

A 110-9-1

The RTL-1 Remotely-Tuned Loop
Mark Connelly - WA1ION - 03 JUL 1991 / updated 25 JUL 1991

The RTL-1 is a remotely-tunable balanced loop antenna system. The RTL-1 amplifier box accommodates Palomar Engineers loop heads as well as those of a homebrew design (ferrite or air core). The RTL-1's remote-tuning capability is compatible with the MWT-2 Option 5 being used as a controller. Refer to my MWT-2 Option 5 article dated 05 JUN 1991. The loop head / loop amplifier assembly may be placed a considerable distance (e. g. 100 ft. / 30 m.) from the controller / receiver "shack" position with little degradation of performance. Gain with the Palomar medium wave loop head is as good as, or better than, the gain when using Palomar's Loop Amplifier box with the same loop head.

A feature of the RTL-1 is modularization: when a better varactor-circuit, front end, or output amplifier card is designed, the card can replace its corresponding earlier-version "building block" without the need for a complete electrical or mechanical design overhaul. Such cards are under development by me, as well as by others such as Dallas Lankford. The RTL-1 can be customized for better dynamic range or higher sensitivity or lower power consumption by modifying individual subassemblies. The RTL-1's Balanced Front End (BFE-A) card, for instance, can be modified to a lower gain BFE-B, using guidelines similar to those in Dallas Lankford's loop amp. improvement articles. This would typically be done if using a higher gain loop head than the (rather inefficient) Palomar model. The BFE-A schematic is accompanied by a table indicating how to modify it to be the lower gain BFE-B. The current BFE-A design is a variation on the differential balanced amp. used by Sanserino et al. Grounded-gate FET designs and an overhauled version of a balanced front-end originally used by Jim Hagan will likely be swapped into the RTL-1 "test bed" for evaluation. Similarly, a varactor card resembling the circuit described by Denzil Wraight (DX Monitor: 25 JUL 1991) could be swapped for VAR-A to reduce instances of intermodulation distortion (IMD).

The frequency range covered by a given medium wave loop head can be extended upwards by enabling a relay in the RTL-1. This relay shunts (parallels) the loop head with 78 uH. A head that normally covers 500 to 1200 kHz can be tuned up to at least 1900 kHz with the relay enabled. As varactor diodes have a lower (maximum C / minimum C) ratio than an air variable capacitor has, use of the relay is sometimes necessary for full medium wave band coverage. Shunting the loop head in this manner reduces gain about 5 dB, but this "necessary evil" seldom makes the difference between hearing or not hearing a given DX signal.

As mentioned earlier, other heads besides the Palomar types may be employed. Drawings supplied with this article show use with a 15-inch ferrite rod loop similar to that used in late '70s era Radio West loops.

Because a remotely-sited loop is generally set up in one position and not constantly moved about for nulling, head tiltability (and critical balancing of the front-end card) is not nearly as important as on an in-shack loop. Tilting and rotating of Palomar heads is, of course, possible; mobility of larger heads is left up to the ingenuity of the builder. Besides the 15-inch rod "loop board" to be described in this article, other mechanically-compatible boards that can be attached to the RTL-1 box could incorporate, for instance, a 1-foot square air core loop.

An obvious question, at this point, would be "How can I null anything with a remotely-sited loop?" Short of employing tilting and rotating servo-motors (a project not for the faint of heart), nulls are most readily obtained by phasing the remote loop against a varactor-tuned whip or against a second remote loop. The ideal set-up would be two remote loops at right angles and a remote whip. The DXer could then pick the pair of remote antennae that would throw the stiffest null on the "pest" station while simultaneously passing the greatest amount of desired DX station signal. Remote loop versus remote whip phasing is done here regularly; it works quite well, providing a nulling scheme better suited to DXing from "field" sites (beaches, etc.) than longwires that can get in the way of vehicular and pedestrian traffic. A subsequent article on a Dual Controller / Phaser for two remotely-tuned antennae will go into this subject more deeply.

Besides remote loop operation, the RTL-1 may be used for remote whip and remote longwire operation in areas without strong local stations. The Radio Shack 20-008 whip works well. Whip / wire operation is discussed in the following section on control usage.

RTL-1 Control Usage

Although the RTL-1 is a remotely-controlled antenna system in most respects, three switches and one potentiometer reside on the RTL-1 box. These controls are, in typical circumstances, rarely adjusted from the operator's "normal" set-ups. If necessary, the RTL-1 box could be overhauled for completely automated operation; of course this would require a considerable increase in the complexity of both the RTL-1 box and the controller unit (e. g. MWT-2 Option 5). This article does not address that scenario.

S1 (Function Switch): This switch selects one of the two operating modes: Loop or Whip / Wire. In the Loop mode, a loop head coil is plugged into RTL-1 J1. The signal across the tank circuit formed by this coil and the varactors on the VAR-A card is amplified by the BFE-A card in a balanced in / unbalanced out configuration. The BFE-A's output is given a further boost by the BBA-C broadband amplifier card. In the Whip / Wire mode, a whip installed at J2 or a longwire installed at J3 is coupled to a tank circuit comprised of the VAR-A card varactors and an inductor selected by bandswitch S2. The signal thus developed is amplified by the BFE-A and BBA-C cards in an unbalanced in / out configuration. J1 should not have a loop head coil plugged into it if the Whip / Wire operating mode has been selected. In situations where a longwire causes overload, R1 may be used.

S2 (Bandswitch): This switch selects one of the twelve frequency ranges by selecting an inductor to place in parallel with the capacitance developed by the VAR-A varactor card. S2 is only used when S1 has been set to the Whip / Wire mode. See Table 3 of this article for approximate frequency ranges.

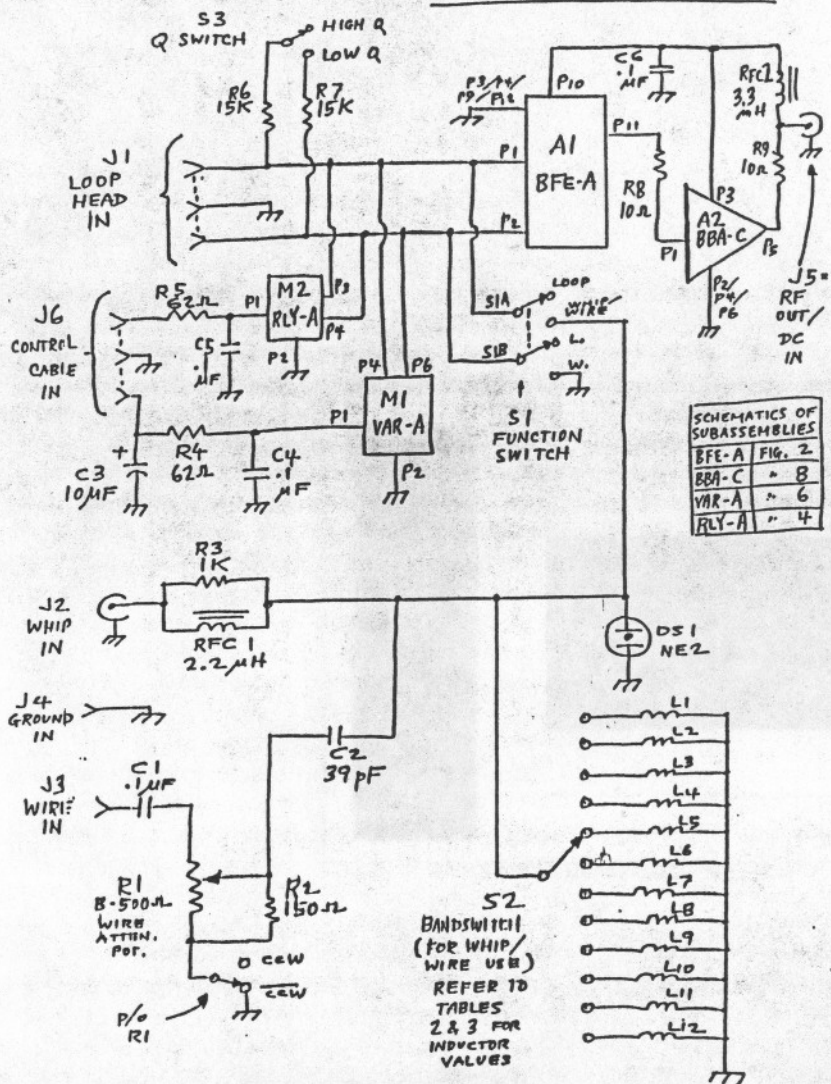
S3 (Q Switch): This switch selects Normal Q or Low Q. Normal Q is generally used because it provides the best sensitivity and selectivity. Low Q may be usable in some phasing applications to ensure more thorough nulling of a "pest" station's sidebands as well as its carrier.

R1 (Wire Attenuator): When remotely-tuning a longwire aerial, use of this pot. may be necessary to prevent overloading of the RTL-1's amplifiers. This is likely to happen in urban areas. Set R1 so that wanted-frequency signals are at their best levels, consistent with the absence of objectionable spurious responses.

A110-9-2

FIGURE 1

RTL-1 REMOTE LOOP
MAIN SCHEMATIC



SCHEMATICS OF SUBASSEMBLIES

BFE-A	FIG. 2
BBA-C	" 8
VAR-A	" 6
RLY-A	" 4

Building the RTL-1 Remotely Tuned Loop

The documentation (schematics, assembly drawings, parts lists, hole lists, etc.) serves as the starting point. The following procedure should serve as an outline for the builder.

1. Gather all necessary parts (see parts lists to follow). Prepare work area with appropriate tools.
2. Drill out chassis box, in accordance with Table 1.

3. Assemble each of the four circuit card subassemblies - these are:

- * BFE-A Balanced Front End Card (Fig's 2&3; Table 4)
- * RLY-A Relay Card (Fig's 4&5; Table 6)
- * VAR-A Varactor Card (Fig's 6&7; Table 7)
- * BBA-C Broadband Amplifier Card (Fig's 8&9; Table 8)

4. Mount each of the circuit cards at the hole locations noted in Table 1.

5. Install jacks, pots, and switches. Solder inductors onto S1 per Figure 1 and Tables 2 & 3.

6. Install wiring and other components per Figure 1 and Tables 1 & 2. Install knobs on S1 and R1. Place labels near controls and jacks.

7. Connect controller (MWT-2 Option 5 or equivalent) to the RTL-1: control cable to J6, RF/power cable to J5. Connect controller output to the receiver.

8. Install Palomar medium wave loop head (or homebrew head - see appendix) at RTL-1 J1. The RTL-1 may now be tested and operated.

Table 1: RTL-1 hole-drilling list
X = Horizontal distance, in inches, from the vertical centerline (VCL) on the side observed. Negative values of X are left of VCL, positive values of X are right of VCL.

Y = Vertical distance, in inches, from the bottom horizontal edge of the side observed.

D = Hole diameter in inches.

Hole loci are first marked on the box with a scriber and are then drilled with a .125" bit. Subsequently, as required, the holes are enlarged to the proper size by using progressively larger bits up to that corresponding to the final desired diameter.

LEFT SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	J4	GND In - black banana jack	-0.375	0.5	0.3125
2	G1	GND H/W - internal lug	0.0	1.25	0.125
3	J3	Wire Ant. In - red banana jack	0.375	0.5	0.3125

FRONT SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	R1	Wire Atten. pot. - shaft	-2.0625	1.0	0.3125
2	R1	Wire Atten. pot. - tab	-1.75	1.0	0.144
3	S1	Function switch - shaft	-1.25	1.0	0.25
4	S1	Function switch - tab	-1.25	0.75	0.125
5	S2	Bandswitch - shaft	0.1875	1.125	0.375
6	S2	Bandswitch - tab	0.1875	0.625	0.144
7	S3	Q switch - shaft	1.625	1.0	0.25
8	S3	Q switch - tab	1.625	0.75	0.125

-(Table 1 -cont.)

TOP SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	J2	Whip Input - BNC jack	-2.5	1.0	0.375
2	M1	Varactor Card - H/W 2	-2.0	3.5	0.125
3	M1	Varactor Card - H/W 1	-1.0	3.5	0.125
4	M2	Relay Card - H/W 2	-1.25	0.5	0.125
5	M2	Relay Card - H/W 1	-1.25	2.0	0.125
6	J1	Loop IN.- stereo phone jack	0.0	2.5	0.375
7	A1	Bal. Front End Card - H/W 2	1.0	4.0	0.125
8	A1	Bal. Front End Card - H/W 4	1.0	3.0	0.125
9	A1	Bal. Front End Card - H/W 1	2.5	4.0	0.125
10	A1	Bal. Front End Card - H/W 3	2.5	3.0	0.125
11	A2	Broadband Amp. Card - H/W 4	1.5	2.0	0.125
12	A2	Broadband Amp. Card - H/W 3	1.5	1.0	0.125
13	A2	Broadband Amp. Card - H/W 2	2.5	2.0	0.125
14	A2	Broadband Amp. Card - H/W 1	2.5	1.0	0.125

RIGHT SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	G2	GND H/W - internal lug	0.0	1.125	0.125
2	J5	RF Out / DC In - BNC jack	0.0	0.5	0.375
3	J6	Control In-stereo phone jack	1.25	1.125	0.375

REAR SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	-	Loop Board mounting H/W 1	-2.25	1.25	0.25
2	-	Loop Board mounting H/W 2	2.25	1.25	0.25

Table 2: RTL-1 "upper level" parts list

Vendor codes for this and other parts lists:

- AB = Abbott Electronics /Woburn, MA
- ACT = Active Electronics /11 Cummings Park /Woburn, MA 01801 /Tel. 1-800-677-8899
- DK = Digi-Key /P. O. Box 677 /Thief River Falls, MN 56701-0677 /Tel. 1-800-344-4539
- MCL = Mini-Circuits / P. O. Box 350166 / Brooklyn, NY 11235-0003
- HOU = Houser Electronics / 11433 Woodside Ave. / Santee, CA 92071 /Tel. 1-800-346-6873
- RS = Radio Shack / Many locations worldwide
- TVH = True-Value Hardware / Numerous USA locations

(Table 2 -cont.)

Item #	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	chassis box	AB	Bud # AC-429	1
2	-	chassis box cover	AB	Bud # BPA-1589	1
3	A1	BFE-A balanced front-end card		(see Table 4)	1
4	A2	BBA-C broadband amplifier card		(see Table 8)	1
5	M1	VAR-A varactor card		(see Table 7)	1
6	M2	RLY-A relay card		(see Table 6)	1
7	(for R1, R2)	knob	HOU	45KN013	2
8	C1,C4,C5,C6	capacitor, 0.1 uF	RS	272-109	4
9	C2	capacitor, 39 pF	HOU	232-1000-039	1
10	C3	capacitor, 10uF tant.	HOU	581-10M35	1
11	DS1	NE2 neon bulb	RS	272-1101	1
12	J1,J6	stereo headphone jack	RS	272-312	2
13	J2,J5	BNC jack	RS	278-105	2
14	J3	red banana jack	RS	274-662	1
15	J4	black banana jack	RS	274-662	1
16	L1	inductor, 10000 uH	HOU	434-1120-104K	1
17	L2	inductor, 3900 uH	HOU	434-1120-393K	1
18	L3	inductor, 1500 uH	HOU	434-1120-153K	1
19	L4	inductor, 560 uH	HOU	43LR564	1
20	L5	inductor, 220 uH	HOU	43LR224	1
21	L6	inductor, 82 uH	HOU	43LR825	1
22	L7	inductor, 33 uH	HOU	43LR335	1
23	L8	inductor, 12 uH	HOU	43LR125	1
24	L9	inductor, 4.7 uH	HOU	43LR476	1
25	L10	inductor, 1.8 uH	HOU	43LQ186	1
26	L11	inductor, 0.68 uH	HOU	43LR687	1
27	L12	inductor, 0.27 uH	DK	M8006	1
28	R1	pot., 500 ohm, linear	HOU	31CT205	1
29	R2	resistor, 150 ohm	RS	271-013	1
30	R3	resistor, 1K	RS	271-1321	1
31	R4,R5	resistor, 62 ohm	HOU	298J500-62	2
32	R6,R7	resistor, 15K	RS	271-1337	2
33	R8,R9	resistor, 10 ohm	RS	271-001	2
34	RFC1	inductor, 2.2 uH	HOU	43LR226	1
35	RFC2	inductor, 3300 uH	HOU	43LR233	1
36	S1	switch, DPDT, on-on	RS	275-614	1
37	S2	switch/ipole/12pos. rotary	HOU	10WV112	1
38	S3	switch, 8PDT, on-on	RS	275-662	1

Small hardware items (for A1, A2, G1, G2, M1, M2)

39	-	screw, 4-40 X .25"	HOU	572-01880	14
40	-	split lockwasher, #4	HOU	572-00649	12
41	-	solder lug, #4	HOU	534-7311	2
42	-	hex nut, 4-40	HOU	572-00486	2

Small hardware items (for mounting loop-holding boards)
Refer to Figures 10 and 11. These are "local hardware store" items. Comparable metric hardware may be substituted.

43	-	screw, 1/4-20X1.5"	TVH or Sears		2
44	-	split lockwasher, 1/4-20	TVH or Sears		2
45	-	flat washer, 1/4-20	TVH or Sears		2
46	-	hex nut, 1/4-20	TVH or Sears		4

Table 3: S2 frequency ranges (Whip / Wire operation)
(Ranges are usually a bit greater than those shown.)

S2 Position #	S2 Knob Pointer "o'clock"	Min. Freq. kHz	Max. Freq. kHz	Tank Inductor Values #	uH
1	6:00	90	140	L1	10000
2	7:00	135	180	L2	3900
3	8:00	165	230	L3	1500
4	9:00	200	340	L4	560
5	10:00	300	530	L5	220
6	11:00	400	800	L6	82
7	12:00	520	1300	L7	33
8	1:00	900	2100	L8	12
9	2:00	1400	3600	L9	4.7
10	3:00	2000	5000	L10	1.8
11	4:00	3500	8700	L11	0.68
12	5:00	4800	12000	L12	0.27

BFE-A (BFE-B) Balanced Front-End Card
(refer to Fig's 2 & 3; Tables 4 & 5)

The input section (comprised of Q1, Q2, and ancillary components) converts the high-impedance balanced tank-circuit signal at P1 & P2 to a medium impedance unbalanced signal at P5 / P7. This signal is passed to the output section (Q3, T1, and other components) that acts to produce an output at P11 capable of driving loads in the 50 to 100 ohm range. DC power, applied at P10, is filtered by R7, C2, C3, R6, and C1.

FIGURE 2 : BFE-A (BALANCED FRONT END CARD) SCHEMATIC

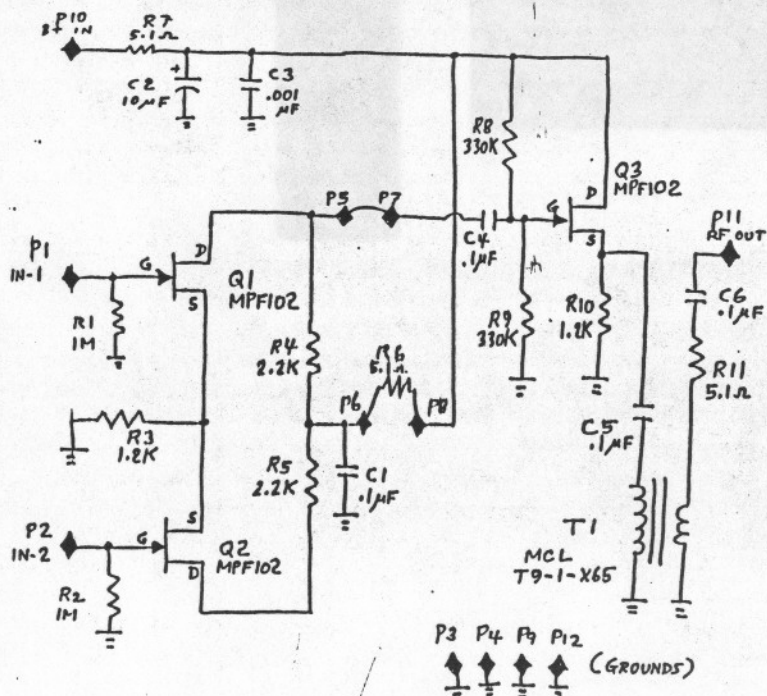


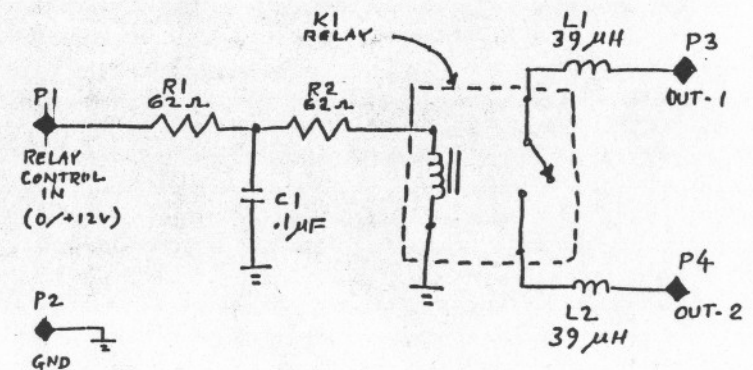
Table 4: (All) BFE-A balanced front-end card parts list
See Table 2 for vendor codes.

Item #	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	BD	perfboard(1.9"X1.4")	RS	276-1396 (cut)	1
2	C1,C4,C5,C6	capacitor, 0.1 uF	RS	272-109	4
3	C2	capacitor, 10uF tant.	MOU	581-10M35	1
4	C3	capacitor, 0.001 uF	RS	272-126	1
5	H1,H2,H3,H4	screw, 4-40 X .25"	MOU	572-01880	4
6	H1,H2,H3,H4	spacer, 4-40 X .5"	MOU	534-1450C	4
7	H1,H2,H3	split lockwasher, #4	MOU	572-00649	3
8	H4	solder lug, #4	MOU	534-7311	1
9	P1-P12	flea-clip for .042 hole	MOU	574-T42-1/100	12
10	Q1,Q2,Q3	FET, MPF102	RS	276-2062	3
11	R1,R2	resistor, 1 megohm	RS	271-1356	2
12	R3,R10	resistor, 1.2K	RS	271-024	2
13	R4,R5	resistor, 2.2K	RS	271-1325	2
14	R6,R7,R11	resistor, 5.1 ohm	MOU	298J500-5.1	3
15	R8,R9	resistor, 330K	MOU	298J250-330K	2
16	T1	RF transformer 9:1	MCL	T9-1-X65	1
17	W	buss wire	RS	278-1341	approx.1'

Table 5: Modifying the BFE-A card to be a lower gain BFE-B
(Of possible value if large loop heads are used; see the article "What's Wrong with Present-Day Loop Antennas" by Dallas Lankford - March 1991. Article appeared in NRC DX News and IRCA DX Monitor.)

Component	BFE-A value	BFE-B value
R1	1M	100K
R2	1M	100K
R3	1.2K	4.7K
R4	2.2K	470 ohms
R5	2.2K	470 ohms
R6	5.1 ohms	4.7K

FIGURE 4 RLY-A RELAY CARD SCHEMATIC

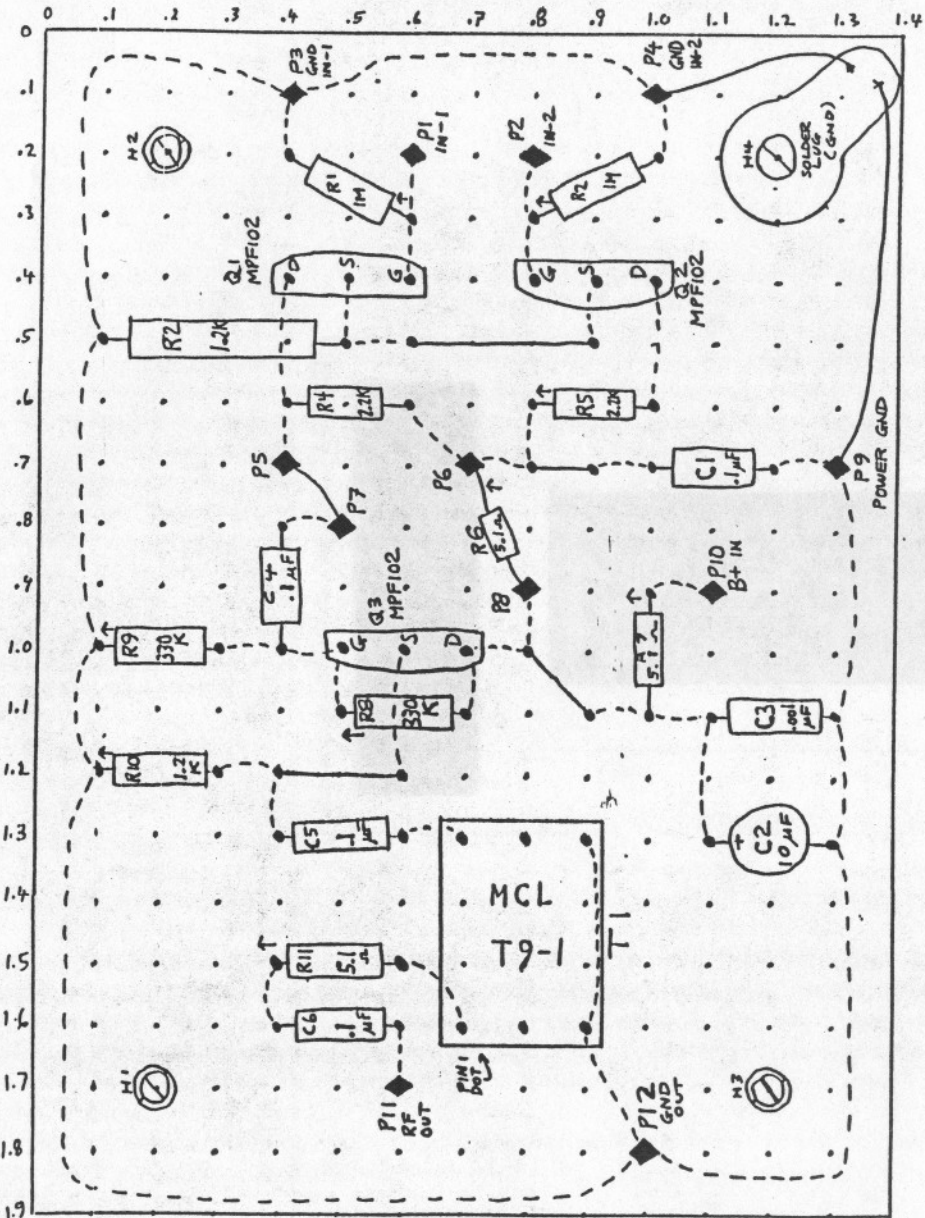


FOR ASSEMBLY, SEE FIGURE 5.
FOR PARTS LIST, SEE TABLE 6.

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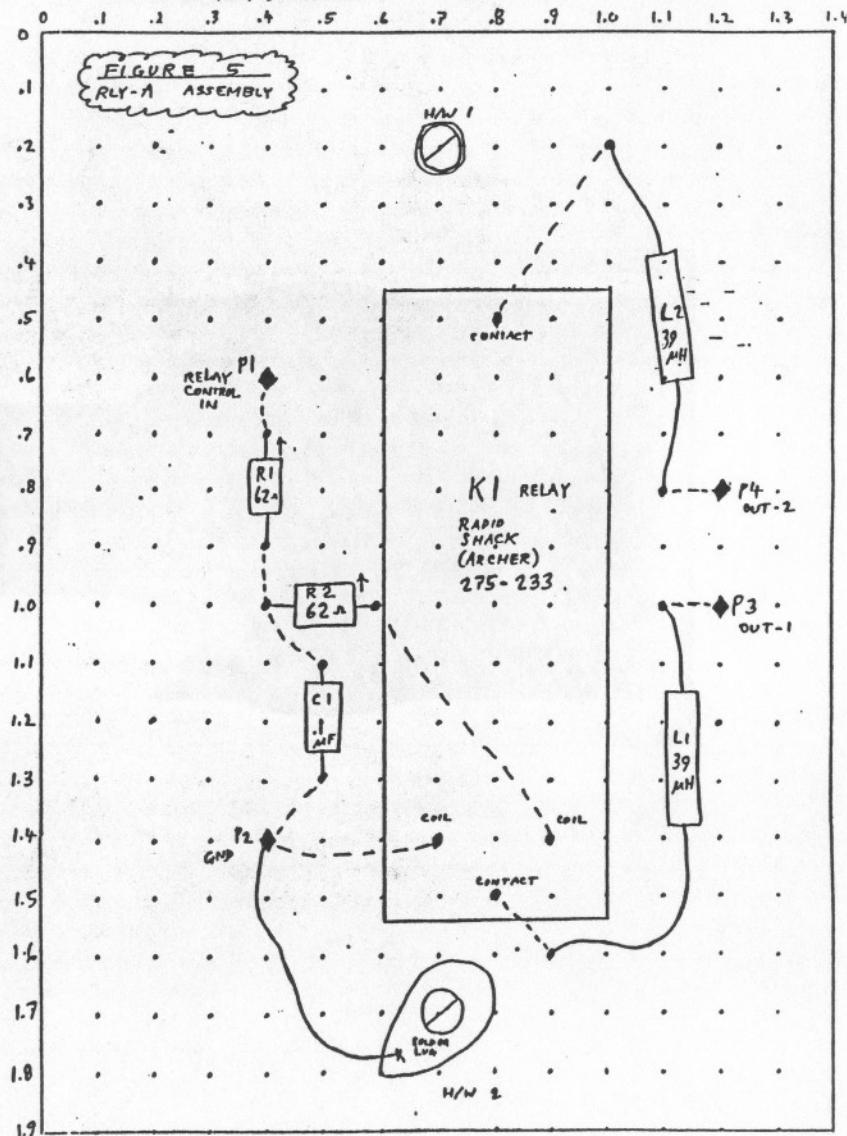
BALANCED FRONT END CARD

FIGURE 3: BFE-A COMPONENTS LAYOUT (ASSEMBLY)



RLY-A Relay Card
(refer to Fig's 4 & 5; Table 6)

RLY-A applies, via relay K1, two 39 uH inductors - total inductance 78 uH - across the loop head (if in the Loop operating mode) or across the S2-selected inductor (if in the Whip / Wire operating mode). Disabling the relay removes this shunt inductance. The purpose of this circuit is to extend the frequency range of medium-wave loop heads upwards to provide full band coverage. It can do the same for Whip / Wire medium-wave operation when S2 is set to the 220 uH (L5) or 82 uH (L6) position.



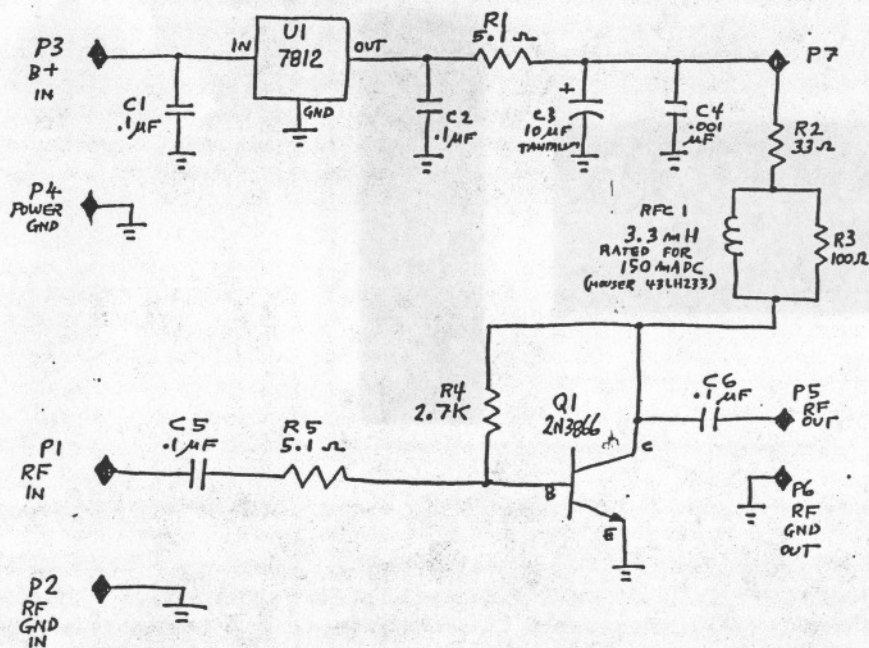
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BBA-C Broadband Amplifier Card
(refer to Fig's 8 & 9; Table 8)

The BBA-C provides 20 dB of gain between the output of the BFE-A Balanced Front-End card and the transmission line back to the receiving position. This gain is necessary with the rather anemic output of Palomar loop heads. Conceivably this amplifier could be eliminated if air-core loops of 1-foot square or larger are used. Power consumption would thereby be reduced and dynamic range enhanced. Converting the front-end from BFE-A to BFE-B, as noted before, could also help dynamic range if a big loop is used.

FIGURE 8

BBA-C BROADBAND AMPLIFIER CARD SCHEMATIC
FOR CONNECTIONS, SEE FIGURE 1.



NOTES

⊥ = CIRCUIT CARD GROUND
FOR ASSEMBLY DRAWING, SEE FIGURE 9.
FOR PARTS LIST, SEE TABLE 8.
THIS IS "A2" OF RTL-1.

FIGURE 9 BBA-C BROADBAND AMP. CARD: ASSEMBLY

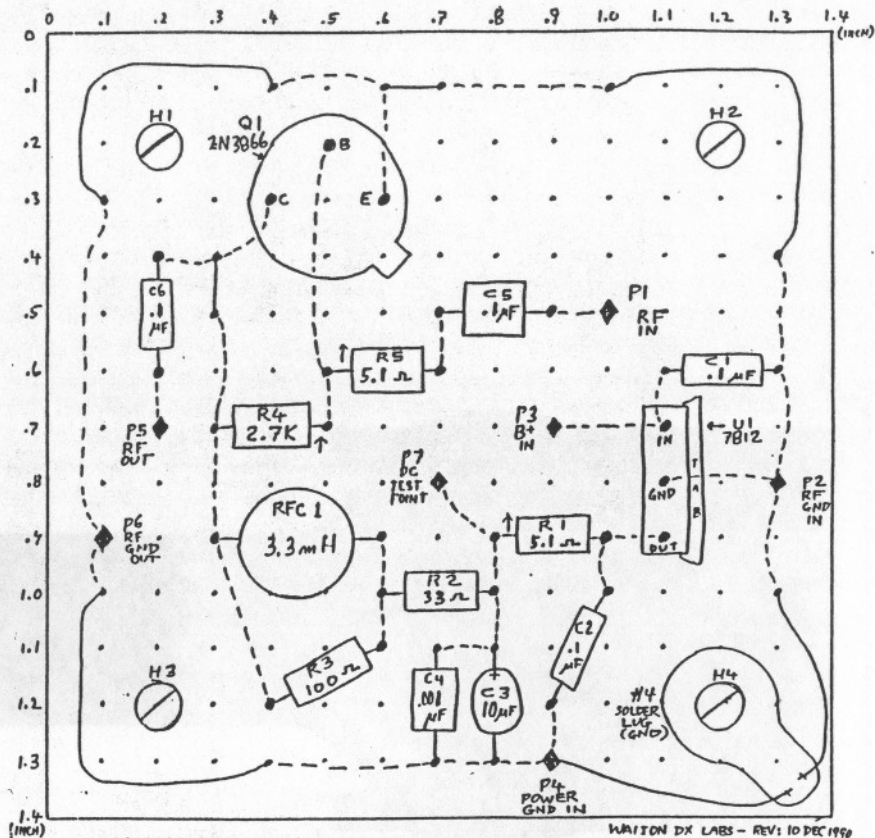


Table 8: (A1) BBA-C broadband amplifier card parts list
See Table 2 for vendor codes.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	BD	perfboard(1.4"x1.4")	RS	276-1396 (cut)	1
2	C1, C2, C5, C6	capacitor, 0.1 uF	RS	272-109	4
3	C3	capacitor, 10uF tant.	MOU	581-10M35	1
4	C4	capacitor, 0.001 uF	RS	272-126	1
5	H1, H2, H3, H4	screw, 4-40 X .25"	MOU	572-01880	4
6	H1, H2, H3, H4	spacer, 4-40 X .5"	MOU	534-1450C	4
7	H1, H2, H3	split lockwasher, #4	MOU	572-00649	3
8	H4	solder lug, #4	MOU	534-7311	1
9	P1-P7	flea-clip for .042 hole	MOU	574-T42-1/100	7
10	Q1	transistor, 2N3866	MOU	511-2N3866	1
11	R1, R5	resistor, 5.1 ohm	MOU	298J500-5.1	2
12	R2	resistor, 33 ohm	RS	271-007	1
13	R3	resistor, 100 ohm	RS	274-1311	1
14	R4	resistor, 2.7K	MOU	298J280-2.7K	1
15	RFC1	inductor, 3300 uH	MOU	43LH233	1
16	U1	voltage regulator, 7812	RS	276-1771	1
17	W	buss wire	RS	276-1341	approx. 1'

APPENDIX

A Sample Loop Head Board

Figures 10 and 11 illustrate the construction of a sample Loop Head board assembly that can be mounted to the rear of the RTU-1 box. The assembly shown, which uses a 15" (0.38m) long / approx. 0.7" (0.018m) diameter cluster of ferrite rods, provides about 10 to 15 dB more gain than the comparable Palomar medium-wave head. Despite the increased gain, the fairly high Q of the loop tends to prevent spurious responses if the loop is tuned properly. Varactor diodes used to tune the head actually seem to be less of a factor in the total IMD picture than the Balanced Front-End (BFE-A) card. This sample Loop Head board is presented as a starting point for the experimenter. As noted earlier, a larger such board could accommodate an air-core loop of 1-ft. square or greater size. For a treatment of an air-core remotely-tuned loop (for shortwave use), see Joe Farley's excellent article "A Remotely Tuned Loop Antenna" in Fine Tuning's Proceedings 1989. NRC Reprint A30, "A Remotely Tuned Directional Loop Antenna" by E. L. Cummins, is also a worthwhile article.

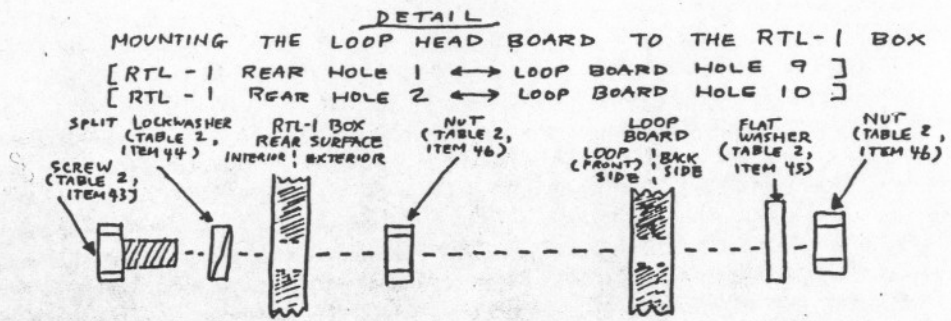


FIGURE 10 LOOP HEAD MOUNTING BOARD
 MATERIAL = WOOD: 9" H x 12" W x 0.75" THICK
 EACH OF THE 10 HOLES IS 0.25" DIAMETER.

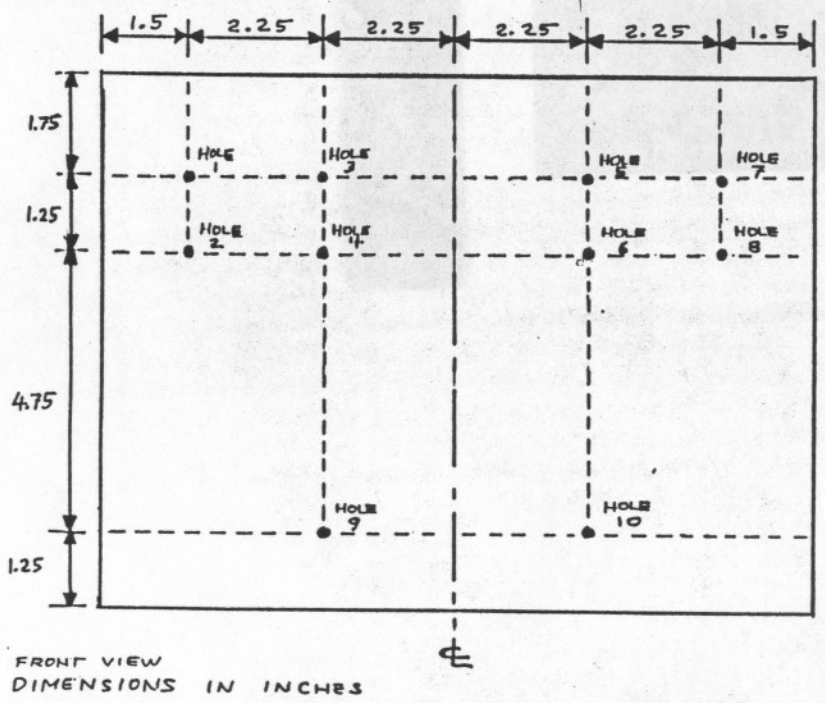
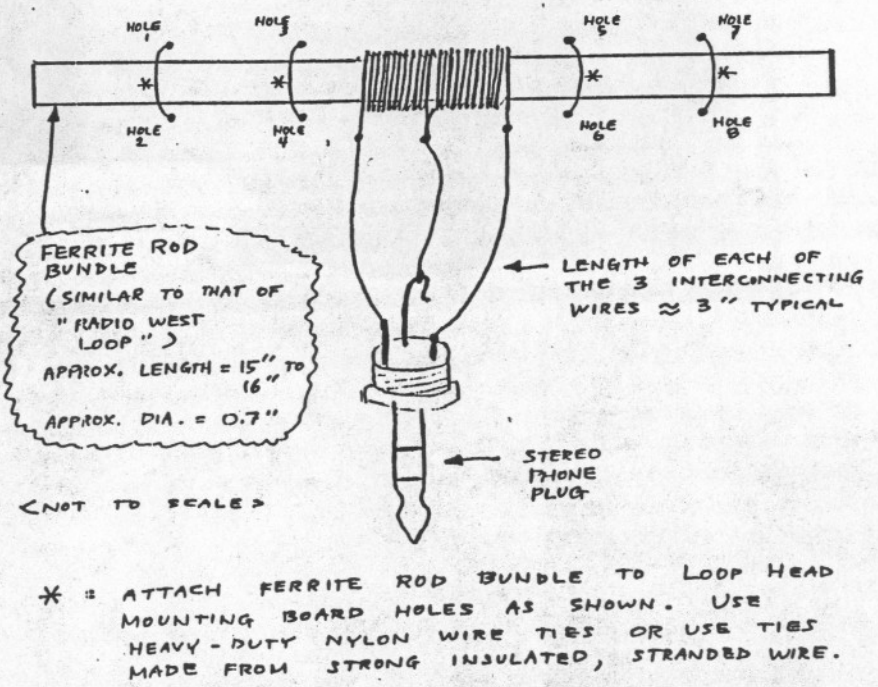


FIGURE 11 MW LOOP HEAD FOR RTL-1
 COIL = 24 TURNS TOTAL (12 EACH SIDE OF CENTER TAP)
 OF RADIO SHACK 278-1215 #22 INSULATED SOLID HOOK-UP WIRE
 WRAP COIL WITH ELECTRICAL TAPE AFTER ASSEMBLY.



APPENDIX

A Sample Loop Head Board

Figures 10 and 11 illustrate the construction of a sample Loop Head board assembly that can be mounted to the rear of the RTU-1 box. The assembly shown, which uses a 15" (0.38m) long / approx. 0.7" (0.018m) diameter cluster of ferrite rods, provides about 10 to 15 dB more gain than the comparable Palomar medium-wave head. Despite the increased gain, the fairly high Q of the loop tends to prevent spurious responses if the loop is tuned properly. Varactor diodes used to tune the head actually seem to be less of a factor in the total IMD picture than the Balanced Front-End (BFE-A) card. This sample Loop Head board is presented as a starting point for the experimenter. As noted earlier, a larger such board could accommodate an air-core loop of 1-ft. square or greater size. For a treatment of an air-core remotely-tuned loop (for shortwave use), see Joe Farley's excellent article "A Remotely Tuned Loop Antenna" in Fine Tuning's Proceedings 1989. NRC Reprint A30, "A Remotely Tuned Directional Loop Antenna" by E. L. Cummins, is also a worthwhile article.

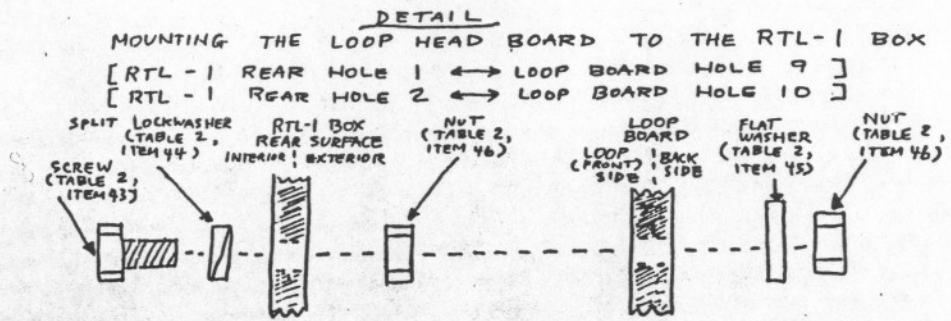


FIGURE 10 LOOP HEAD MOUNTING BOARD
 MATERIAL = WOOD: 9" H x 12" W x 0.75" THICK
 EACH OF THE 10 HOLES IS 0.25" DIAMETER.

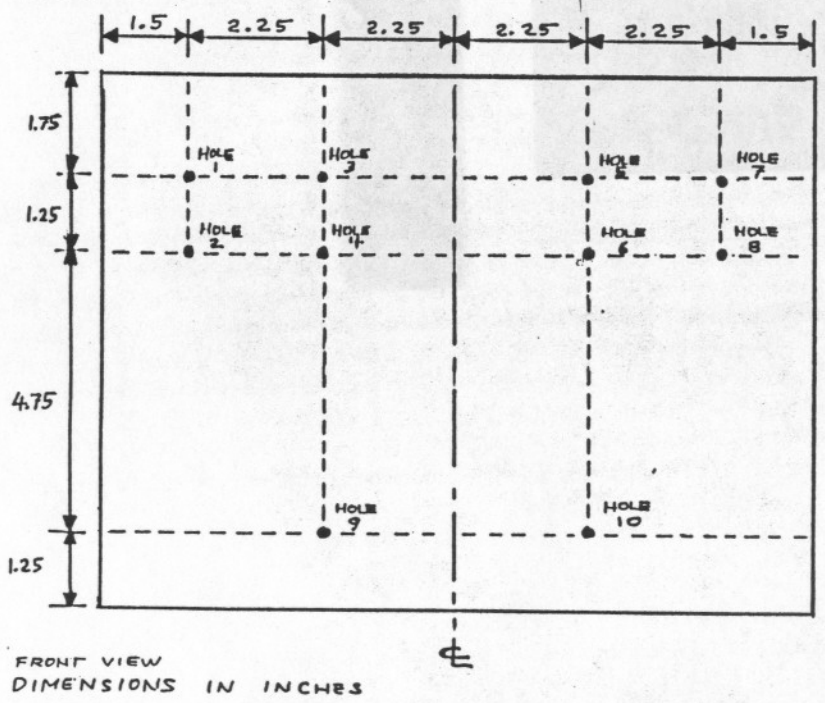
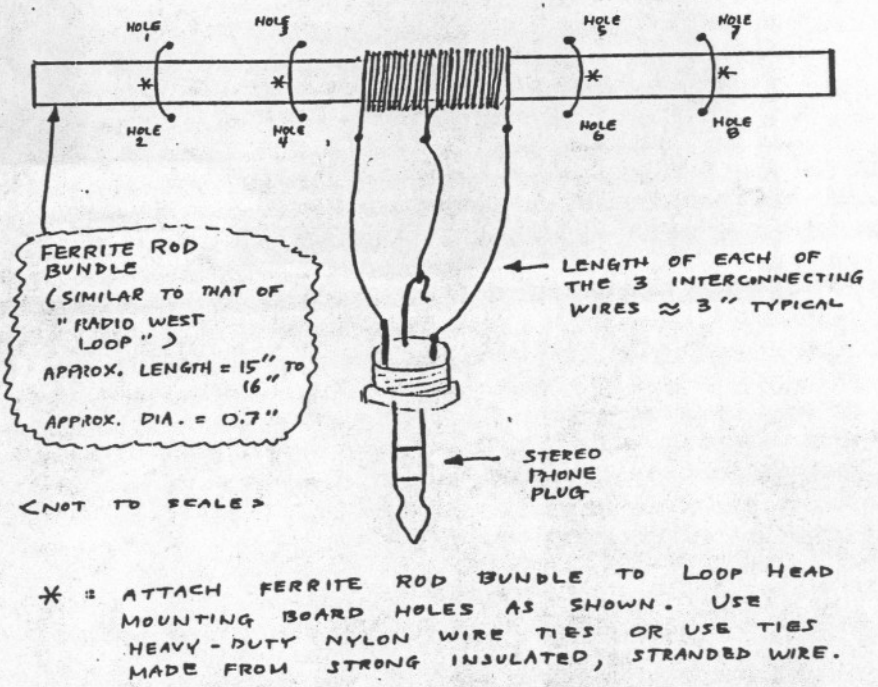


FIGURE 11 MW LOOP HEAD FOR RTL-1
 COIL = 24 TURNS TOTAL (12 EACH SIDE OF CENTER TAP)
 OF RADIO SHACK 278-1215 #22 INSULATED SOLID HOOK-UP WIRE
 WRAP COIL WITH ELECTRICAL TAPE AFTER ASSEMBLY.



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Conclusion

The RTL-1 remote loop may perform well in situations where a loop situated at the normal operating position fails due to excessive electrical noise, blockage by walls or higher buildings, etc. RTL-1 can be phased against a remotely-tunable whip (e. g. MFJ 1024 / RTU-1) or against another RTL-1 loop to achieve good quality nulls in a restricted space such as on the roof of a vehicle or in a room not having noise and/or shielding problems. Previous null-creating methods either required rotating / tilting a loop or phasing two wires of considerable length. These previous methods are not always implementable because of space constraints or poor reception quality in the vicinity of a movable-by-hand loop.

The RTL-1, by virtue of its modularization, can serve as a platform for improvements. It is the author's intention that others will freely "tweak" the design and present their findings in the pages of the major DX journals.

FIGURE 12

BLOCK DIAGRAM
DXING SYSTEM WITH RTL-1
REMOTELY - TUNED LOOP

