2. MAINTENANCE

2.1 Disassembly

Turn the power switch off and remove the battery and antenna before disassembly and reassembly

2.1.1 Bottom Cover and Front Case

– Bottom Cover –

Remove the two screws Ⓐ and detach the bottom cover, then remove the two screws Ⓑ fixing the front case.

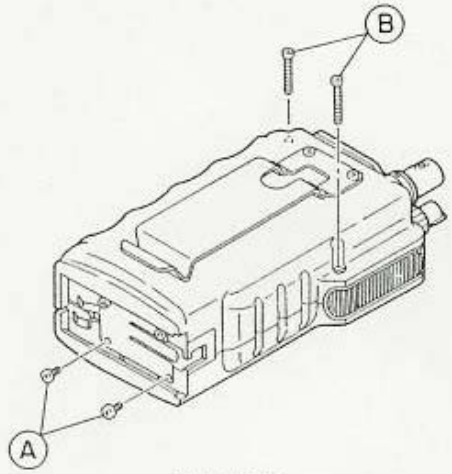

Figure 2-1

– Front Case –

Open the front case in the direction of an arrow and disconnect the connector Ⓒ.

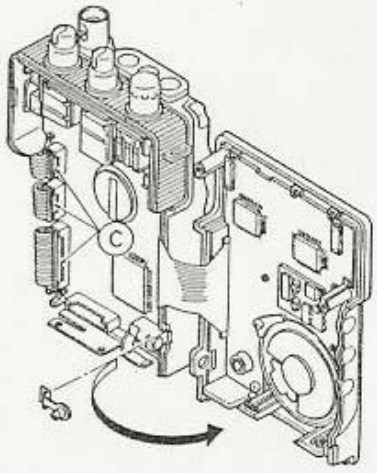

Figure 2-2

2.1.2 Display P.C. Board

Remove the six screws Ⓓ and two screws Ⓔ, and you will be able to disconnect the display P.C. board.

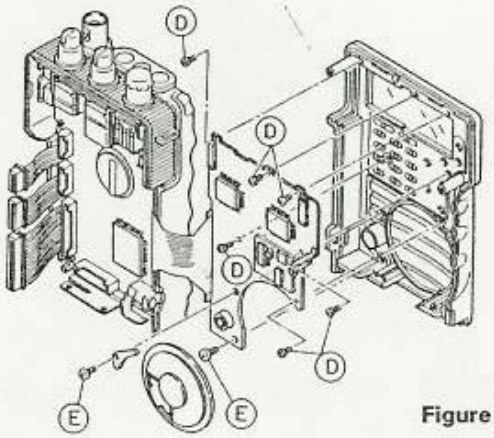

Figure 2-3

2.1.3 AF and RF P.C. Boards

Remove the four screws Ⓕ, then the four screws Ⓖ, four spacers Ⓗ and Ⓘ and five screws Ⓙ, and you will be able to disconnect each board.

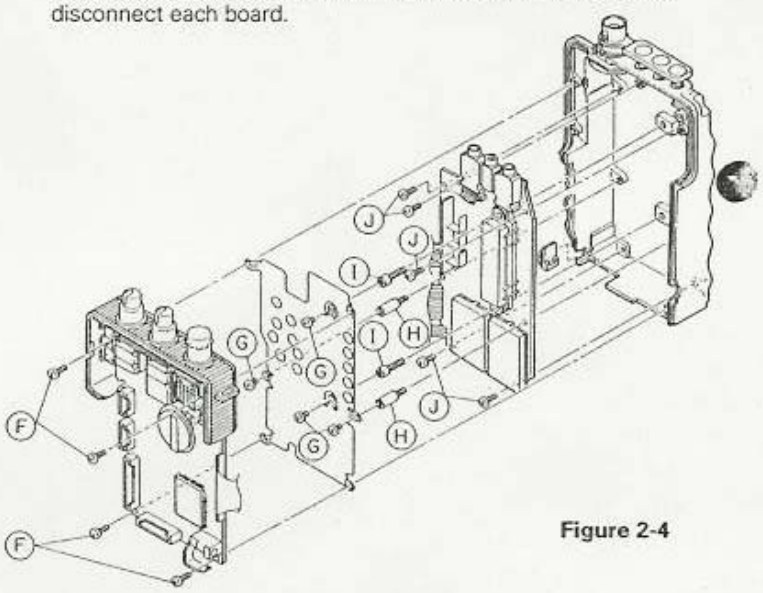

Figure 2-4

2.1.4 Accessory (Tone Squelch Board: CTN520)

a) Turn OFF the power of the transceiver, and install the tone squelch board to the transceiver by two accessory screws.
b) Plug the connector of the tone squelch board securely into the socket of the transceiver.

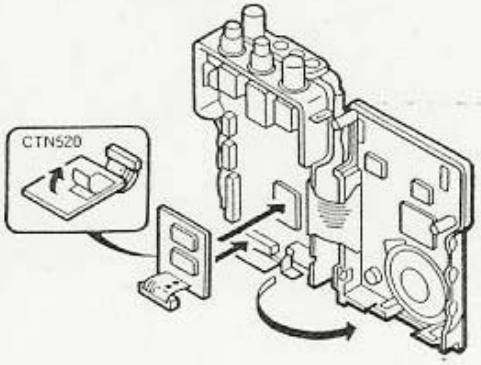

Figure 2-5

Warm up the instruments for at least 30 minutes before use.

General Conditions

Note: Of RF alignment, the audio output is10mW.

Supply voltage ..... 7.2 V DC
Audio output ..... 75 mW

AF dummy load ..... 8 Ω
Standard modulation ..... ±3.5 kHz at 1 kHz
RF dummy load ..... 50 Ω
Ajustment frequencies
Receive frequency ..... VHF 145.990MHz
UHF 435.000 MHz
Transmit frequency ..... VHF 145.990 MHz
UHF 435.000 MHz

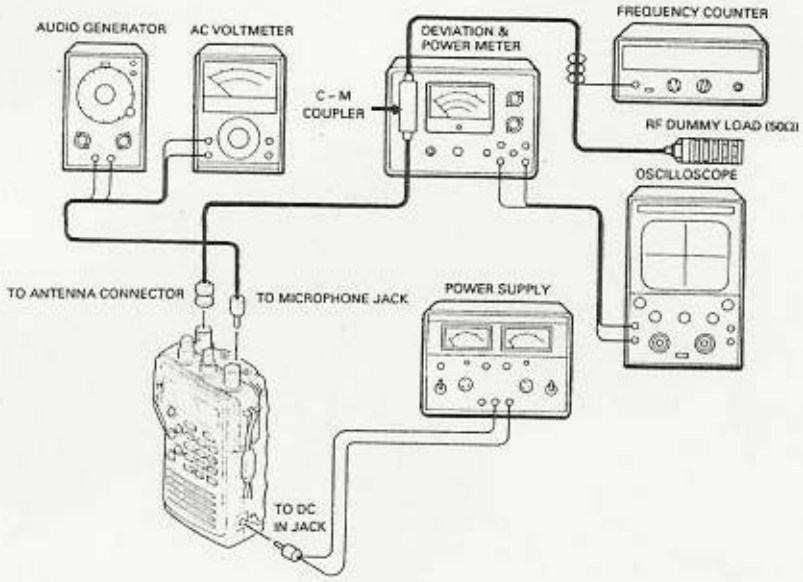

Figure 2-6 Transmitter test set up

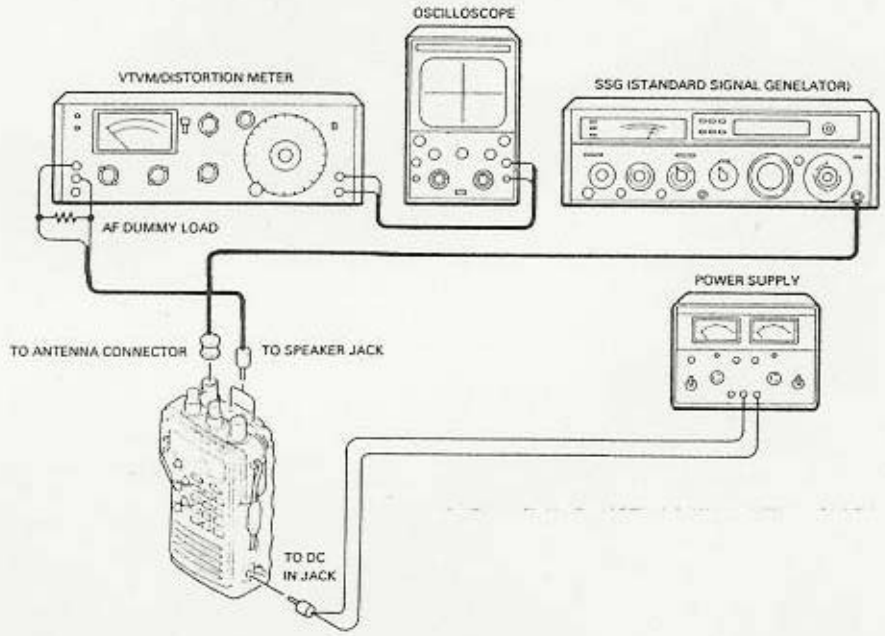

Figure 2-7 Receiver test set up

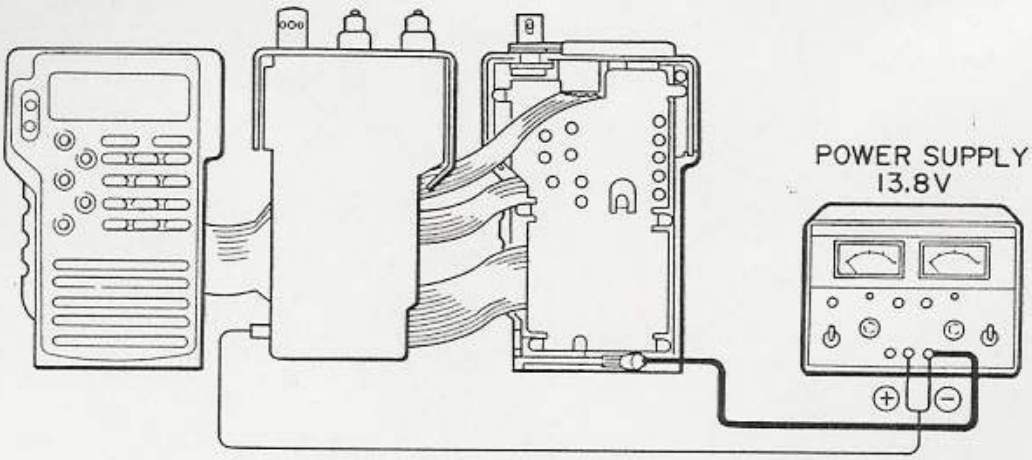

Figure 2-8 Ground cable running for transmit power alignment

2.3 Alignment Reference Points

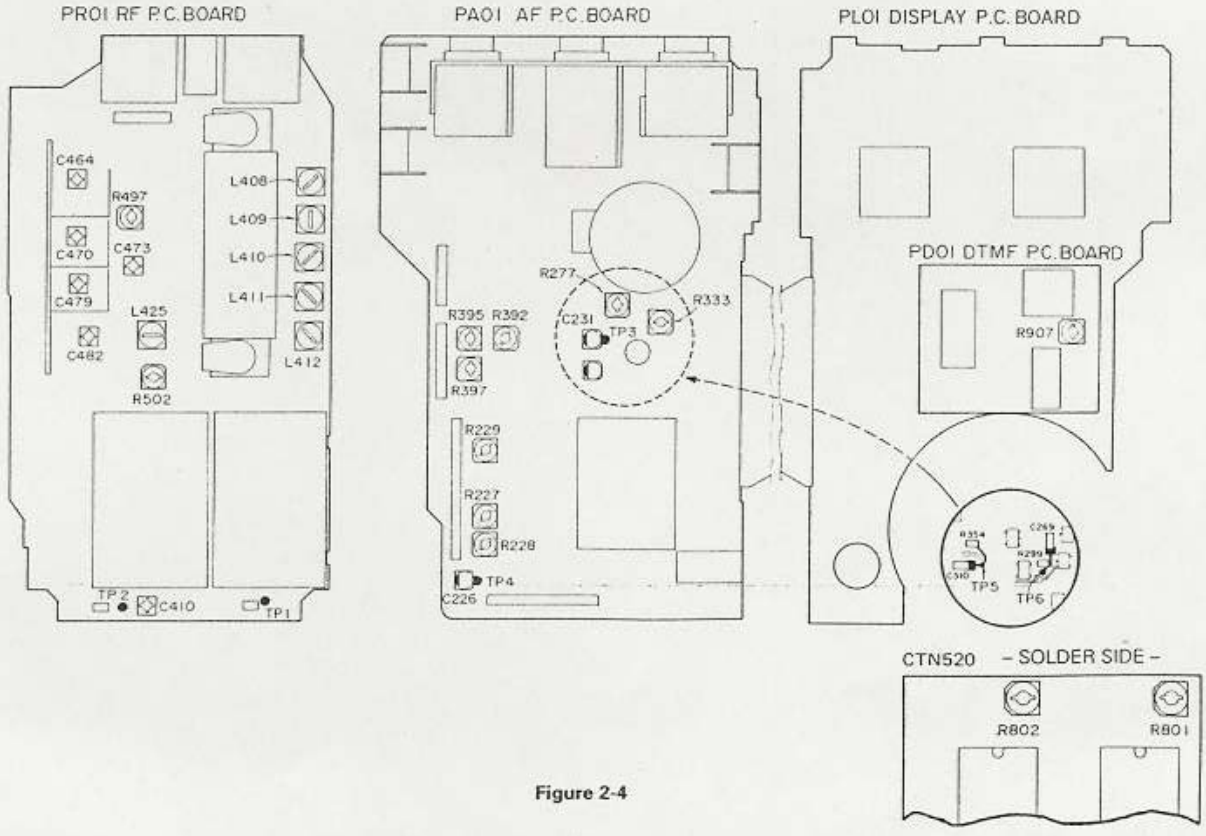

Figure 2-4

2.4 Alignment and Performance Check

2.4.1 Power Supply

– 4 V/5 V Regulator –

a) Apply a supply voltage of 7.2 V DC to the transceiver, and set the power switch to ON.
b) Connect a voltmeter to TP3 and check that the regulator voltage at TP3 is between 4.75 and 5.25 V DC.
c) Connect a voltmeter to TP4 and check that the regulator voltage at TP4 is between 3.8 and 4.2 V DC.
d) The VHF current drain will be around 38 mA with squelch ON, and the UHF current consumption around 45 mA with squelch ON.

2.4.2 Microprocessor

– Clock –

NOTE: The microprocessor clock is 4 MHz. The internal tone frequency is produced from the microprocessor clock.
Accordingly, the tone frequency alignment becomes the microprocessor clock alignment.

2.4.3 PLL Synthesizer

– VCO Frequency Setting –

a) Set the channel frequency of the transceiver to 145.990 MHz in the receive mode.
b) Connect a voltmeter to TP1 and check that the voltage at TP1 is between 1.25 and 1.55 V DC.
c) Key the transmitter and check that the voltage at TP1 is between 1.4 and 1.7 V DC.
d) Set the channel frequency of the transceiver to 435.000 MHz in the receive mode.
e) Connect a voltmeter to TP2 and check that the voltage at TP2 is between 2.35 and 2.65 V DC.
f) Key the transmitter and check that the voltage at TP2 is between 1.65 and 1.95 V DC.

– Local Frequency –

a) Display frequencies of the VHF and UHF bands (in twin mode), and set the channel frequency of the transceiver to 435.000 MHz.
b) Key the transmitter and measure by a frequency counter the output passed through a C – M coupler.
c) Adjust C410 so that the frequency counter reads 435.00000 MHz.

2.4.4 Receiver

NOTE: Perform alignment with the RF P.C. board's shield plate remaining attached.

– UHF Sensitivity –

a) Rotate the UHF and VHF squelch control knobs of the transceiver fully counterclockwise and clockwise, respectively.
b) Set the channel frequency of the (Standard Signal Generator) transceiver and the SSG frequency to 435.000 MHz. The SSG signal shall be subject to standard modulation. Connect the speaker plug in to the SPU terminal (UHF external speaker jack).
c) Connect a voltmeter to TP5 and raise the SSG output level so that the voltage at TP5 becomes about 0.5 V DC.
d) Set the channel frequency of the transceiver to 435.050 MHz. Adjust C464, C470, C473, C479, C482 and L425 in this order and repeat this sequence twice to maximize the reading of the voltmeter.
e) Set the channel frequency of the transceiver to 439.950 MHz, and adjust C482 so that the reading of the voltmeter is maximized.
f) Set the channel frequency of the transceiver to 435.050 MHz, and adjust C464, C470, C473 and C479 in this order so that the reading of the voltmeter is maximized.
g) Set the channel frequency of the transceiver to 435.050 MHz, and check that SINAD is less than –8 dBu.
h) Check that SINAD is less than 1.5 dB against the center value in a range of 430.050 MHz to 439.950 MHz.
i) Set the channel frequency of the transceiver to 435.050 MHz, and check that 20 dB QS is less than –5 dBu.
j) Set the channel frequency of the transceiver to 439.950 MHz, and check that the first image ratio is more than 45 dB.

NOTE: If out of standard, reperform from step d).

k) Set the channel frequency of the transceiver to 435.050 MHz, and check that the S/N ratio is more than 44 dB.
l) With the SSG output level set to 20 dBu, adjust R333 so that the reading of the signal meter maximized.
m) Check that when the reading of the signal meter is maximum between 430.050 MHz and 439.950 MHz the SSG output level is between 16 dBu and 24 dBu.

– VHF Sensitivity –

a) Rotate the VHF and UHF squelch control knobs of the transceiver fully counterclockwise and clockwise, respectively.
b) Set the channel frequency of the transceiver and the SSG frequency to 145.990 MHz. The SSG signal shall be subject to standard modulation. Connect the speaker plug in to the SPV terminal (VHF external speaker jack).
c) Connect a voltmeter to TP6 and raise the SSG output level so that the voltage at TP6 becomes about 0.5 V DC.
d) Set the channel frequency of the transceiver to 145.990 MHz, and adjust L408, L409, L410, L411 and L412 in this numerical order so that the reading of the voltmeter is maximized. At this time, check that SINAD is less than –9.5 dBu.
e) Set the channel frequency of the transceiver and the SSG frequency to 145.500 MHz. Then, with the SSG output level set to 20 dBu, adjust R277 so that the reading of the signal meter is maximized.

2.4.5 Transmitter

– UHF RF Output –

NOTE: Before alignment, put the supply voltage and the transceivers voltage in agreement with each other. For accurate alignment of the transmission output, the RF P.C. board's shield plate should remain attached. Then, connect the ground cable as shown in Figure 2-8.

a) Set the supply voltage of the transceiver to 13.8 V, and the transmission output to the high power mode. Then, rotate R228 fully counterclockwise.
b) Connect a voltmeter to the antenna connector and set the channel frequency of the transceiver to 435.000 MHz. Key the transmitter and check that the maximum output power is more than 6.5 W.
c) After step b), set the transceiver to the VHF, transmission output and high power mode. Key the transmitter and check the output power is more than 5.5 W.
d) Set the channel frequency of the transceiver to 435.000 MHz, and set the transmission output to the high power mode. Key the transmitter and adjust R502 so that the output power is 6.5 W.
e) Set the supply voltage of the transmitter to 7.2 V DC, and set the transmission output to the low power mode.
f) Set the channel frequency of the transceiver to 435.000 MHz. Then, Key the transmitter and adjust R229 so that the output power is 0.4 W. At this time, check that the current drain is between 480 mA and 580 mA.
g) Set the supply voltage of the transceiver to 13.8 V DC, and set the RF output to the high power mode. Key the transmitter and adjust R227 so that the output power is 5.2 W. At this time, check that the current drain is between 1.2 A and 1.5 A.
h) Set the RF output to the middle power mode. Key the transmitter and adjust R228 so that the output power is 2.8 W. At this time, check that the current drain is between 900 mA and 1100 mA.
i) Set the supply voltage of the transceiver to 6.0 V DC, and set the RF output to the high power mode. Key the transmitter and check that the output power is more than 1.2 W.
j) Set the supply voltage of the transceiver to 13.8 V DC and set the transmission output to the high power mode.
k) Check that between 430.000 MHz and 439.950 MHz, when Key the transmitter the difference between maximum and minimum in RF output level is within 0.5 W.

– VHF RF Output –

NOTE: Be sure to perform the VHF transmission output alignment after the termination of the UHF transmission output alignment.

a) Set the supply voltage of the transceiver to 13.8 V, and set the RF output to the high power mode.
b) Connect a voltmeter to the antenna connector, and set the channel frequency of the transceiver to 145.990 MHz. Key the transmitter and adjust R497 so that the output power is 5.2 W. At this time, check that the current drain is between 0.9 A and 1.25 A.
c) Set the RF output to the mid power mode. Then, check that the output level is between 2.2 W and 2.8 W. At this time, check that the current drain is between 800 mA and 1100 mA.
d) Set the supply voltage of the transceiver to 7.2 V DC, and set the RF output to the low power mode. Check that the output level is between 0.24 watt and 0.45 W. At this time, check that the current drain is between 480 mA and 580 mA.

– UHF Modulation –

a) Set the supply voltage and channel frequency of the transceiver to 7.2 V DC and 435.000 MHz. Connect the microphone plug as shown in Figure 2–10 below in to the external microphone jack, and adjust R397 so that the frequency deviation is ±5 kHz provided that the AG output is a sine wave of 1 kHz, 60 mV.
b) Turn ON the time constant 750 usec of the linear detector filter. Then, check that the frequency difference between the plus and minus areas in ±5.0 kHz deviation is within 0.30 kHz.
c) Adjust the AG output and set the deviation to ±3.5 kHz, thereupon measure the distortion. At this time, check that the distortion is within 3%.
d) After step c), check that with the microphone plug released from AG, the AG output voltage is between 4 mV AC and 8 mV AC.

– VHF Modulation –

a) Set the supply voltage and channel frequency of the transceiver to 7.2 V DC and 145.990 MHz. Connect the microphone plug as shown in Figure 2–10 below in to the external microphone jack, and adjust R395 so that the frequency deviation is ±5 kHz provided that the AG output is a sinewave of 1 kHz, 60 mV.
b) Turn ON the time constant 750 usec of the linear detector filter. Then, check that the frequency difference between the plus and minus areas in ±5.0 kHz deviation is within 0.30 kHz.
c) Adjust the AG output and set the deviation to ±3.5 kHz, thereupon measure the distortion. At this time, check that the distortion is within 5%.
d) After step c), check that with the microphone plug released from AG, the AG output voltage is between 4 mV AC and 8 mV AC.

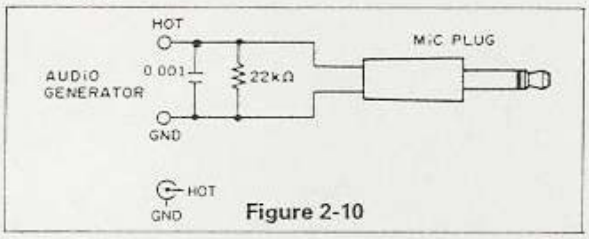

Figure 2-10

– Built-in Touch Tone Board –

a) Perform transmission with the microphone plug connected in to the external microphone jack. At this time, the audio generator (AG) output shall be zero.
b) Set the channel frequency of the transceiver to 435.000 MHz.
c) Adjust R907 so that when the "8" key is pressed, the frequency deviation is ±3.2 kHz. At this time, check that the monitor sound is heard from the speaker.
d) Set the channel frequency of the transceiver to 145.950 MHz, and connect the microphone plug in to the external microphone jack, then Key the transmitter.
e) Check that when the "8" key is pressed, the frequency deviation is between ±2.7 kHz and ±3.8 kHz.

– UHF Tone Squelch Board: CTN520 –

a) Install the tone squelch board into the transceiver, after which set the pertinent switch of the transceiver to ON.
b) Turn ON the tone squelch and set the tone frequency to 67 Hz.
c) Set the channel frequency of the transceiver to 430.050 MHz. Then, check that the tone frequency deviation is between ±0.5 kHz and ±0.9 kHz, and the distortion is within 15%. If without, adjust R802 so that the deviation is ±0.6 kHz.
d) Set the tone frequency to 250.3 Hz. Then, check that the tone frequency deviation is between ±0.5 kHz and ±0.9 kHz, and the distortion is within 15%.

– VHF Tone Squelch Board: CTN520 –

a) Install the tone squelch board into the transceiver, after which set the pertinent switch of the transceiver to ON.
b) Turn ON the tone squelch and set the tone frequency to 67 Hz.
c) Set the channel frequency of the transceiver to 145.990 MHz. Then, check that the tone frequency deviation is between ±0.5 kHz and ±0.9 kHz, and the distortion is within 15%. If without, adjust R80 so that the deviation is ±0.75 kHz.
d) Set the tone frequency to 250.3 Hz. Then, check that the tone frequency deviation is between ±0.5 kHz and ±0.9 kHz, and the distortion is within 15%.

Table 2-1

TONE FREQUENCY (Hz)			
67.0	97.4	136.5	192.8
71.9	100.0	141.3	203.5
74.4	103.5	146.2	210.7
77.0	107.2	151.4	218.1
79.7	110.9	156.7	225.7
82.5	114.8	162.2	233.6
85.4	118.8	167.9	241.8
88.5	123.0	173.8	250.3
91.5	127.3	179.9	
94.8	131.8	186.2	

– UHF Tone Burst –

a) Set the channel frequency of the transceiver to 435.000 MHz.
b) Engage the transmission mode with the microphone plug connected in to the external microphone jack.
c) Press the CALL button and emit the burst signal.
d) Adjust R392 so that the frequency deviation is ±3.5 kHz.
e) Check that the tone burst frequency is between 1,730 Hz and 1,770 Hz, the frequency deviation is between ±3.2 kHz and ±3.8 kHz and the distortion is within 7%.

– VHF Tone Burst –

a) Set the channel frequency of the transceiver to 146.000 MHz.
b) Engage the transmission mode with the microphone plug connected in to the external microphone jack.
c) Press the CALL button and emit the burst signal.
d) Check that the tone burst frequency is between 1,730 Hz and 1,770 Hz, the frequency deviation is between ±3.2 kHz and ±3.8 kHz, and the distortion is within 7%.