A99-12-1

The MWT-2 Regenerative Tuner

Mark Connelly - WA1ION - 10 DEC 1990

The MWT-2 tuner is an updated version of the MWT-1 described in a 1985 article. The following prior works should be consulted in conjunction with this article:

Articles of direct relevance
(* = NRC / IRCA reprint)

* The MWT-1: A Medium-Wave Tuner / Pre-selector with Regeneration Capability - Mark Connelly - 18 DEC 1985 (the predecessor of MWT-2)

The Dynamic Duo - Ken Cornell - Monitoring Times - FEB 1989 (important regenerative tuner background material)

* Micro-MWDX-4A Loop-vs.-Wire Phaser - Mark Connelly - 15 MAR 1989 (Fig. 2 shows how to mount a transformer card similar to MWT-2 Option 4's card. Fig. 3 of that article shows how to mount the variable capacitor and vernier knob. The drawing after the hole list shows grounding hardware such as that used for MWT-2 G1, G2, G3, & G4.)

A list at the end of this article lists supplementary articles and publications of value to the DXer / builder.

Like the MWT-1, the MWT-2 can provide passive or active preselection as well as broadband variable attenuation. Passive tuning is used when local station strengths are very high (as in an urban area). More often, though, active tuning will be the mode of choice: it can offer improvements to both sensitivity and selectivity.

The baseline MWT-2 design offers performance similar to that of the MWT-1. Unlike MWT-1, it offers the ability to supply power to active whips such as the MFJ 1024. Indeed, the MWT-2 / MFJ 1024 combination is a potent antenna set-up for situations where use of a loop or longwire is not feasible (such as from a motel room when travelling). Additionally, the MWT-2 has been configured to allow the user to implement options for the following improvements over previous active tuners:

1. extended frequency coverage (approx. 130-8750 kHz) with internal coils and a jack to allow coils for other frequency ranges

2. regeneration vernier (fine-adjust) control with the addition of another potentiometer

3. higher gain option (extra amplification stage) for low-signal level work such as groundwave from rural locales, auroral DX, TA DX pre-sunset, TP DX post-sunrise, and DX using short antennae (or the output of a phasing system)

4. broadband amplification function (using a modified function switch and an impedance transformer)

Documentation has been organized to track that of MWT-1 when possible. This allows the builder / DXer to make quick comparisons between the two units.

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Organization of article

A99-12-2

Table 1: MWT-2 Controls and Input / Output Connectors

Controls

location	designation	operational description
left side	R1	input attenuator pot
top	C1	main tuning capacitor
top	R2	regeneration control pot
top	S1	bandswitch
top	S2	function switch
top	S3	antenna length (coupling) switch
top	S4	input mode switch

Input / Output Connectors

location	designation	operational description / connector type	
left side	J1	RF source input	BNC jack
left side	J2	wire antenna input	banana jack
left side	J3	earth ground input	banana jack
right side	J4	RF output	BNC jack
right side	J5	B+ in	phono jack
right side	J6	9V battery holder	Keystone 1290

Table 2: S1 Bandswitch Settings Chart
(Ranges are usually a bit greater than those shown.)

S1 Position #	S1 Knob Pointer "o'clock"	Min. Freq. kHz	Max. Freq. kHz	Tank Inductor Values "Main" L #	"Main" L uH	"Tap" L #	"Tap" L uH
=	=====	====	====	===	====	===	====
1	9:30	130	187	L1	4700	L7	1000
2	10:30	187	280	L2	2200	L8	470
3	11:30	405	590	L3	470	L9	100
4	12:30	590	870	L4	220	L10	47
5	1:30	870	1280	L5	100	L11	22
6	2:30	1280	1900	L6	47	L12	10

Building the MWT-2 Tuner

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 Tables 4, 5, 6). Prepare work area with appropriate tools.

2. Drill out chassis box, in accordance with Table 3.

3. Assemble RFE-C front-end card per Figures 2 & 3 and Table 5. 0.5 inch spacers are mounted at each of the 4 corner holes. Set the completed RFE-C aside temporarily.

4. Mount 0.5" spacers for vernier knob, tap two 6-32 mounting holes in C1, mount C1, then install vernier knob. See Micro-MWDX-4A article to see how this is done. Consult hole list. Holes 5 through 9 of Micro-MWDX-4A serve the same purpose as Holes 1 through 5 of MWT-2.

5. Install jacks, pots, and switches. Solder inductors onto S1 per Figure 1B and Table 2.

6. Mount RFE-C card inside chassis right side, per hole list (Table 3).

7. Install wiring and other components per Figure 1A and Tables 4, 6, & 7.

8. Install knobs per Table 4.

9. Connect phono plug P1 to jack J5 to permit power to go to the unit. Install 9V battery in J6.

10. Place labels near controls and jacks. Test the unit (use the "Operating the MWT-2" section of this article as a guide).

Operating the MWT-2

Before operating any of the four modes, connections to/from the MWT-2 must be made. The antenna or other signal source may be connected to J1 or J2. Earth ground should be connected to J3 if the cable to the receiver will be longer than 10'/3 m. or if the receiver is not grounded. Earth ground may be an actual ground connection or a "dummy" ground provided by a spare long-wire antenna. A 9V battery or AC adapter should be connected to J6. The RF-output coaxial cable (to the receiver input) should be connected to J4.

Mode (1): direct feed of antenna to receiver

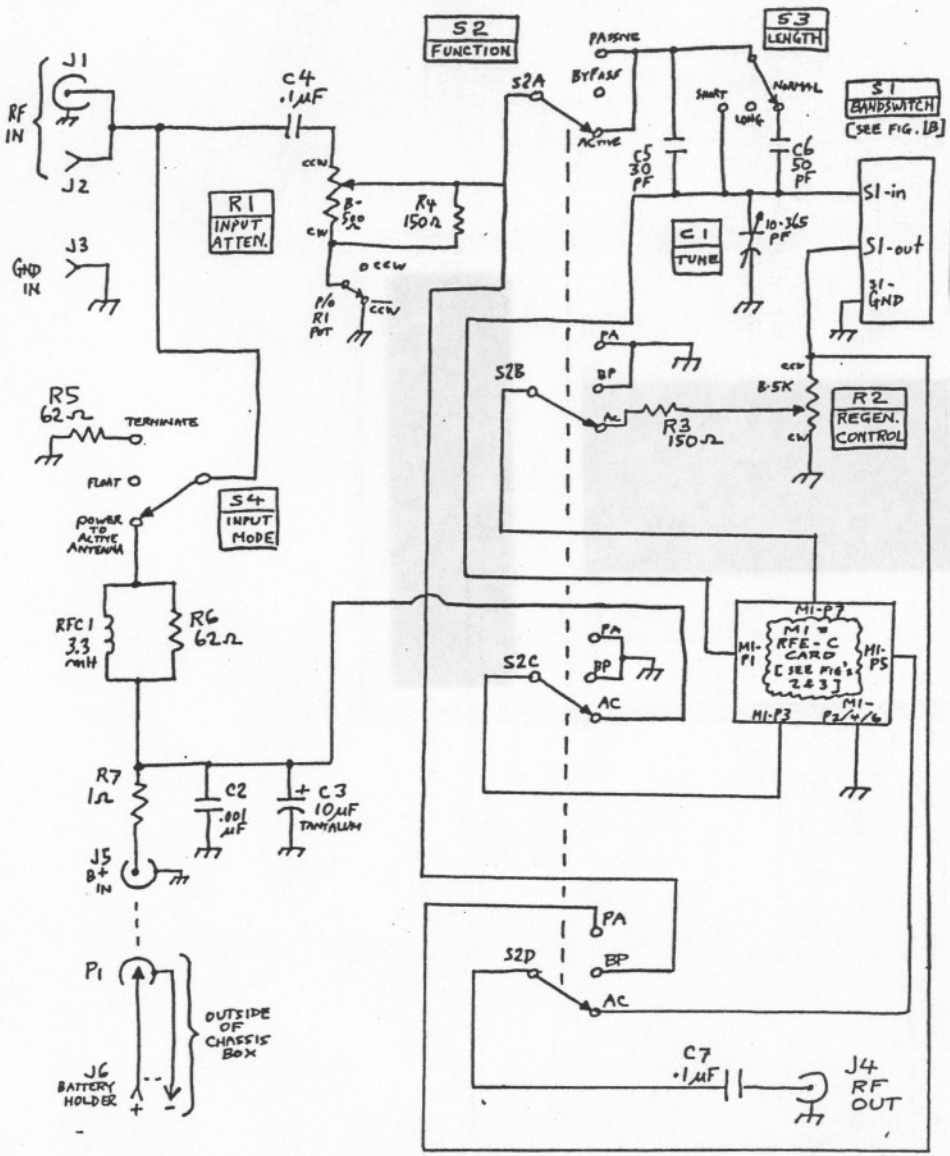
Set-up: The following controls are not used in Mode (1): C1, R2, S1, S3. Their positions are irrelevant. Set R1 initially to fully CCW (the switch on R1 takes the R1 // R4 attenuator out of the line). Set S2 to Bypass. Set S4 to "Float" unless an active antenna is being used - in that case, set S4 to "Power to Active Antenna".

Operate: With receiver on desired frequency, check that the wanted signal is of sufficient strength and has no spurious mixing signals or images from strong local stations. If spurs / images are present, adjust R1 until they go away. If the wanted station is now too weak, a different operating mode (2, 3, or 4) is suggested.

A99-12-3

FIGURE 1A
SYSTEM SCHEMATIC

MWT-2 (WITHOUT OPTIONS)



Mode (2): passive tuning

Set-up: R2 is not used in Mode (2). Its position is irrelevant. Set R1 initially to fully CCW. Set S1 for operating frequency range desired, in accordance with Table 2. Set S2 fully CCW = passive tuning position. Set S3 to up = "normal" length position. Set S4 to "Float" unless an active antenna is being used - in that case, set S4 to "Power to Active Antenna".

Operate: Adjust C1 for maximum strength of the desired-frequency station. If overloading-caused spurious responses QRM the desired signal when C1 is properly peaked, set S3 to middle = "long" and re-peak C1. If, after having done that, spurs still exist; adjust R1 to make the spurs go away. Setting S4 to left = "Terminate" position may also help (if it had been on "Float"). Slight re-peaking of C1 may then be necessary.

Mode (3): simple (non-regen.) active tuning

Set-up: Set R1 initially to fully CCW. Set R2 to fully CW. Set S1 for operating frequency range desired, in accordance with Table 2. Set S2 fully CW = active tuning position. Set S3 to up = "normal" length position (wire length greater than 10'/3 m.) or to down = "short" length position (antenna shorter than 10'). Set S4 to "Float" unless an active antenna is being used - in that case, set S4 to "Power to Active Antenna".

Operate: Adjust C1 for maximum strength of the desired-frequency station. If overloading-caused spurious responses QRM the desired signal when C1 is properly peaked, set S3 to the next longest position (e. g. to "long" if it had been on "normal") and re-peak C1. If, after having done that, spurs still exist; adjust R1 to make the spurs go away. Setting S4 to left = "Terminate" position may also help (if it had been on "Float"). Slight re-peaking of C1 may then be necessary.

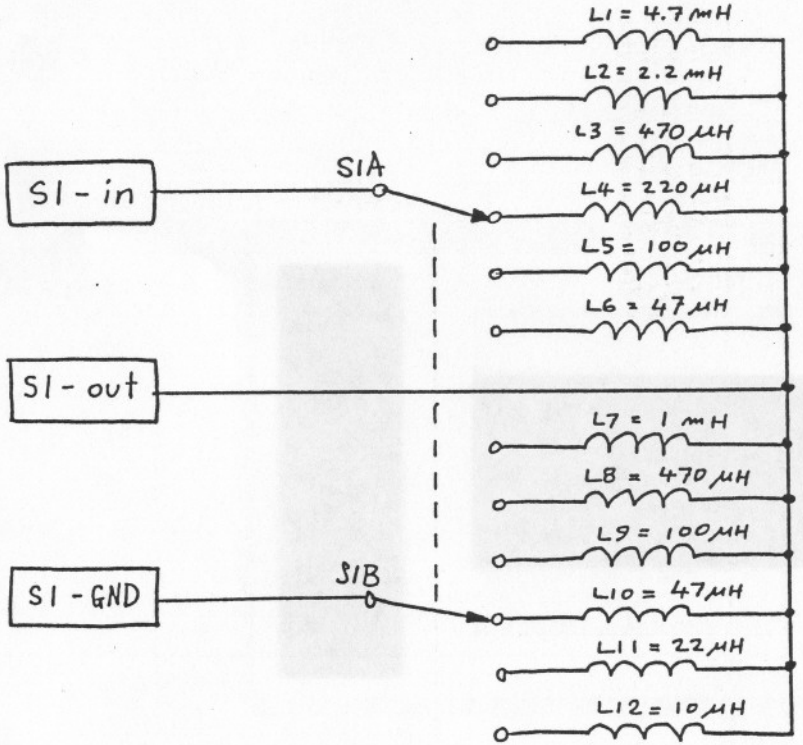
Mode (4): regenerative active tuning

Perform all Mode (3) steps above. Bring R2 gradually CCW in small steps; after each step re-peak C1. An increase in signal level and tuning sharpness should be readily apparent. At the "regeneration threshold" the received audio gets muddy; beyond that threshold, oscillation occurs.

A99-12-4

FIGURE 1B

STANDARD MWT-2 S1 BANDSWITCH



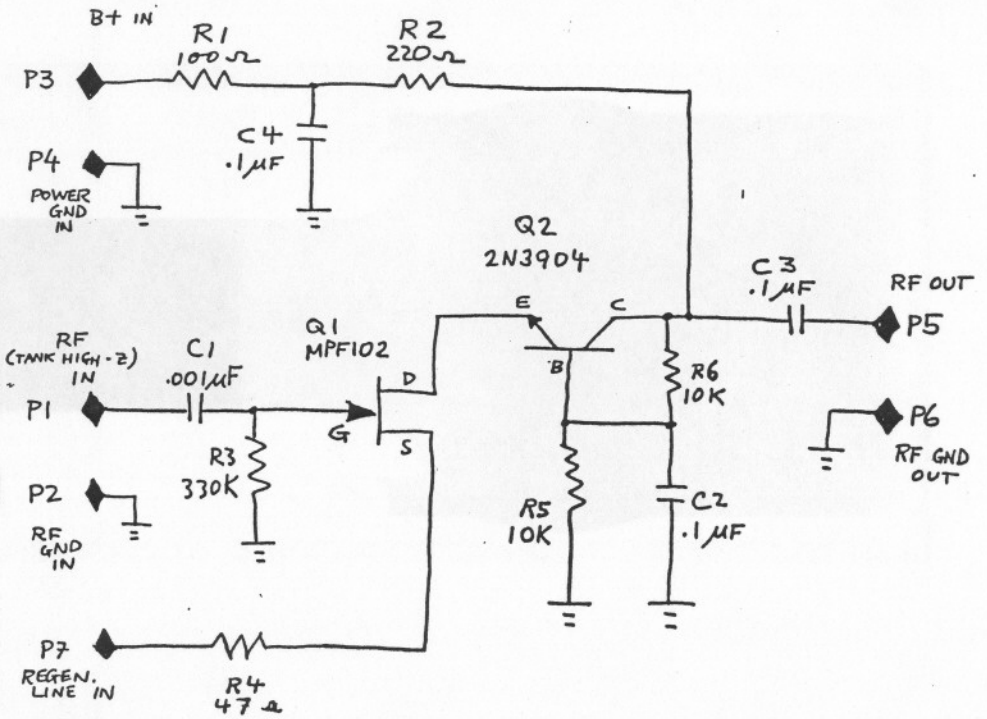
FOR CONNECTIONS, SEE FIG. 1A & TABLE 7.
FOR PARTS LIST, SEE TABLE 4.
FOR FREQUENCY RANGES, SEE TABLE 2.

MWT-2 REGENERATIVE TUNER

FIGURE 2

RFE-C REGEN. FRONT-END CARD (MODIFIED KEN CORNELL DESIGN)

FOR CONNECTIONS, SEE FIGURE 1A.
(COMPONENT DESIGNATIONS ARE INDEPENDENT OF MWT-2 COMPONENTS IN MAIN ASSEMBLY)



NOTES

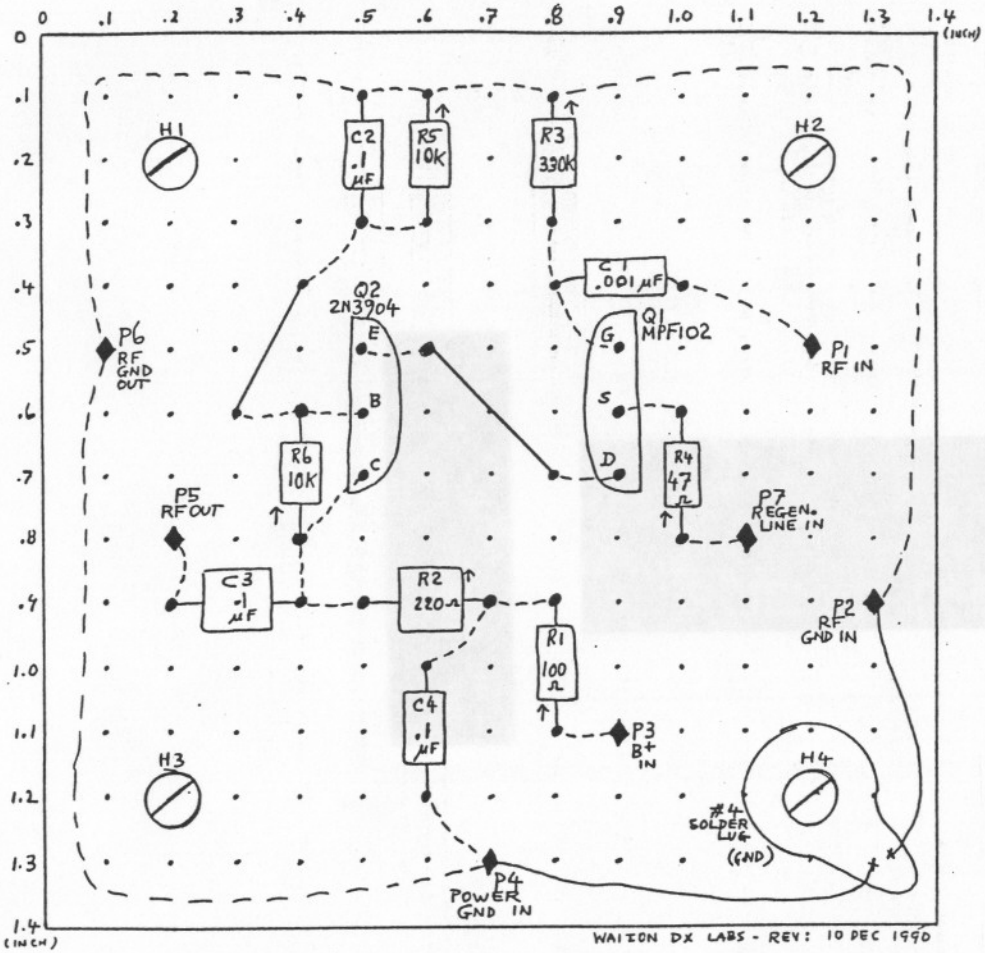
⏚ = CIRCUIT-BOARD GROUND

FOR ASSEMBLY DRAWING ("ROADMAP"), SEE FIGURE 3
FOR PARTS LIST, SEE TABLE 5.

THIS IS "M1" OF MWT-2.

A99-12-5

MWT-2 FIGURE 3 RFE-C REGENERATIVE FRONT-END CARD ASSEMBLY



NOTES

FOR SCHEMATIC : SEE FIGURE 2.

FOR PARTS LIST : SEE TABLE 5.

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

— = BUSS WIRE ON COMPONENT SIDE OF BOARD.

--- = BUSS WIRE ON SOLDER SIDE OF BOARD.

Table 3: MWT-2 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.

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LEFT SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	J3	GND In - black banana jack	-0.75	1.25	0.3125
2	J2	Wire Ant. In-red banana jack	-0.75	0.5	0.3125
3	G1	GND H/W - internal lug	0.0	1.125	0.125
4	J1	RF source in - BNC jack	0.0	0.5	0.375
5	R1	Input Atten. Pot - shaft	1.25	0.625	0.3125
6	R1	Input Atten. Pot - tab	1.5625	0.625	0.144

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TOP SIDE

Hole #	Comp. Desig.	Description	X	Y	D
1	C1	Tuning cap. - mounting H/W 1	-1.963	3.0	0.144
2	C1	Tuning cap. - shaft	-1.5	2.75	0.5
3	C1	Tuning cap. - mounting H/W 2	-1.037	3.0	0.144
4	-	C1's vernier knob - H/W 1	-2.14	2.125	0.125
5	-	C1's vernier knob - H/W 2	-0.86	2.125	0.125
6	R2	Regen. Control pot. - shaft	-1.875	0.625	0.3125
7	R2	Regen. Control pot. - tab	-1.5625	0.625	0.144
8	G2	GND H/W - internal lug	-1.25	1.125	0.125
9	S4	Input mode switch - shaft	-1.0	0.4375	0.25
10	S4	Input mode switch - tab	-0.75	0.4375	0.144
11	S3	Length switch - shaft	-0.25	2.25	0.25
12	S3	Length switch - tab	-0.25	2.0	0.125
13	S2	Function switch - shaft	0.0	0.875	0.375
14	S2	Function switch - tab	0.0	0.375	0.144
15	S1	Bandswitch - shaft	1.0	2.25	0.375
16	S1	Bandswitch - tab	1.5	2.25	0.144
17	G3	GND H/W - internal lug	1.625	3.25	0.125

A 99-12-6

Table 3 (continued)

R I G H T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
1	J6	battery holder - H/W 1	-1.625	2.625	0.125
2	J6	battery holder - H/W 2	-1.625	1.75	0.125
3	G4	GND H/W - internal lug	0.0	1.125	0.125
4	J4	RF out - BNC jack	0.0	0.5	0.375
5	M1	Regen.Front End Card-H/W 3	0.625	1.375	0.125
6	M1	Regen.Front End Card-H/W 1	0.625	0.375	0.125
7	M1	Regen.Front End Card-H/W 4	1.625	1.375	0.125
8	M1	Regen.Front End Card-H/W 2	1.625	0.375	0.125
9	J5	B+ input - phono jack	1.125	2.125	0.25

Table 4: "upper level" parts list

Vendor codes:

RS = Radio Shack / Many locations worldwide
MOU = Mouser Electronics / 11433 Woodside Ave. / Santee, CA 92071
RK = Radiokit / P. O. Box 973 / Pelham, NH 03076

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	chassis box	MOU	537-TF-779	1
2	M1	RFE-C regenerative front-end card (see Table 5)			
3	(for C1)	vernier knob	MOU	45KN100	1
4	(for R1, R2)	knob	MOU	45KN013	2
5	(for S1, S2)	knob	RS	274-416	2
6	B1	9V alkaline battery	RS	23-553	1
7	C1	variable cap.,10-365pF	RK	BC-01	1
8	C2	capacitor, 0.001 uF	RS	272-126	1
9	C3	capacitor, 10uF tant.	MOU	581-10M35	1
10	C4,C7	capacitor, 0.1 uF	RS	272-109	2
11	C5	capacitor, 30 pF	MOU	ME-232-1000-030	1
12	C6	capacitor, 50 pF	MOU	ME-232-1500-050	1
13	J1,J4	BNC jack	RS	278-105	2
14	J2	red banana jack	RS	274-662	1
15	J3	black banana jack	RS	274-662	1
16	J5	phono jack	RS	274-346	1
17	J6	battery holder (Keystone 1290)	MOU	534-1290	1
18	L1	inductor, 4700 uH	MOU	ME434-1120-473K	1
19	L2	inductor, 2200 uH	MOU	ME434-1120-223K	1
20	L3,L8	inductor, 470 uH	MOU	43LR474	2
21	L4	inductor, 220 uH	MOU	43LR224	1
22	L5,L9	inductor, 100 uH	MOU	43LR104	2

Table 4 (continued)

23	L6,L10	inductor, 47 uH	MOU	43LR475	2
24	L7	inductor, 1000 uH	MOU	43LR103	1
25	L11	inductor, 22 uH	MOU	43LR225	1
26	L12	inductor, 10 uH	MOU	43LR105	1
27	P1	phono plug	RS	274-339	1
28	R1	pot.,500 ohm, linear	MOU	31CT205	1
29	R2	pot., 5K, linear	MOU	31CT305	1
30	R3,R4	resistor, 150 ohm	RS	271-013	2
31	R5,R6	resistor, 62 ohm	MOU	29SJ500-62	2
32	R7	resistor, 1 ohm	MOU	29SJ500-1.0	1
33	RFC1	inductor, 3300 uH	MOU	43LH233	1
34	S1	switch/2pole/6pos.rotary	MOU	10WW026	1
35	S2	switch/4pole/3pos.rotary	MOU	10YX043	1
36	S3,S4	switch,SPDT,on-off-on	RS	275-325	2

Table 5: (M1) RFE-C regenerative front-end card parts list

See Table 4 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	capacitor, 0.001 uF	RS	272-126	1
3	C2,C3,C4	capacitor, 0.1 uF	RS	272-109	3
4	H1,H2,H3,H4	screw, 4-40 X .25"	MOU	572-01880	4
5	H1,H2,H3,H4	spacer, 4-40 X .5"	MOU	534-1450C	4
6	H1,H2,H3	split lockwasher, #4	MOU	572-00649	3
7	H4	solder lug, #4	MOU	534-7311	1
8	P1,P2,P3,P4, P5,P6,P7	flea-clip for .042 hole	MOU	574-T42-1/100	7
9	Q1	FET, MPF102	RS	276-2062	1
10	Q2	transistor, 2N3904	MOU	570-2N3904	1
11	R1	resistor, 100 ohm	RS	274-1311	1
12	R2	resistor, 220 ohm	RS	274-1313	1
13	R3	resistor, 330K	MOU	29SJ250-330K	1
14	R4	resistor, 47 ohm	RS	271-009	1
15	R5,R6	resistor, 10K	RS	271-1335	2
16	W	buss wire	RS	278-1341	approx. 1'

Table 6: small hardware parts list

See Table 4 for vendor codes.

Note: Mounting hardware is supplied with the following components: J1, J2, J3, J4, J5, R1, R2, S1, S2, S3, S4.

Hardware is required by the following component designators: C1, the vernier knob for C1, G1, G2, G3, G4, and M1. All required hardware is listed below:

A99-12-7

Table 6 (continued)

Used on	Description/Value	Vendor	Vendor Stock #	QTY
G1-G4(4),J6(2), M1(4),C1 knob(4)	screw, 4-40 X .25"	MOU	572-01880	14
C1(2)	screw, 6-32 X .25"	MOU	572-01888	2
M1(4),C1 knob(2)	split lockwasher, #4	MOU	572-00649	6
C1(4)	split lockwasher, #6	MOU	572-00650	4
G1-G4(4)	solder lug, #4	MOU	534-7311	4
G1-G4(4)	hex nut, 4-40	MOU	572-00486	4
C1 knob(2)	spacer, 4-40 X .5"	MOU	534-1450C	2

Table 7: wiring / component connections

Notes: I = insulated wire, approx. #22 AWG
B = bare solid (buss) wire

Lengths are maximum typical required amount; in actual practice, use the shortest length possible to minimize stray coupling.

OUTSIDE BOX

wire #	From	To	Description
1	J6 + terminal pin	P1 plug - center pin	2" I
2	J6 - terminal pin	P1 plug - shield pin [P1 connects to J5]	2" I

INSIDE BOX

wire #	From	To	Description
3	J1	J2	1" B
4	J3	G1 internal GND lug	1" B
5	R1 switch (left)	G1 internal GND lug	2" I
6	R1 switch (right) [R1 CW	R1 CW R1 arm	0.5" B R4]
7	R1 arm	S2A arm	3" I
8	S2A arm [R1 CCW =	S2D-ByPass C4 side 1]	1" I
9	C4 side 2	J1	2" I
10	C4 side 2 [S4-Power to Active Ant. =	S4 arm (R6 & RFC1) side 1]	2" I
11	(R6 & RFC1) side 2 [S4-Terminate	S2C-ACtive G2 internal GND lug	2" I R5]
12	S2B-ByPass	G2 internal GND lug	2" I
13	S2B-ByPass	S2B-PAssive	0.5" B
14	S2C-ByPass	G2 internal GND lug	2" I
15	S2C-ByPass [R2 arm =	S2C-PAssive R3 side 1]	0.5" B
16	R3 side 2	S2B-ACtive	3" I
17	[R7 side 1 = [R7 side 2 R7 side 2	J5] G3 internal GND lug S2C-ACtive	C2 & C3] 5" I
18	S2C arm	M1-P3	3" I
19	S2B arm	M1-P7	3" I
20	S3 arm	S2A-ACtive	2" I
21	S2A-ACtive	S2A-PAssive	1" I
22	M1-P5 [J4 =	S2D-ACtive C7 side 1]	3" I
23	C7 side 2	S2D arm	2" I
24	R2 CCW	S2D-PAssive	3" I
25	S2D-PAssive	S1-out	1" I
26	S1-GND	G4 internal GND lug	2" I
27	S1-in	S3-short	1" I
28	S3-short [S3-short [S3-short	C1-stator S3 arm S3-normal	1" I C5] C6]

Table 7 (continued)

Wire S1-in, out, GND and coil connections per Figure 1B.

Table 8: control orientation conventions

Ensure that components are mounted and wired in accordance with this table; align knob pointers to clock positions indicated. Orientations are as viewed from outside the chassis box assembly.

Side	Control	Orientation Conventions
top	C1	CCW = minimum C (vernier scale at 0) CW = maximum C (vernier scale at 100)
left	R1	CCW = maximum level (no attenuation) = 7:00 CW = minimum level (maximum attenuation) = 5:00
top	R2	CCW = maximum regen. = 7:00 CW = minimum regen. = 5:00
top	S1	[see Table 2]
top	S2	CCW = passive = 11:00; middle = bypass = 12:00; CW = active = 1:00
top	S3	"short" = down; "long" = middle; "normal" = up
top	S4	"Terminated" = left; "Float" = middle; "Power to Active Antenna" = right

A99-12-8

Appendix: Options for the MWT-2

Option 1 = frequency range extension
(Refer to Figures 4 & 8 and to Tables 9 & 11)

Additional frequencies can be covered by substituting a 12-position, 2-pole rotary switch for S1. The switch is to be configured to provide 11 ranges determined by inductors L1 through L22 and a twelfth range determined by an external tapped-coil assembly installed by the user at the added J7 stereo-headphone-type jack (Radio Shack 274-312, or equivalent). Installing Option 1 gives coverage of numerous popular bands including longwave broadcast, LOWFER, beacons, medium wave broadcast, 160-80/75-40 meter hams, and 120-90-75-60-49-41 meter shortwave broadcasts. A switch-position versus frequency-range table (similar to Table 9) should be placed somewhere on the chassis box - e. g. on the bottom cover - for the operator's convenience. Option 1 may be installed with or without the other options.

Table 9: S1 frequency ranges (Option 1)
(Ranges are usually a bit greater than those shown.)

S1 Position #	S1 Knob Pointer "o'clock"	Min. Freq. kHz	Max. Freq. kHz	Tank Inductor Values "Main" L #	"Main" L uH	"Tap" L #	"Tap" L uH
1	7:00	130	187	L1	4700	L12	1000
2	8:00	187	280	L2	2200	L13	470
3	9:00	280	405	L3	1000	L14	220
4	10:00	405	590	L4	470	L15	100
5	11:00	590	870	L5	220	L16	47
6	12:00	870	1280	L6	100	L17	22
7	1:00	1280	1900	L7	47	L18	10
8	2:00	1900	2760	L8	22	L19	4.7
9	3:00	2760	4050	L9	10	L20	2.2
10	4:00	4050	5900	L10	4.7	L21	1.0
11	5:00	5900	8750	L11	2.2	L22	0.47
12	6:00	(determined by external coil at J7)					

Option 2 = regeneration vernier pot.

Smoother control of regeneration is possible by changing R3 from a 150 ohm fixed resistor (as in Figure 1A) to a 500 ohm linear-taper potentiometer (Mouser 31CT205 or equivalent - see Figure 8 and Table 11). During operation, this pot. is normally set to center position until R2 has been adjusted to the regeneration threshold (point at which audio gets "muddy" and oscillation breaks out). Then, R3 may be adjusted (while simultaneously re-peaking C1) to obtain desired tight selectivity consistent with intelligible audio. Option 2 may be installed with or without the other options.

Option 3 = higher gain
(Refer to Figures 5, 6, & 8 and to Tables 10 & 11)

An extra amplification stage is added for rendering very low level input signals usable to the DXer. Such inputs typically result from using short antennae, running a passive phaser ahead of the MWT-2, and/or DXing from rural locales during daylight or auroral night-time conditions. The BBA-C broadband amplifier shown provides good dynamic range and gain. It is somewhat battery-hungry, pulling about 120 mA in normal operation. The previous BBA-B design (as used on MWDX-4 phasing units) may be substituted. BBA-B pulls about 50 mA and has gain comparable to that of BBA-C (approximately 20 dB), but it is more susceptible to overload in strong-signal (urban / suburban) environments. Option 3 may be installed with or without the other options.

Table 10: (A1) BBA-C broadband amplifier card parts list

See Table 4 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,P2,P3,P4, P5,P6,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	29SJ500-5.1	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	29SJ250-2.7K	1
15	RFC1	inductor, 3300 uH	MOU	43LH233	1
16	U1	voltage regulator, 7812	RS	276-1771	1
17	W	buss wire	RS	278-1341	approx. 1'

Option 4 = broadband amplification function
(Refer to Figures 7 & 8 and to Table 11)

The S2 function switch is replaced by a 4-position, 6-pole rotary switch (Mouser 10WR064, or equivalent) and is wired in with additional components R8, R9, and the TA1 transformer assembly. This option requires installation of Option 3 (higher gain). When installed, Option 4 provides a fourth function switch setting: Broadband Amplification. This is particularly useful when the input is already of a narrowband nature (such as a phasing-unit output or the low-impedance coupling-coil output

A99-12-9

of a tuned passive loop) but is of insufficient level to overcome receiver noise. Untuned shortwire antennae may be broadband-amplified if there are no extremely strong signals present that could cause mixing spurs to be produced.

Table 11: holes added to implement options
Refer to Table 3 for definitions of X, Y, D hole drilling parameters.

Holes added for Option 1

T O P S I D E

Hole #	Comp. Desig.	Description	X	Y	D
18	J7	External Coil In-stereo jack	-0.125	3.25	0.375

++

Holes added for Option 2

T O P S I D E

Hole #	Comp. Desig.	Description	X	Y	D
19	R3	Regen. Vernier pot - shaft	1.5	0.625	0.3125
20	R3	Regen. Vernier pot - tab	2.0	0.625	0.144

++

Holes added for Option 3

R I G H T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
10	A1	Broadband Amp. Card - H/W 3	-1.625	1.375	0.125
11	A1	Broadband Amp. Card - H/W 1	-1.625	0.375	0.125
12	A1	Broadband Amp. Card - H/W 4	-0.625	1.375	0.125
13	A1	Broadband Amp. Card - H/W 2	-0.625	0.375	0.125

++

Holes added for Option 4

L E F T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
7	TA1	Imped. Transformer - H/W 1	0.7	1.875	0.125
8	TA1	Imped. Transformer - H/W 2	1.5	1.875	0.125

Supplementary Articles and Publications

Additional information on construction practices and DX-related circuit design may be obtained from the following:

(* = NRC / IRCA reprints)

* MWDX-4 and Mini-MWDX-4 series Phasing Units - Mark Connelly - 11 OCT 1985 (Shows BBA-B amp. card which may be used in place of Option 3 BBA-C)

* The Mini-MWDX-3: A Simple, Effective Phasing Unit - Mark Connelly - 5 DEC 1984 (construction practices)

* RT-1: Remotely - Controlled Antenna Tuner - Mark Connelly - 24 OCT / 26 DEC / 27 DEC, 1984. (construction practices)

publications

NRC: Antenna Manuals, Receiver Manuals, Beverage Manual, Loop Manual

IRCA: Technical Guide

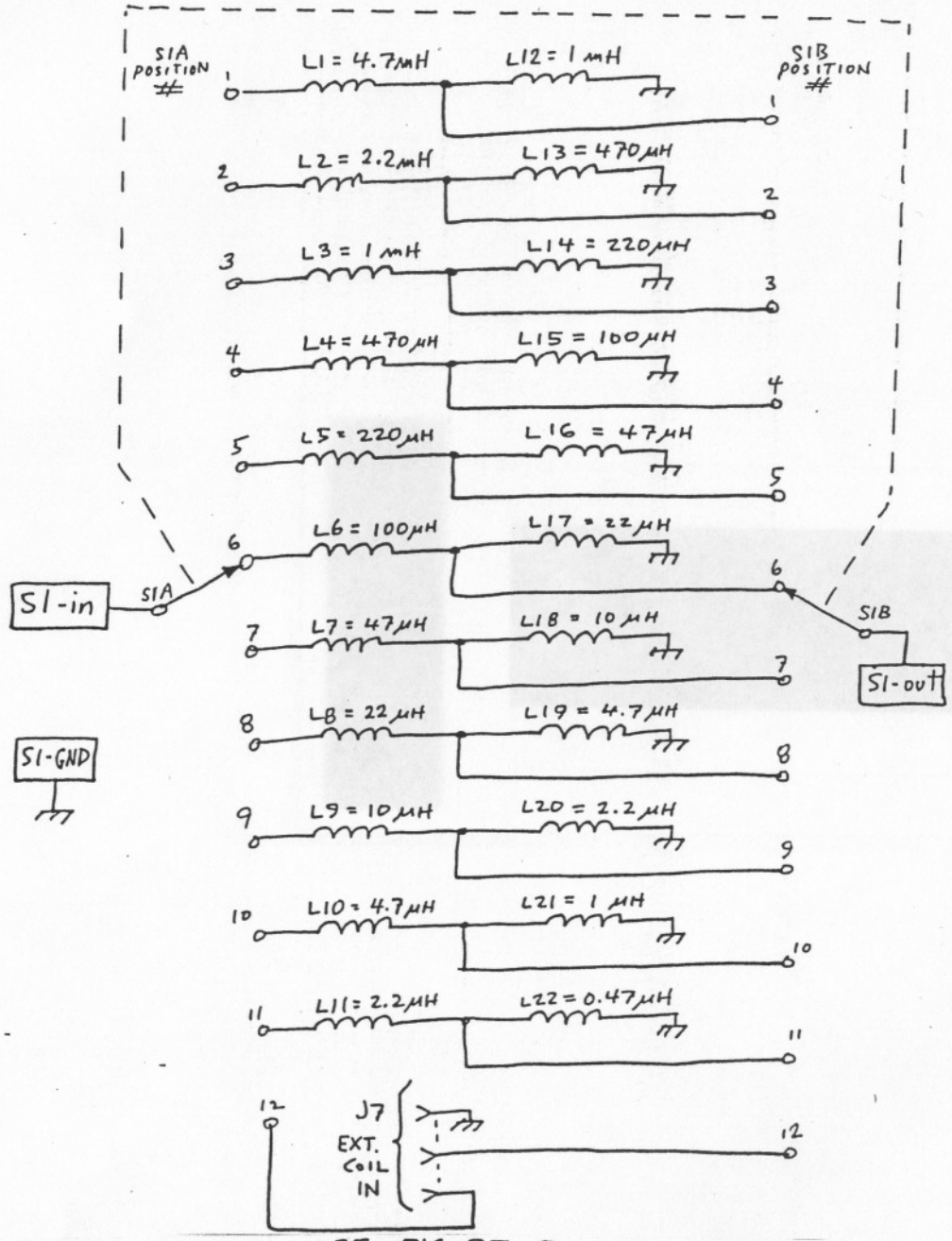
Ken Cornell: Low & Medium Frequency Scrapbook

ARRL: Radio Amateur's Handbook, Low Band DXing (ON4UN)

Fine Tuning / John Bryant: Proceedings 1988, Proceedings 1989

FIGURE 4 MWT-1 (OPTION 1) S1 BANDSWITCH WITH J7 JACK

A99-12-10



FOR CONNECTIONS, SEE FIGURE 8.
SWITCH IS MOUSER 10 WR 212, OR EQUIVALENT.
FOR FREQUENCY RANGES, SEE TABLE 9.

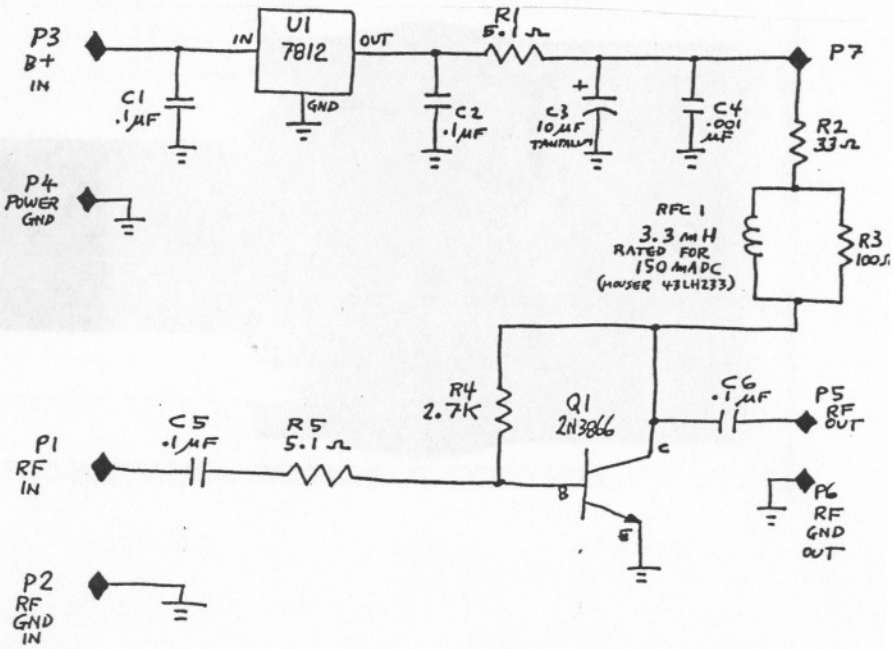
MWT-2
OPTION 3

FIGURE 5

BBA-C BROADBAND AMPLIFIER CARD : SCHEMATIC

FOR CONNECTIONS, SEE FIGURE 8.

(COMPONENT DESIGNATIONS ARE INDEPENDENT OF MWT-2 MAIN ASSEMBLY COMPONENTS)



NOTES

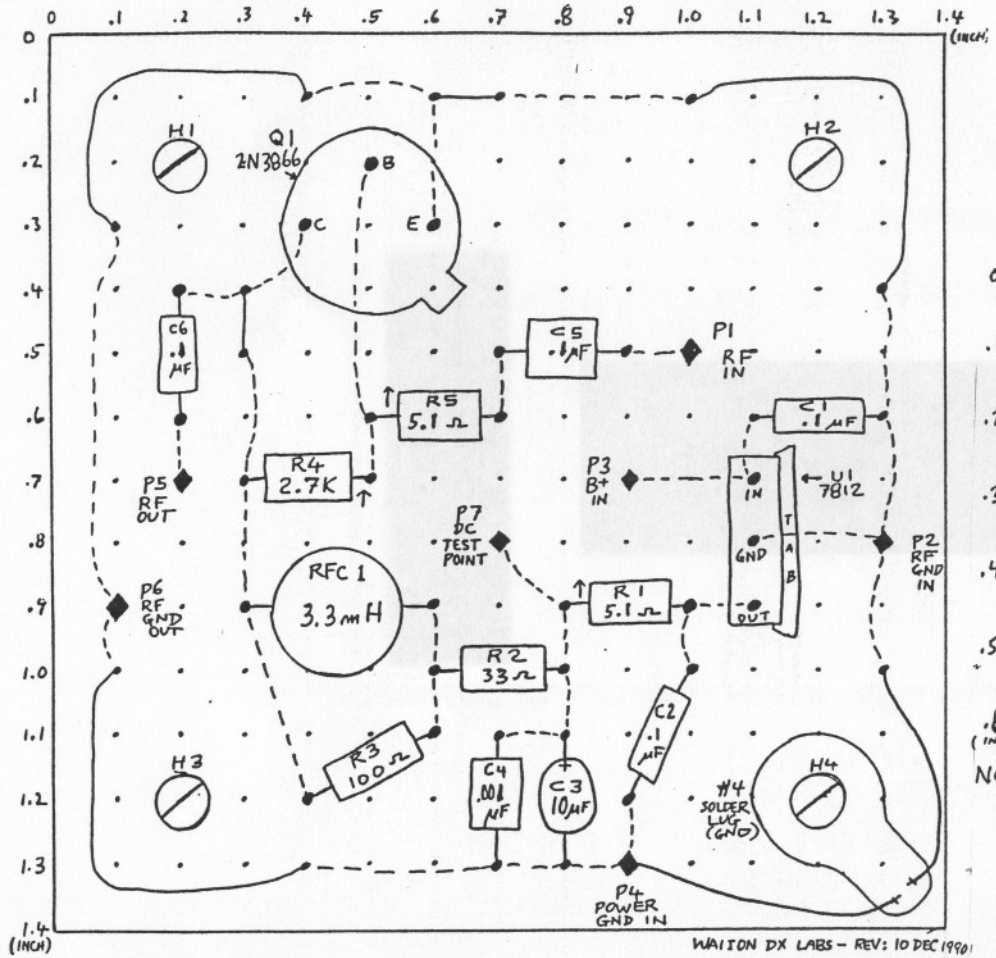
⏚ = CIRCUIT BOARD GROUND

FOR ASSEMBLY DRAWING, SEE FIGURE 6.
FOR PARTS LIST, SEE TABLE 10.

· THIS IS "A1" OF MWT-2 (OPTION 3).

A99-12-11

MWT-2 FIGURE 6 BBA-C BROADBAND AMPLIFIER CARD: ASSEMBLY

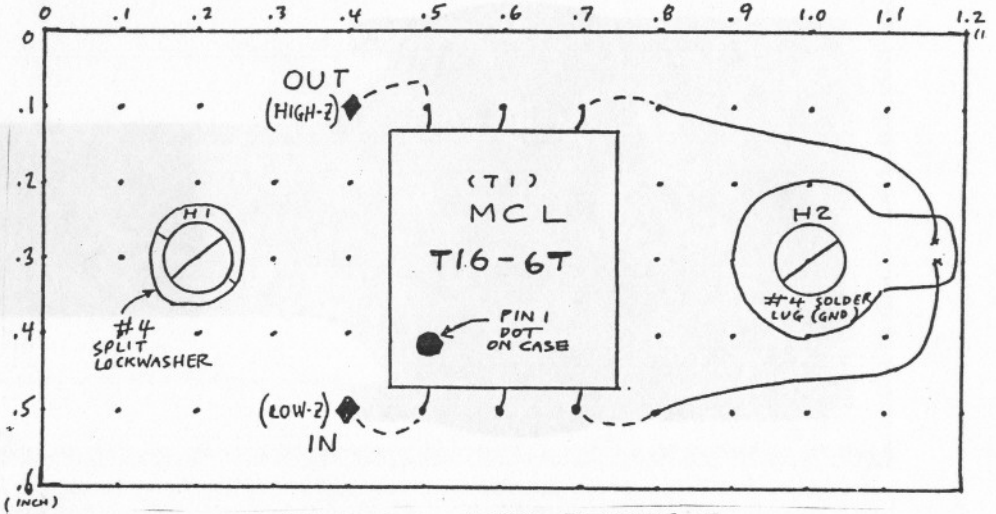


NOTES

FOR SCHEMATIC: SEE FIGURE 5.
FOR PARTS LIST: SEE TABLE 10.
↑ = LONG-LEAD SIDE OF VERTICALLY-MOUNTED COMPONENT.
— = BUSS WIRE ON COMPONENT SIDE OF BOARD.
--- = BUSS WIRE ON SOLDER SIDE OF BOARD.

FIGURE 7

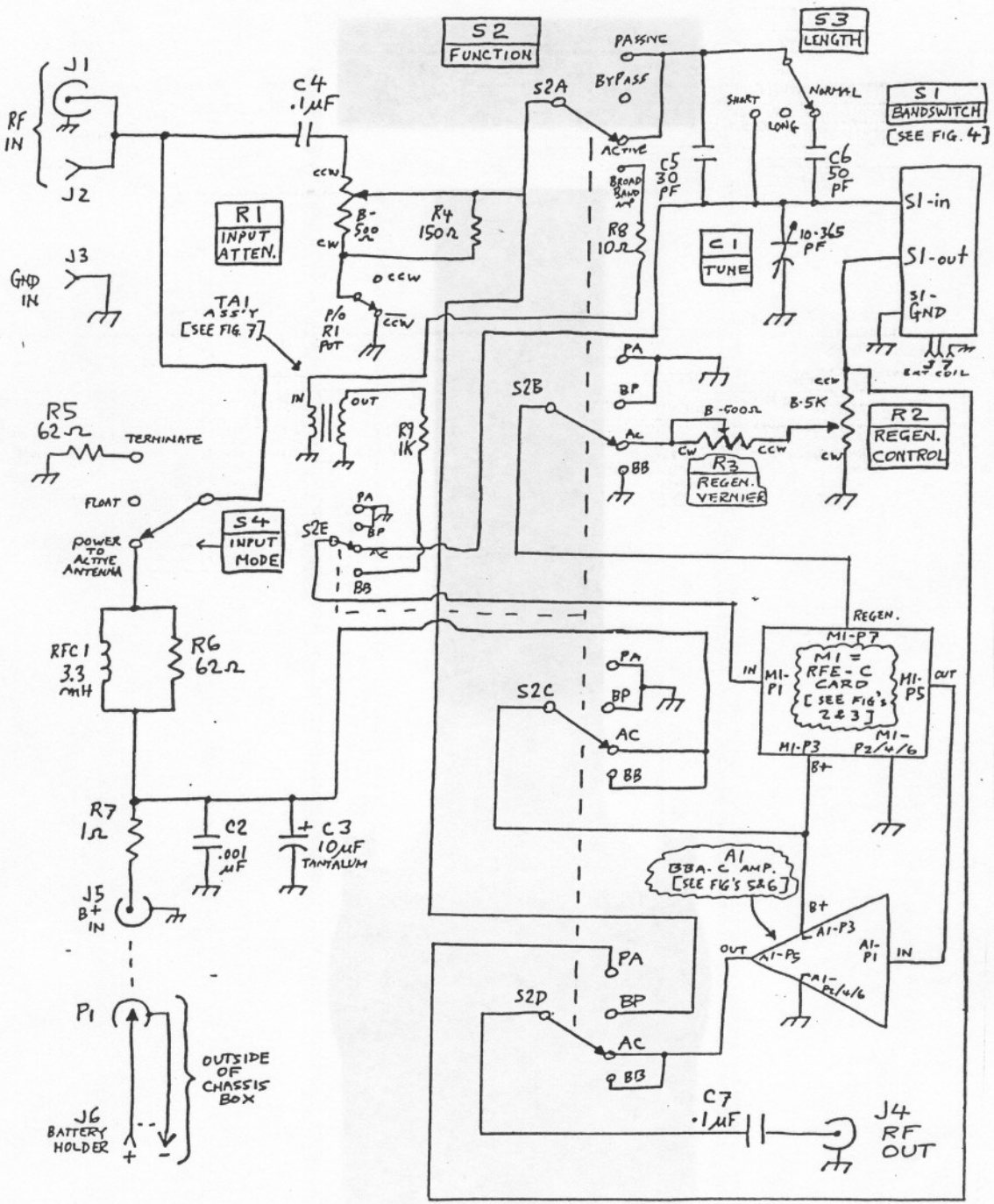
IMPEDANCE TRANSFORMER CARD: ASSEMBLY
("TA1" FOR MWT-2 OPTION 4)



NOTES:
a) FOR CONNECTIONS, SEE FIGURE 8.
b) SCREWS FOR H1, H2 ARE 4-40 x .25": THESE CONNECT TO 4-40 x .5" SPACERS ON THE BACK OF THE CARD.
c) BOARD IS FABRICATED FROM PERFBOARD WITH .1" x .1" GRID OF .042" HOLES.
d) IN, OUT PINS = MOUSER 574-T42-1/100 OR EQUIV.
e) SOLID LINE = WIRE ON COMPONENT SIDE OF BOARD
DASHED LINE = WIRE ON SOLDER SIDE OF BOARD
f) MINI-CIRCUITS LABS T36-1 OR TT25-1 MAY BE SUBSTITUTED FOR T16-6T TRANSFORMER

FIGURE 8
SYSTEM SCHEMATIC

MWT-2 (WITH OPTIONS 1, 2, 3, & 4)



A99-12-12