REQUIRED TEST EQUIPMENT FOR VHF RECEIVER SERVICIN		REOUIRED TE	ST EQUIPMENT	FOR VHF	RECEIVER	SERVICIN
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Recommended Model

Minimum Specifications

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AC-DC VOM	DC voltage measurements, general	Motorola T1009	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
DC Multimeter	DC voltage readings requiring a high input resistance meter	Motorola S1063	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio voltage measurements	Motorola S1053	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter	RF voltage measurements	Motorola S1339	Measurement range: 100 uV-3 V from 1 MHz-512 MHz Inputs: 50 ohm and high impedance
Oscilloscope	Waveform observation	Motorola R1004	Vertical sensitivity: 5 mV- 10 V/division Horizontal time base: 0.2 usec. 0.5 sec/division
Frequency Meter	Receiver frequency measurement	Model R1200 Service Monitor with high stability oscillator (X suffix) option. Fre- quency calibration recommended every 6 months or less.	Measurement range: 134-174 MHz Frequency resolution: 10 Hz
RF Signal Generator	Receiver alignment and troubleshooting	Motorola R1200 Service Monitor with attenuator	Frequency range: 134-174 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 S1067	Frequency range: 20 Hz-20 kHz Output level: 50 mV-1 V
PL Tone Generator*	Tone-coded Private-Line decoder troubleshooting	Motorola S1333	Frequency range: 10 Hz-9999 Hz Output level: 0-3 V rms
DPL Test Set**	Digital Private-Line encoder-decoder troubleshooting	Motorola SLN6413	
Radio Test Set	Meter readings at circuit metering points for alignment and troubleshooting	Motorola S1056 Portable Test Set with a TEK-37 or TEK-37A Test Set Adapter or a Motorola TEK-5 Meter Panel with a TEK-40 (MICOR Adapter) Cable.	

^{*}Required for tone-coded Private-Line models only.

NOT

All test equipment, with the exception of the DPL test set and dc power supply, may be replaced by the Motorola R2001 System Analyzer. Tuning tools Motorola Part No. 66-82977K01 and 66-83398A01 are to be used for alignment purposes.

RECEIVER FREQUENCY CALCULATIONS

Where

 f_0 = channel element frequency f_c = carrier frequency f_{inj} = injection frequency

10.7 MHz I-F Receivers 10.8 MHz I-F Receivers

$$f_{\text{inj}}$$
 = $f_{\text{c}} - 10.7 \,\text{MHz}$ f_{inj} = $f_{\text{c}} - 10.8 \,\text{MHz}$
= $f_{\text{c}} - 10.7 \,\text{MHz}$ f_{o} = $f_{\text{c}} - 10.8 \,\text{MHz}$

VHF RECEIVER ALIGNMENT PROCEDURE

The tuning procedure should be performed using the Motorola S1056 portable Test Set. Connect metering cable to receiver metering socket on rear of interconnect board. Place the A/B switch in the A position and the FUNCTION SELECT switches to the RCVR position and meter reverse position. If using the TEK5-F or modified TEK5-B through TEK5-E meter panels, put the function switch to position C and the M1, 2 switch to the normal position. If using the optional station metering box, put the FORWARD-REVERSE switch in the FORWARD position.

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For units containing two receivers, align each receiver individually using this same procedure.

Step Meter P	osition	Adjust	Procedure
		L1-L5	Preset the rf preselector tuning screws per the coil preset chart.
12	L	101, L102, L103	Preset the injection string coil slugs per the coil preset chart.
-3 2		L201	Starting with the slug flush with top of coil form, adjust the detector coil for the first reading of 24 uA on meter 2 (no input signal is necessary). After adjusting the detector coil, depress S201 (using a non-metallic alignment tool) while observing meter 2 reading. Release S201.
4		L201	Quiet the radio by injecting a strong on-channel signal at the base station antenna connector or by setting a signal generator exactly on 10.7 MFI2 (or 10.8 MHz for receivers with shifted i-f frequency) and spraying into the i-f Adjust the quadrature detector coil, L201, to obtain the same M2 reading as in Step 3.
		-	Perform Step 5A for radios with maximum receive frequency separation of 0.5 MHz or less; perform Steps 5B and 5C for radios with maximum receive frequency separation greater than 0.5 MHz
5A 3	L	.103, L102, L101	Adjust the injection string coils for peak reading on meter 3 with lowest frequency selected. Repeat until no further improvement is obtained.
5 B 3		103, L 102, L 101	Adjust the injection string coils for peak reading on meter 3 with highest frequency selected. Repeat until no further improvement is obtained. Tune L103 for peak meter 3 reading with lowest frequency selected. Repeak L101 and L102 for peak on highest frequency and L103 on lowest frequency until no further improvement is obtained.
.5C 3		L102	If meter 3 reading on lowest frequency is less than meter 3 reading on highest frequency, increase meter 3 reading on lowest frequency by adjusting L102 for best balanced reading.
		L103*	If meter 3 reading on highest frequency is less than meter 3 reading on lowest frequency, increase meter 3 reading on the highest frequency by adjusting L103 for best balanced reading. Make sure the frequency reading does not drop below the highest frequency reading.
6 1		L5 (and L153 n optional preamp)	Adjust L1, L2, (L153), L3, L4, L5 in order for peak reading on meter 1 using the highest frequency and maintaining meter 1 between 30 and 40 uA by adjusting the signal generator output. Repeat until no further improvement is obtained.
			Perform Step 7 only for radios with maximum receive frequency separation greater than 0.5 MHz.
7		L5 (and L153 on optional preamp)	Adjust L1, L2, (L153), L3, L4, L5 once in that order for peak reading on meter 1 using the <i>lowest</i> frequency and maintaining meter 1 between 30 uA and 40 uA by adjusting the signal generator output.
8 Audio zero beat (See Note)	Cha	nnel Element	For each frequency, set rf generator to the carrier frequency (\pm 75 Hz) without modulation. With a wire connected to a 1 mV, 10.7 MHz (or 10.8 MHz for receivers with shifted i-f frequency) signal source, "spray" the signal near Q201. Warp channel element for audio zero beat.
			Perform Step 9A for radios with maximum receive frequency separation of 0.5 MHz or less; perform Step 9B for radios with maximum receive frequency separation greater than 0.5 MHz
9A AC Voltmeter across speaker	on r	or L1 and L2 cvr. with op- nal preamp)	Adjust L5 (or L1 and L2 in Preamp Radios) for best quieting with the highest frequency selected. Receiver tuning is now complete.
9B AC Voltmeter across speaker	adj	-L5 (Do not just L153 on onal preamp)	Check 20 dB quieting sensitivity on all frequencies. <i>If necessary</i> , retune L1 and L2 <i>once</i> on highest frequency for best quieting. Check sensitivities again and <i>if necessary</i> retune L3-5 <i>once</i> , on the lowest frequency, for best quieting.

Note: Alternate Method of Setting Receiver Oscillator Frequency Using a Frequency Counter.

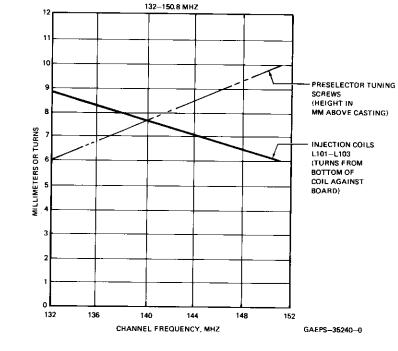
"Sniff" the injection frequency in the following manner: Connect a coax cable which has 1 to 2 inches of ground shield removed from one end to the frequency counter. Insert this end into coil form L103 in the receiver injection circuit. This should provide enough signal to accurately gate the counter. For each frequency, adjust the receiver channel element for the injection frequency ± 75 Hz. (Calculate injection frequency using appropriate formula at beginning of alignment procedure.)

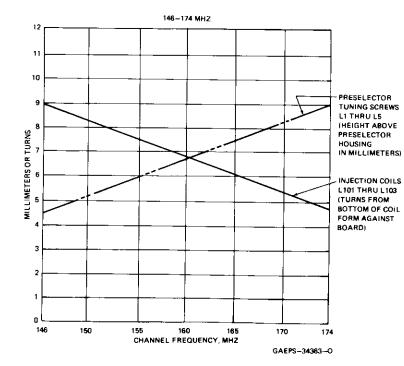
RECEIVER METER READINGS

RECEIVER ALIGNMENT
MODEL SERIES TRD6170A, TRD6180A, TRD6190A

When the receiver is properly aligned, meter deflections should fall within the following limits. Where two numbers are given, the readings are non-preamp/preamp.

Switch Position	Meter 1	Meter 2	Meter 3	
Meter Reading (no signal)	12/14 uA (min) 30/32 uA (max)	20 uA (min) 28 uA (max)	10 uA (min)	
Function Metered	Limiter/Detector	Detector Alignment	Receiver Injection	





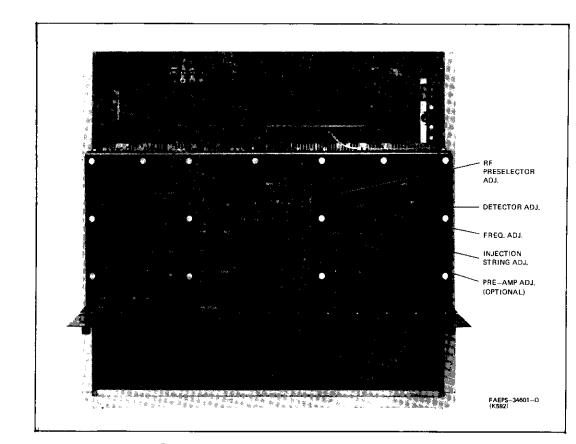


Figure 2. Receiver Alignment Adjustment Locations

ECEIVER ALIG

Coil Preset Charts

Motorola No. PEPS-34505-A

11/15/82 - V & G

^{**}Required for Digital Private-Line models only.