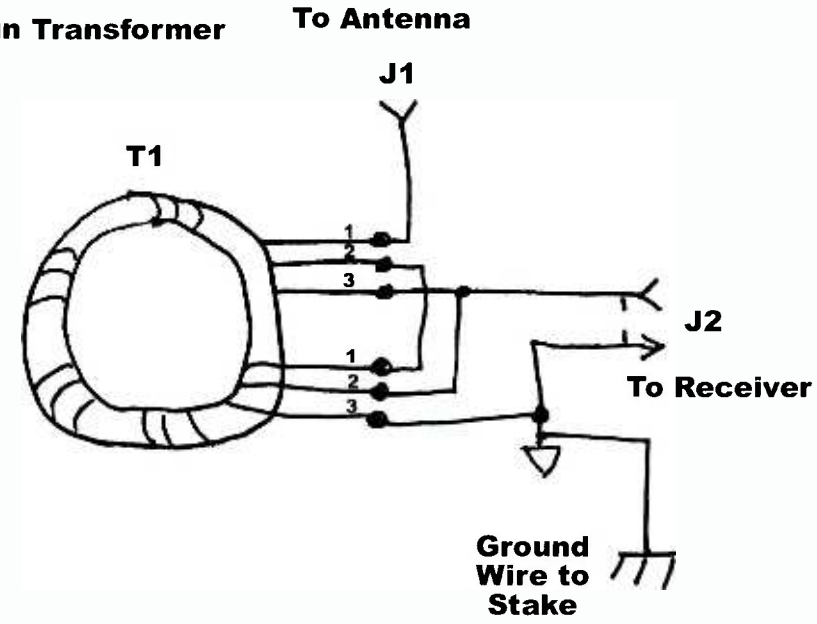


FIG. 2 — *Diagram of the matching transformer. The assembly is housed in a 2-3/4 x 2-1/8 x 1-5/8 aluminum box (RS 270-235). See the text for an alternative assembly method.*

J1 — Binding post (RS 274-662).
J2 — Coaxial connector, female (RS 278-201).
T1 — 7 trifilar turns of wires, prewound together at 5 turns per inch, on Amidon FT-114-75 toroidal core. Any wire size from #20 to # 30 will work, insulated or enamel-coated will work. The Radio Shack kit (RS278-1345) contains suitable wire. The wires should be color coded in some manner to allow appropriate connections. (Toroid cores are available from Amidon Associates, 250 Briggs Ave., Costa Mesa, CA 92626.)

sooner or later you are sure to hear almost everything. To evaluate the Backyard Beverage your author decided to limit the monitoring to two hours per night over four nights in late November and early December.

To determine if the receiver employed made a difference, the output of the Beverage was fed to an Icom 751 and to a Grundig 400 Yacht Boy. In general, the results between the popularly priced Grundig portable and the sophisticated ham radio transceiver were not much different — in situations with heavy interference, the selectivity and the bandpass tuning of the Icom were helpful, but only marginally. It would seem that the antenna is much more important than the receiver for this frequency band.

The results of the listening tests are shown in Chart 1. Clearly the little Beverage provided excellent results. The chart tells us that one may want to study Portuguese rather than Spanish, as stations in Brazil dominate the log. Of course, Brazil also covers a good deal of the land mass of South America. With such long distances to cover, shortwave broadcasting is extensively utilized in Brazil by domestic stations.

Because the antenna is bidirectional, two unexpected stations were heard. One was the time station in Irkutsk, Russia, on 5004 MHz. The other was China CNR2 broadcasting from near Beijing.

Requiring only a hank of wire and a transformer that is easy to fabricate, you might want to try a Backyard Beverage. It works well from the broadcast band to over 7 MHz. The antenna is clearly for the winter season. Once the grass starts to grow, and the lawn needs mowing, the Beverage can be put away to await the next low frequency DX season.

BLAKESLEE FOOTNOTES

1 "Hams Span the Atlantic on Shortwave," *QST*. December 1996.
2 Devoldere, *Low Band DXing*, ARRL, Inc, 1987. Available from ARRL, 225 Main Street, Newington, CT 06111.
3 Bobbett, *World Radio-TV Handbook* - 1999 Edition, 1999. Available from Grove Enterprises, 7540 Hwy. 64 W, Brasstown, NC 28902.

Latin Band Log (Chart 1)

This chart shows stations monitored over a total of 8 hours on four days.

Freq	Country	Station
4755	Brazil	R. Educacao
4765	Brazil	R. Rural
4780	Ecuador	R. Oriental
4790	Peru	R. Atlantida
4799.8	Ecuador	R. Popular
4805	Brazil	R. Atahuapha do Amazonas
4820	Honduras	R. Voz Evangelica
4825	Brazil	R. Cancao
4830	Venezuela	R. Tachira
4835	Brazil	R. Atalaia
4845	Brazil	R. Cabocia
4875	Brazil	R. Roraima
4885	Brazil	R. Clube do Para
4905	China	CNR2
4915	Brazil	R. Difusora
4919	Ecuador	R. Quito
4930	Honduras	R. Internacional
4939	Venezuela	R. Continental
4945	Brazil	R. Nacional, Porto Velho
4955	Colombia	R. Dif. International
4960	Ecuador	R. Federacion Shuar
4974.6	Peru	R. del Pacifica
4980	Venezuela	Ecos del Torbes
4985	Brazil	R. Brazil Central
4991	Peru	R. Ancash
4995	Peru	R. Andina
5000	Venezuela	Naval du Capital (under WWV)
5004	Russia	Time station, Irkutsk
5020	Ecuador	La Voz del Upano
5025	Peru	R. Quilabambia
5030	Ecuador	R. Catolica National
5035	Brazil	R. Aparecida
5045	Brazil	R. Cultura do Para
5075	Colombia	Caracol Colombia