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A COUPLER AND UPGRADES FOR THE QUANTUM LOOP

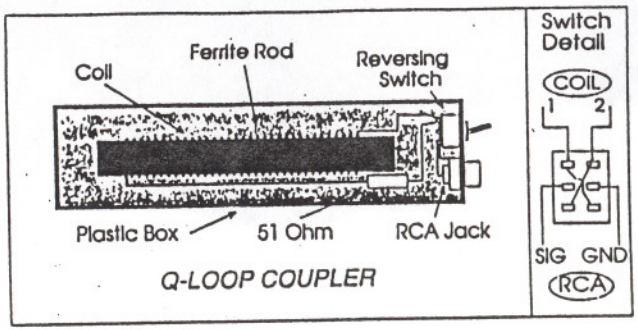
Gerry Thomas

A couple of people who have purchased Quantum Loops have requested a means of coupling the antenna to radios without external antenna terminals. I've finally got around to putting together a coupler and, since it should work with other amplified loops, thought I'd take a few minutes to pass on the details of its construction. Following the coupler construction section are a few mods to the Quantum Loop that might prove beneficial to some Quantum Loop owners.

QUANTUM LOOP COUPLER

Conceptually, this device is very simple and its total parts cost is around $10.00 to $12.00 (less if it's assembled out of parts from your junk box). Basically, it consists of a coil wound on a ferrite rod housed in a plastic cabinet. A signal is fed to one lead of the coil and routed to ground through a 51 Ohm, 1/4W resistor (to provide a load for the amp). Mounting hardware, an input jack, and a current reversing switch round out the principal components. The coupler is connected to the output of the Quantum Loop via a 3-foot patch cord (RG-174U) suitably terminated with connectors.

When placed near the cabinet of a portable radio (and parallel to its internal ferrite rod antenna), the signal being radiated by the coupler is picked up by the radio's antenna and coupling occurs. One of the nice things about a physically discrete connection (like the coupler) is that tuning sharpness (or Q) and gain can be controlled simply by varying the distance between the coupler and the radio...but more on that later.



COMPONENTS

--Ferrite rod - I use a 3-5/8" L by 5/16" D rod (you don't want a monster rod or it may pick up signals on its own).
--Plastic cabinet - I chose a black 4" L x 1" W x 1" D cabinet.
--Coil - The amount of wire doesn't matter too much once you get beyond a couple of feet; I use three feet of 28 gauge magnet wire close-wound.
--Reversing switch - This is a standard miniature DPDT toggle.
--Jack - I chose RCA because of its small size; anything that will fit will do. You could hard-wire the connection but I like the flexibility of a jack.
--Resistor - A 1/4W, 51 Ohm carbon resistor is fine.
--Mounting method - You could glue the rod to the bottom of the cabinet but I decided to use nylon ties and mounting platforms.
--Patch cord - RG-174U is sufficiently flexible and is shielded (though not perfectly - 76%); a PL-259 plug (and reducer) was used in order to match the output connector of the Quantum Loop.

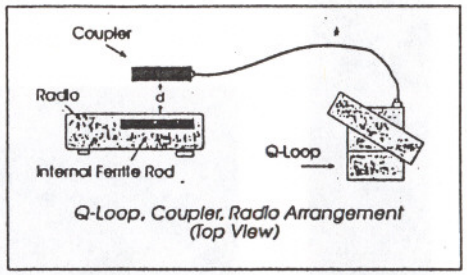
CONSTRUCTION

Construction is pretty self-evident with nothing being particularly critical (other than the wiring of the current reversing switch). A look at the preceding illustration should provide all the important information but here is a outline of the steps in the construction of the coupler...

1. Wind the coil on the rod (or on a coil form) being sure to leave leads long enough to reach the reversing switch. Tape or Q-dope in place.
2. Solder the jumpers on the DPDT switch (see illustration).
3. Drill two holes in one end of your chosen cabinet and mount the switch and jack.
4. Mount rod/coil assembly in cabinet.
5. Hook up coil wires and 51 Ohm resistor to switch, and wires to RCA jack.
6. Assemble the patch cord with connectors.
7. Cover cabinet and attach patch cord.
8. Connect to loop.

OPERATION

Position the Quantum Loop at a sufficient distance from the portable radio to prevent oscillation and place the coupler near the radio (it can be on the table top; it doesn't have to be in contact with the radio) so that the coupler is parallel to the radio's internal ferrite rod (see illustration below).



Q-Loop, Coupler, Radio Arrangement (Top View)

The distance ("d" in the illustration) between the coupler and the radio will determine the gain and Q of the system (as will the angle between the coupler and radio). In general, decreasing "d" will result in an increase in gain and a lowering of Q; conversely, increasing "d" decreases gain but increases Q. This latter condition deserves some qualification -- there is a point of critical coupling where both gain and Q are optimal (but not necessarily maximal) for a given listening situation. Playing with the "d" variable will result in optimal performance for a given set of conditions.

If you notice a dip or notch as you tune the exact frequency of the desired station, flip the current reversing switch. The notch indicates that the coil in the coupler and the coil of the radio's antenna are wound in opposite directions; the reversing switch will correct the situation and a peak should result. Theoretically, if the signal being provided by the coupler is the same as the signal being picked up by the radio's internal loop, judicious tweaking of the Quantum Loop's tuning knob (to create an in-phase condition) then a flip of the reversing switch to the "reverse" position should result in a notch of infinite depth. In real terms, I haven't found it possible to decrease the gain of the Quantum sufficiently to match my radios' internal rod's signal so, while a notch is sometimes detectable, it hasn't been particularly useful.

At moderately close coupling ratios, the output of the Quantum Loop is so high that the signal being radiated by the coupler largely swamps the radio's internal antenna thereby negating its signal capturing ability. In other words, by using the coupler with a loop like the Quantum, you need only rotate the loop's head to obtain nulls on most stations. On stronger stations, the radio's antenna/circuitry will pick up enough signal so that rotating the radio is necessary for deepest nulls.

If you have neither the time nor inclination to build one of these couplers, I'll put one together for Quantum Loop owners for $17 (+ $3 shipping). If you haven't purchased a Quantum Loop, the price is $27 (+ $3 shipping).

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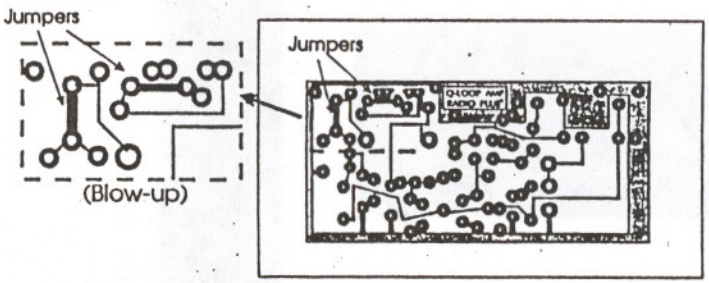
QUANTUM LOOP UPGRADES

Q IMPROVEMENT

In Mark Connelly's excellent review of the Quantum Loop last season, he suggested adding inductance in the coil legs to reduce the possibility of SW feedthrough under certain situations. This modification works and all Quantum Loops I've constructed since then have included this SW filter. However, there is a minor drawback... By introducing the inductance, DC resistance is also introduced thereby lowering the Q (and, ultimately, the gain) of the coil assembly. The DC resistance of the inductors is only 1.2 Ohms, which appears to be minimal, but is signficant when compared to the .1 Ohm of a direct conductor. Therefore, all Quantum Loops I've sold recently have had the inductors included in the circuit but I've also by-passed them with defeatable jumpers. The thinking being that if SW feedthrough is a problem, the owner could simply snip the jumpers to reactivate the filter.

Following are the details for performing this mod on existing Quantum Loops. Note that Q will be increased to the point where the steeper, deeper, and narrower nose and skirts of the passband may cut the sidebands on stations on the lower portion of the band. While this degrades fidelity, as a DXer, I prefer the greater control sharp Q provides.

1. Remove loop head and set aside.
2. Remove four (4) screws securing the amplifer base.
3. Locate printed circuit board.
4. Study following figure and solder the two (2) short jumpers to the points illustrated in the figure.
5. Replace amplifier base and install screws.



(Note: If you have one of the earlier, hand-wired, versions of the Quantum Loop that has had the inductors installed after the fact, just solder a jumper across each of the inductors visible on the bottom of the board.)

LOOP HEAD PIVOT BEARING

One owner of a Quantum Loop apparently over tightened the cap screws holding the loop head to the chrome pedestal. The result was slightly stripped threads which the cap screws didn't adequately "bite." If you have this problem, here are two possible fixes...

A. Remove the outer, smaller nylon washer bearing from the pivot assembly. This will allow the cap screw to protrude farther into the thread and get a better grip.

OR...

B. Drop me a line and I will send you a full-length sex bolt assembly (yeah, that's what they're called, hi) that goes all the way through the pivot point. The drawback of this solution is that the shielded wires that run from the loop head to the pivot plug will sometimes gather when the loop head is tilted.

All of the preceding upgrades will be gladly performed by me if you'd rather. There is no charge but I'd appreciate return shipping. Thanks....

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