TUNING INSTRUCTIONS

RECOMMENDED TEST EQUIPMENT

The following equipment is required to properly align the receiver. Equipment equivalent to the models indicated may be used.

NOTE: Test equipment must be properly calibrated and adjusted as recommended by the equipment manufacturer prior to alignment of the receiver.

TABLE 2. TEST EQUIPMENT

Type	Designation
VOM, 50μA, 5000 ohm with	Simpson Model 260 or 270
Test Adapter for VOM	RCA CX-40 (MI-559234)
or	
Test Meter	RCA TM868
or	
Test Meter Panel	RCA MI-559240
RF Signal Generator	Measurements FM560
IF and Audio Signal Generator	Hewlett Packard HP606A
20 dB Pad	Measurements M-342
Clip lead, 4" long	–
Coax adapter, BNC plug to phono socket with 10K resistor in series	–
Tools required:	
Non-metallic Screwdrivers 0.1" blade and 0.2" blade	GC8276
Hexagonal Alignment Tools	
0.1" across flats	RCA Stock No. 228788
0.075" across flats	RCA Stock No. 424562
Phillips screwdriver	–
Long-nose pliers	–
Frequency Counter	Hewlett-Packard HP5245L

INSTALLATION ADJUSTMENTS

This section describes the steps necessary to initially adjust the Receiver following installation. Adjustments include peaking the antenna coil, and the adjustment of volume level, squelch control, and TCXO frequency.

For exciter adjustments, refer to the appropriate Transmitter instruction book.

CAUTION

In mobile systems, disconnect the system plug before removing modules or com-

TABLE 3. INSTALLATION ADJUSTMENTS

Step	Type of Adjustment	CX-40, TM868, or Test Meter Panel Switch Position	Test Socket Pins (+)	Test Socket Pins (–)	Description of Adjustment
1	———	———	—	–	Supply an on-frequency carrier signal with an RF signal generator connected to the antenna jack. Connect receiver plug of CX-40, TM868, or Test Meter Panel to test socket.
2	Antenna Peaking	position 8	8	9	Peak 1Z1. Do not adjust 1Z2 through 1Z5.
3	TCXO Frequency	position 2+ or 2-	2	9	Adjust TCXO frequency trimmer for zero reading; repeat on all channels.
4	Low Level Audio Controls	———	—	–	Rotate low level audio control on control unit (RCVR AUDIO control on base station Receiver Panel) fully clockwise and adjust RF generator for 1000 μV, 3 kHz deviation, on-frequency carrier signal modulated by a 1000 Hz tone. Adjust the low level audio control for 5 watts into a resistive 8 ohm load.
5	Squelch Control	———	—	–	Adjust the Squelch control to the point at which the audio noise is squelched. Do not adjust beyond this point; further adjustment will decrease receiver sensitivity.
6	Speaker Volume Controls	———	—	–	Adjust all other volume controls on the system control unit for a comfortable listening level.
7	———	———	—	–	Disconnect all test equipment.

ponents, to protect equipment from possible damage. The power ON/OFF switch on the Control Unit controls power to the mobile station, but does not remove all DC from the unit.

Solid-state devices in this receiver can be permanently damaged if the full-load to no-load voltage regulation and transients exceed a 20% voltage increase from the specified input voltage rating of the unit. Because of this, the preferred configuration for bench testing is a power supply charger and battery which will "filter" any undesirable voltage condition.

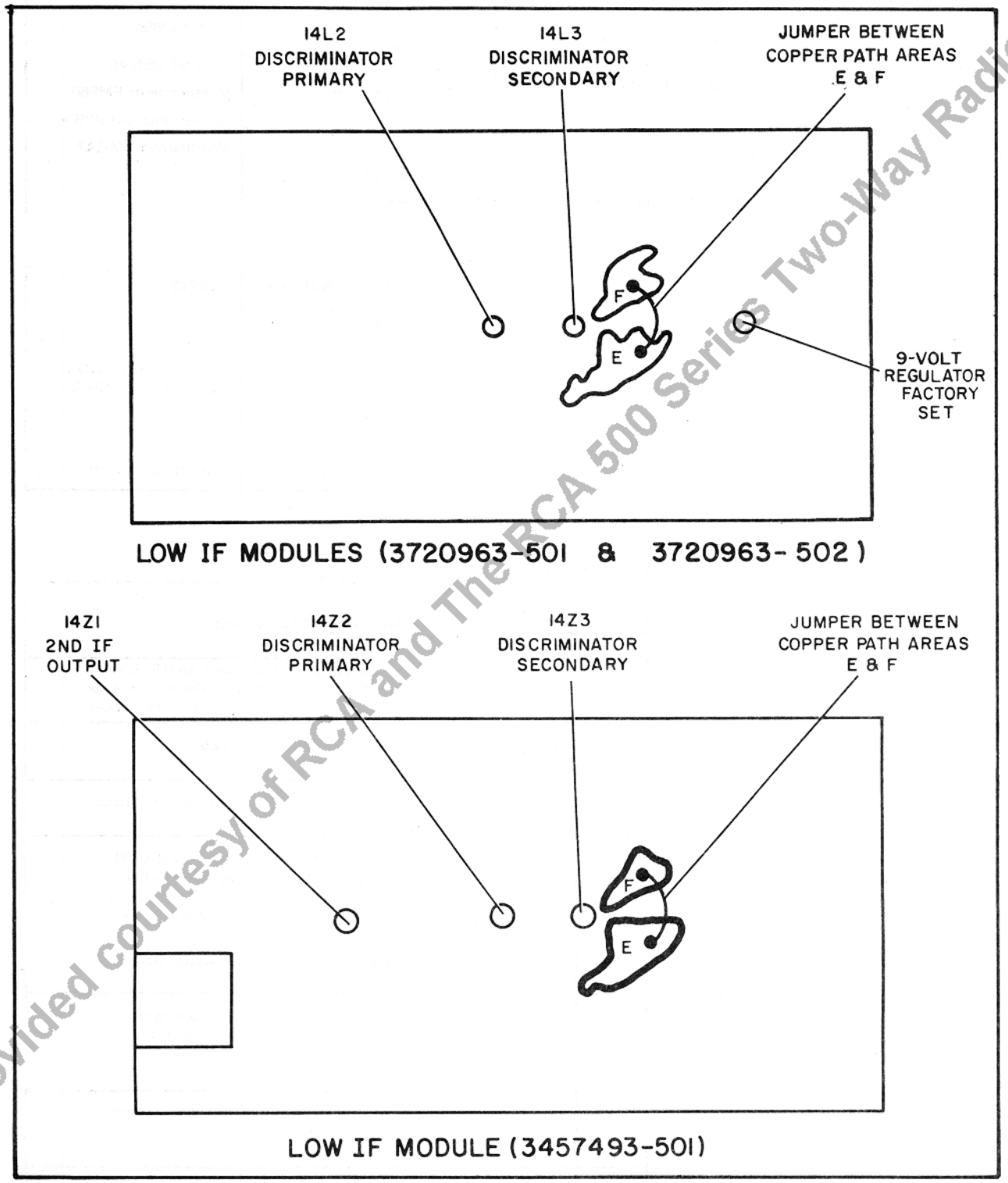

Figure 8. Low IF Module Adjustment Locations

RECEIVER ALIGNMENT

This section describes the adjustments necessary to properly align the receiver. This procedure assumes:

1. Receiver connected to the system in which it is used.

2. Installation adjustments completed.

3. Required test equipment available and adjusted per the manufacturer's service manual.

CAUTION

In mobile systems, disconnect the system plug before removing modules or components to protect equipment from possible damage. The Control Unit power switch (ON/OFF), when in the OFF position, does not remove all DC from the radio unit.

To proceed with the alignment, follow the steps outlined in Table 4, then proceed with the front end alignment procedure of Table 5 for single frequency receivers or Table 6 for multiple frequency receivers.

TABLE 4. IF ALIGNMENT

Step	Type of Adjustment	CX-40, TM868, or Test Meter Panel Switch Position and Typical Reading	Test Socket Pins (+)	Test Socket Pins (–)	Description of Adjustment
1	Low IF	————	—	—	Connect a jumper between copper path areas E and F on the Low IF Module, or swing the module out and jumper pins 23 and 27.
2	Low IF	————	—	—	Set signal generator to 455 kHz ±100 Hz using frequency counter.
3	Low IF	————	—	—	Remove the connector (of the 455 kHz Filter) from 13J1 on the 14.5 MHz IF Pin Board. Connect high side of signal generator through coaxial adapter (and 10K resistor) to center pin of plug just removed, and low side to shell and ground.
4	Low IF	————	—	—	Connect test meter plug to receiver test socket.
5	Low IF	position 8 10 μA	8	9	Energize receiver and adjust signal generator output for a reading of 10 μA.
6	Low IF	postion 8 10 μA	8	9	This step performed on 3457493-501 Low IF Module only. Peak 14Z1 (see Figure 8). Re-adjust generator for 10 μA reading, and re-peak 14Z1. Re-adjust generator output to keep meter reading at 10 μA (with 10 to 24 mV input). Continue until 14Z1 is adjusted for maximum.
7	Low IF	position 3 35-40 μA	3	9	Peak discriminator primary adjustment (see Figure 8).
8	Low IF	postion 2+ and 2- zero μA	2	9	Remove jumper from copper path areas E and F or pins 23 and 27. Adjust discriminator secondary adjustment (see Figure 8) for zero reading in both meter switch positions (both polarities on test socket pins).
9	High IF	————	—	—	Adjust generator to 14.5 MHz ±100 Hz. Connect generator to IF Test jack 13J2 on the 14.5 MHz IF Pin Board. Re-connect the 455 kHz Filter plug to 13J1 on the 14.5 MHz IF Pin Board.
10	High IF	position 8 10 μA	8	9	Adjust 13T2, 13L3, 13L2, 13L1, and 13T1 (in that order) for peak reading, while continually adjusting generator output to keep meter reading between 5 and 10 μA (with 20 to 80 μV input).
11	High IF	position 8 10 μA	8	9	Repeat step 10 until no further improvement is obtained.
12	——	————	—	—	Proceed with front end alignment procedures: Table 5 for single frequency receivers; Table 6 for multiple frequency receivers.

TABLE 5. FRONT END ALIGNMENT – SINGLE FREQUENCY RECEIVERS

Step	Type of Adjustment	CX-40, TM868, or Test Meter Panel Switch Position and Typical Reading	Test Socket Pins (+)	Test Socket Pins (–)	Description of Adjustment
1	Buffer/ Multiplier	position 4	4	9	Ensure that the TCXO is inserted. Peak11L1.
2	Buffer/ Multiplier	position 5	5	9	Peak 11L2. Do not re-peak 11L1.
3	Buffer/ Multiplier	position 5	5	9	Tune 10C16 for a small dip.
4	Buffer/ Multiplier	position 6	6	9	Peak 10C12. Re-peak 10C16 and 10C12.
5	Buffer/ Multiplier	position 6	6	9	Find approximate tuning position by adjusting 10C6 for a dip.
6	Buffer/ Multiplier	position 7	7	9	Adjust 10C1 for maximum (this may be a very small peak). Re-peak 10C6 and 10C1.
7	Buffer/ Multiplier	position 6	6	9	Starting with 11L2 core backed out (CCW), turn the core clockwise for a peak reading. Observe meter reading at this point. Now continue to turn the core clockwise until meter reading is reduced by 2 μA from the maximum value.
8	Helical Resonators/ 1st Mixer	position 2+ or 2-	2	9	Connect RF generator to antenna jack (do not use an input pad until partial RF alignment necessitates the use of one) and adjust generator frequency until the correct frequency is obtained, as indicated by a sudden change in the meter reading.
9	Helical Resonators/ 1st Mixer	position 8 10 μA	8	9	Adjust 1Z5, 1Z4, 1Z3, 1Z2, and 1Z1 in that order for peak, while continually adjusting generator output to maintain a meter reading of 10 μA or less.
10	Helical Resonators/ 1st Mixer	position 8	8	9	Insert a 20 dB pad into the RF lead of the generator. Re-peak 13T1, 10C1, 1Z5, 1Z4, 1Z3, 1Z2, and 1Z1 (in that order) while continually adjusting generator output to maintain meter indication of 10 μA or less. NOTE: It may be necessary to correct tuning of 10C1 and 1Z5 for best 20 dB quieting sensitivity.

TABLE 6. FRONT END ALIGNMENT – MULTIPLE FREQUENCY RECEIVERS

Step	Type of Adjustment	CX-40, TM868, or Test Meter Panel Switch Position and Typical Reading	Test Socket Pins (+)	Test Socket Pins (–)	Description of Adjustment
1	Buffer/ Multiplier	———	—	—	If highest and lowest receive frequencies are more than ±0.1% of center frequency apart: 1. Replace one of the TCXOs with a Center Frequency Alignment Oscillator, and set the frequency selector to that position; or, if Center Frequency Alignment Oscillator is not available, 2. Set frequency selector for closest frequency to center frequency (tuning in this manner may degrade performance on other frequencies).
2.	Buffer/ Multiplier	———	—	—	Preset all front end tuning adjustments on the Helical Resonator Module, Mixer/Multiplier Module, and Buffer Module to minimum position (all cores backed out and all capacitors set to minimum value).
3	Buffer/ Multiplier	position 4	4	9	Peak 11L1.
4	Buffer/ Multiplier	position 5	5	9	Peak 11L2.
5	Buffer/ Multiplier	position 5	5	9	Tune 10C16 for a dip.
6	Buffer/ Multiplier	position 5	5	9	Carefully tune 10C12 for a peak meter reading. Do not re-peak 10C16.
7	Buffer/ Multiplier	position 6	6	9	Tune 10C6 for a dip in meter reading.
8	Buffer/ Multiplier	position 7	7	9	Tune 10C1 for a peak in meter reading. Re-peak 10C6 and 10C1.
9	Helical Resonators/ 1st Mixer	position 2+ or 2-	2	9	Connect RF generator to antenna jack (do not use an input pad until partial RF alignment necessitates the use of one) and adjust the generator frequency until the correct frequency is obtained, as indicated by a sudden change in the meter reading.
10	Helical Resonators/ 1st Mixer	position 8	8	9	Adjust 1Z1, 1Z2, 1Z3, 1Z4, and 1Z5 (in that order) for peak, while continually adjusting the generator output to maintain a meter reading of 10 μA or less.
11	Helical Resonators/ 1st Mixer	———	—	—	Do not re-peak any adjustments.
12	Helical Resonators/ 1st Mixer	position 7	7	9	Remove TCXO from circuit. Meter reading must decrease by at least 2 μA.

TABLE 7. METERING POINTS – TYPICAL READINGS

Function	CX-40, TM868, or Test Meter Panel Switch Position	Test Socket Pins (+)	Test Socket Pins (–)	Typical Readings TCXO Inserted	Typical Readings TCXO Removed	Notes
Discriminator (–)	2-	9	2	0	0	1
Discriminator (+)	2+	2	9	0	0	1
Discriminator Primary Tuning	3	3	9	23.0 μA	23.0 μA	
TCXO Output	4	4	9	20.0 μA	0	
1st Tripler drive	5	5	9	20.0 μA	2.0 μA	
2nd Tripler drive	6	6	9	24.0 μA	0	
1st Mixer current	7	7	9	25.0 μA	16.0 μA	
Low IF Metering	8	8	9	10.0 μA	0	2

NOTES:

1. The discriminator must have been previously adjusted for zero output with a 455 kHz ±100 Hz signal.
2. A signal input of 2.5 μV to 4.5 μV is required at 470 MHz to produce 10 μA reading.

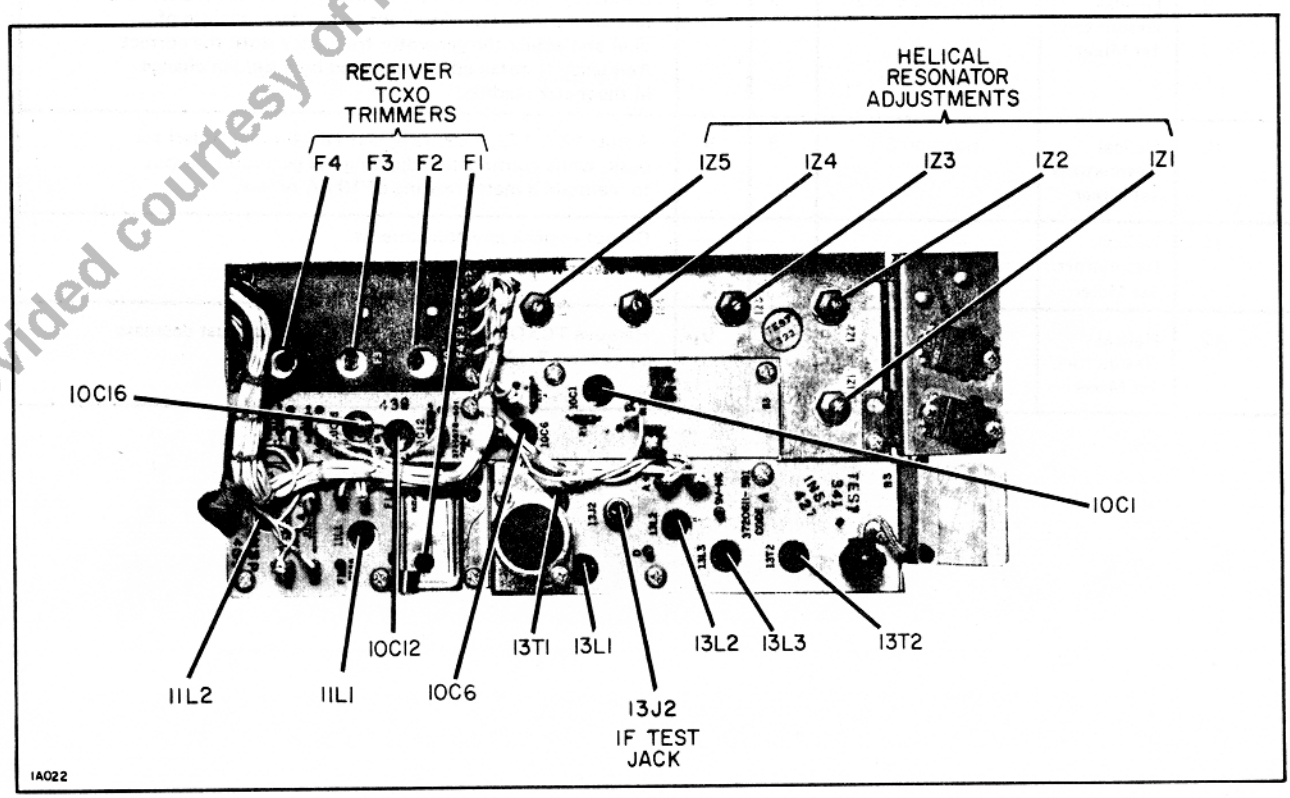

Figure 9. Receiver Casting Adjustment Locations