BBL-1 Broadband Loop Antenna
Mark Connelly, WA1ION - 30 APR 1999

Part 1: Introduction
This section of the article describes the construction of the loop head, including details of "whip module" boxes.

The BBL-1 Broadband Loop Antenna System was developed primarily for DXpedition use, though it may be used at home or at other fixed-site locations. The antenna head can provide the normal figure-of-eight directional pick-up pattern familiar to users of tuned loops (such as the Kiwa).

For a loop to provide adequate signal level in an untuned (broadband) application, it must be physically larger than a tuned loop. Though a broadband loop isn't as easy to tilt or to rotate as a smaller tuned loop of comparable gain, tilting and rotating can be done when it's deemed absolutely necessary. The best way to accomplish this is to bolt or clamp the loop head bottom-side center to a heavy-duty photographer's tripod.

I usually position the BBL-1 loop on the roof of my car. I use strong spring clamps to attach the loop base to Thule roof racks for a secure mount, even during strong gusts of wind at seaside or mountaintop DXpedition sites. Since I'm not physically tilting or rotating the loop, I obtain nulling by phasing the loop's RF contribution against that from an active whip such as the MFJ-1024. Suitable phasing units include the homebrew DXP-1, the Wellbrook APU 100, or a modified MFJ-1026. The loop-versus-active whip combination can develop a cardioid (heart-shaped) pattern useful to DXers trying to hear stations in the opposite direction of "pest" signals to be nulled. Electrically-rotatable nulls can also be produced by phasing two similarly-oriented BBL-1 loops spaced about 164 ft. (50 m) apart; or by phasing two closely-spaced loops aimed at a right angle to each other.

The construction of the BBL-1 loop head is a bit novel. A wooden board 6 ft. (1.83 m) long serves as the base. Two "whip modules" are installed, one at each end of the board. Each of these modules has a plastic case with an attached 6 ft. Radio Shack telescoping whip. The whips act as the vertical sides of a square loop in the vertical plane. An obvious benefit of using the telescoping whips is that they can be "scoped down" (collapsed) for transporting the antenna system from place to place. For those with vehicles too small to fit a 6 ft. long board inside during the transportation process, the

board may be cut at its center and then connected together (during stationary rooftop DXpedition use) by a steel "joiner" plate, screws, and wing nuts. If separated back into two 3 ft. halves, the set-up should be easily transportable in almost any car.

The top horizontal member of the square loop is formed by a 6 ft. wire fitted with "alligator" clips. During operation, this wire is clipped from the top of one whip to the top of the other.

The square loop horizontal bottom is formed by two 3 ft. wires, one from each whip base. These leads are run towards the center of the loop head base board. For a very simple connection to the receiver or phaser input, the two bottom leads can go to the primary terminals of a Mini-Circuits T1-6-X65 (or equivalent) 1:1 transformer. The secondary of the transformer would then connect to the 50-ohm coaxial cable going back to the operator's position.

In many cases, the passive connection scheme described above won't provide quite as much signal as you want. For this reason, and also to allow the implementation of the useful "K9AY Antenna" mode, a head-unit balun / amplifier box, the BA-1, was designed.

Additional articles that are likely to follow may provide information about further designs involving the broadband loop concept.
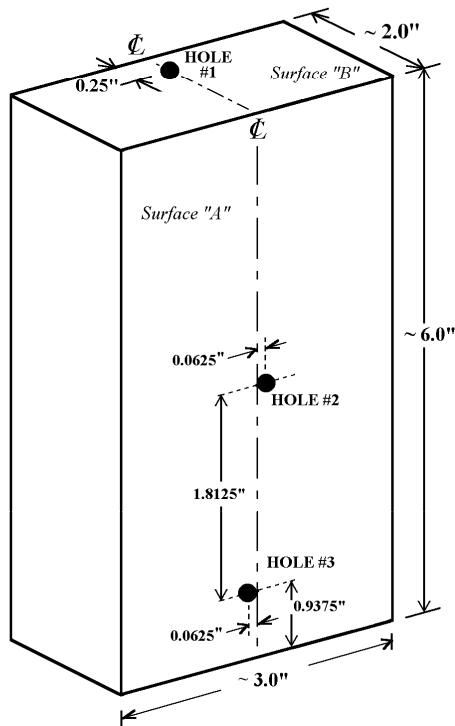
WM-1 Whip Module Assembly, as used for
BBL-1 Broadband Loop and APW-1 Active / Passive Whip

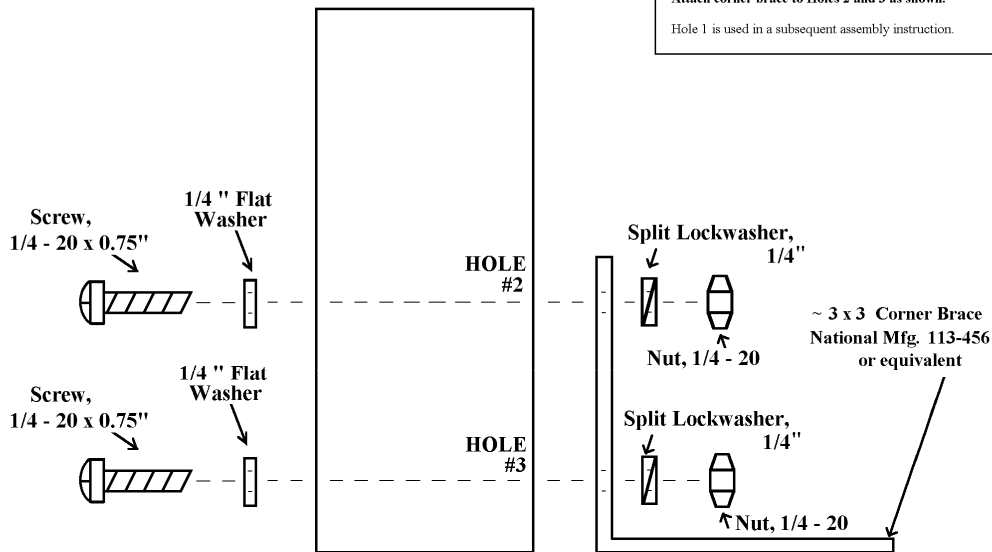Chassis Box Preparation

Box used = Radio Shack 270-1805.

Approximate dimensions are 3.0 " wide by 6.0 " high by 2.0 "
deep (76.2 mm by 152.4 mm by 50.8 mm).

Surface "A" of this drawing is the side opposite to the side which
has the detachable covers.

Remove the plastic and metal covers from the box. Set these aside
temporarily.

Drill the three holes indicated. The diameter of Hole 1 is 0.28125"
(7.14 mm); Holes 2 and 3 are each 0.25 "(6.35 mm) diameter.

Attach corner brace to Holes 2 and 3 as shown.
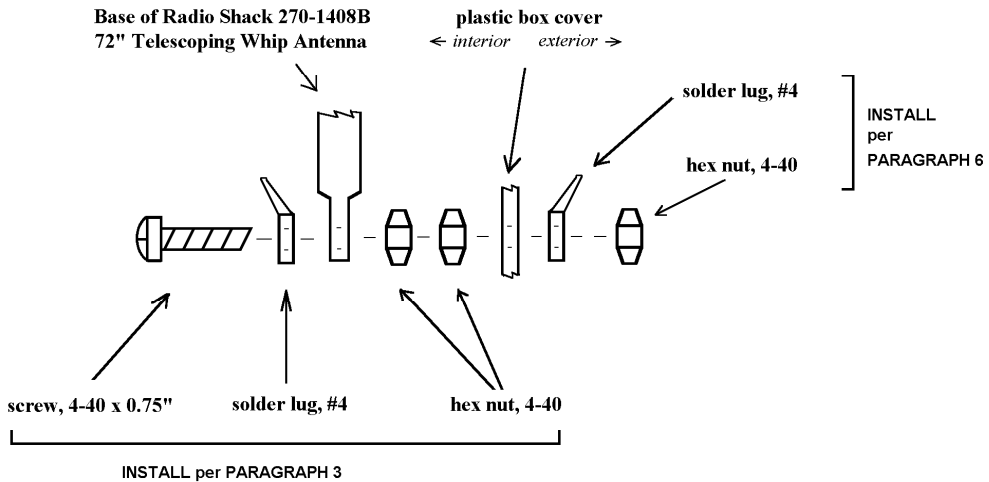
Hole 1 is used in a subsequent assembly instruction.

WM-1 Whip Module Figure 1 above

WM-1 Figure 2
Whip Module
(attaching whip antenna
to plastic box cover)

PLASTIC
COVER

0.125" DIA.

0.5"
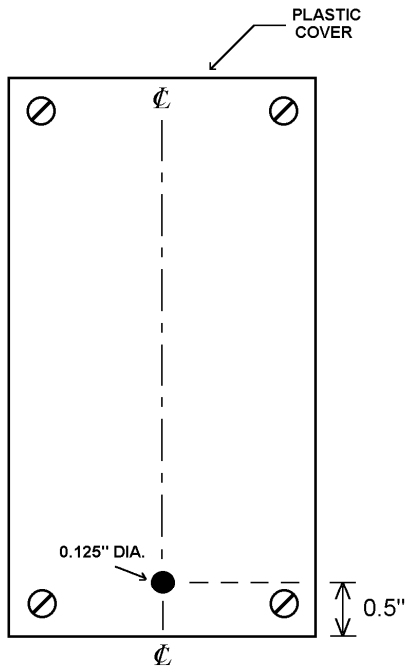
WM-1 Whip Module Assembly, continued

Chassis Box Cover Preparation; Whip Antenna
Installation

1. Drill a 0.125" diameter hole, as shown, near the
lower edge of the plastic cover (which should, at this
point, be detached from the box).

2. Enlarge the existing hole on the base of a Radio
Shack 270-1408B telescoping whip. Diameter of
the enlarged hole should be 0.125".

3. Assemble screw, solder lug, and two hex nuts onto
the whip antenna base, as shown. Tighten hardware
well.

4. Pass the top of the whip antenna through Hole 1:
the hole previously drilled on Surface "B" of the
chassis box.

5. Pass the free end of the antenna base screw
(installed in paragraph 3) through the hole drilled in
the cover (in paragraph 1).

6. Loosely attach the antenna base to the cover with
a solder lug and hex nut as shown. Secure the cover
to the box with the four corner screws supplied, or
use four #6 x 0.5" sheet metal screws for a stronger
fit. When the box cover is tightly installed, tighten
the nut on the solder lug to complete the WM-1
assembly. Solder a 3 ft. length of insulated stranded
wire to the lug on the outside of the WM-1 box. On
the other end of this wire, solder an alligator clip.

Base of Radio Shack 270-1408B
72" Telescoping Whip Antenna

plastic box cover
← *interior*   *exterior* →

solder lug, #4

hex nut, 4-40

INSTALL
per
PARAGRAPH 6

screw, 4-40 x 0.75"   **solder lug, #4**   **hex nut, 4-40**

INSTALL per PARAGRAPH 3

WM-1 Whip Module Figure 2 above

WM-1 Whip Module Revised: Tuesday, 16 March, 1999
WM-1   Revision: A
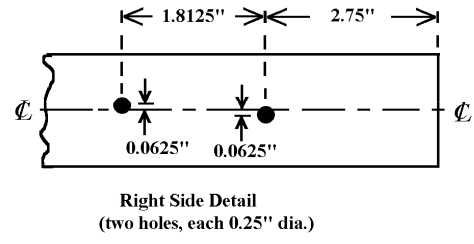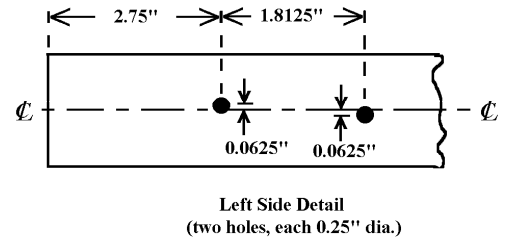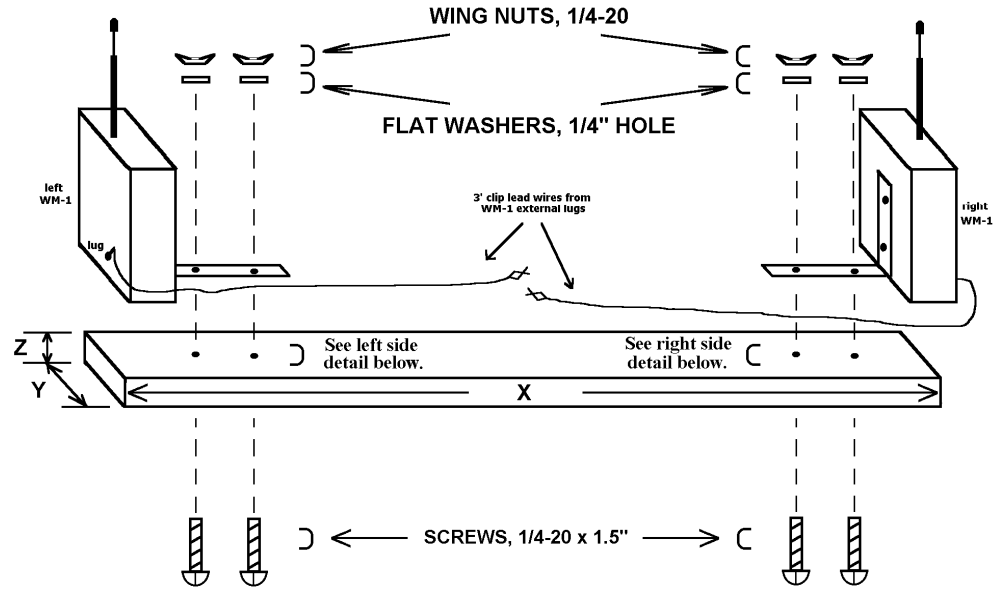
Bill Of Materials   16 March,1999   07:00:00

Item	Quantity	Reference	Vendor: Stock Number	Part Description	Notes
1	1	ANT1	RS: 270-1408B	Telescoping Whip Antenna, 72"	
2	1	H_BX1	RS: 270-1805	Plastic Chassis Box, 3" * 6" * 2"	
3	1	H_CB1	HM: sku # 0487579	Corner Brace, National Mfg. 113-456, 3.125"/3.125"/0.75"	
4	2	H_FW1 - H_FW2	REID: HHW-0050	Flat washer, 1/4"	
5	2	H_LW1 - H_LW2	REID: HHW-0550	Lock washer, split, 1/4"	
6	2	H_N1 - H_N2	REID: HN-050	Hex Nut, 1/4-20	
7	3	H_N3 - H_N5	MOU: 5721-440	Hex Nut, 4-40	
8	2	H_SC1 - H_SC2	REID: MF-1714	Screw, 1/4-20 * .75"	
9	1	H_SC3	MOU: 5721-440-3/4	Screw, 4-40 * .75"	
10	4	H_SC4 - H_SC7	MOU: 5721-6-1/2	Screw, Sheet Metal, #6 * .5"	
11	2	H_SL1 - H_SL2	MOU: 534-7311	Solder lug, #4, internal tooth	
12	1	W1	RS: 278-1218	Wire, 22AWG insulated, length 3 ft.	
13	1	P1	RS: 270-1545	Alligator clip, miniature	

Vendor Codes

HM: HouseMart.com: http://www.housemart.com
MOU: Mouser Electronics: http://www.mouser.com
REID: Reid Tool Supply Company: http://www.reidtool.com
RS: Radio Shack: http://www.radioshack.com

BBL-1 Broadband Loop
Drawing BBL-1_f1: Attaching
Whip Modules to Base Board

NOTES:
Pictorial drawing, not to scale
Approximate dimensions of board (inches): X = 72, Y = 3.5, Z = 0.75
Possible center-of-board assemblies (wire tie-points, amplifier box, tripod hole) not shown

WING NUTS, 1/4-20

FLAT WASHERS, 1/4" HOLE

left
WM-1

3' clip lead wires from
WM-1 external lugs

right
WM-1

lug

Z

Y

See left side
detail below.

See right side
detail below.

X

SCREWS, 1/4-20 x 1.5"

2.75"   1.8125"

$\mathbb{C}$

0.0625"   0.0625"

Left Side Detail
(two holes, each 0.25" dia.)

1.8125"   2.75"

$\mathbb{C}$

0.0625"   0.0625"

Right Side Detail
(two holes, each 0.25" dia.)

BBL-1 Loop: Head Assembly above

BBL-1 Broadband Loop Revised: Friday, 30 April, 1999

BBL-1   Revision: A

Bill Of Materials   30 April,1999   07:00:00

Item	Quantity	Reference	Vendor: Stock Number	Part Description	Notes
1	1	BA1_1	* separate parts list *	BA-1 Balun / Amplifier module assembly	optional
2	1	BD	(local supply store)	Wooden Board, approx. 72 * 3.5 * 0.75 in. (183 * 9 * 2 cm)	
3	4	H_FW1 - H_FW4	REID: HHW-0050	Flat washer, 1/4"	
4	4	H_N1 - H_N4	REID: MIN-2	Wing Nut (thumb nut), 1/4-20	
5	4	H_SC1 - H_SC4	REID: MF-1718	Screw, 1/4-20 * 1.5"	
6	2	P1	RS: 270-1545	Alligator clip, miniature	use with item 8
7	1	T1	MCL: T1-6-X65	1:1 RF transformer	optional, use if no item 1
8	1	W1	RS: 278-1218	Wire, 22AWG insulated, length 6 ft.	connects tops of extended whips
9	2	WM1_1 - WM1_2	* separate parts list *	WM-1 Whip Module assembly	

Vendor Codes

MCL: Mini-Circuits: http://www.minicircuits.com
REID: Reid Tool Supply Company:
http://www.reidtool.com
RS: Radio Shack: http://www.radioshack.com