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Service Manual

CLASSIC III

MOBILE/BASE CB TRANSCEIVER

FCC TYPE ACCEPTED

Courier

PRICE $2

NOTICE

FCC Rules and Regulations, Part 95, requires that only those persons possessing a valid First or Second Class Radio Telephone Operator's license are permitted to make repairs or adjustments in the transmitter section of any Citizens Band Transceiver.

CERTIFICATION

FANON/COURIER Corporation, Pasadena, California, certifies that this Citizens Band Transceiver meets FCC Rules and Regulations, Part 95, regarding frequency tolerance, stability, power input, modulation, and spurious suppression.

This certification is void if crystals other than those recommended by the manufacturer are installed or if any modification is made to the transmitter circuits, not specified by FANON/COURIER Corporation, or by any personnel not holding the proper FCC license.

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SECTION I

INTRODUCTION

This service manual, together with the owner's instruction manual, provides a complete set of instructions necessary to install, operate and service the transceiver.

The service instructions given are intended to be used by service personnel who are familiar with CB (Citizens Band) equipment. Therefore, detailed information on basic electronic circuitry, service procedures and test equipment setups are not included.

Before replacing any parts or making repairs, please read the warranty printed on the back of this manual, under which the unit is warranteed.

FANON/COURIER or equivalent quality parts should always be used when replacing faulty or damaged components, as many of the frequency controlling components have been selected for their temperature, vibration, stability and other characteristics.

SERVICE AND FACTORY MAINTENANCE

Should the unit require Factory Service, write or call the FANON/COURIER Service Department, 990 South Fair Oaks Avenue, Pasadena, California 91105, and request RETURN AUTHORIZATION. When shipping the unit to the factory, please enclose a full description of the problem with the unit. Pack all articles well enough to withstand rough handling during shipping. Follow the instructions given in the Return Authorization Form which will be sent to you.

GENERAL DESCRIPTION

The transceiver is a completely solid-state radio receiver and transmitter designed to operate in the 27 MHz (11 meter) Class D Citizens Band.

The receiver section is a double conversion superhetrodyne type with a first IF frequency of 11.275 MHz and a 455 KHz second IF. A ceramic filter is used in the second IF amplifier to enhance selectivity without degrading the audio frequencies. The local oscillator frequencies are generated by a frequency synthesizer.

The transmitter section also utilizes the frequency synthesizer to generate the 23 channel carrier frequencies. The power output stage is a high gain RF power transistor, conservatively rated to produce 3 watts of carrier power.

SECTION II
TEST AND ALIGNMENT PROCEDURES

The following procedures provide information required to verify the performance of the transceiver to the manufacturers' specifications. Applicable portions of the procedures should be performed if frequency or RF power output controlling parts have been repaired or replaced.

All test equipment should be checked for accuracy against approved standards, (National Bureau of Standards).

TEST EQUIPMENT REQUIRED

(Or Equivalent)

* RF Wattmeter with 50 watt load, Bird Model 50
* VTVM, Hewlett Packard Model 410B
* Oscilloscope, Tektronix Model 545 or modulation monitor, Heath Model 610
* RF Signal Generator, Standard Model, Measurements Corp., Model 80 or Hewlett Packard Model 609
* Frequency Counter, Systron Donner Model 7015
* Audio Generator, Hewlett Packard Model 200AB
* RMS Volt/Wattmeter, EICO Model 260
* DC Power Supply, 13.6VDC, 2 Ampere regulated
* Spectrum Analyzer, Hewlett Packard Model 141T, 8554L/8552A
* VHF Counter Pre Amplifier, Pagel Electronics
* Millivoltmeter, Ballantine Model 300D
* Distortion Analyzer, Hewlett Packard Model 330B

WARNING

PERSONNEL POSSESSING A FIRST OR SECOND CLASS RADIO TELEPHONE OPERATOR'S LICENSE ONLY ARE ALLOWED TO PERFORM ADJUSTMENTS IN THE TRANSMITTING SECTION OF THIS TRANSCEIVER.

All internal controls are designed to ensure permanence of adjustment and should not be disturbed unless it is positive that readjustments are necessary. The location of all test and adjustment points are shown in Figure 9.

Details on how to connect and disconnect the test equipment are not always given, however, always turn the power OFF before replacing crystals or removing and replacing component parts.

NOMINAL SPECIFICATIONS

GENERAL

* Transistors - 25
* Diodes - 16
* Electronic Switching
* Self-contained Speaker - 6" x 2" with 8 ohm voice coil
* Dynamic Microphone - with Press-to-Talk switch
* Illuminated Channel Indicator and "S"/RF power meter
* Twenty three Channel Selector with P.A. position
* Modulation Indicator
* Volume and Squelch controls
* Power On/Off switch
* Regulated AC power supply
* Delta Tuning switch
* Automatic Noise Limiter switch
* External Speaker and P.A. jacks
* Operates from 13.8V DC or 117V AC. 50/60 Hz (Positive or Negative ground).
* Coaxial Antenna Connector - 50 ohms impedance
* DX/Local switch
* Under dash mounting bracket for mobile installation

RECEIVER SECTION

* Frequency Range	26.965 to 27.255 MHz
* Sensitivity	0.3uV for 10db S/N at 1 KHz at 30% Mod.
* Selectivity	BW 6KHz min. at 6db down.
* Adj. Channel Rejection	45db average
* Audio Distortion at 1KHz	Less than 10% at 3W
* Spurious Response	-50db
* Cross Modulation Rejection	Better than 40db
* Intermodulation Rejection	Better than 50db
* Readability	0.07uV at 85% Mod.
* Squelch Sensitivity	0.1uV
* Squelch Stop Sensitivity	30uV (adjustable)
* Noise Limiter	Series gate

TRANSMITTER SECTION

* Frequency Range	26.965 to 27.255 MHz
* Power Input at 13.8V DC	5 watts
* Power Output at 13.8V DC	3 watts
* Modulation (5mV at microphone)	100%
* Emission (Class D operation)	6A3
* Hum and Noise	40db down
* Frequency Tolerance	±.005%
* Antenna Impedance	50 ohms
* Switching	Electronic
* Modulation Distortion	Less than 15% at 85% modulation at 1KHz

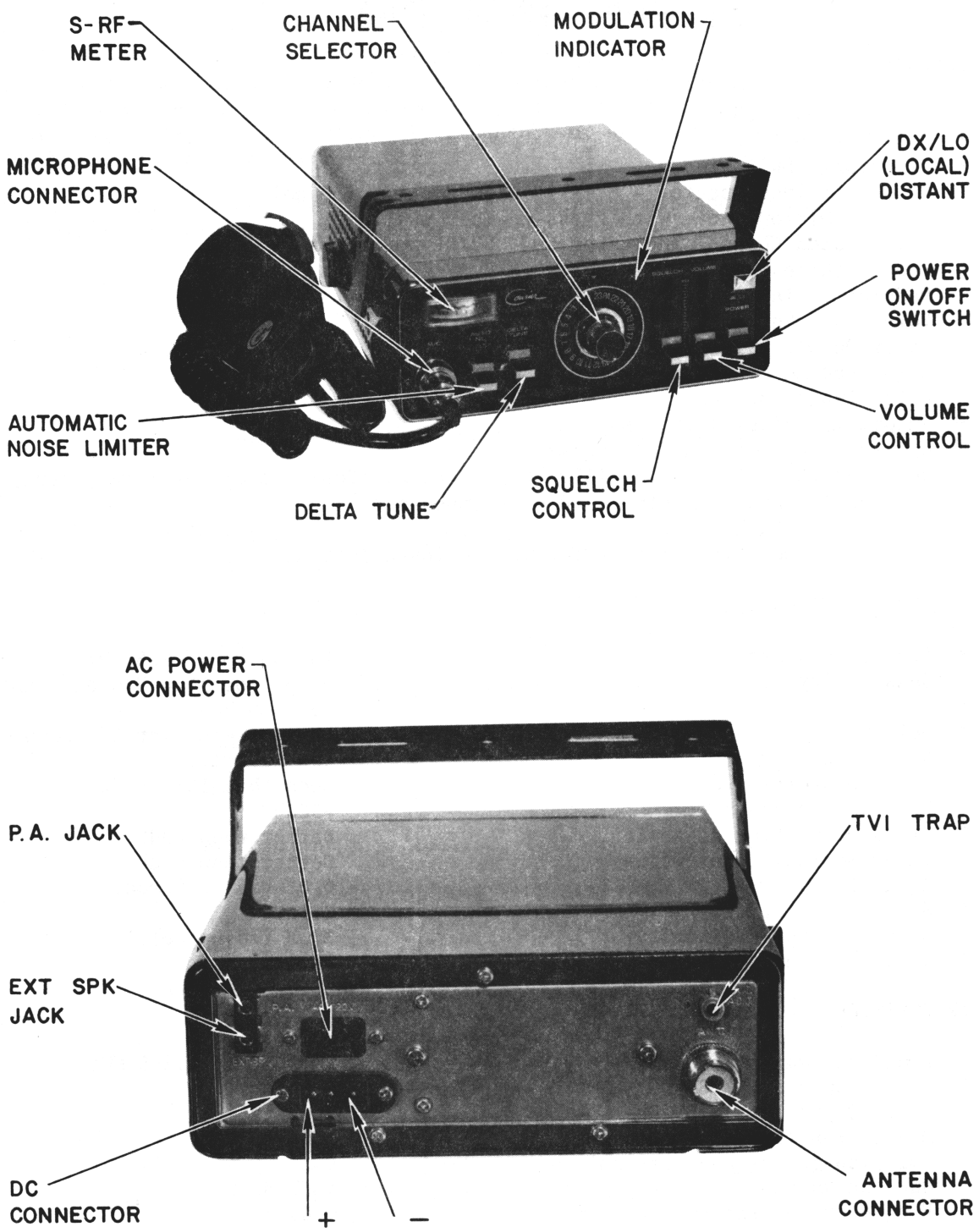

FIGURE 1, FRONT AND REAR PANEL CONTROLS, INDICATORS AND CONNECTORS

1. PRELIMINARY

A. Regulated Power Supply Adjustment

1) Remove three screws from the rear of the case and slide the front panel and circuit board forward. Place the unit on a shop towel or other padded surface to protect the printed circuit board.

2) Set the transceiver front panel controls as follows:

Power On/Off Switch	to	OFF
Channel Selector	to	CH 13
LO/DX Selector	to	DX
Volume Control	to	Up position
Squelch Control	to	Up position
Delta Tune	to	Zero Position
Auto NL	to	OFF

3) Insert the AC power cord connector into the AC receptacle on the rear of the chassis and connect to a 117V AC, 60 Hz power outlet.

4) Connect a VTVM negative lead to the speaker ground connection (black wire) and the positive lead to the TOP terminal of the POWER On/Off switch.

5) Turn the POWER switch to ON and adjust R728 to obtain 13.8 ±0.2 volts. R728 may be adjusted from the bottom of the circuit board with an insulated screw driver.

B. Power Source

The transceiver may be operated from either 117 VAC or from 13.8 VDC. For testing convenience 117 VAC is used for the following procedures. However, the unit should be tested for proper operation using 13.8 VDC after repair or adjustments have been completed.

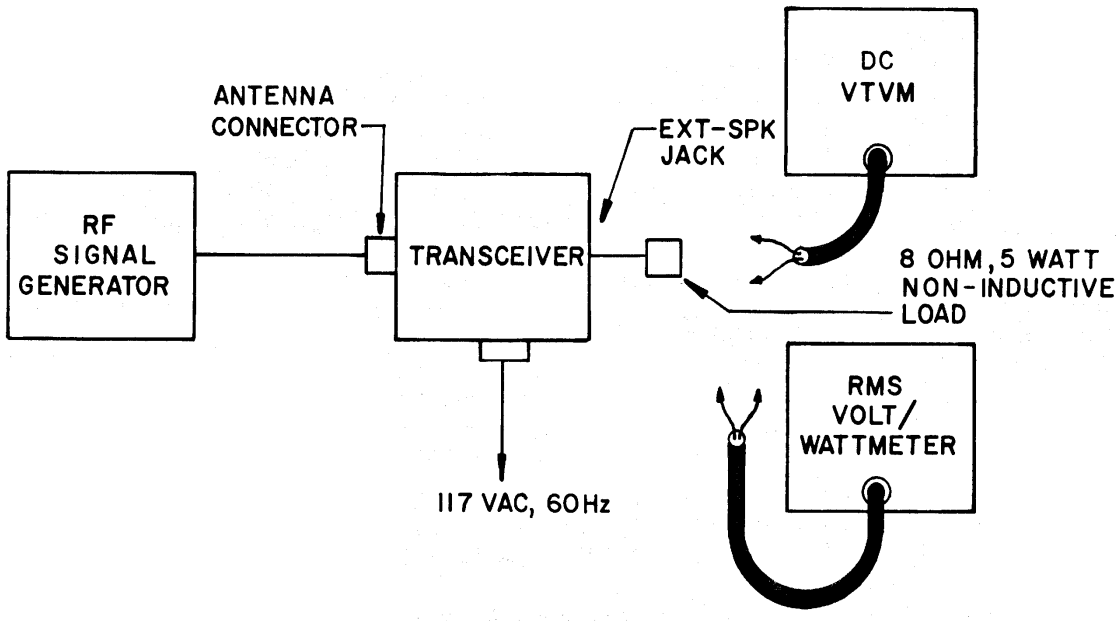

FIGURE 2, TEST SETUP FOR RECEIVER ALIGNMENT

2. Receiver Section Alignment and Tests

A. Connect the transceiver to the test equipment as shown in Figure 1. Adjust the transceiver front panel controls as follows:

Power Switch	to	ON
Channel Selector	to	Channel 13
LO/DX Switch	to	DX
Volume Control	to	Full Up position
Squelch Control	to	Full Up position
Auto NL	to	OFF
Delta Tune	to	Center position

B. AGC Voltage Adjustment

1) Set the RF signal generator frequency to 27.115 MHz and modulate 30% with a 1 KHz audio signal. SET THE RF OUTPUT TO ZERO.

2) Connect a DC VTVM to the base of Q302 and adjust R305 to obtain a reading of 2.0 volts. Be sure there is no signal at the antenna.

C. Synthesizer Frequency Measurements

1) 23 MHz Oscillator Adjustment and Frequency Measurement

a. Connect a DC VTVM to the base terminal of Q901 and observe a reading on the VTVM. Adjust L901 CLOCKWISE until the oscillation stops (VTVM reading approaches ZERO).

b. Adjust the core of L901 COUNTER CLOCKWISE until oscillation starts again and continue turning ONE FULL TURN MORE.

c. Connect a frequency counter to the base terminal of Q102. Set the RF signal generator output to ZERO.

d. Measure the frequency of X4 (23.440 MHz crystal). Allow time for the frequency counter to make a regular count.

e. Frequency should be 23.440 MHz ± .002% (±500 Hz). If the frequency is out of tolerance, adjust L901 ± 1/2 turn to correct for the out of tolerance. If the frequency is still out of tolerance, readjust L901 to its original setting and replace the crystal with a new crystal and measure the frequency.

f. Rotate the channel selector to the other channels (1, 5, 9, 17, 21) and measure the frequency of the other 5 crystals. Frequency of each should be ±500 Hz of their assigned frequency. Replace all defective crystals and measure the frequency.

2) 11.730 MHz Oscillator Frequency Measurement

a. Remove crystal X4 and set the channel selector to channel 13. Connect the frequency counter to the base of Q301. Set the DELTA/TUNE switch to the center position.

b. The frequency of X11 should be 11.730 MHz ± .002% (±300 Hz). Replace if defective and measure the frequency.

2. Receiver Section Alignment and Test (Continued)

D. Alignment of RF Coils and Transformers

1) Disconnect the VTVM from the base of Q302. Connect an RMS VTVM across the 8 ohm audio output load. Adjust the RF signal generator output to obtain 0.5 volts on the RMS VTVM.

2) Adjust L101, T301, T302, T304, T305 and T306 for maximum reading on the RMS VTVM.

Note: As the coils are adjusted the RMS VTVM reading should increase. Therefore, as the adjustments are made reduce the RF signal generator output to maintain the minimum useful signal on the RMS VTVM, 0.5 volts or less. Repeat the adjustment several times to obtain the maximum output.

3) After the above coils and transformers have been peaked for maximum sensitivity, adjust L901, L902, L903 and L904 for maximum reading on the RMS VTVM.

E. Sensitivity Measurements

1) DX Sensitivity

a. Set the transceiver front panel controls as follows:

Volume Control	to	Full Up position
Squelch Control	to	Full Up position (Minimum)
Channel Selector	to	Ch 13
Delta Tune	to	Center position
Auto NL	to	ON
DX/LO Selector	to	DX
Power Switch	to	ON

b. Connect an RMS VTVM across the 8 ohm audio load and adjust the RF signal generator to 27.115 MHz, modulate 30% with a 1 KHz audio signal.

c. Adjust the RF signal generator output to obtain 2.0 volts, (500 mW) on the RMS VTVM. The RF signal generator output should be o.5 uV (Odb) or less.

2) LO Sensitivity

Set the DX/LO selector to the LO position and increase the RF signal generator output to obtain 2.0 volt (500 mW) on the RMS VTVM. The signal generator output should read approximately 50 uV (+40 db).

F. S/RF Meter Calibration

1) Maintain the test setup as in Step 2D1). Adjust the RF signal generator output to 100 uV (46 db).

2) Observe the S/RF meter and adjust R518 to obtain a reading of 9 on the meter.

G. DELTA TUNE Frequency Measurement

1. Maintain the test setup as in Step 2D. Set the DX/LO Selector to DX. Adjust the signal generator output to obtain 1.0 volt on the RMS VTVM. Vary the signal generator frequency for maximum output on the VTVM. RECORD THE FREQUENCY.

2. Set the DELTA TUNE selector to the (+) position (UP), Carefully adjust the signal generator frequency for maximum reading on the RMS VTVM. RECORD THE FREQUENCY.

3. The difference in the frequency recorded in Step G1 and Step G2 should be approximately 1.2 KHz.

4. Readjust the DELTA TUNE selector to the CENTER position and adjust the signal generator frequency for maximum output. Frequency should be the same as recorded in Step G1).

5. Set the DELTA TUNE selector to the (-) position (DOWN). Carefully adjust the signal generator frequency for maximum reading on the RMS VTVM.

6. The difference in the frequency readings obtained in Steps G4 and G5 should be approximately 1.2 KHz.

H. Squelch Adjustments

1. Set the SQUELCH CONTROL to the MINIMUM (UP) position, the DX/LO SELECTOR to DX, and the AUTO/NL to ON.

2. Connect the signal generator to the antenna connector and adjust the frequency to 27.115 MHz. Modulate 30% with a 1KHz audio signal. Set the output voltage to 1uV (6db).

3. Connect an RMS VTVM across the 8 ohm audio load. Adjust the transceiver VOLUME CONTROL to obtain 2 volts on the RMS VTVM.

4. Readjust the SQUELCH CONTROL to MAXIMUM (DOWN) position. DO NOT CHANGE THE VOLUME CONTROL SETTING.

5. Reset the signal generator output voltage to 1000uV (60db).

6. Adjust R508 to OPEN the squelch, (obtain 2 volts on the VTVM).

7. Disconnect the signal generator from the antenna connector and remove the miniature phone plug from the EXT SPK jack.

8. Turn the VOLUME CONTROL to maximum (UP) and adjust the SQUELCH CONTROL from minimum (UP) position to a point where the noise stops.

9. Reconnect the signal generator to the antenna connector and increase the the generator output to the point where the audio signal is heard in the transceiver speaker. The signal generator output voltage should be approximately 0.2 to 0.4μV (-6db).

I. Audio Output Measurement

1) Connect an RMS VTVM and a distortion analyzer across the 8 ohm audio load. Adjust the RF signal generator to 27.115 MHz and modulate 30% with a 1 KHz audio signal.

2) Set the transceiver front panel controls as follows:

Volume Control	to	Full Up position
Squelch Control	to	Full Up position
DX/LO	to	DX
Delta Tune	to	Center position
Auto NL	to	OFF
Channel Selector	to	13
Power Switch	to	ON

3) Adjust the RF signal generator output to obtain 4.9 volts (3.0 watts) on the RMS VTVM. The distortion analyzer should indicate a maximum of 10% distortion.

3. Transmitter Section Alignment and Tests

PERSONNEL POSSESSING A FIRST OR SECOND CLASS RADIO TELEPHONE OPERATOR'S LICENSE ONLY ARE ALLOWED TO PERFORM ADJUSTMENTS IN THE TRANSMITTING SECTION ON THIS TRANSCEIVER.

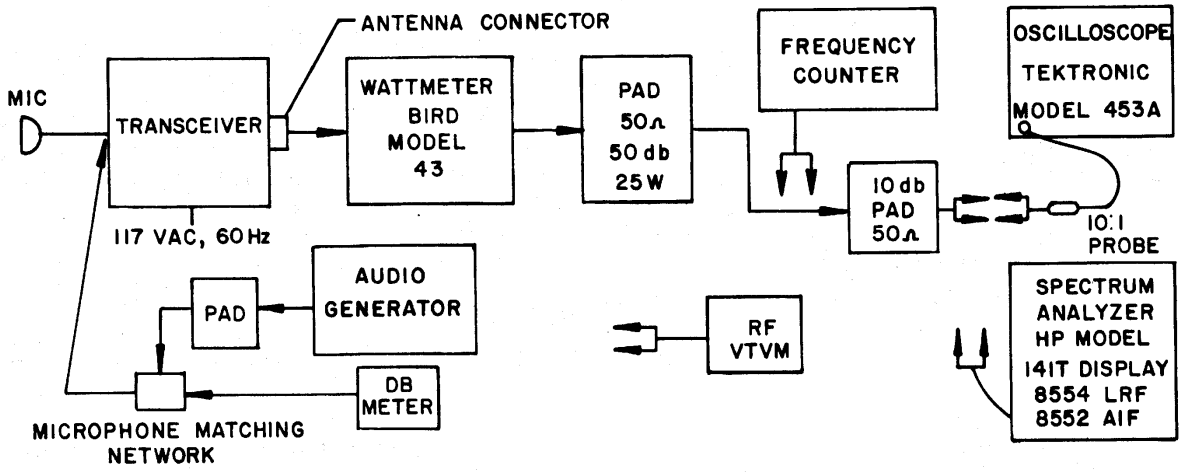

FIGURE 3, TEST SETUP FOR TRANSMITTER ALIGNMENT

3. Transmitter Section Alignment and Tests (Continued)

A. Preliminary

1) Remove the case from the transceiver and connect the AC power cord to the power connector on the rear panel. Connect the test equipment as shown in the Test Equipment Setup Diagram.

2) Set the transceiver front panel controls as follows:

Volume Control	to	Center position
Squelch Control	to	Full down position (Squelch)
Power Switch	to	ON
Channel Selector	to	Channel 13
Delta Tune	to	Center position

3) Connect the AC power plug into a 117 VAC, 60 Hz power source and measure the DC voltage at the power On/Off Switch. Adjust R728 if necessary, to obtain 13.8 VDC ±.2 volts.

B. Synthesizer Frequency Measurements

1) Perform procedure given in Section I, Step 2C for the adjustment of L901 and the frequency measurements of X1, X2, X3, X4, X5, and X6.

2) 14 MHz Oscillator Frequency Measurements

a. Remove crystal X4 from its socket. Connect a frequency counter to the base terminal of Q902.

b. Key the transmitter and measure the frequency of X7 (14.950 MHz) Be sure the channel selector is set to channel 13.

c. Allow time for the frequency counter to make a regular count. The frequency of X7 should be 14.950 MHz ± .002% (±300 Hz).

d. Rotate the channel selector to channels 14, 15 and 16 and measure the frequency at each position for crystals X8, X9 and X10. Frequency of each crystal should be .002% (±300 Hz) of their assigned frequency. REPLACE ALL DEFECTIVE CRYSTALS and measure the frequency of each replaced crystal.

3) 11.275 MHz Oscillator Frequency Measurement

a. Remove crystal X7 from its socket and set the channel selector to channel 13. Connect a frequency counter to the base terminal of Q906.

b. Key the transmitter and measure the frequency of X12. Frequency should be 11.275 MHz ± .002% (±300 Hz). REPLACE WITH A NEW CRYSTAL AND MEASURE THE FREQUENCY if defective.

3. Transmitter Section Alignment and Tests (Continued)

B. Synthesizer Frequency Measurements

4) Channel Frequency Measurement

a. Install crystals X4 and X7. Connect the frequency counter to the base terminal of Q906. Rotate the channel selector through channel 1 through 23. Key the transmitter at each channel and allow the frequency counter to make a regular count.

b. Each channel frequency MUST be ±.005% (±1000 Hz) of their assigned frequency as shown below

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	26.965000 MHz	9	27.065000 MHz	17	27.165000 MHz
2	26.975000 "	10	27.075000 "	18	27.175000 "
3	26.985000 "	11	27.085000 "	19	27.185000 "
4	27.005000 "	12	27.105000 "	20	27.205000 "
5	27.015000 "	13	27.115000 "	21	27.215000 "
6	27.025000 "	14	27.125000 "	22	27.225000 "
7	27.035000 "	15	27.135000 "	23	27.255000 "
8	27.055000 "	16	27.155000 "		

C. RF Coils and Transformer Adjustments

1) Set the CHANNEL SELECTOR to channel 13 and connect an RMS VTVM to the base of Q909 power amplifier. Key the transmitter, do not talk into the microphone

2) Adjust L905, L906, L907 and L908 for maximum voltage reading on the meter. Repeat the above adjustment for maximum voltage indication.

D. Unmodulated RF Power Output Measurement

Set the CHANNEL SELECTOR to channel 13 and key the transmitter, do not talk into the microphone. Observe the RF wattmeter and adjust L910, L912 and L913 for maximum RF power output. The RF output reading on the RF wattmeter should be 3 to 4 watts maximum. If more than 4 watts is indicated, adjust L913 to obtain a maximum of 4 watts.

E. Modulated Power Output

1) Connect the audio signal generator to pin 2 of the microphone connector through a matching network as shown on the Test Setup Diagram. Set the frequency to 1 KHz and the output to zero.

2) Connect an oscilloscope to the 10 db, 50 ohm pad as shown in the Test Setup Diagram. Key the transmitter, do not talk into the microphone, and obtain a carrier wave pattern as shown in Fig. 4, Pg. 15.

E. Modulated Power Output (Continued)

3) While keying the transmitter, adjust the audio generator output to obtain 50% modulated carrier as shown on the diagram below.

4) Increase the audio generator input 16 db. Observe the modulated carrier and adjust R523 to obtain a maximum of 95% modulation.

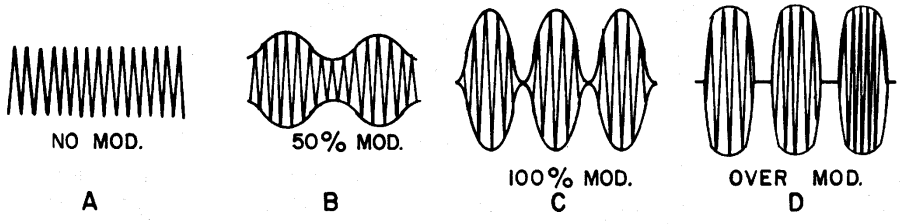

FIGURE 4, MODULATION WAVE PATTERNS

F. Harmonic Suppression Observation

1) Connect an audio signal generator to the Mic Jack, terminal #2 through a matching network as shown on the Test Setup Diagram, and set the frequency to 1 KHz and the output to zero.

2) Connect an oscilloscope to the 10 db, 50 ohm pad as shown in the Test Setup Diagram. Key the transmitter, do not talk into the microphone, and obtain a carrier wave pattern as shown on Figure 4.

3) While keying the transmitter, adjust the audio generator output to obtain a 50% modulated carrier.

4) Readjust the audio generator frequency to 2500 Hz and increase the audio generator output 16 db.

5) Disconnect the oscilloscope and connect a spectrum analyzer to the 10 db pad.

6) Key the transmitter and adjust the TVI trap (L914) for minimum indication of the (54 MHz) signal. All harmonics up to 270 MHz and below 27 MHz should be 50 db or more below the carrier fundamental, as shown in Figure 5.

G. "S"/RF Meter Adjustment

1) Press the transmit switch (do not talk into the microphone) and observe a reading on the wattmeter.

2) Adjust R517, if necessary, to make the meter read the same wattage as the wattmeter.

Upon completion of all test and adjustments, reseal the RF coils with coil wax and reassemble the cabinet and check harmonics again as in Step 3F.

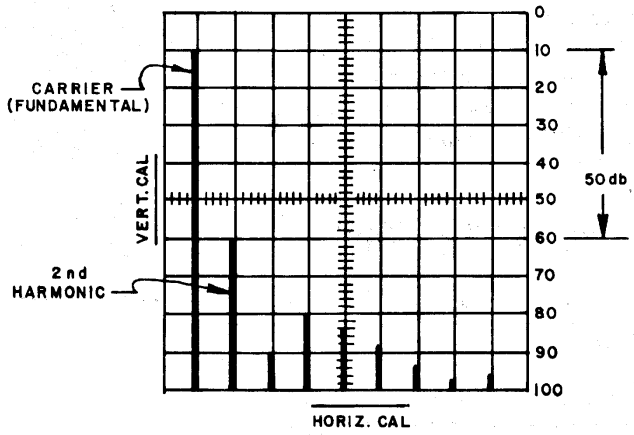

FIGURE 5, HARMONICS FREQUENCY PATTERNS