UHF "MITREK"

TRANSMITTER ALIGNMENT

Note: This sheet was extracted from manual 6881045E75-A

FREQUENCY	CALCULATION
406-420 MHz	f_C
450-512 MHz	$f_O = \frac{}{36}$

Where f_O = crystal frequency, f_C = carrier frequency.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

Transmitter Alignment Procedure
Motorola No. PEPS-26613-E
9-12-84 GGI

UHF "MITREK" TRANSMITTER TUNING PROCEDURE FOR 75/100 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set of the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909 R911, R813	Preset L702, L704, L705, L706, L707 and L708 to be flush with top of can. Set L701 and L703 7 turns in from top of can. Set L9-12 1/4 inch (6 mm) above filter casting. Set R909 and R813 fully clockwise. Set R911 at mid rotation.
2	M3	L701-703	Peak L702, then peak L701, L702, and L703.
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706, L707, L704, and L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a *dip* MTR5.
	For wide-space operation, go to Step 12.		
6	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11.
7	M7	L12	Turn counterclockwise and peak L12. *If no MTR 7 indication is observed*, preset L9, L10, L11, L12 (Step 1) and go back to Step 6. *If definite peak of L12 cannot be obtained*, rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
8	M6	L708*	Peak L708*.
9	M7	R911	Rotate 911 fully clockwise and note MTR 7. Rotate R911 counterclockwise until MTR 7 drops by 1 uA. *If no change is observed*, set R911 fully counterclockwise.
10	Wattmeter	R813	Rotate R813 until power output decreases to 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation*, or 100 W *for both 75 W 406-420 MHz, 450-512 MHz operation and 200 W (ERP) 470-512 MHz operation. If output power is less than, or equal to, required set power before adjustment*, rotate R813 until power just begins to drop.
11	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation*, or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation*, or 86 W *for 200 W (ERP) 470-512 MHz operation or 65 W for 150 W (ERP) 470-512 MHz operation.*
	This completes the alignment for single frequency radios, For multi-frequency radios, perform the following steps.		
12	M3	L701, L703	Peak L701, L703 on *highest* frequency.
13	M3	L702	Peak L702 on lowest frequency.
14	M5	L706, L707, L704	Peak L706, L707 for highest peak on *highest* frequency. If meter 5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
15	M6	L708*	Peak L708* on peak closest to bottom of coil on *highest* frequency.
16	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11 on *highest* frequency. (L9 may have a shallow dip.)
17	M7	L12	Peak L12 on *highest* frequency. *If no MTR 7 indication is observed*, preset L9, L10, L11, L12 (Step 1) and go back to Step 16. *If definite peak of L12 cannot be obtained*, rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
18	M6	L708*	On the *lowest* frequency, peak L708* on peak closest to bottom of coil.
19	M7	On the lowest frequency, L10, L11	Turn L10, L11 clockwise 45 ° (1/8 turn). *If no MTR 7 is shown*, then preset L9, L10, L11, L12 (Step 1) and go back to Step 16. If required, go back to Step 1.
20	M7	R911	Rotate R911 fully clockwise and note MTR 7 for all transmit frequencies. At frequency of highest MTR 7 reading, rotate R911 for a 1 uA drop in MTR 7. *If MTR 7 has dropped by more than 1 uA for any other frequency*, use frequency of greatest drop to readjust R911 for a 1 uA drop in MTR 7.
21	Wattmeter	R813	On the *lowest* frequency, rotate R813 for a power output of 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation*, or 100 W *for both 75 W, 406-420 MHz, 450-512 MHz operation, and 200 W (ERP) 470-512 MHz operation. If power output is less for any other transmit* frequency, use frequency of lowest power output to readjust R813. *If power output is less than required before adjusting R813*, adjust R813 until power output just begins to drop.
22	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation*, or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation*, or 86 W *for 200 W (ERP) 470-512 MHz operation, or 65 W for 150 W (ERP) 470-512 MHz operation.* Check all transmit frequencies to ensure no more than ± 8 W change *for 110 W set*, or ± 6 W *for 65 W, 83 W or 86 W set.* Readjust R909, if required, to maintain readings within these limits.

*L708 is tuneable only in 450-512 MHz radios .

UHF MITREK TRANSMITTER TUNING PROCEDURE FOR 30/50 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set or the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Set Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909, R911, C800, C813*	Adjust L702, L704, L705, L706, L707 and L708* to be flush with top of can. Set L701 and L703 seven turns in from top of can. Set L9-L12 1/4 inch (6mm) above filter casting. Set R909 fully clockwise, R911 180° from fully counterclockwise or 90° from fully clockwise. Set C800, C813* 1/2 turn from tight.
2	M3	L702, L701, L702, L703	Peak L702, then peak L701, L702, L703
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706, L707, L704, L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a dip in meter 5.
	For wide-space operation, go to Step 13.		
6	M6	L9, L10, L11	Turn counterclockwise and dip L9, peak L10 and dip L11.
7	M7	L12	Peak L12. If no MTR 7 is observed, then preset L9, L10, L11, L12, and go back to Step 6.
8	M7	C813*	Peak C813*
9	M6	L708*	Peak L708*
10	Wattmeter	C800, R911	Peak C800. If 65 W (50 W radio) or 38 W (30 W radio) is not obtained, then increase R911 until the required power is obtained or no further increase is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 5. If necessary, go back to Step 1.
11	Wattmeter	R911, C813*	Set R911 to 65 W (50 W radio), 38 W (30 W radio), or to power level in Step 10. Retune C813*. Reset R911 if necessary.
12	Wattmeter	R909, C800	Set R909 for 55 W (50 W radio) or 34 W (30 W radio) and peak C800. Reset R909 if necessary.
	This completes alignment for single frequency radios. For multi-frequency radios, complete the following steps.		
	NOTE F_L = Lowest transmitter frequency. F_H = Highest transmitter frequency.		
13	M3	L701, L703	On F_H: Peak L701, L703
14	M3	L702	On F_L: Peak L702.
15	M5	L704, L706, L707	On F_H: Peak L706, L707. If M5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
16	M6	L708*	On F_H: Peak L708* on peak closest to bottom of coil.
17	M6	L9, L10, L11	On F_H: Turn counterclockwise and dip L9, peak L10, dip L11 (L9 may have shallow dip).
18	M7	L12	On F_H: Peak L12, if no indication, preset L9, L10, L11, L12 and go back to Step 17.
19	M7	C813*	On F_H: Peak C813*
20	Wattmeter	C800	On F_H: Peak C800. If power is less than 65 W (50 W radio) or 38 W (30 W radio), then increase R911 until the power is obtained or until no further increase in power is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 16. If needed go to Step 1.
21	M6	L708*	On F_L: Peak L708* on lowest frequency on peak closest to bottom of coil.
22	M7	L10, L11	On F_L: Turn L10, L11 clockwise in 45° (1/8 turn). If no MTR 7 is shown, then preset L9, L10, L11, L12 and go back to Step 17. If needed go to Step 1.
23	M7	C813*	On F_L: Peak C813*.
24	Wattmeter	C800, R911	Peak C800. Set R911 to 65 W (50 W radio) or 38 W (30 W radio), or to the same power obtained in Step 20. If the difference in power between all channels is less than or equal to 5 W (50 W radio) or 3 W (30 W radio), go to Step 25; if not, then go to Step 26.
25	Wattmeter	C800, R909	On lowest power channel, set R909 to 55 W (50 W radio) or 34 W (30 W radio) and repeak C800. Reset R909 if necessary. A balance of C800, may be necessary to achieve difference of less than 5 W (50 W radio) or 3 W (30 W radio). If the required balance cannot be achieved, then reset R909 full clockwise, and go to Step 26.
	Perform Step 26A if there is a difference of 5-8 W between any two channels. Perform Step 26B if the power difference between any two channels is greater than 8 W.		
26A	Wattmeter	C800, C813*	Balance power on all channels. R911 may have to be turned down to the proper power output. If balance cannot be achieved, go to Step 26B.
26B	Wattmeter	L9, L12	Balance power on all channels. Balancing of L9, L12 should not degrade the output power, of the channel having the highest output power, (as obtained in Step 26A), by more than 2W. If balance cannot be achieved, go to Step 26C.
26C	Wattmeter	L10, L11	On the lowest power channel, tune L10, L11 slightly (less than 1/8 turn). For an increase in power, go back to Step 26B.
	Once the required balancing is achieved, go to Step 25. If proper balancing cannot be obtained, preset R911, L708* L9-12, and go to Step 16.		

*C813 adjustments apply only to 50 W (450-512 MHz) radios. L708 is tuneable only in 450-512 MHz radios.

NOTE

L9-L12 should be all about the same height when properly tuned.

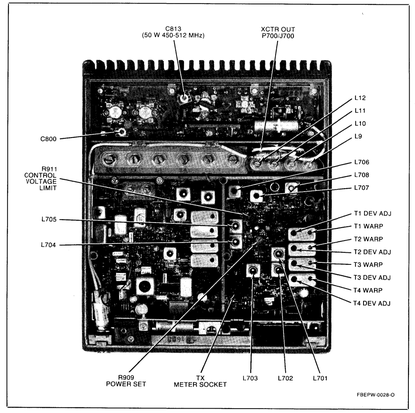

Figure 1. Transmitter Control Locations for 30/50 Watt Models

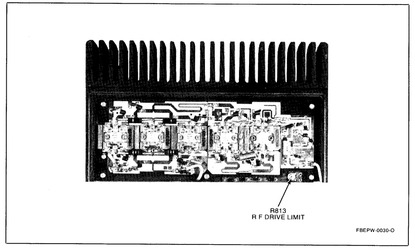

Figure 2. Power Amplifier Control Locations for 75/100 Watt Models

OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on frequency" should be done *after* the transmitter has been aligned, but *before* transmitter deviation is checked and set. To set the oscillator on frequency, perform the following steps:

Step 1. Set up the frequency meter as described in the frequency meter instruction manual.

Step 2. Set the frequency selector switch on the control head to the F1 position (multi-frequency units only).

Step 3. Key the transmitter with no modulation using the portable test set. On "Private-Line" or "Digital Private-Line" coded squelch models, disable the "Private-Line" encoder by shorting the code disable points on the "Private-Line" or "Digital Private-Line" encoder/decoder board.

Step 4. Adjust the T1 FREQ ADJ control for proper readings on the frequency meter. If the frequency as indicated on the frequency meter is too low, turn the T1 FREQ ADJ control counterclockwise, if too high, turn the control clockwise. Set the frequency to within ± 225 Hz.

Step 5. Set the frequency selector switch to the F2 position and repeat Step 4 using the T2 FREQ ADJ control.

Step 6. Repeat Step 4 for F3 and F4, respectively.

Step 7. On "Private-Line" or "Digital Private-Line" models, remove the short added in Step 3.

NOTE

Omit Steps 5 and 6 for single frequency units.

DEVIATION ADJUSTMENTS

NOTE

The oscillator frequency adjustment *must* be made *prior* to this adjustment.

Step 1. Connect the output leads of the tone oscillator through a .33 uF capacitor to the transmitter audio input (microphone receptacle).

Step 2. Connect the ac voltmeter across the same terminals and adjust the tone generator output to 1 volt at 1000 Hz.

Step 3. Place the frequency selector switch in the F1 position (in multiple frequency models) and key the transmitter using the portable test set. Adjusting the T1 DEV ADJ control, for 4.8 kHz deviation as read on the deviation measuring instrument used. For multiple frequency models adjust the F2, F3, and F4 DEV controls with the frequency selector switch in the corresponding position.

Step 4. "Private-Line" tone deviation should be between 0.5 and 1 kHz.

FINAL METER READINGS

1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.
2. The readings at M3 and M5 are purely relative and do not give actual current or voltage measurements.
3. Multiply the microampere scale reading obtained at M7 by 0.7 (30 W), 0.8 (50 W), or 1.1 (75/100 W) to determine the actual final amplifier current in amperes.

WHEN THE TRANSMITTER IS PROPERLY ALIGNED, METER DEFLECTIONS SHOULD FALL WITHIN THE LIMITS SHOWN IN TABLE BELOW.

	METER 3	METER 5	METER 6	METER 7
METER READINGS	15 (min) 50 (max)	10 (min) 50 (max)	6 (min) 50 (max)	17 (max) 50 W or 100 W radios) 13 (max) 75 W radios)
FUNCTION METERED	Base of First Doubler	Base of Low Level Ampl	Input of Exciter Filter	Final Ampl Current