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RTL-1A: Improved Version of RTL-1 Remotely-Tuned Loop

Mark Connelly - WA1ION - 15 APR 1992

This article is an addendum to "The RTL-1 Remotely-Tuned Loop", an article I published in July of 1991. The original design has been upgraded to the RTL-1A model by the following modifications:

* A switch (S4) has been added to enable or disable the output amplifier. In urban areas or with very sensitive receivers / large loop heads, use of too much gain can compromise dynamic range. (The output amplifier is still needed with smaller loopheads, less sensitive receivers, and rural locations.)

* Another added switch (S5) now allows broadband, as well as tuned, operation in the active whip / wire mode. Broadband operation permits rapid bandscanning, shortwave parallel checking, etc. (at least in areas not congested with local stations that could give rise to spurious responses).

* The BFE-C card (described in my recent article and updater) is used in place of the BFE-A. This balanced front-end, an adaptation of Dallas Lankford's design, has better noise and strong-signal handling characteristics than the BFE-A. See the BFE-C article and updater for full construction documentation (schematic, assembly, parts list).

* An upgraded broadband amplifier card, BBA-C1, is used in place of the BBA-C. Through laboratory tests with synthesizers and a spectrum analyzer at work after-hours, design optimizations have been made for improved IMD / spur performance in two-tone tests (1000, 1100 kHz). Calculated third-order intercept is in the +32 to +36 dBm range. Amplifier gain is about 23 dB. Complete BBA-C1 documentation is included in this article. This amplifier may be used in place of BBA-C in any of my other designs (e. g. MWDX-5).

* Other minor component changes have been made as part of the RTL-1A upgrade.

Documentation changes to figures and tables in the original RTL-1's article

RTL-1 Figure 1: replace with RTL-1A (this article) Figures 1A and 1B.

RTL-1 Table 1: Amend the hole list by adding:

L E F T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
4	S4	Tuned/Broadband switch-shaft	1.25	1.25	0.25
5	S4	Tuned/Broadband switch- tab	1.25	1.0	0.125

R I G H T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
4	S5	Amp. On / Off switch - shaft	-1.125	1.25	0.25
5	S5	Amp. On / Off switch - tab	-1.125	1.5	0.125

RTL-1 Table 2: Amend the parts list as follows:

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
(Items 1 through 8: no change)					
9	C2	capacitor, 47 pF	MOU	232-1000-047	1
(Items 10 through 32: no change)					
33	R8	resistor, 100K	RS	271-1347	1
34	R9	resistor, 330 ohm	RS	271-017	1
35	RFC1	inductor, 2.2 uH	MOU	43LR226	1
36	RFC2	inductor, 2200 uH	MOU	434-05-222J	1
37	S1	switch,DPDT,on-on	RS	275-614	1
38	S2	switch/1pole/12pos.rotary	MOU	10WW112	1
39	S3,S4	switch,SPDT,on-on	RS	275-662	2
40	S5	switch,3PDT,on-on	MOU	10TC280	1
41	-	screw, 4-40 X .25"	MOU	572-01880	14
42	-	split lockwasher, #4	MOU	572-00649	12
43	-	solder lug, #4	MOU	534-7311	2
44	-	hex nut, 4-40	MOU	572-00486	2
45	-	screw, 1/4-20X1.5"	TVH or Sears		2
46	-	split lockwasher,1/4-20	TVH or Sears		2
47	-	flat washer,1/4-20	TVH or Sears		2
48	-	hex nut, 1/4-20	TVH or Sears		4

RTL-1 Tables 4 & 5 and Figures 2 & 3 are changed to the equivalent documentation from the BFE-C article and updater.

RTL-1 Figure 8: replace with RTL-1A Figure 2. This is the schematic for the BBA-C1 Improved Broadband Amplifier that replaces the BBA-C.

RTL-1 Figure 9: replace with RTL-1A Figure 3. This is the BBA-C1 assembly drawing.

RTL-1 Table 8: replace with RTL-1A Table 1. This is the BBA-C1 parts list.

The following RTL-1 figures remain unchanged: 4, 5, 6, 7, 10, 11, 12.

The following RTL-1 tables remain unchanged: 3, 6, 7.

Table 1: (A1) BBA-C1 Improved Broadband Amplifier card parts list [replaces Table 8 of RTL-1 article]

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-P8	flea-clip for .042" hole	MOU	574-T42-1/100	8
10	Q1	transistor, 2N3866	MOU	511-2N3866	1
11	R1,R5,R8	resistor, 4.7 ohm	MOU	29SJ500-4.7	3
12	R2	resistor, 33 ohm	RS	271-007	1
13	R3,R6	resistor, 680 ohm	MOU	29SJ250-680	2
14	R4	resistor, 2.7K	MOU	29SJ250-2.7K	1
15	R7	resistor, 1 ohm	MOU	29SJ500-1.0	1
16	RFC1	inductor, 2200 uH	MOU	434-05-222J	1
17	U1	voltage regulator, 7812	RS	276-1771	1
18	W	buss wire	RS	278-1341	approx.1'

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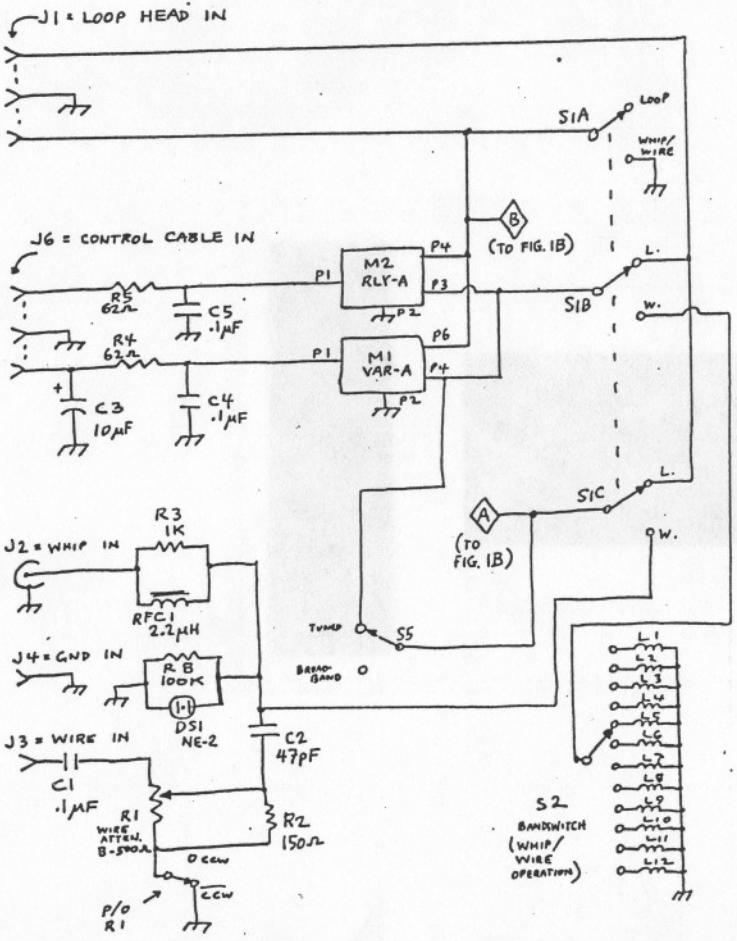
FIGURE 1A : RTL-1A REMOTE LOOP MAIN SCHEMATIC (INPUT)



A note on varactor diodes: Besides the Motorola MVAM108 (available from Active Electronics, as stated in the RTL-1 article), several other devices can be used. Any of the other Motorola MVAM-prefix devices should work: some require different bias voltages. Allied Catalogue number 910, page 608 shows their stock number 586-0602 (Siemens part number BB112). Price was listed as $ 0.60; it has now risen to $ 0.75. Allied's address is 7410 Pebble Drive - Fort Worth, TX 76118; telephone is 1-800-433-5700. The BB112 seems fully compatible with the MVAM108. Also, per information from Dallas Lankford, the widely-available ECG618 and NTE618 devices can also be used.

FIGURE 1B : RTL-1A REMOTE LOOP MAIN SCHEMATIC (OUTPUT)

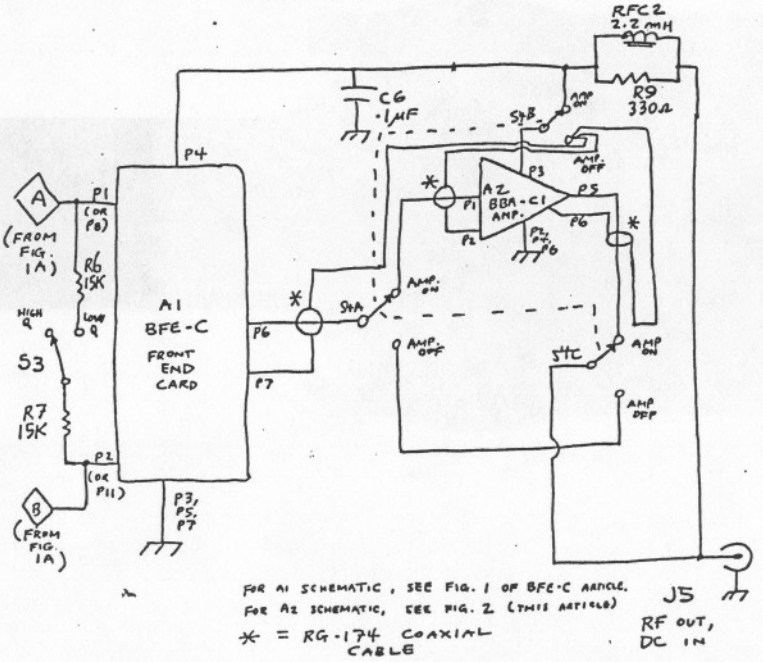


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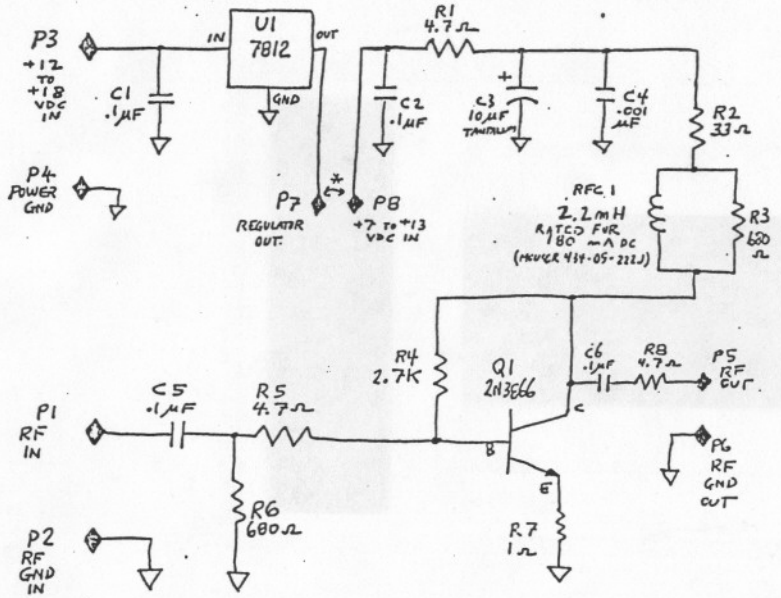
FIGURE 2 : BBA-C1 IMPROVED BROADBAND AMPLIFIER CARD - SCHEMATIC

(WATSON DX LABS - 17 MAR 1992)



NOTES

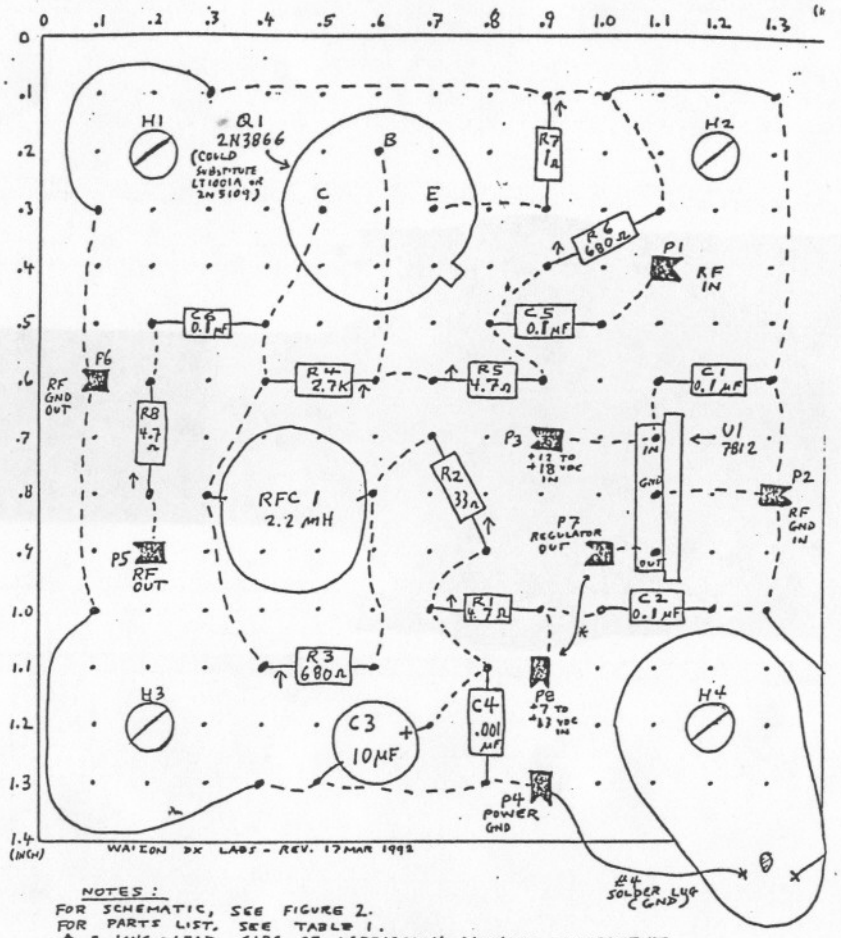
⏚ = CIRCUIT CARD GROUND

* = JUMPER FOR REGULATED OPERATION

FOR ASSEMBLY, SEE FIGURE 3.

FOR PARTS LIST, SEE TABLE 1.

FIGURE 3 : BBA-C1 IMPROVED BROADBAND AMPLIFIER CARD - ASSEMBLY



NOTES:

FOR SCHEMATIC, SEE FIGURE 2.

FOR PARTS LIST, SEE TABLE 1.

↑ = LONG-LEAD SIDE OF VERTICALLY-MOUNTED COMPONENT.

— = BUSS WIRE ON COMPONENT SIDE OF BOARD

--- = BUSS WIRE ON SOLDER SIDE OF BOARD

⋈ = "FLEA CLIP" TERMINAL PIN (OPEN SIDE ↖)

* = JUMPER INSTALLED FOR REGULATED OPERATION