

Motorola M110/MC micro alignment (VHF)

1. ALIGNMENT

Note: Key the radio while making adjustments or measurements.

1.1 GENERAL

Perform all adjustments at a supply voltage 13.2 \pm 0.1 volts dc, unless the instruction call for a different voltage.

Interpret instruction to turn controls clockwise (CW) or counterclockwise (CCW) to mean »as viewed from the component side of the circuit board«.

Picture A and B show the locations of the components.

When you perform any of the tune-up procedures given in sections 1.2, 1.3, 1.4 and 1.5, the radio must be completely assembled except for the chassis cover, top cover of the synthesizer compartment, and the radio sleeve. When you have completed the tune-up, install the synthesizer cover, chassis cover and sleeve before testing the radio against specifications following the procedures given in sections 1.4, 1.5, 1.6 and 1.8 .

The following test equipment is recommended for aligning and servicing the MC micro radio:

R2001D Communication System Analyzer

or

R2200B Service Monitor

GTF180A Mobile test set with

GTF244A Adapter cable for MC micro

PFT4053A Psophometric filter

FTP3005B Select 5 test unit (not required with R2001D)

R1001B Power supply

or

S1347D Power supply (for radios with 10 watts or less power)

R1037 Digital multimeter

or

R1024B Digital multimeter

1.2 TO ADJUST THE TRANSMITTER

(1) Preset the following pots:

* HI PWR	R453	Fully CCW
* LO PWR	R455	Fully CCW
* VOLT LIMIT	R463	Fully CW

(2) Adjust the radio's dc supply voltage to 13.2 \pm 0.1 VDC (12.6 VDC for MAU1, six-watt model).

(3) Select the channel with highest transmit frequency.

- (4) Connect the radio antenna output to an accurate RF power meter that provides a 50-ohm load.
- (5) Connect a dc voltmeter from the steering line test point (SL) to ground. Meter impedance should be 11 megaohms or more.
- (6) Key the radio and adjust coil L210 until the voltage reads 7.0 VDC
- (7) Select the channel with the lowest transmit frequency. Key the radio and verify that dc voltage is at least 2.5 VDC
- (8) Select any transmit channel. (If radio has the MAB889 slaved RF power option, select any high power transmit channel).
- (9) Key the radio and adjust R453 (HI PWR) for:

Model number	Power setting
MAU0	1.0 W
MAU1	6.0 W
MAU2	10.0 W
MAU3	25.0 W

- (10) Switch through all channels (all high power channels for MAB889). On each channel key the radio and note the power output.
 For MAU0, MAU2 and MAU3 models note the channel that gives the minimum power output; for MAU1 models note the channels that give the maximum power output. If more than one channel gives the same maximum or minimum power, choose any one of those channels.

- (11) Switch through all transmit channels (all high power channels for MAB889). On each channel, key the radio while watching the dc voltage at Pin 4 of connector P6, or at test point CV on the command board. Record the number of the channel that gives the greatest voltage and what voltage is. (If more than one channel gives the same maximum voltage, choose any of those channels). If it is greater than 10.0 VDC, go to step 14 if not go to step 12.

- (12) On the channel that step 11 showed to have the highest dc voltage, turn R463 fully CCW. Turn R453 fully CW.

- (13) Key the radio. Adjust the voltage limit pot R463 for a dc voltage 2.0 higher than voltage level recorded in step 11, as measured at Pin 4 of P6 or at test point CV

- (14) Set the channel selector to the channel that was noted in step 10. Key the radio and adjust R453 for:

Model number	Power setting
MAU0	1.1 W
MAU1	5.6 W
MAU2	10.7 W
MAU3	26.8 W

(15) Verify that all channels (all high power channels in MAB889) produce at least 1.0, 10.0 or 25.0 watts as appropriate for MAU0, MAU2 and MAU3 models. Verify that no channels produces more than 6.0 watts for MAU1 models.

(16) If the radio has option MAB889 (slaved RF power level) select any low power channel. Key the radio and adjust R455 for an output power of 1.0 watt (or other specified power setting) for MAU1 and MAU2 models. Verify that the RF power output on all low power channels is between 0.7 and 1.4 watts.

Readjust R455 slightly if necessary. For MAU0 models, adjust R455 for an output power of 0.1 watt or some other specified power level. Verify that RF power output on all low power channels is between 70 and 140 mW.

1.3 TO ADJUST THE REFERENCE OSCILLATOR

- (1) Connect the radio antenna output to an accurate frequency counter through a suitable attenuator.
- (2) Select any transmit channel.
- (3) Key the radio and adjust L151 (all models except those with 2 ppm stability) or R163 (models with 2 ppm stability) until the exact transmit frequency (~100 Hz) appears on the counter.
- (4) Check all transmit channels to verify that the correct transmit frequencies have been programmed.

1.4 TO ADJUST THE DEVIATION

- (1) Connect the radio antenna output to a modulation analyzer or test receiver through a suitable attenuator
- (2) Connect an audio oscillator to the microphone audio input through the circuit in figure C. Set the oscillator frequency to one kHz and the output level to 800 mV RMS.
- (3) Preset pots R302 (VCO MOD) and R305 (REF MOD) fully CCW.
- (4) Select any transmit channel. For PL models select channel that transmit PL.
- (5) Key the radio and adjust the VCO MOD pot R302 for appropriate deviation level:

Channel spacing	Deviation setting
25 kHz	~ 4.6 kHz
20 kHz	~ 3.7 kHz
12.5 kHz	~ 2.3 kHz

Note

If + and – deviation readings differ, use only the higher reading.

- (6) Change the audio oscillator frequency to 200 Hz and maintain the output level at 800 mV RMS.

- (7) Key the radio and observe the waveform on an oscilloscope connected to demodulated output of a test receiver. Test receiver should be non-deemphasized and there must be dc coupling between the test receiver and the scope. (AC coupling is suitable if the corner frequency is 2 Hz or lower.) Adjust R305 (REF MOD) for the flattest square-wave response with minimum tilt.
- (8) Return the audio oscillator frequency to one kHz, 800 mV and repeat step 5.

1.5. TO ALIGN THE RECEIVER

Note

Adjust the transmitter VCO and reference oscillator before aligning the receiver

1.5.1 Receiver VCO

- (1) Connect a high impedance (11 megaohms or greater) dc voltmeter from steering line test point (SL) to ground.
- (2) (Radios with more than one receive frequency) Select the channel with highest receive frequency.
- (3) Adjust the receiver VCO coil (L201) until the voltage meters reads 7.0 VDC.
- (4) Select the channel with the lowest receive frequency and verify that test frequency is at least 2.5 VDC.

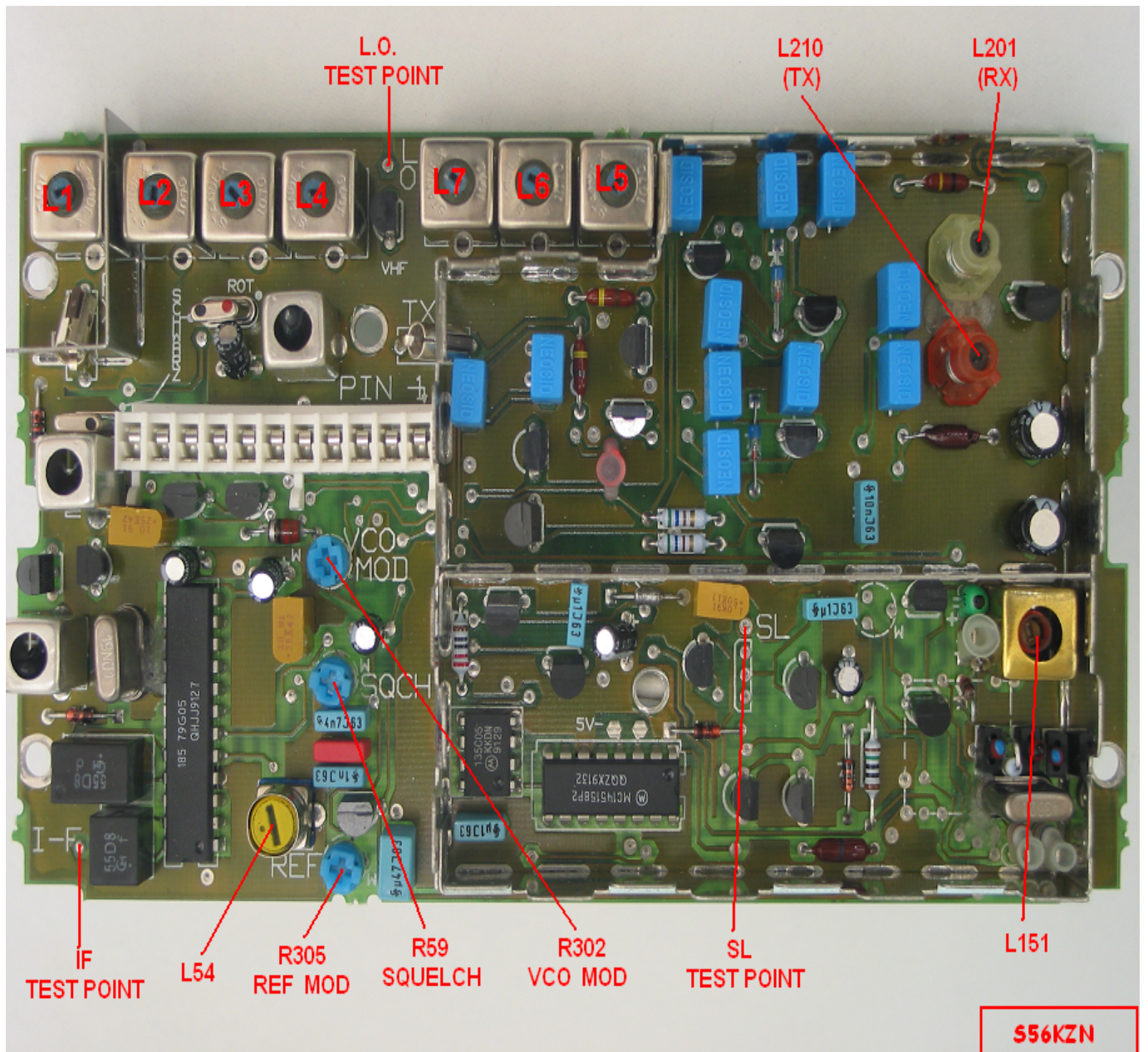
1.5.2. Receiver

- (1) Find the tune-up frequency, f_{tune} as follows:
 - (a) On single channel radios and multi channel radios with a single receive frequency: $f_{\text{tune}} = f_{\text{receive}}$
 - (b) On multi channel radios that have a receive bandwidth of two MHz or less: $f_{\text{tune}} = \text{frequency of highest frequency channel}$
 - (c) On multi channel radios that have a receive bandwidth greater than two MHz but less than or equal to four MHz find f_{mid} where:

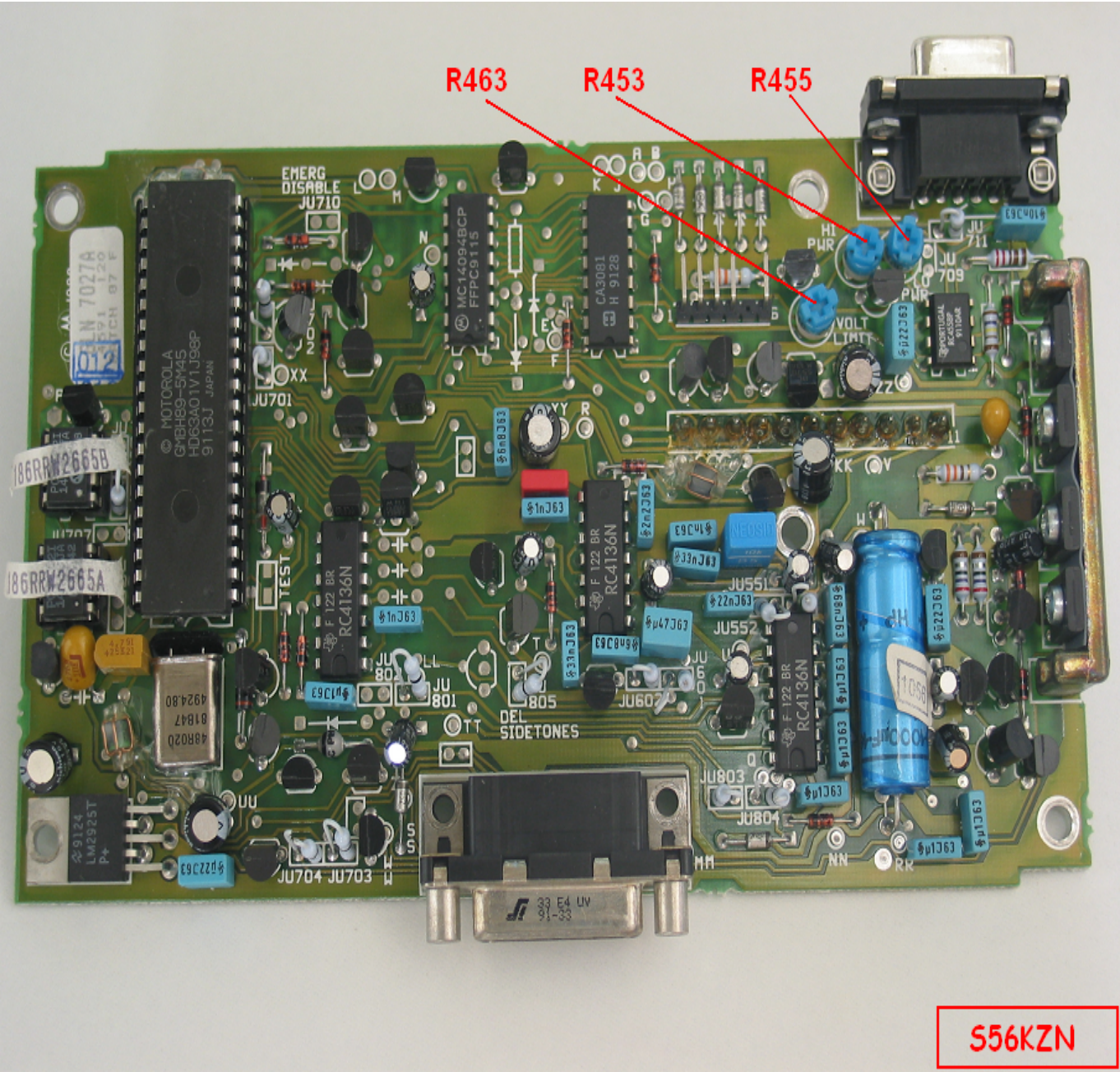
$$f_{\text{mid}} = (f_{\text{highest}} + f_{\text{lowest}}) : 2$$
 If one of the radio channels has a frequency within 500 kHz of f_{mid} perform the tune-up on that channel. If not you must either get a tune-up PROM programmed to f_{mid} or program the tune-up frequency f_{mid} into the radio (EZ models only). EV models contain a preprogrammed tune-up channel, accessed by temporarily shorting the TEST pins on the command board.
- (2) Set the channel selector switch to the channel of the tune-up frequency as determined in step 1 above
- (3) Connect a two ohm resistive load across Pin 4 of J5 (hot lead) and Pin 5 of J5 (ground lead). Monitor the audio output across this load resistor.

- (4) Preset the slugs of L1 thru L7 for f_{tune} flush with the circuit board.
- (5) Connect a dc voltmeter from the local oscillator test point (LO) to ground.
- (6) Peak the injection filter coils L6, L5 and L7 in that order, for maximum dc voltage typically between 2.1 and 3.5 VDC. Repeat until you cannot make the dc voltage increase any farther.
- (7) Connect an RF signal generator to the antenna connector and adjust it to generate an unmodulated on channel signal strong enough to quiet receiver.
- (8) Connect an ac voltmeter with bandwidth of at least 500 Hz (an HP331A distortion analyzer) from the IF test point to ground. Increase the RF generator output until the ac voltmeter indicates approximately 30 mV. Adjust the RF filter coils L1, L3, L4 and L5 until the voltmeter peaks. Reduce the generator's RF level as necessary to maintain approximately 30 mV RMS on the meter during this process. Repeat the adjustment until you can get no further increase in voltage.
- (9) Set the RF level of the generator 1 mV. Modulate it with 1 kHz at 60% of full system deviation. Full system deviation for channel spacing of 25 kHz is ~ 5 kHz; for 20 kHz ~ 4 kHz; for 12.5 kHz ~ 2.5 kHz. Adjust the volume control to get an audio level of about one volt RMS across the 2 ohm load. Slowly peak the quad coil, L54 for maximum audio output.
- (10) Adjust the squelch as follows:
 - (a) Preset the squelch control R59 CCW.
 - (b) Apply an on-channel RF signal at a level of one mV. Modulate with a one kHz tone at 60% of full system deviation.
 - © Adjust the volume control for 1.7 volts RMS across the two ohm load.
 - (d) Reduce the RF level until the CCITT-weighted SINAD is 10 dB.
 - (e) Enable the carrier squelch mode with the front panel switch.
 - (f) Slowly turn the squelch control CW until the audio is squelched (muted) then very slowly turn CCW until the radio just unsquelches (unmutes)
 - (g) Reduce the generator RF level to zero slowly increase the level until the radio just unsquelches and verify that the CCITT-weighted SINAD at this RF level is between 8 and 12 dB SINAD. Readjust R59 slightly if necessary.

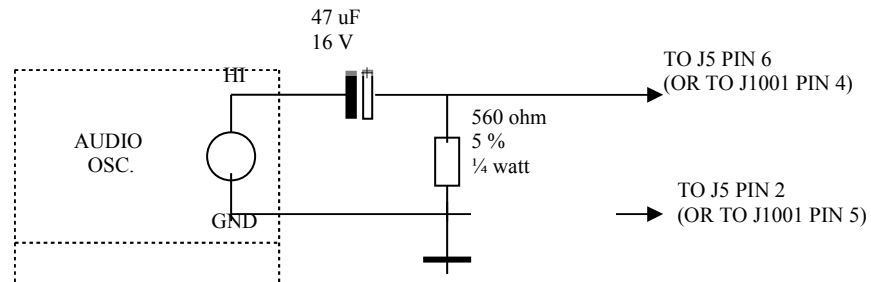
Picture »A«
Alignment points on RF board



Picture »B«
Alignment points on command board



**Picture »C«
Connecting Audio Oscillator to microphone**



This is a transcript from service manual, there might be some typo errors in the text, so I can not overtake any responsibility of any sort of the possible damages to your radio.

Beno, s56kzn