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QST Issue: Feb 1957
Title: Snoop Loop, The
Author: Claude M. Maer, Jr., W0IC

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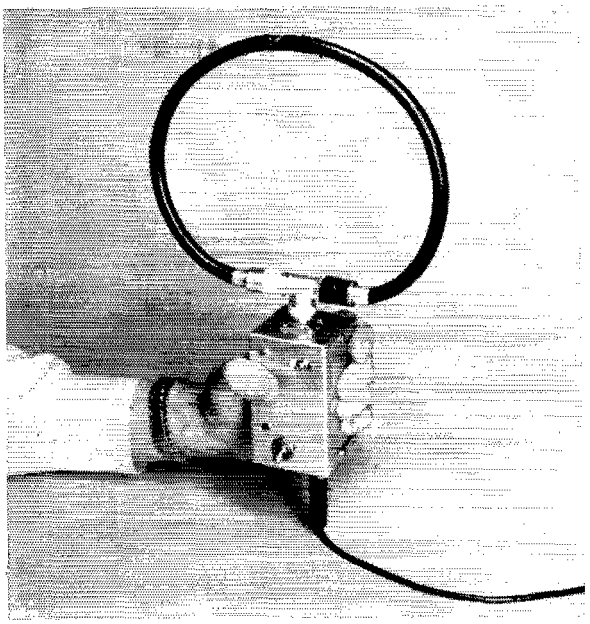

The box containing the detector and amplifier is also the "handle" for WØIC's "Snoop-Loop." The loop mounting, using a coax tee as a support, is a convenience but is not an essential part of the loop assembly.

The loop tuning capacitor is screwdriver adjusted. An on-off switch and headphone jack (on the bottom in this view) are the operating controls.

The Snoop-Loop

Everything Else Is Transistorized — Why Not A Portable D.F. Loop?

BY CLAUDE M. MAER, JR.,* WØIC

HAVE YOU EVER been up a creek without a paddle? To get to the point, have you ever been hidden-transmitter hunting on a night as dark as the inside of a potted power transformer? If you have, brush the tar out of your eyes and nose and continue reading.

Picture yourself, after taking off at the start of the hunt, heading in the right direction, signal getting stronger and stronger, excitement increasing with each additional S unit on the meter. You're following your loop closely — it's working just as good as a ten-element beam on 20 fed by a water-cooled kilowatt — and now you're getting out of town into the countryside. The roads are unfamiliar, and the null is beginning to swing rather rapidly, showing that you are getting in close. Whoops — it shifts to give a direction at right angles to the car. You look carefully across the deep ditch beside the road into the dark field where you know your cagey buddy is hiding. No roads into the field as far as you can see in either direction. You dare not waste miles driving up and down the road looking for an entrance, for each tenth of a mile counts.

You park beside the road, grab your flashlight, and plunge into the veldt in the direction your loop null clearly indicates. But after taking a few steps you're up to your armpits in brush and can't see ten feet forward or backward. You stumble on in hopes of running into the hidden transmitter — you're probably not more than 500 feet from it — but away from your car with its sensitive receiver and amazingly sharp loop it really becomes a hunt for the needle in the haystack. Now do you see what I mean about the lack of a paddle?

After this happened to me a few times, I decided that something had to be done. I had an old loop left over from the early days of transmitter hunting, and it was a simple trick to wire in a germanium diode, capacitor and headphone jack. I was all set — I could leave my car on the nearest main travelled road, walk in to the hidden transmitter, find out how he managed to get in there with his car and — if a helicopter was not necessary — drive right in in jig time.

Well, I tried it at the very next transmitter hunt after bragging quite a bit about my new secret weapon. I reached a very close spot in the car (at least, I thought it was close) and started out on foot. Alas, no signal in my phones. I knew it was tuned to frequency because I had checked it earlier in the evening on a nearby mobile. My "weapon" was a dud. Later checking showed that it was good for only about 25 to 35 feet. Not good enough. What to do?

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The Solution?

All sorts of thoughts came to mind, but the one that kept recurring was the use of a transistor, one of those supposedly magic devices which will some day replace the trusty old UV-201-A and require only a fraction of the power and voltage. But the trouble was that I didn't know anything about transistors. Also, what do transistors cost? Probably several bucks, which was more than I wanted to put into a device used once or twice a month at most. I was very pleasantly surprised to find at my next visit to the radio store that modern production-run transistors cost only about one buck, instead of several. So in I jumped, picked up two of the little devils and headed for the *Handbook*.[1]

Without going into the details, I found that transistors are not at all difficult to understand if you can keep the names of the connections straight in your mind. I also found that the one-buck transistors were only good for audio and i.f. service, and that the most gain could be realized from the so-called common- or grounded-emitter connection. Although some experts frown on comparing transistors with vacuum tubes, it was very easy for me to visualize the grounded-emitter circuit as being the same as the customary grounded-cathode circuit of the vacuum tube. (My goodness, it wasn't too long ago that, as far as I knew, the grounded-cathode circuit was the only way to connect up a tube.) It seems that the base acts like a grid, and the collector acts like the plate. In order to obtain any appreciable plate — oops, collector — current flow, the base has to be biased with a very small voltage of the same polarity as that applied to the collector. Generally speaking, the audio sensitivity and gain of a transistor stage is dependent upon the amount of base bias — within limits, the greater the base bias, the greater the audio sensitivity of the stage. So far so good.

[1] *The Radio Amateur's Handbook*, 33rd edition, 1956, pages 77–81.

How About the Little Gem?

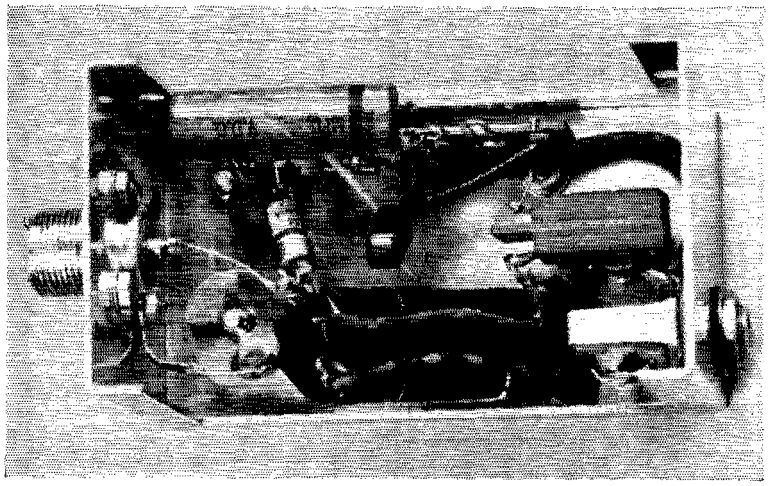
About this stage in my mental gyrations, I recalled an article in *QST* about the use of a transistor in a field-strength meter.[2] This struck a familiar note — wasn't a field-strength meter just what I wanted for tracking down these wily boys hiding in the bulrushes? I hurriedly located the Little Gem in the measurements chapter of the *Handbook*,[3] and looked at the diagram. It took me a while to catch on to the meter balancing circuit, but I really got baffled when I looked at the base circuit. Look, Ma, no bias. How come?

This puzzle took a few days of sneaking in a thought now and then during lulls at the office, and then a cryptic note in the *Handbook* description began to sink in: "The transistor is used in the common-emitter arrangement connected so that the rectified d.c. from the crystal flows in the base-emitter circuit." I got a hot flash — that's where the bias comes from. A little more thought showed me that this was the correct connection for the transistor if the meter were to read relative signal strength, because when a fixed bias is applied to the base circuit the average collector current remains more or less constant for all signal levels. Of course, the instantaneous current will vary with a.c. input so that an audio signal will come through and be amplified.

Right there I had to make a decision. Did I want to use a meter or headphones? For a number of reasons I chose the headphones. In the first place, the trouble I was trying to overcome was lack of sensitivity in my portable loop. I reasoned that the time you need the most sensitivity is when the signal is weak, and with the Little Gem circuit there is less bias on the base with weak signals (remember the Little Gem gets its bias from rectifying the incoming signal) and thus the least sensitivity at that

[2] Campbell, "The Transistorized 'Little Gem,'" *QST*, Aug., 1955.

[3] *The Radio Amateur's Handbook*, 33rd edition, 1956, p. 503.



Interior construction is very simple, a lug strip providing wiring terminals for most of the parts. The two penlite cells are wrapped with tape and supported by leads soldered to the terminals.

time. Thus, it seemed to me that the signal-biased circuit was not what I was looking for. In addition, the use of a meter requires a light on the meter face when it is being read, and three hands are needed to hold the loop, a separate meter case and the light. At the same time you want to keep a sharp lookout where you are walking and, most important, for the hidden transmitter itself. Even if a battery-operated pilot light were to be installed, meters have to have a balancing circuit and tend to jiggle when carried. Also, they will go off scale when getting in close, and I hated to think of my nice surplus 100-microampere meter winding its needle around the peg. As it turned out, the headphones have been very satisfactory for the transmitter hunts here in Denver because there is modulation on the signal at all times and the modulated signal comes through fine.

After doing the thinking for a week or so, it took about a half hour to connect in my transistor audio stage, and I had a real secret weapon, the "Snoop-Loop." It works, too. On the ten-meter band I can read signals up to one mile under good transmitting conditions, but even in the thick woods a quarter of a mile is duck soup. I believe that a half mile can be said to be the working range of the device.

It's a good idea to check out these distances carefully, before you make the mistake I made one night. When first testing it out on a hunt, I stepped out of the car to see if I could hear the hidden transmitter. Sure enough, there was a weak signal in the phones. I had become used to using the loop with only the diode detector, and in the excitement of getting in close forgot about the greatly increased sensitivity I had built in. I rushed off down the road on foot, following my Snoop-Loop, and about one mile later at the top of a high hill I stumbled onto the hidden site. Boy, I still have scars from the blisters on my feet! As it turned out, we could have driven on the main road to within 500 or 600 feet of the site and then my little loop would have led us into the location, which could not be seen from the road. In that case a meter might have been helpful, but you can learn the relation of audio strength to distance fairly accurately with a little practice.

In localities where the signal from the hidden transmitter is unmodulated the meter circuit will have to be used. The Little Gem should work quite well, but some means should be included for reducing sensitivity to keep that meter pointer straight. Sometimes, detuning the input circuit will do the trick, but if the only tuning is in the loop circuit itself, detuning may cause some strange directional effects.

Construction

Fig. 1 shows how simple the unit really is. Almost any size box can be used, but I happen to be one who doesn't like to burn his fingers trying to solder connections in small places, so I chose a medium-sized aluminum case, 4 by 2¼ by 2¼ inches (ICA No. 29338). Any equivalent box will suffice and leave plenty of soldering room.

The loop is constructed of RG-8/U coax. Since a coax "tee" connector is used for convenience and ease of mounting, one end of the coax loop is connected to a male plug in the conventional way but the center conductor of the other end is shorted to the shield so that the male connector at that end has no connection to the center prong. This results in an unbalanced circuit, but seems to give good bidirectional null readings as well as an easily-detectable maximum reading when the grounded end of the loop is pointed in the direction of the transmitter. Careful tuning will improve this maximum reading as described in an earlier article.[4]

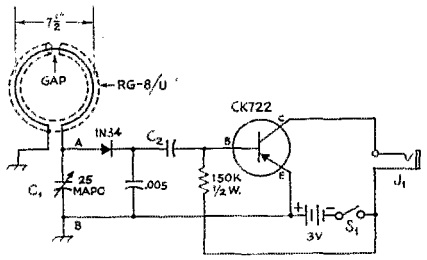


Fig. 1 — "Snoop-Loop" circuit for 28-Mc. operation. The loop is a single turn of RG-8/U inner conductor, the outer conductor being used as a shield. Note the gap in the shielding; about a 1-inch section of the outer conductor should be cut out.
C_1 — 25-$\mu\mu$f. midget air padder.
C_2 — 0.1 μf. or more (paper).
J_1 — Open-circuit phone jack.
S_1 — S.p.s.t. toggle.
"A" and "B" (chassis ground) refer to alternative input circuits shown in Fig. 2.

Placement of parts can be seen in the photographs. Be sure to insulate the headphone jack from the case because both connections are above ground three volts worth (no danger of any serious shock!). Also, don't forget to remove one inch of shielding from the top of the loop. You won't get much signal unless you do.

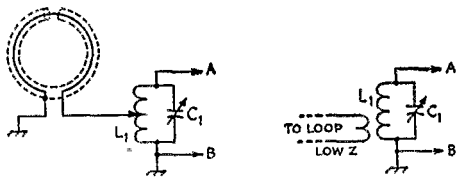


Fig. 2 — Input circuits for lower-frequency bands. L_1C_1 should cover the desired amateur band, but the L/C ratio is not critical. In the circuit at the left, adjust the position of the tap on L_1 for maximum signal strength. The circuit at the right is for use with a length of low-impedance line between the loop and tuned circuit L_1C_1. As an alternative to the inductive coupling shown, the line could be tapped on L_1.
"A" and "B" connect to correspondingly-designated points in the circuit in Fig. 1, substituting for the loop and C_1 in that circuit.

[4] Amphar, "Unidirectional Loops for Transmitter Hunting," *QST*, March, 1955.

The Snoop-Loop is not limited to the ten-meter band or to a built-in loop. Fig. 2 shows alternative circuits for other bands and for plugging in a separate loop connected by a low-impedance transmission line.[5] Select coil and capacitor combinations that will tune to the desired frequencies. Plug-in coils could be used. It is a good idea to have the r.f. end of the unit fairly well shielded, to eliminate signal pickup except through the loop. Incidentally, sensitive high-impedance phones really improve the performance of the Snoop-Loop. I use a single hearing-aid button type with 8000 ohms impedance and 2000 ohms d.c. resistance.

Fig. 3 shows the Little Gem connection for using a meter in place of the headphones.

I don't know if this little loop will be as helpful to you as the paddle we originally talked about, but it sure helps on a dark night in the country. (Tip to the hidden-transmitter operator — If you want to foul up some of your pals using these loops, just hide near the transmitting antenna of a 50,000-watt broadcasting station. But that's another story!)

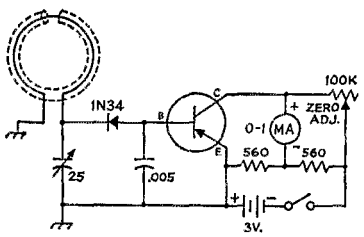


Fig. 3 — The "Little Gem" metering circuit, for use with unmodulated signals. Other components same as Fig. 1.

[5] Duncan, "Transmitter Hunting — Seattle Style," *QST*, March, 1955.
Norberg, "Transmitter Hunting with the D. F. Loop," *QST*, April, 1954.

How They Planned the First DXpedition

BY JULIAN N. JABLIN*, W2QPQ

The scene is laid in a little shack on the outskirts of Cadiz, Spain, where the Sociedad Radiotelegrafía Jamón de Cadiz meets weekly. As the curtain rises, Cristóbal is aimlessly tuning the receiver. José, the club president, enters.

JOSÉ: Buenos días, amigo. How's DX?

CRISTÓBAL: The band's deader than Isabella's grandfather. What's new?

JOSÉ: I worked a G last night who told me about a funny thing that happened to him. Seems that he had the beam pointed west, even though he knows that nothing's out there, of course, when he heard . . .

ROBERTO (*bursts in*): Hola! I just worked my cousin in Seville on 75. Bad news for us. That Seville Latón Pounders' Club!

CRISTÓBAL: Qué?

ROBERTO: They've just made their 87th country toward DXCC, and you know what that means. There aren't any more than 87 countries. So they are tied with us.

JOSÉ: We're tied with them!

ROBERTO: We're both tied. And there's no chance of making any more countries. Those Sevillaño lids!

CRISTÓBAL (*at the rig*): . . . aquí es EA1OU, el estación de la Sociedad Radiotele . . . Qué??? What did you guys say?

ROBERTO: The Seville gang made their 87th country. So we're now tied.

JOSÉ: And there aren't any more countries.

ROBERTO: So how can we get our lead back?

JOSÉ: We can't invent a country.

CRISTÓBAL: Maybe we can find one.

JOSÉ: Where — under Ferdinand's bed?

CRISTÓBAL: Don't be estupido. Now look. I've never agreed with you guys that the world is flat — that it just drops off way out west. José, what did that G tell you last night?

JOSÉ: He just said that he had the beam pointed west by accident and he was calling CQ and when he signed he heard someone smack on his frequency but it was so weak he couldn't read him so he never made the QSO but he was sure there was a station there.

CRISTÓBAL: He talks like a phone man, too.

ROBERTO: So he heard a signal. So what? Did he ever measure the front-to-back ratio of his beam? Did he ever hear of sunspots? Those Gs could learn a lot about radio. Everybody knows that there aren't any countries out west. Just space.

CRISTÓBAL: Everybody knows everything. But nobody's ever been there. I'd like to get a boat and sail west, just to see for myself. I'll bet there are countries there. Or something.

JOSÉ: Why not?

ROBERTO: But everybody knows . . .

JOSÉ: Claro. Still, supposing that Cristóbal is right. We could take the lead from those Sevillaños again. And if Cris should be very lucky, there might be several countries.

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