

REQUIRED TEST EQUIPMENT FOR “MITREK” RADIO SERVICING			
General Type	Application	Recommended Model	Minimum Specifications
AC-DC VOM	DC voltage measurements, general	Motorola T1009A	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
DC Multimeter	DC voltage readings requiring a high input resistance meter	Motorola S1063B	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio voltage measurements	Motorola S1053C	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter	RF voltage measurements	Motorola S1339A	Measurement range: 100 uV-3 V from 1 MHz-512 MHz Inputs: 50 ohm and high impedance
Oscilloscope	Waveform observation	Motorola R1004A	Vertical sensitivity: 5 mV - 10 V/division Horizontal time base: 0.2 usec. 0.5 sec/division
RF Wattmeter	Transmitter output power measurement	Motorola S1350A with appropriate element and T1013A RF Dummy Load	Measurement range: 0-50 Watts, 0-100 Watts
Frequency Meter	Transmitter frequency measurement	Model R1200A Service Monitor with high stability oscillator (X suffix) option. Frequency calibration recommended every 6 months or less.	Measurement range: 1-512 MHz Frequency resolution: 10 Hz
Deviation Meter	Transmitter modulation deviation	Motorola R1200A Service Monitor	Measurement range: 0-10 kHz deviation Frequency range: 406-512 MHz
RF Signal Generator	Receiver alignment and troubleshooting	Motorola R1200A Service Monitor with attenuator	Frequency range: 406-512 MHz Output Level: 0.1 uV-100,000 uV Must be capable of at least ±3 kHz deviation when modulated by 1 kHz tone.
Audio Signal Generator	Audio circuit troubleshooting	Motorola S1067B	Frequency range: 20 Hz-20 kHz Output Level: 50 mV-1 V
PL Tone Generator*	Tone-Coded “Private-Line” Decoder Troubleshooting	Motorola S1333B	Frequency range: 10 Hz-9999 Hz Output level: 0-3 V rms
DPL Test Set**	“Digital Private-Line” Encoder-Decoder Troubleshooting	Motorola SLN6413A	
Radio Test Set w/appropriate metering cable SKN6012B	Meter readings at circuit metering points for alignment and troubleshooting	Motorola S10563 Portable Test Set, TEK5B- E Metering Panel with RPX4053A Conversion Kit, or TEK5F Metering Panel.	
Tuning Tool Kit	Receiver and transmitter alignment	Motorola HLN4023A	
DC Power Supply	DC power for shop service	Motorola R1011AA	1-20 V DC 0-40A

*Required for tone-coded “Private-Line” models only.

**Required for “Digital Private-Line” models only.

NOTE

If version B through E of the TEK-5 Portable Test Set are used *they must first be modified* using RPX4053A Conversion Kit.

FREQUENCY CALCULATIONS

FREQUENCY

CALCULATION

406-420 MHz

450-512 MHz

f_o = (f_c - 10.7) / 9

Where f_o = crystal frequency, f_c = carrier frequency

POSITIVE GROUND SYSTEMS

CAUTION

In positive ground systems the case of the TEK-5 Meter Panel and portions of the S1056B Portable Test Set are hot with respect to the vehicle chassis due to the nature of the positive ground installation. Take necessary precautions that the test equipment does not contact the vehicle chassis.

UHF “MITREK” RECEIVER ALIGNMENT PROCEDURE

- To perform this tuning procedure, use either the Motorola portable test set or the TEK-5 on Position A. When using the TEK-5F or modified TEK-5B through modified TED-5E meter panels, put the M1, 2 polarity switch in the reverse position and ignore the polarity notes.
- F_L is the lowest receive frequency; F_H is the highest. For single-frequency radios, F_L = F_H.
- IMPORTANT: When using the Motorola portable test set for M4, put the FUNCTION SELECTOR SWITCH in the proper position for M4 operation.

Step	Test Set Meter Position	Adjust	Procedure
1.		L1-L6	Preset the RF preselector tuning screws per the preset chart.
2.		L7-L8	Preset the injection filter tuning screws 15mm (9/16 inch) above the retainer nuts.
3.		L104, L106	Preset the L104 and L106 coil slugs 13 turns below flush with the top of the coil form.
4.		L101	Preset the mixer gate coil slug to the bottom of the coil form. This is a final adjustment. (The 470-512MHz radio does not have L101.)
5.		L102	Preset the mixer drain coil slug 15 turns below flush with the top of the coil form.
6.		L204, L206	Preset the IF matching network coil slugs 8 turns below flush with the top of the coil form.
7.	2 (reverse)	L208	Starting with the slug flush with the top of the coil form, screw it in until Meter 2 first reads 24 uA. (No input signal is necessary).
8.*	6	L104, L106	Set the frequency selector to F _L . Starting with L104, alternately adjust the injection buffer coils ½ turn at a time <i>clockwise</i> until Meter 6 moves. Then adjust L104 and L106 for a peak reading on Meter 6. Check for multiple peaks and adjust for the highest peak.

NOTE: For single-frequency radios and for multiple-frequency radio with F_H-F_L less than or equal to 1 MHz, perform Steps 9-11. For multiple-frequency radios with F_H-F_L greater than 1 MHz, perform Steps 12-16.

9.*	6	L104	For single-frequency radios, or if the Meter 6 reading on F _H is higher than on F _L , go to Step 10. Otherwise, adjust L104 so that the reading on Meter 6 is <i>balanced</i> between F _L and F _H . Repeat Step 9 until the <i>highest possible balanced</i> reading is obtained.
10.*	6	L7	Set the frequency selector to F _L . Adjust L7 <i>clockwise</i> for a <i>peak</i> on Meter 6.
11.*	6	L8	Adjust L8 <i>clockwise</i> for a <i>dip</i> on Meter 6. Go to Step 17.

*Do NOT repeat Steps 8 and 9 (L104, L106) after doing Step 10 (L7).

Do NOT repeat Step 10 after doing Step 11 (L8).

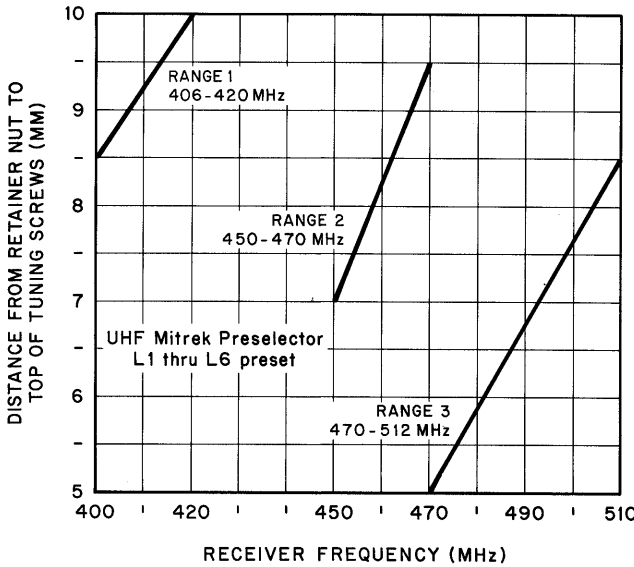
12.†	6	L104	If the Meter 6 reading on F _H is higher than the Meter 6 reading on F _L , go to Step 13. Otherwise, adjust L104 so that the reading on Meter 6 is <i>balanced</i> between F _L and F _H . Repeat Step 12 until the <i>highest possible balanced</i> reading is obtained.
13.†	6	L7	Set the frequency selector to F _L . Adjust L7 <i>clockwise</i> for a <i>peak</i> on Meter 6.
14.†	6	L7	Adjust L7 <i>counterclockwise</i> for a 2 uA <i>reduction</i> in the Meter 6 reading.
15.†	6	L8	Adjust L8 <i>clockwise</i> for a <i>dip</i> on Meter 6.
16.†	6	L8	Adjust L8 <i>counterclockwise</i> for a 1 uA <i>increase</i> in the Meter 6 reading.

†Do NOT repeat Step 12 (L104, L106) after doing Step 13 (L7).

Do NOT repeat Steps 13 and 14 after doing Step 15 (L8).

17.	1 (Reverse)	L1-L6	Set the rf generator to the F _L carrier frequency (±100Hz) and adjust the output level for 35 uA on Meter 1. Adjust L1 through L6 in order <i>clockwise</i> for a peak reading on Meter 1. While making this adjustment, adjust the rf signal generator output to maintain Meter 1 between 30 and 40 uA. (If you cannot obtain a Meter 1 reading between 30-40 uA initially, adjust L1 through L6 ½ turn clockwise. Repeat this until Meter 1 reads 30-40 uA. Then complete Step 17.)
18.	1 (Reverse) 4	Receiver Oscillator Warp	For each frequency: Set the rf generator to the carrier frequency (±100Hz) and adjust the output level for a Meter 1 reading of 35 uA. Activate the Meter 4 circuit by shorting the Meter 4 enable pins. Adjust the oscillator frequency for a <i>zero</i> reading on Meter 4.
19.	1 (Reverse)	L102, L204, L206	Set the rf signal generator to F _L , apply standard test modulation (1 KHz tone, ±3 KHz deviation) to the generator, and adjust the output level for 35 uA on Meter 1. Adjust the IF coils for a <i>peak</i> reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the generator output. Repeat until there is no further improvement.
20.	7 (AC voltmeter across the speaker)	L208	With the same conditions as in Step 19, adjust L208 slowly for <i>maximum</i> audio voltage across the speaker.

Step	Test Set Meter Position	Adjust	Procedure
21.	1 (Reverse)	L1-L6	If F _H is 400-460 MHz or 470-494 MHz, adjust L1 through L5 ¼ turn <i>counterclockwise</i> and L6 ½ turn <i>counterclockwise</i> . If FH is 460-470 MHz or 494-512 MHz, adjust L1 through L5 ½ turn <i>counterclockwise</i> and L6 one turn <i>counterclockwise</i> .
22.	1 (Reverse)	L1-L5	Set the frequency selector to F _L , remove the test modulation, and adjust the output level for 35 uA on Meter 1. Adjust L1 through L5 <i>in order</i> clockwise for a peak reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the rf signal generator output. Do NOT repeat this step without having repeated Steps 1, 17, and 21 first.
23.	(AC voltmeter across the speaker)	L6	For single-frequency radios, or if F _H -F _L is less than or equal to 1.8 MHz, adjust L6 for best quieting on F _L . If F _H -F _L is greater than 1.8 MHz, adjust L6 for best <i>balanced</i> quieting between F _L and F _H .
24.	1 (Reverse) 4	Receiver Oscillator Warp	Repeat Step 18
Receiver alignment is complete.			



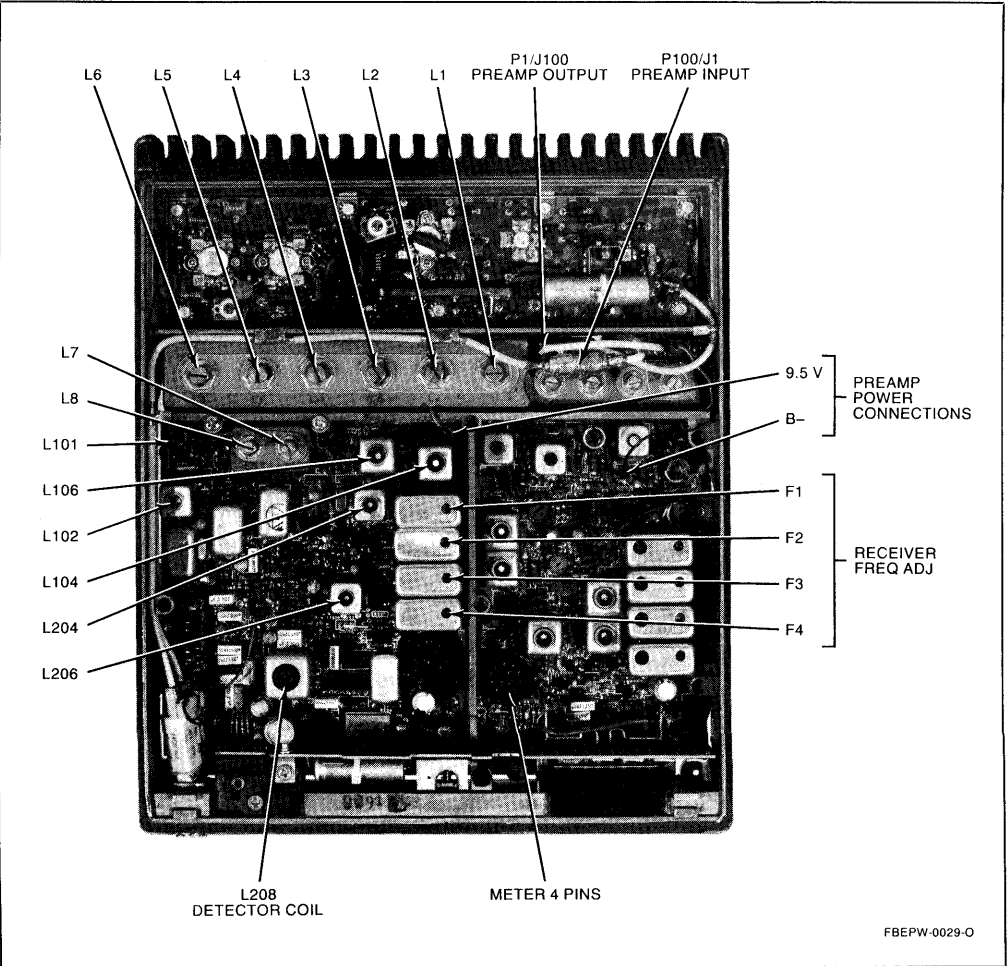
NOTE: The tuning procedure is written for use with the Motorola portable test set. If using the Tek5-F or modified Tek5-B through Tek5-E meter panels, put the M1,2 polarity switch in the reverse position and ignore the indicated polarity notes.

BEPW- 0022 -0

Positions of Tuning Screws for Various Frequency Ranges

UHF “MITREK”
RECEIVER ALIGNMENT

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



Receiver Adjustment Points

Receiver Alignment Procedure
Motorola No. PEPS-26612-E
9-12-84 GGI

RECEIVER ALIGNMENT/TRANSMITTER ALIGNMENT