The MWT-3 Regenerative Tuner / Controller

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The MWT-3 provides passive and active preselection, broadband amplification and attenuation, and control of remotely - tuned loops and active whips (RTL-1A, etc.). Its amplifier configuration, using the RFE-D and BUF-A cards, gives it improved dynamic range over earlier regenerative tuners such as MWT-1 and MWT-2. As with other tuners of this type, it is placed in the signal path ahead of the receiver's RF input.

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. Tuning covers 140 kHz through 10 MHz. Many portable receivers and low- to medium-price communications receivers have mediocre selectivity, insufficient for serious foreign-split DXing. By the correct setting of the regeneration on the MWT-3, splits 1 kHz from comparable-strength domestics (e. g. Spain - 999 vs. CKBW / WLUP - 1000) can produce readable audio on most receivers.

BROADBAND AMPLIFICATION is usually used when a band-limited input (e. g. a tuned loop's output) is not adequately above the receiver's noise floor. Broadband amplification of a wideband input source is to be used cautiously. Even if the MWT-3 itself doesn't overload, the receiver may.

The BYPASS function routes the input to the output through the attenuation control when amplification or preselection is unnecessary.

All of the above functions can be used to condition a variety of signal sources en route to the receiver. Conditioning, depending upon reception requirements, may be narrowing the received bandwidth, increasing signal level, or reducing signal level. The signal source may be a longwire, a phasing unit's output, a passive loop, or an active loop / active whip.

The MWT-3 can be used to enable an active, remotely-tuned antenna to be its signal source. Such active antennas have the advantages of small physical size for the amount of signal produced and the ability to place the antenna at an optimum location for signal pickup or electrical noise suppression - e. g. on a tower, on a vehicle's roof, or a considerable distance out in a field or forest away from power lines. My previous articles on the RTU-1 modified MFJ 1024 Active Whip and the RTL-1 Remotely-Tuned Loop (and upgraded RTL-1A version) go into considerable detail on the value of such antennas on mobile "beach mini-DXpeditions" and in motel-room DXing on business and vacation trips. Remotely-tuned active antennas require that the following are passed from the "shack" controller to the remote site: DC power for the remote antenna's amplifier, a control voltage for varactor tuning, and - in most cases - a relay control voltage for switching frequency ranges (or switching between broadband and tuned modes) at the remote antenna. RF from the active antenna must be passed back to the receiving position through 50-ohm coaxial cable. In the MWT-3, RF is passed in through BNC jack J1 and banana jack J2. DC power (typically +12 VDC) is passed out through these same jacks when S4 is set to the "Power to Active Antenna" position. Varactor and band-relay control voltages are passed out through stereo headphone jack J7. If Input Mode switch S4 is set to "Spare", the control cable to the remote antenna can be used as an antenna itself; this could be useful if its directional properties differ considerably from those of the remote active antenna. S5 controls the relay at the remotely-tuned antenna and R3 controls the varactor tuning voltage.

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Organization of article

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Table 1: MWT-3 Controls and Input / Output Connectors

Controls

location	designation	operational description
left side	S6	Input Select switch
top	C1	Tuning capacitor
top	R1	Input Attenuation pot
top	R2	Regeneration Control pot
top	R3	Remote Tuning pot
top	R4	Regeneration Vernier pot
top	S1	Bandswitch
top	S2	Function switch
top	S3	Length switch
top	S4	Input Mode switch
top	S5	Remote Relay switch (band 1 / 2)

Input / Output Connectors

location	designation	operational description	connector type
left side	J1	Main RF input	BNC jack
left side	J2	Main RF input	banana jack
left side	J3	Earth Ground input	banana jack
left side	J7	Remote Antenna Control	stereo phone jk
left side	J8	Spare Antenna 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

Operating the MWT-3

Connections

Before operating any of the four functions, connections to / from the MWT-3 must be made.

J1/J2: The main antenna or signal source should be connected to J1 or J2.

J3: Earth ground can 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 longwire on or near the ground.

J5 / J6 / P1: A 9V battery may be used for power if the MWT-3 is not being used with a remotely-tuned active antenna. The battery is to be installed in holder J6 and plug P1 connected to the J5 B+ input RCA jack. If the MWT-3 is being used to operate a remote active antenna, a power source of greater current and voltage capacity is required. A supply capable of 11 VDC minimum, 19 VDC maximum should be connected to J5 in that circumstance.

J4: The RF-output coaxial cable (to the receiver input) should be connected to J4.

J7: If a remotely-tuned active antenna is to be used, connect its control cable to J7. This cable should be wired so the tip of its stereo headphone plug (mating to J7) is used for the varactor control line (Figure 1: J7-A) and the center section for the relay control line (J7-B). If the control cable's length exceeds 10m / 33', a ground line should be connected to the remaining (base) section of the cable's plug which mates to J7. Note that actual DC power to the active antenna is sent out through the J1 connector also used for RF input.

J8: If J7 is not used, a spare antenna can be connected to J8. When the S6 Input Select switch is set for the Spare (instead of the Main J1/J2) input, this spare antenna is used as the MWT-3 input signal source. When J7 is used, as noted above, the control cable to the active antenna can be used as the spare antenna. Having Main and Spare signal sources available can allow diversity in directional pickup patterns.

Procedures

Physical orientations of controls are as described in Table 10.

Controlling a remote active antenna involves S4, S5, and R3 settings. Steps to do this follow the discussion of the four MWT-3 S2-selected functions. Discussions of these four functions assume that the active antenna, if used, has already been set up to deliver signal at the desired frequency.

BYPASS function (direct feed of antenna to receiver)

Set-up: Set R1 initially to fully CCW (= maximum input: the switch on R1 takes the R1 // R5 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 function is suggested.

PASSIVE TUNING function

Set-up: Set R1 initially to fully CCW. Set S1 for operating frequency range desired, in accordance with Table 2. Set S2 to "Passive Tune". Set S3 to "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 "Long" and re-peak C1. If, after having done that, spurs still exist; adjust R1 to make the spurs go away. Setting S4 to the "Terminated" position may also help (if it had been on "Float"). Slight re-peaking of C1 may then be necessary.

If signal levels resulting from passive tuning are insufficient, Active Tuning will be required.

ACTIVE TUNING function

Set-up: Set R1 initially to fully CCW = minimum attenuation. Set R2 to fully CW = minimum regeneration. Set R4 (Regen. Vernier) to center. Set S1 for operating frequency range desired, in accordance with Table 2. Set S2 to "Active Tune". Set S3 to "Normal" length position (wire length greater than 10'/3 m.) or to "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 "Terminated" may also help (if it had been on "Float"). Slight re-peaking of C1 may then be necessary.

To increase gain and to narrow the received bandwidth with regeneration:

Bring R2 gradually CCW in small steps; after each step re-peak C1. An increase in signal level and tuning sharpness should soon be apparent. At the "regeneration threshold" the received audio gets muddy; beyond that threshold, oscillation occurs. When you're at this threshold, use R4 for a more precise adjustment of desired reception.

BROADBAND AMPLIFICATION function

Set-up: Set R1 initially to CW (maximum attenuation to protect from overload damage). Set S2 to "Broadband". 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, gradually adjust R1 in a counterclockwise direction until the maximum wanted-frequency signals are heard with no interference from spurious overload-caused (intermodulation-distortion) responses. If the maximum achievable (spur-free) level of the wanted signal is insufficient, Active Tuning is suggested.

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CONTROL OF A REMOTE ACTIVE ANTENNA

It is assumed that the RF & DC power connection has been made from the active antenna to MWT-3 J1 and that the control cable (if desired for remote tuning) has been connected to J7.

Set S2 to "Bypass". Set R1 to fully CCW (minimum attenuation). Set S4 to "Power to Active Antenna" and set S6 to "Main" antenna input. If you are running a broadband active antenna (e. g. no control cable to J7), you may now proceed to the steps outlined in one of the four S2-selected modes above.

For remote tuning, set S5 to Band 1 or Band 2: this depends on the desired frequency of reception and the bandswitching ranges of your specific remotely-tuned active antenna. Some active antenna designs use the S5-controlled relay to switch between a single tuned range and broadband operation. Adjust R3 to peak up the desired-frequency signal. R3 controls the voltage biasing the varactor diode in the tank-circuit of the remotely-tuned antenna.

Once the active antenna has been set up correctly to deliver RF to the receiver via the MWT-3 in the Bypass mode, other MWT-3 functions (Passive Tuning, Active Tuning, Broadband Amplification) can be utilized, if desired, to optimize reception. The active antenna's input is then treated like any other RF source.

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Building the MWT-3 Regenerative Tuner / Controller

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 3.

3. Assemble the A1 (RFE-D) Regenerative Front-End Card subassembly, per Figures 3 & 4 and Table 5.

4. Mount the A1 (RFE-D) circuit card at the hole locations noted in Table 3.
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5. Assemble the A2 (BUF-A) Buffer Card subassembly,
   per Figures 5 & 6 and Table 6.

6. Mount the A2 (BUF-A) circuit card at the hole locations
   noted in Table 3.

7. Assemble the TA1 1:16 Impedance Transformer Card subassembly,
   per Figure 7 and Table 7.

8. Mount the TA1 circuit card at the hole locations in Table 3.

9. Install jacks, pots, and switches. Solder inductors onto
   S1 per Figure 2 and Table 2.

10. Install wiring and other components per Figures 1, 2,
   8, 9 and Tables 1-4, 9-10. Install knobs on C1, R1, R2,
   R3, R4, S1, S2, and S3 per Tables 1-4, and 10. Place
   labels near controls and jacks.

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

S1 Pos. #	S1 Knob Pointer "o'clock"	Min. Freq. kHz	Max. Freq. kHz	"Main" L ["Tap" L] Tank Inductor Values L#	uH	Mouser Part #
==	==:==	=====	=====	=======	=====.=	============
1	6:00	140	200	L1	4700	434-1120-473K
["	"	"	"	L13	1000	43LR103]
2	7:00	200	280	L2	2200	434-1120-223K
["	"	"	"	L14	470	43LR474]
3	8:00	280	400	L3	1000	43LR103
["	"	"	"	L15	220	43LR224]
4	9:00	400	600	L4	470	43LR474
["	"	"	"	L16	100	43LR104]
5	10:00	600	900	L5	220	43LR224
["	"	"	"	L17	47	43LR475]
6	11:00	900	1250	L6	100	43LR104
["	"	"	"	L18	22	43LR225]
7	12:00	1250	1850	L7	47	43LR475
["	"	"	"	L19	10	43LR105]
8	1:00	1850	2600	L8	22	43LR225
["	"	"	"	L20	4.7	43LR476]
9	2:00	2600	3800	L9	10	43LR105
["	"	"	"	L21	2.2	43LR226]
10	3:00	3800	5200	L10	4.7	43LR476
["	"	"	"	L22	1	43LR106]
11	4:00	5200	7500	L11	2.2	43LR226
["	"	"	"	L23	0.47	43LR477]
12	5:00	7500	10000	L12	1	43LR106
["	"	"	"	L24	0.22	43LR227]

Table 3: MWT-3 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.

Chassis Box = Mouser # 537-TF-782: 7" X 5" X 3"

L E F T   S I D E

Hole #	Comp. Desig.	Description	X	Y	D
1	J8	Spare Ant.In-red banana jack	-1.75	0.875	0.3125
2	S6	Input Source switch - tab	-1.25	2.0	0.125
3	S6	Input Source switch - shaft	-1.0	2.0	0.25
4	J3	GND In - black banana jack	-1.0	1.25	0.3125
5	J2	RF Input - red banana jack	-1.0	0.5	0.3125
6	G1	grounding H/W - internal lug	0.0	1.125	0.125
7	J1	Main RF Input - BNC jack	0.0	0.5	0.375
8	J7	Remote Ant. Ctrl.-stereojack	1.0	0.75	0.375

T O P   S I D E

Mounting holes on C1 must be tapped to 6-32 thread.

Hole #	Comp. Desig.	Description	X	Y	D
1	S5	Remote Relay switch - tab	-2.75	4.25	0.125
2	S5	Remote Relay switch - shaft	-2.75	4.0	0.25
3	R3	Remote Tuning pot - tab	-3.1875	2.75	0.144
4	R3	Remote Tuning pot - shaft	-2.6875	2.75	0.375
5	R1	Input Atten. pot - tab	-3.125	1.25	0.144
6	R1	Input Atten. pot - shaft	-2.8125	1.25	0.3125
7	(C1)	Vernier Knob - H/W 1	-1.89	3.125	0.125
8	C1	Tuning Capacitor -Mtg.H/W 1	-1.713	4.0	0.144

Table 3 - T O P S I D E (continued)

9	C1	Tuning Capacitor - shaft	-1.25	3.75	0.5
10	C1	Tuning Capacitor -Mtg.H/W 2	-0.787	4.0	0.144
11	(C1)	Vernier Knob - H/W 2	-0.61	3.125	0.125
12	G2	grounding H/W - internal lug	-1.5	2.25	0.125
13	R2	Regen. Control pot - shaft	-1.625	1.25	0.3125
14	R2	Regen. Control pot - tab	-1.3125	1.25	0.144
15	TA1	1:16 Imped. Xfmr. card-H/W 1	-0.625	2.25	0.125
16	TA1	1:16 Imped. Xfmr. card-H/W 2	-0.625	1.45	0.125
17	S4	Input Mode switch - shaft	-0.6875	0.5625	0.25
18	S4	Input Mode switch - tab	-0.4375	0.5625	0.125
19	S3	Length switch - shaft	0.25	4.0	0.25
20	S3	Length switch - tab	0.25	3.75	0.125
21	S2	Function switch - shaft	0.5625	1.125	0.375
22	S2	Function switch - tab	0.5625	0.625	0.144
23	G3	grounding H/W - internal lug	2.25	3.75	0.125
24	S1	Bandswitch - shaft	1.75	2.75	0.375
25	S1	Bandswitch - tab	2.25	2.75	0.144
26	R4	Regen. Vernier pot - shaft	2.25	0.75	0.3125
27	R4	Regen. Vernier pot - tab	2.5625	0.75	0.144

R I G H T S I D E

Hole #	Comp. Desig.	Description	X	Y	D
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1	J6	battery holder - H/W 1	-1.5	2.625	0.125
2	J6	battery holder - H/W 2	-1.5	1.75	0.125
3	A1	Regen. Front-End card -H/W 1	-1.875	1.25	0.125
4	A1	Regen. Front-End card -H/W 2	-1.875	0.45	0.125
5	A1	Regen. Front-End card -H/W 3	-0.875	1.25	0.125
6	A1	Regen. Front-End card -H/W 4	-0.875	0.45	0.125
7	J5	B+ input - phono jack	0.0	1.125	0.25
8	J4	RF out - BNC jack	0.0	0.5	0.375
10	A2	Buffer Amp. card - H/W 1	1.5	2.2	0.125
11	A2	Buffer Amp. card - H/W 2	1.5	0.6	0.125

Table 4: "upper level" parts list
NOTE: For bandswitch inductors, see Table 2.

*: Note follows parts list.

Vendor codes for this and subsequent parts lists:

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          AE  = Antique Electronics /688 W. First St.
                                    /Tempe, AZ 85281
                                    /Tel. 1-602-894-9503

          DK  = Digi-Key            /P. O. Box 677
                             /Thief River Falls,MN 56701-0677
                                    /Tel. 1-800-344-4539

         GER  = Gerber Electronics  / 128 Carnegie Row
                                    / Norwood, MA 02062
                                    /Tel. 1-617-769-4852, 769-6000

         MCL  = Mini-Circuits Lab.  / P. O. Box 350166
                                    / Brooklyn, NY 11235-0003
                                    /Tel. 1-718-934-4500

         MOU  = Mouser Electronics  / 11433 Woodside Ave.
                                    / Santee, CA 92071
                                    /Tel. 1-800-346-6873

          RS  = Radio Shack / Many locations worldwide
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Schematic = Figures 1 & 2.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	chassis box	MOU	537-TF-782	1
2	A1	RFE-D front-end		(see Table 5)	1
3	A2	BUF-A buffer card		(see Table 6)	1
4	TA1	1:16 transformer		(see Table 7)	1
5	(C1)	knob	MOU	45KN100	1
6	*	knob	RS	274-416	6
7	B1	9V alkaline battery	RS	23-553	1
8	C1	var. cap.,10-365pF	AE	CV-235	1
9	C2	capacitor, 0.001uF	MOU	539-CK05103K	1
10	C3	capacitor, 10 uF	MOU	581-10K35	1
11	C4-9,13	capacitor, 0.33 uF	DK	P4890	7
12	C10	capacitor, 22 pF	MOU	232-1000-022	1
13	C11	capacitor, 30 pF	MOU	232-1000-030	1
14	C12	capacitor, 82 pF	MOU	232-1500-082	1
15	D1	zener diode, 9.1V	MOU	333-1N4739A	1
16	J1,4	BNC jack	RS	278-105	2
17	J2,8	red banana jack	RS	274-662	2
18	J3	black banana jack	RS	274-662	1

Table 4 (continued)

19	J5	phono jack	RS	274-346	1
20	J6 *	battery holder	MOU	534-1290	1
21	J7	stereo headphone jk	RS	274-312	1
22	P1	phono plug	RS	274-339	1
23	R1,3	pot.,500 ohm,linear	MOU	31CT205	2
24	R2	pot.,5K,linear	MOU	31CT305	1
25	R4	pot.,10K,10-Turn	MOU	594-53411103	1
26	R5,14	resistor, 200 ohm	MOU	30BJ250-200	2
27	R6,7,9	resistor, 330 ohm	RS	271-1315	3
28	R8,10,11	resistor, 100 ohm	RS	271-1311	3
29	R12	resistor, 1 ohm	MOU	29SJ500-1.0	1
30	R13	resistor, 10 ohm	RS	271-1301	1
31	RFC1	inductor, 2.2 mH	MOU	434-05-222J	1
32	RFC2,3	inductor, 4.7 mH	MOU	434-1120-473K	2
33	S1	switch/2pole/12pos.	MOU	10WR212	1
34	S2	switch/6pole/4pos.	MOU	10WR064	1
35	S3	swch,SPDT,on/off/on	RS	275-325	1
36	S4	swch,DPDT,on/off/on	RS	275-620	1
37	S5,6	switch,SPDT,on-on	RS	275-326	2

Misc. items: hook-up wire, buss wire, solder,labels "AS REQUIRED"
* Item 6 note: for S1, S2, R1, R2, R3, R4
* Item 20 note: Keystone 1290 or equivalent.

Table 5: (A1) RFE-D Regenerative Front-End card parts list
Vendor codes per Table 4.
Schematic = Figure 3 / Assembly = Figure 4.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	BD	perfboard:1.4"X1.2"	RS	276-1396 (cut)	1
2	C1,4	capacitor, 0.001 uF	MOU	539-CK05102K	2
3	C2	capacitor, 0.1 uF	MOU	539-CK05104K	1
4	C3	capacitor,10uF tant	MOU	581-10K35	1
5	H1-4	screw, 4-40 X .25"	MOU	572-01880	4
6	H1-4	spacer, 4-40 X .5"	MOU	534-1450C	4
7	H1-3	split lockwasher,#4	MOU	572-00649	3
8	H4	solder lug, #4	MOU	534-7311	1
9	P1-9	flea-clip/.042 hole	MOU	574-T42-1/100	9
10	Q1	FET, MPF102	RS	276-2062	1
11	R1	resistor, 10 ohm	RS	271-1301	1
12	R2	resistor, 1K	RS	271-1321	1
13	R3	resistor, 1M	RS	271-1356	1
14	R4	resistor, 47 ohm	RS	271-009	1

+ buss wire, solder - as required

Table 6: (A2) BUF-A Buffer Amplifier card parts list
Vendor codes per Table 4.
Schematic = Figure 5 / Assembly = Figure 6.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	BD	perfboard:1.2"X2.0"	RS	276-1396 (cut)	1
2	C1	capacitor, 0.01 uF	MOU	539-CK05103K	1
3	C2	capacitor,10uF tant	MOU	581-10K35	1
4	C3	capacitor, 0.001 uF	MOU	539-CK05102K	1
5	C4,5	capacitor, 0.1 uF	MOU	539-CK05104K	2
6	H1,2	screw, 4-40 X .25"	MOU	572-01880	2
7	H1,2	spacer, 4-40 X .5"	MOU	534-1450C	2
8	H1,2	solder lug, #4	MOU	534-7311	2
9	P1-7	flea-clip/.042 hole	MOU	574-T42-1/C	7
10	R1,2	resistor, 680K	MOU	271-680K	2
11	R3	resistor, 100 ohm	MOU	271-100	1
12	R4,5	resistor, 4.7 ohm	MOU	295-4.7	2
13	T1	RF transformer 4:1	MCL	T4-6T-X65	1
14	U1	buffer amplifier IC	GER	(National)LH0033CG	1
+ buss wire, solder - as required					

Table 7: TA1 1:16 impedance transformer card / parts list
Vendor codes per Table 4.
Assembly = Figure 7.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	perfboard:0.6"X1.2"	RS	276-1396 (cut)	1
2	H1,2	screw, 4-40 X .25"	MOU	572-01880	2
3	H1,2	spacer, 4-40 X .5"	MOU	534-1450C	2
4	H1	split lockwasher,#4	MOU	572-00649	1
5	H2	solder lug, #4	MOU	534-7311	1
6	in,out	flea-clip/.042 hole	MOU	574-T42-1/C	2
7	T1	RF transformer,1:16	MCL	T16-6T-X65	1
+ buss wire, solder - as required					

Table 8: small hardware parts list, comprised of tables 8A - 8F
See Table 4 for vendor codes.

Note: Mounting hardware is supplied with the following components: J1 through J5, J7, J8, R1 through R4, S1 through S6.

*** Table 8A = A1 mounting hardware (excluding Table 5 items) ***

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	screw, 4-40 X.25"	MOU	572-01880	4
2	-	split lockwasher,#4	MOU	572-00649	4

*** Table 8B = A2 mounting hardware (excluding Table 6 items) ***

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	screw, 4-40 X.25"	MOU	572-01880	2
2	-	split lockwasher,#4	MOU	572-00649	2

*** Table 8C = C1 mounting hardware (see Figure 9) ***
[ ] designators refer to hole locations from Table 3
Hardware is divided equally for each hole listed with each item.

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	[8],[10]	screw, 6-32 X.4375"	DK	H157	2
2	[8],[10]	split lockwasher,#6	MOU	572-00650	2
3	[7],[11]	screw, 4-40 X.25"	MOU	572-01880	2
4	[7],[11]	spacer, 4-40 X .5"	MOU	534-1450C	2

** Table 8D = hardware for TA1 card mounting (excl. Table 7 items) **

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	screw, 4-40 X.25"	MOU	572-01880	2
2	-	split lockwasher,#4	MOU	572-00649	2
3	-	hex nut, 4-40	MOU	572-00484	2

*** Table 8E = hardware for battery holder J6 ***

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	-	screw, 4-40 X.375"	MOU	572-01881	2
2	-	split lockwasher,#4	MOU	572-00649	2
3	-	hex nut, 4-40	MOU	572-00484	2

*** Table 8F = grounding hardware ***

Item	Designator	Description/Value	Vendor	Vendor Stock #	QTY
1	G1,G2,G3	screw, 4-40 X.375"	MOU	572-01881	3
2	G1,G2,G3	solder lug, #4	MOU	534-7311	3
3	G1,G2,G3	hex nut, 4-40	MOU	572-00484	3

Table 9: wiring / component connections

Notes:

1. Wire types: D = direct connection using component's own lead (When assembling, install Wire #1, then the direct connections, then wires #2 through #52.)
   I = insulated wire, approx. #22 AWG
   B = bare solid (buss) wire
   TP = twisted-pair (insulated)

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

3. Inductors L1 through L24 are wired directly to switch S1 in accordance with Figure 2 and Table 2. The designator "S1 Common" in the following list refers to the the common connection (junction) of the L1 through L24 sides that are not connected to the S1 switch contacts.

4. J7-C (Figure 1) is tied to chassis ground via direct mechanical connection.

5. GB (Ground Buss) = Wire #1 (bare buss wire from S4B "Terminated" to the ground lug on the TA1 card).

6. Switch position abbreviations - S2 positions: PT = Passive Tune, BP = Bypass, AT = Active Tune, BB = Broadband Amplification. S4 positions: TERM. = Terminated, PAA = Power to Active Antenna.

Table 9 (continued)

INSIDE BOX wire #	From	To	Description
1	S4B 'TERM.'	TA1 GND lug(SeeNote5)	2.5" B =GB
2	J1	J2	1.5" B
3	J2	S6 "Main Ant."	2" I
-	C4 side 1	J8	D
-	C4 side 2	S6 "Spare Ant."	D
-	C5 side 1	J7-A	D
-	C6 side 1	J7-B	D
-	C5 side 2	C6 side 2	D
4	S6 "Spare Ant."	C5 side 2	2.5" I
-	RFC2 side 1	J7-A	D
-	RFC3 side 1	J7-B	D
-	R6 side 1	RFC2 side 2	D
-	R8 side 1	RFC3 side 2	D
5	R8 side 2	S5 arm	2.5" I
6	R6 side 2	C7 side 1	1" I
-	C7 side 2	G2	D
-	R7 side 1	C7 side 1	D
-	R7 side 2	R3 arm	D
7	G1	J3	1.5" B
8	J3	S5 "Band 1"	1.5" I
9	S6 arm	C8 side 1	3.5" I
10	C8 side 1	S4A arm	2.5" I
-	C8 side 2	R1 CCW	D
11	S5 "Band 2"	R9 side 1	2" I
12	R9 side 1	S4B arm	3" I
-	R9 side 2	R3 CCW	D
-	D1 cathode	R3 CCW	D
-	C9 side 1	R3 CCW	D
-	D1 anode	R3 CW	D
-	C9 side 2	R3 CW	D
13	R3 CW	G2	1" B
14	R1 arm	S2B arm	4" I
-	R1 arm	R5 side 1	D
15	R1 CW	R1 switch nr. CW pin	0.5" B
-	R5 side 2	R1 switch nr. CW pin	D
16	R1 switch nr. CCW pin	G2	2" I
17	R2 CW	G2	1" B
18	R2 arm	R4 CW	5" I
19	R4 CW	R4 arm	0.5" B
20	R2 CCW	S1 Common(see Note 3)	4" I
21	C1 stator	S1A arm	2.5" I
22	C1 stator	C10 side 1	1" B

Table 9 (continued)

-	C11 side 2	S3 "Normal"	D
-	C10 side 2	S3 arm	D
-	C12 side 2	S3 "Short"	D
-	C10 side 1	C11 side 1	D
-	C11 side 1	C12 side 1	D
23	S3 arm	S2B 'AT'	3.5" I
24	S2B 'AT'	S2B 'PT'	1" I
-	RFC1 side 1	S4A 'PAA'	D
-	R11 side 1	RFC1 side 1	D
-	C2 side 2	GB (see Note 5)	D
-	C2 side 1	RFC1 side 2	D
-	RFC1 side 2	R11 side 2	D
25	RFC1 side 2	S2A 'BB'	2" I
26	S2A 'BB'	S2A 'AT'	0.5" B
-	R12 side 2	J5	D
-	C3 " + "	R12 side 1	D
-	C3 " - "	GND lug on J5	D
27	S2A 'AT'	R12 side 1	4" I
28	S2A 'BP'	GB (see Note 5)	2" I
29	S2A 'BP'	S2A 'PT'	0.5" B
30	S4B 'PAA'	RFC1 side 2	1" I
-	R10 side 1	S4A 'TERM.'	D
-	R10 side 2	GB (see Note 5)	D
31	S2E 'PT'	S1 Common(see Note 3)	3" I
32	S1A arm	S2C 'AT'	2.5" I
33	S1B arm	G3	1.5" B
34	R4 CCW	S2D 'AT'	2.5" I
-	C13 side 2	J4	D
35	C13 side 1	S2E arm	4" I
36a	S2E 'BB'	A2-P5	5" TP
36b	GB (See Note 5)	A2-P7	5" TP
37	S2E 'BB'	S2E 'AT'	0.5" B
38	S2E 'BP'	S2B arm	2" I
39a	A1-P5	A2-P1	5" TP
39b	A1-P6	A2-P2	5" TP
40	A1-P3	A2-P3	3.5" I
41	A1-P3	S2A arm	3" I
42	A1-P1	S2C arm	3" I
43	A1-P7	S2D arm	3" I
44	S2D 'BB'	S2D 'BP'	1.5" I
45	S2D 'BP'	S2D 'PT'	0.5" B
46	S2D 'PT'	S2C 'PT'	1" B
47	S2C 'PT'	S2C 'BP'	0.5" B
48	S2C 'PT'	TA1 GND lug	2" I
-	R13 side 2	TA1-in (= T1 pin 1)	D
49	S2B 'BB'	R13 side 1	2" I
-	R14 side 1	TA1-out (= T1 pin 6)	D
50	S2C 'BB'	R14 side 2	2.5" I

Table 9 (continued)

OUTSIDE BOX

wire #	From	To	Description
51	J6 + terminal pin	P1 plug - center pin	2" I
52	J6 - terminal pin	P1 plug - shield pin	2" I
	[P1 connects to J5 for battery operation]		

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Table 10: 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 = 9:00; CW = maximum C = 3:00
top	R1	CCW = maximum level (no attenuation) = 7:00 CW = minimum level (maximum attenuation) = 5:00
top	R2	CCW = maximum regeneration = 7:00 CW = minimum regeneration = 5:00
top	R3	CCW = maximum varactor voltage =max. remote freq. CW = minimum varactor voltage =min. remote freq.
top	R4	CCW = maximum regeneration (vernier) = 7:00 CW = minimum regeneration (vernier) = 5:00
top	S1	[see Table 2]
top	S2	"Passive Tune" = 10:30; "Bypass" = 11:30; "Active Tune" = 12:30; "Broadband Amp." = 1:30
top	S3	"Normal" = up; "Long" = center; "Short" = down
top	S4	"Terminated" = left; "Float" = center; "Power to Active Antenna" = right
top	S5	"Band 2" = up; "Band 1" = down
top	S6	"Spare Antenna" = left; "Main Antenna" = right

/* end of text; drawings follow */
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FIGURE 1: MWT-3 REGEN. TUNER / CONTROLLER
(CONTROL / INPUT SECTION)

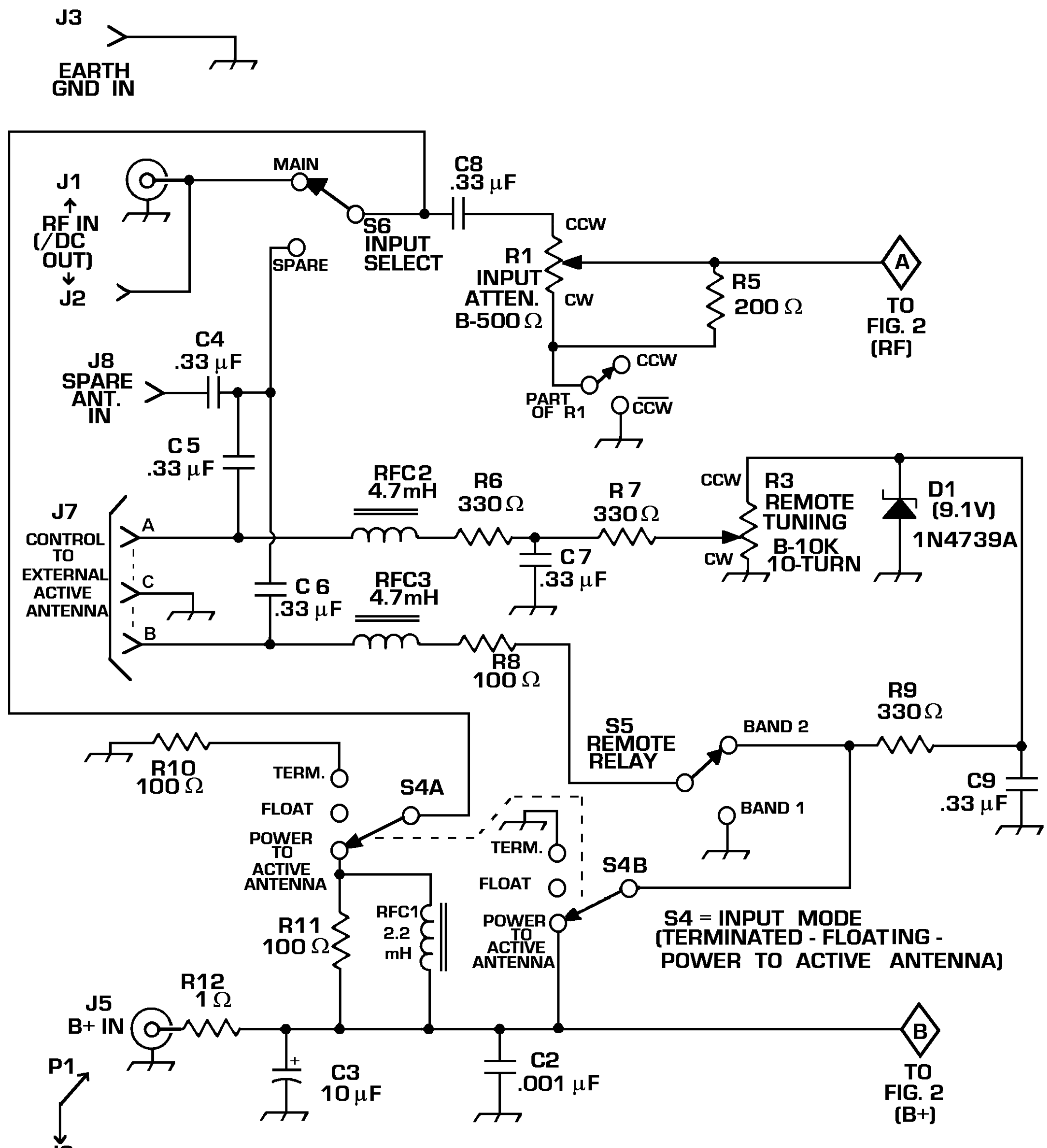


figure 1 above

FIGURE 2: MWT-3 REGEN. TUNER / CONTROLLER (TUNER / AMPLIFIER / OUTPUT SECTION)

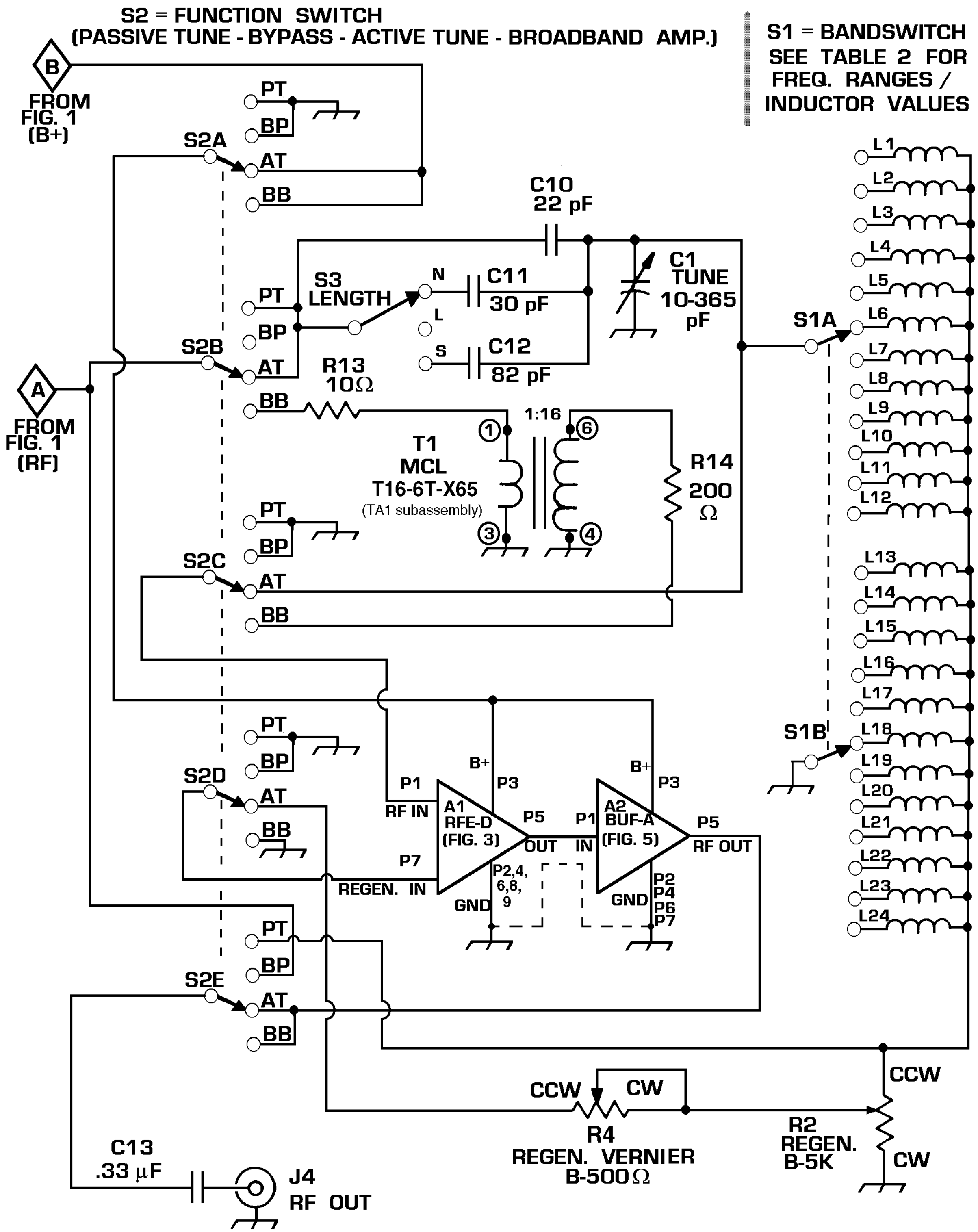


figure 2 above

FIGURE 3: MWT-3 REGEN. TUNER / CONTROLLER
(SCHEMATIC: RFE-D REGEN. FRONT-END CARD)

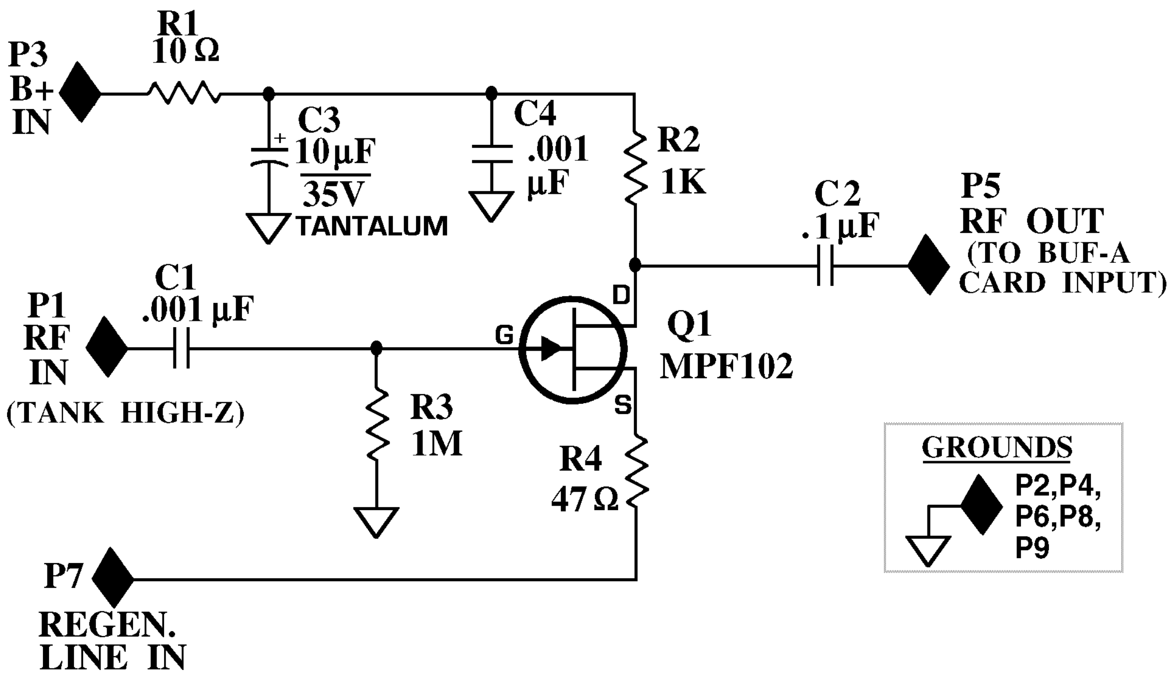
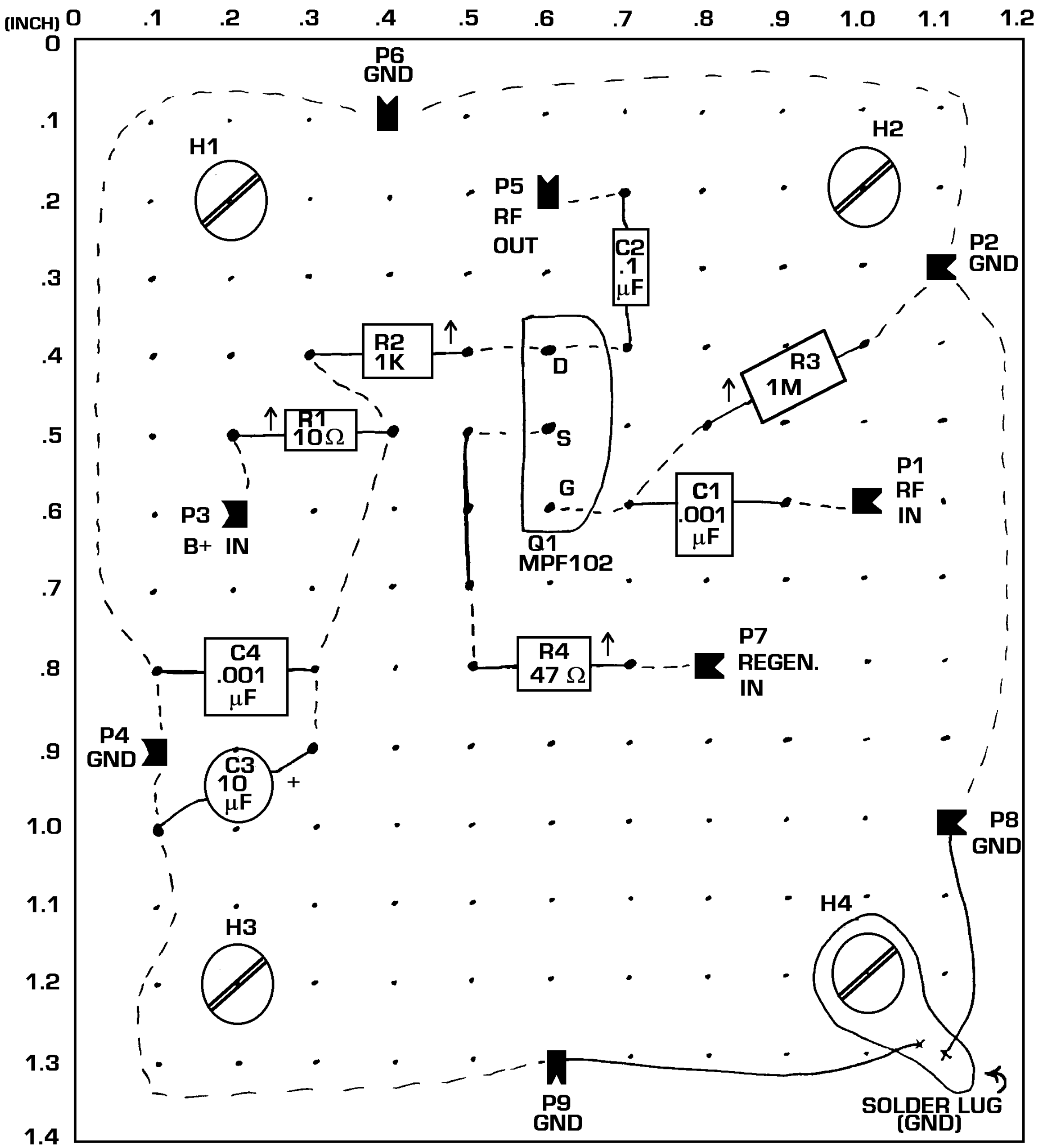


figure 3 above

FIGURE 4: MWT-3 REGEN. TUNER / CONTROLLER (ASSEMBLY: RFE-D REGEN. FRONT-END CARD)



Notes

For schematic, see Figure 3.
For parts list, see Table 5.

↑ = Long lead side of vertically-mounted component

- - - = Buss wire on solder side of board

—— = Buss wire on component side of board

= "Flea clip" terminal pin OPEN SIDE

figure 4 above

FIGURE 5: MWT-3 REGEN. TUNER / CONTROLLER (SCHEMATIC: BUF-A BUFFER AMPLIFIER CARD)

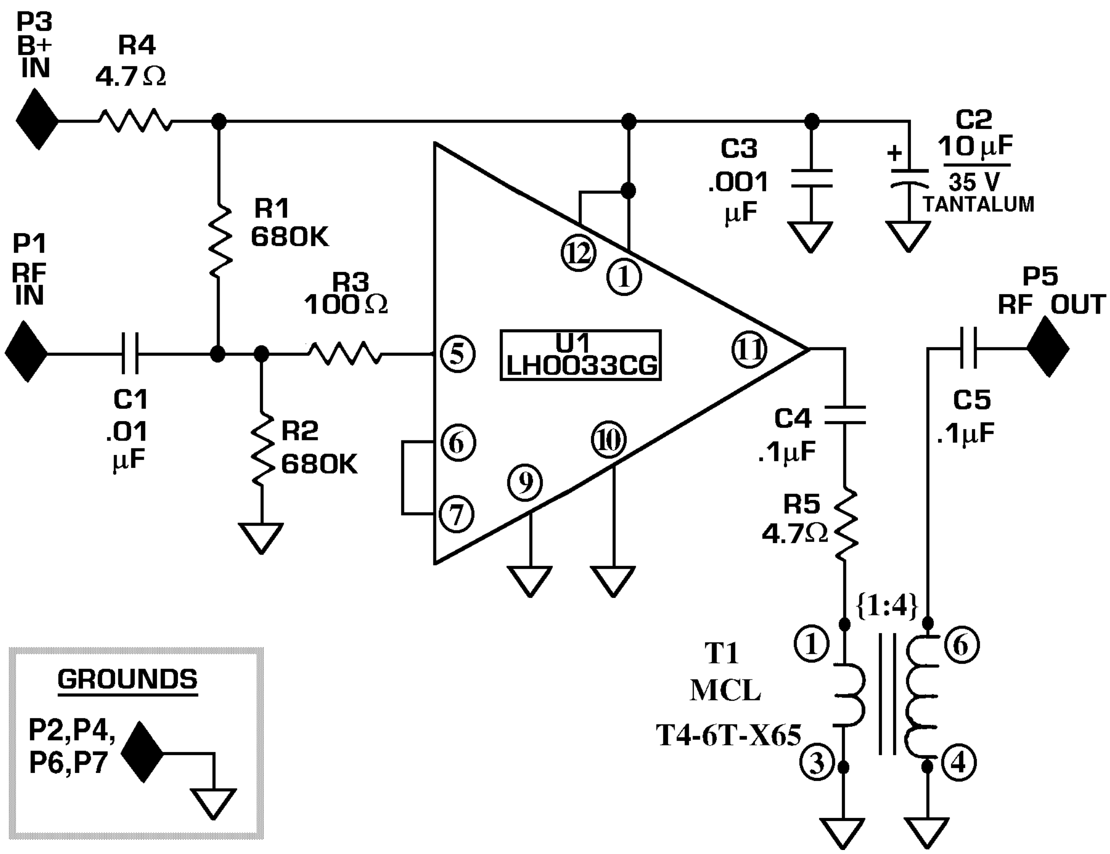
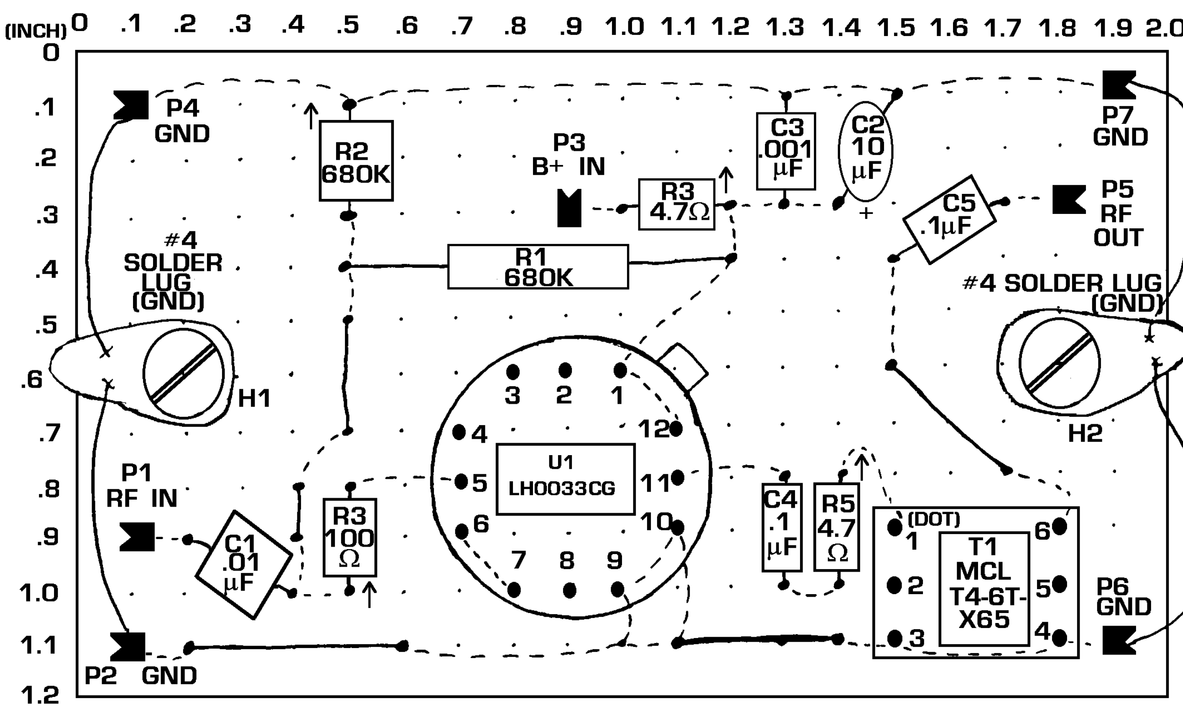


figure 5 above

FIGURE 6: MWT-3 REGEN. TUNER / CONTROLLER
(ASSEMBLY: BUF-A BUFFER AMPLIFIER CARD)



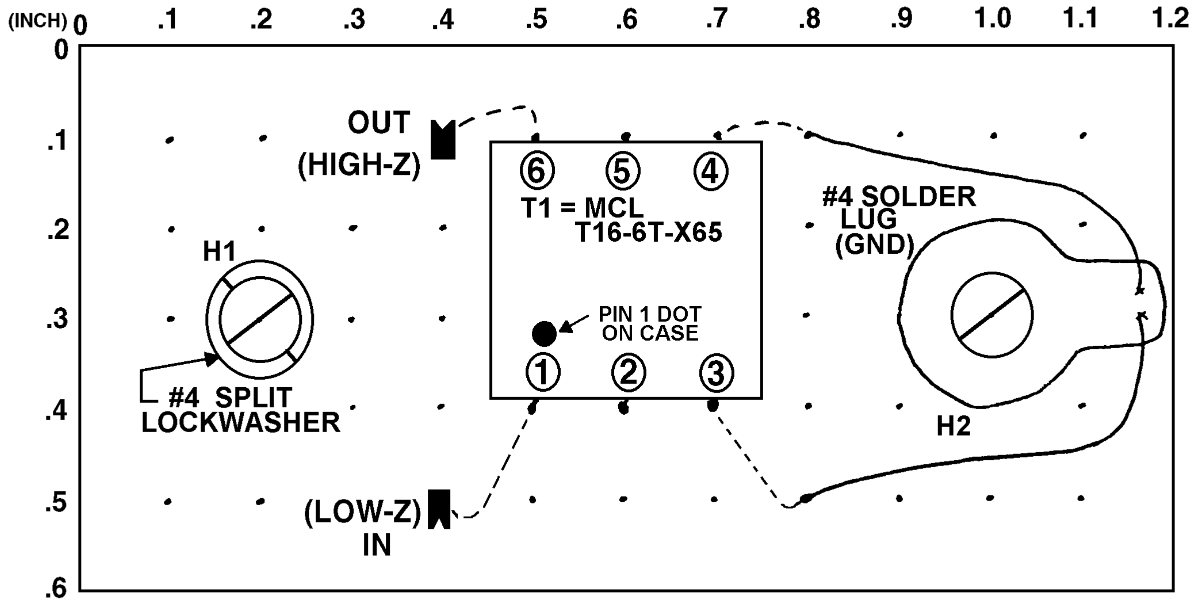
Notes

For schematic, see Figure 5.
For parts list, see Table 6.

↑ = Long lead side of vertically-mounted component
- - - = Buss wire on solder side of board
—— = Buss wire on component side of board
= "Flea clip" terminal pin
OPEN SIDE

figure 6 above

FIGURE 7: MWT-3 REGEN. TUNER / CONTROLLER (ASSEMBLY: TA1 IMPEDANCE TRANSFORMER CARD)



Notes

For connections, see Figure 2.

For parts list, see Table 7.

Each screw mates to a 4-40 X 0.5" spacer on reverse of board.

- - - = Buss wire on solder side of board

—— = Buss wire on component side of board

= "Flea clip" terminal pin

OPEN SIDE

MCL T36-1-X65 or TT25-1-X65 may be substituted for T1.

figure 7 above

FIGURE 8: MWT-3 REGEN. TUNER / CONTROLLER (SWITCH DETAILS: SKETCH OF INTERIOR VIEW OF COMPONENTS, BOTTOM COVER REMOVED)

NOTE: POSITIONS, SIZES ARE APPROXIMATE; NOT TO SCALE
RIGHT, LEFT SIDE CONNECTORS / CONTROLS NOT SHOWN

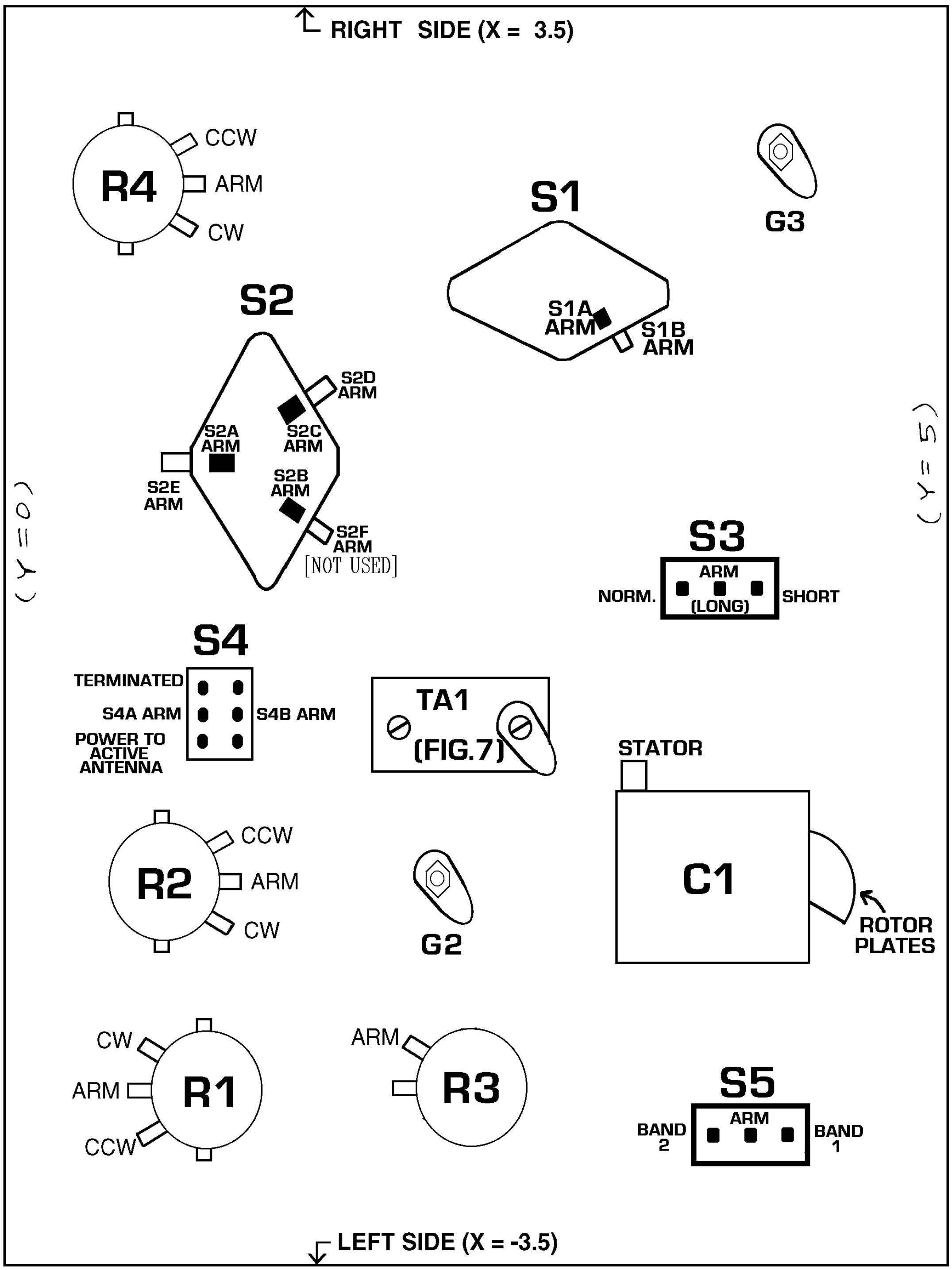


figure 8 above

FIGURE 9: MWT-3 REGEN. TUNER / CONTROLLER
(C1 VARIABLE CAPACITOR / VERNIER KNOB MOUNTING)

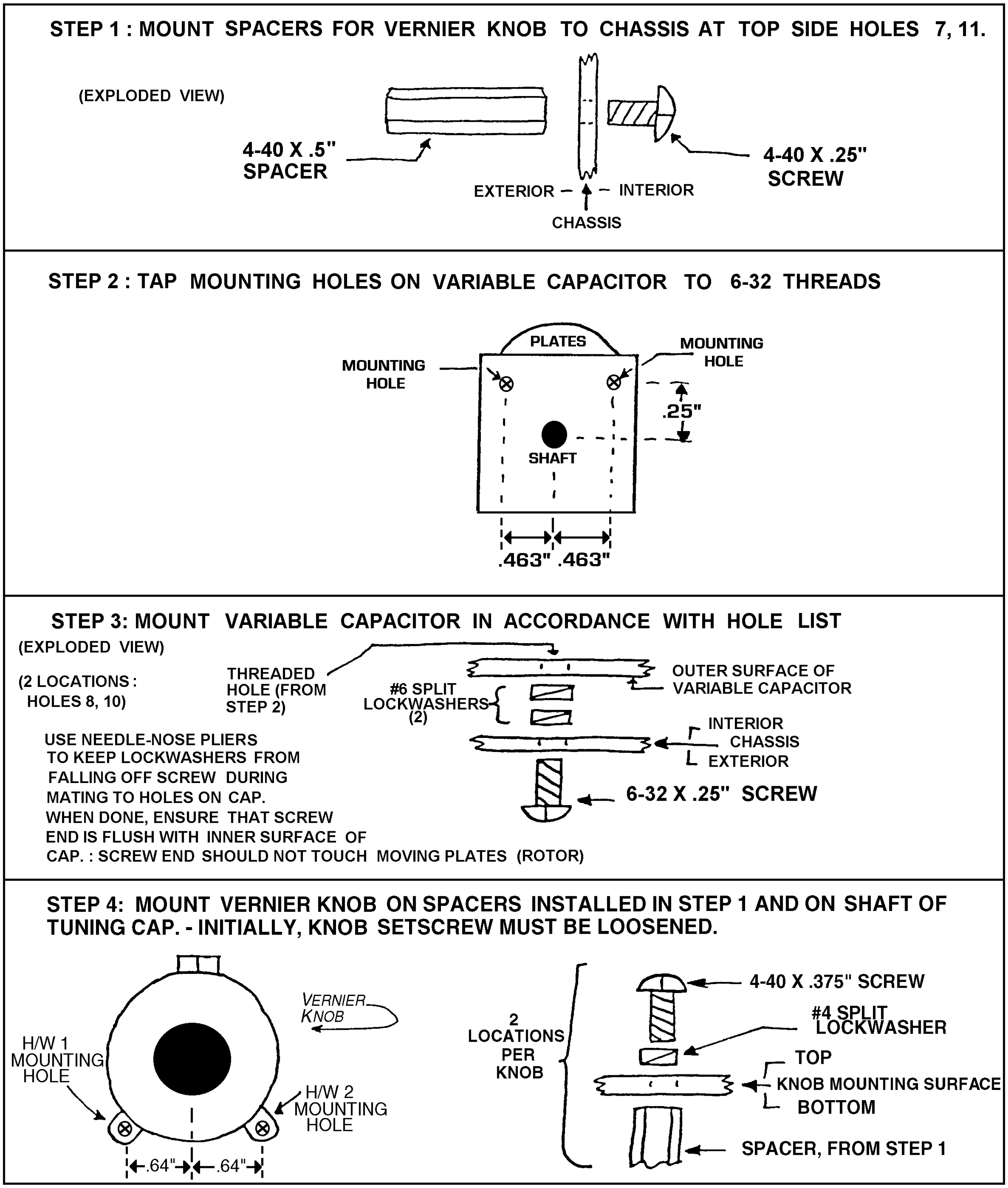


figure 9 above

/* end */