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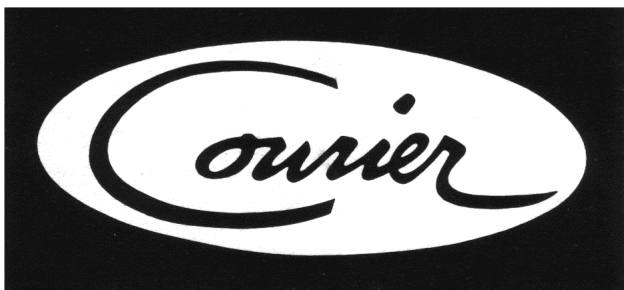
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Service Manual

GLADIATOR

23 CHANNEL CB TRANSCEIVER

AM-SINGLE SIDE BAND



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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INTRODUCTION

This service manual, together with the owner's instruction manual, provides a complete set of instructions necessary to install, operate and service the Gladiator Citizens Band 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 to the Gladiator, please read the warranty printed on the back of this manual, under which the Gladiator is warranted.

SERVICE AND FACTORY MAINTENANCE

Should the Gladiator require Factory Service, write or call the FANON/COURIER Service Department, 990 South Fair Oaks Avenue, Pasadena, California 91105 and request a 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 you in the Return Authorization Form.

GENERAL DESCRIPTION

The Courier Gladiator is an AM Single Side Band radio receiver and transmitter, designed to operate in the 26 to 27 MHz Citizens Band. The set operates from 13.8 VDC for mobile operation.

RECEIVER

The receiver section is a double conversion superhetrodyne type with adjustable squelch, a single side band clarifier, a variable range control and a volume control.

TRANSMITTER

The transmitter section utilizes three crystal controlled oscillators to produce the 23 Citizens Band channel frequencies and their upper and lower side bands, a total of 69 channels. The power output stage is a high gain RF power transistor, conservatively rated to produce the 5 watt input and 15 watt input PEP (peak envelope power) on SSB (single side band) operation.

GENERAL NOMINAL SPECIFICATIONS

Frequency Range-
23 Channels, 26.965 through
27.255 MHz, Crystal Controlled,
AM, Upper and Lower Side bands.

Frequency Control-
Crystal controlled Synthesizer
Technique

Frequency Tolerance-
Channel Frequency \pm 500 Hz.

Frequency Stability
0.005% from -30° C to 50° C.

Operating Temperature-
 -20° C to $+50^{\circ}$ C.

Primary Power (Input Voltage)
13.8V DC (EIA Standard).

Antenna-
50 Ohm (unbalanced)

Dimensions-
H = 3"; W = 10-9/16";
L = 11-3/4".

Weight-
9 Lbs, 7 Oz.

RECEIVER SECTION NOMINAL SPECIFICATIONS

Sensitivity-
AM = Less than 0.25uV
for 10db $\frac{S + N}{N}$
SSB = Less than 0.15uV
for 10db $\frac{S + N}{N}$

Selectivity-
AM = \pm 3KHz at 6db
SSB = \pm 2.1KHz at 6db.

Spurious Rejection-
More than 60db.

1st IF Frequency-
AM & SSB = 7.8MHz

2nd IF Frequency-
AM = 455KHz.

Clarifier Range-
 \pm 600Hz.

Audio Output-
6 Watts.

Squelch Range-
AM & SSB adjustable from
0.15uV to 500uV

TRANSMITTER SECTION NOMINAL SPECIFICATIONS

Input Power-
AM = 5 Watts
SSB = 15 Watts PEP.

Output Power-
AM = 3.5 Watts
SSB = 10 Watts PEP.

Modulation Capability-
100%.

Frequency Response-
400 Hz to 3 KHz at 3 db.

Spurious Harmonic Suppression-
60 db Minimum.

SSB Filter-
Crystal Lattice Type 7.8 KHz
2.1 KHz at 6 db; 5.5 KHz at 60 db.

Output Impedance-
50 Ohms Unbalanced.

SERVICE INSTRUCTIONS

The Gladiator transceiver contains many new circuits not usually found in Citizens Band radio transceivers. Therefore, service personnel should thoroughly familiarize themselves with the theory and operation of SSB radio reception and transmission before attempting to service the Gladiator.

Study the Gladiator owners manual, the schematic, the functional block diagrams and other illustrations found in this manual before making any repairs or adjustments.

The transceiver has been very carefully adjusted, aligned and tested at the factory with precision test equipment, therefore, do not make any unnecessary adjustments to the internal potentiometers, coils or transformers. Adjustments should be made ONLY when associated parts have been replaced due to failure.

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 best temperature, vibration and other characteristics.

When ordering replacement parts, refer to the Replacement Parts List in this manual. Give a brief description of the part and the Courier part number.

VERIFICATION TEST

The following tests are designed to verify the performance of the transceiver to the manufacturer's specifications after Service has been performed requiring the replacement of parts, repair of malfunctioning components or adjustment.

The tests are based upon the use of test equipment, whose accuracy has been checked against approved standards (National Bureau of Standards) for frequency and stability.

Service personnel must have a First or Second Class Radio Telephone Operator's License before making any adjustments in the transmitter section of the transceiver.

Details on connecting and disconnecting test equipment are not always mentioned, however, ALWAYS TURN THE POWER OFF before connecting or disconnecting equipment.

Before adjusting RF coils, warm the wax with a small soldering iron. Touch the center of the cores, not the windings.

TEST EQUIPMENT REQUIREMENTS

The following items of test equipment, or EQUIVALENT, are required to properly service the GLADIATOR TRANSCEIVER. The signal generators used should be checked against secondary standards which meet the National Bureau of Standards for accuracy and stability.

EQUIPMENT LIST

- * Wattmeter, Bird Model 43.
- * Wattmeter/DB Meter, EICO Model 261.
- * Regulated Power Supply, 0-16V DC, 5 Ampere.
- * Spectrum Analyzer, Hewlett Packard Model 8554/8552A.
- * Millivolt Meter, Ballantine Model 300D.
- * RF Signal Generator, Meguro Model MS6-2285
- * Frequency Counter, Systron/Donner Model 7015.
- * Oscilloscope, Tektronix Model 453A.
- * (2) Audio Signal Generators, EICO Model 378.
- * AC Voltmeter, Hewlett Packard Model 410B.
- * DC Voltmeter, Simpson Model 260.
- * Decade Attenuator, General Radio Model 1450-TB.
- * Coaxial T Connector, Hewlett Packard Model 11042A.
- * Load, 50 ohms, Non-Inductive.
- * Load, 8 ohms, Non-Inductive.
- * VHF Signal Generator, H. Packard 608E.

TROUBLESHOOTING CHART

| TROUBLE | PROBABLE CAUSE |
|---|---|
| 1. Unit dead - Indicator lights will not glow when power switch is on. | <ul style="list-style-type: none"> a. Defective power source. b. Fuse blown. c. POWER switch defective. d. L19, CH (power choke) open |
| 2. Fuse blows after replacement. | <ul style="list-style-type: none"> a. Power source polarity reversed. b. TR27, TR28, D64 or C212 shorted. |
| 3. No audio when in the AM Mode, S Meter indicates reception of signals. Carrier is modulated when transmitting. | <ul style="list-style-type: none"> a. D27, VR5, TR9 or C86 defective. b. Speaker defective (open or shorted voice coil). c. PA/CB switch sections S4-2 or S4-3 defective. d. Volume control VR16 defective. |
| 4. No audio when in the SSB Mode. - S Meter indicates reception of signals. - Carrier is modulated when transmitting. | <ul style="list-style-type: none"> a. TR8, D18, D19 or C81 defective. b. PA/CB switch section S4-3 defective. |
| 5. Poor reception when in the AM Mode. | <ul style="list-style-type: none"> a. Antenna connection defective. b. C1, C2 or D1 shorted. c. TR1 or TR6 low gain or defective. d. Crystal X15 or Channel switch defective. e. Poor RF or IF alignment. |
| 6. Very low background noise. - Transmitter operates normally. | <ul style="list-style-type: none"> a. Channel Selector switch defective or has dirty contacts. b. Low power supply voltage, less than 10 volts. c. Squelch circuit defective (TR18, TR19, VR10, C118 or D32). d. AGC circuit defective (TR20, D23, C120 or VR3). e. Partially shorted speaker. f. Low power supply voltage, less than 10 volts. |
| 7. Very low background noise. - Low transmit power. | <ul style="list-style-type: none"> a. Antenna system defective, high SWR. b. Power source voltage low, less than 10 volts. c. Crystal synthesizer component defective (C28, D3, D4, D5, D6, TR2, TR3, TR4 or TR5). |

TROUBLESHOOTING CHART

| TROUBLE | PROBABLE CAUSE |
|---|--|
| 8. Squelch function inoperative. - AM receiver does not silence. | a. TR18, TR19, VR10, C118, D32, C100 or C101 defective open circuit. |
| 9. Squelch function inoperative. - AM receiver will not awaken. | a. TR18, TR19, VR10, C118, D32, C100 or C101 shorted. |
| 10. Transmitter does not operate. - Receiver functions normally. - Failure in AM/Mode and SSB/Mode. | a. Microphone transmit switch defective. b. Relay K1 sections 2, 3 or 4 defective. c. Microphone cord defective. |
| 11. Transmitter does not operate. - Failure in SSB Mode only. | a. Crystal oscillators X16 or X17 defective. b. TR1, TR2, D48, D49, D50, D51, VR13, CT19, TR23 or TR24 defective. |
| 12. Receiver does not operate. - Failure in SSB Mode only. | a. D10, D11, D14, D15, IC1, TR8, D18, D19, D20 or D21 defective (open). |
| 13. Noise Blanker does not function. | a. TR7, or C58 defective. b. D7, D8, D9, or C62 defective (shorted). c. Blanker switch S3 defective. |

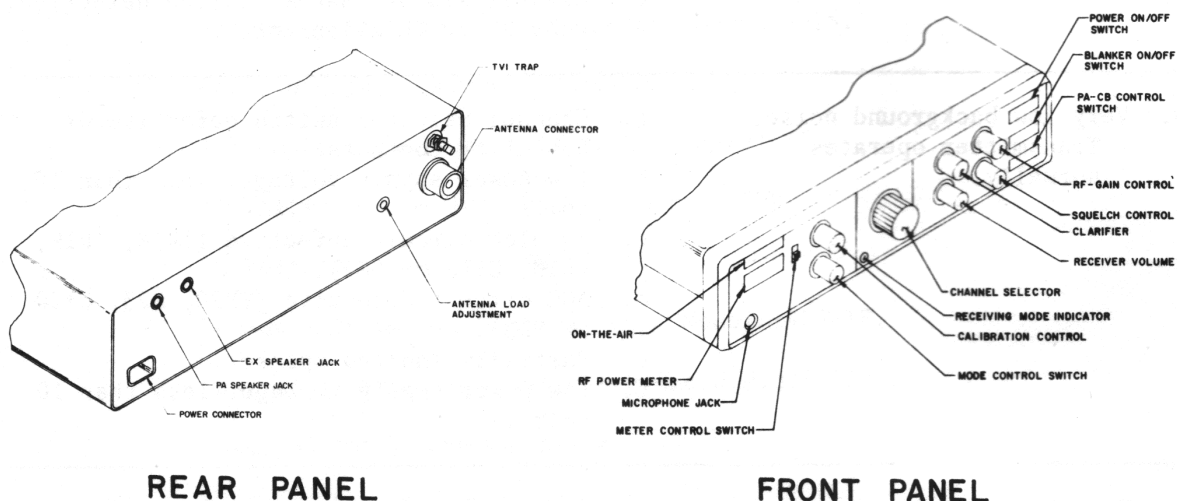


FIGURE I, CONTROLS AND INDICATORS

RECEIVER SECTION VERIFICATION TESTS

CAUTION: TRIMMER CAPACITORS SHOULD NOT REQUIRE ADJUSTMENT UNLESS A CRYSTAL, TRANSISTOR, COIL OR OTHER FREQUENCY CONTROLLING COMPONENT HAS BEEN REPLACED.

1. SYNTHESIZER (see figure 2)

A. Eleven MHz Frequency Measurement.

- 1) Remove the top cover ONLY from the transceiver.
- 2) Connect a DC power supply to the power cord, red lead (+) and black lead (-). Adjust the voltage to 13.8 ± 0.2 VDC. Be sure the transceiver power switch is in the OFF position before inserting the power plug into the connector on the rear panel.
- 3) Set the transceiver front panel controls as follows:

| | | |
|-----------|----|-----------------|
| CLARIFIER | to | Center position |
| MODE | to | AM |
| PA/CB | to | CB |
| CHANNEL | to | (see chart) |
| POWER | to | OFF |

- 4) Connect a calibrated frequency counter probe to TP2 and the ground to TP1. Turn the transceiver POWER switch ON.
- 5) Set the CHANNEL SELECTOR switch to the channels shown in the chart and observe the frequency on the frequency counter. The frequency for each channel should be within ± 25 Hz. Adjust the respective trimmer capacitor ONLY IF NECESSARY to correct for OUT OF TOLERANCE condition.

| CHANNEL SELECTOR | 11 MHz CRYSTAL | ADJUST TRIMMER | FREQUENCY IN MHz (± 25 Hz) |
|---------------------|-------------------|-------------------|------------------------------------|
| 1 | X1 | CT2 | 11.000 |
| 5 | X2 | CT3 | 11.050 |
| 9 | X3 | CT4 | 11.100 |
| 13 | X4 | CT5 | 11.150 |
| 17 | X5 | CT6 | 11.200 |
| 21 | X6 | CT7 | 11.250 |

B. USB, 8 MHz Frequency Measurement.

- 1) Turn the transceiver POWER to OFF.

- 2) Set the MODE switch to the USB position.
- 3) Connect the frequency counter probe to TP3 and the ground to TP1.
- 4) Turn the transceiver POWER to ON.
- 5) Set the CHANNEL SELECTOR switch to channels 1, 2, 3 and 4 and observe the reading on the frequency counter. The frequency should be within ± 5 Hz. Adjust the respective trimmer capacitor ONLY IF NECESSARY to correct for OUT OF TOLERANCE condition.

| CHANNEL SELECTOR | USB CRYSTAL | ADJUST TRIMMER | FREQUENCY IN MHz (± 5 Hz) |
|------------------|-------------|----------------|--------------------------------|
| 1 | X7 | CT8 | 8.166500 |
| 2 | X8 | CT9 | 8.176500 |
| 3 | X9 | CT10 | 8.186500 |
| 4 | X10 | CT11 | 8.206500 |

C. LSB, 8 MHz Frequency Measurement.

- 1) Turn the transceiver POWER to OFF.
- 2) Set the MODE switch to LSB.
- 3) Connect the frequency counter probe to TP3 and the ground to TP1.
- 4) Turn the transceiver POWER to ON.
- 5) Set the CHANNEL SELECTOR switch to channels 1, 2, 3 and 4 and observe the frequency on the counter. Frequency should be ± 5 Hz as shown in the chart below:

| CHANNEL SELECTOR | USB CRYSTAL | ADJUST TRIMMER | FREQUENCY IN MHz (± 5 Hz) |
|------------------|-------------|----------------|--------------------------------|
| 1 | X11 | CT12 | 8.163500 |
| 2 | X12 | CT13 | 8.173500 |
| 3 | X13 | CT14 | 8.183500 |
| 4 | X14 | CT15 | 8.203500 |

D. Mixer and Filter Coil Adjustments (see Figures 3 and 4)

- 1) Turn the transceiver POWER to OFF.
- 2) Connect an RF VTVM probe to TP4 and the ground to TP5. Set to a scale to read 500 mV at center scale.
- 3) Set the transceiver front panel controls as follows:

| | | |
|-----------|----|-----------------|
| CLARIFIER | to | Center position |
| MODE | to | AM |
| CHANNEL | to | 15 |
| POWER | to | ON |

- 4) Adjust T4, T5, T6, T7 and T8 for maximum reading on the VTVM. Voltage should be 290 mV to 330 mV.

E. USB (X16) and LSB (X17) Frequency Adjustments.

- 1) Turn the transceiver POWER to OFF.
- 2) Connect a frequency counter probe to TP8 and the ground to TP9.
- 3) Set the transceiver front panel controls as in step D3.
- 4) Observe the frequency reading on the counter. The frequency should be 7.7985 MHz $\pm 0/-5$ Hz. Adjust CT17 ONLY IF NECESSARY to bring the frequency into tolerance.
- 5) Change the MODE switch to LSB and observe 7.8015 MHz $\pm 0/-5$ Hz. Adjust CT18 ONLY IF NECESSARY to bring the frequency into tolerance.
- 6) Turn the transceiver POWER to OFF.
- 7) Connect an RF VTVM probe to TP8 and the ground to TP9. Set to read 500 mV at center scale.
- 8) Set the MODE switch to USB and turn the POWER to ON.
- 9) Adjust T16 for maximum reading on the VTVM. Reading should be approximately 300 mV.

F. AM 2nd Local Oscillator Adjustment

- 1) Turn the transceiver POWER to OFF.
- 2) Change the MODE switch to AM.
- 3) Connect a frequency counter probe to TP7 and the ground to TP9.
- 4) Turn the transceiver POWER to ON.
- 5) Observe 7.3435 MHz ± 5 Hz on the counter. Adjust CT16 ONLY IF NECESSARY to bring the frequency into tolerance.

The frequency Synthesizer circuit board contains 14 crystals and their associated circuit components which function in conjunction with 3 other crystal oscillator circuits located on the main circuit board (see Figure 4). These crystal controlled oscillators generate the 69 channel frequencies (23 AM, 23 USB and 23 LSB) used by the Gladiator transceiver. Therefore, it is of utmost importance that the circuits function properly. When transmitting or receiving, the set should TURN-ON instantly.

If the carrier fails to come on instantly when the transmit switch is pressed, or when changing channels there is no background noise on receive, there may be a problem in these circuits.

The following Frequency Synthesis Chart is provided to assist in the location of the trouble in the frequency generating circuits.

FREQUENCY SYNTHESIS CHART

[TP-2] [TP-4] [TP-8]

| CHANNEL FREQUENCY | F1 AM/SSB | F2 AM/USB-RT | F3 LSB-RT | F4 AM/USB-R | F5 LSB-R | F6 AM/USB-T | F7 LSB-T | F8 USB-RT | F9 LSB-RT |
|----------------------|--------------|-----------------|--------------|----------------|-------------|----------------|-------------|--------------|--------------|
| 26.965 MHz | 11.000MHz | 8.1665MHz | 8.1635MHz | 7.7985MHz | 7.8015MHz | 19.1665MHz | 19.1635MHz | 7.7985MHz | 7.8015MHz |
| 27.015 " | 11.050 " | " | " | " | " | 19.2135 " | 19.2135 " | " | " |
| 27.065 " | 11.100 " | " | " | " | " | 19.2665 " | 19.2635 " | " | " |
| 27.115 " | 11.150 " | " | " | " | " | 19.3165 " | 19.3135 " | " | " |
| 27.165 " | 11.200 " | " | " | " | " | 19.3665 " | 19.3635 " | " | " |
| 27.215 " | 11.250 " | " | " | " | " | 19.4165 " | 19.4135 " | " | " |
| 26.975 MHz | 11.000MHz | 8.1765MHz | 8.1735MHz | 7.7985MHz | 7.8015MHz | 19.1765MHz | 19.1735MHz | 7.7985MHz | 7.8015MHz |
| 27.025 " | 11.050 " | " | " | " | " | 19.2265 " | 19.2235 " | " | " |
| 27.075 " | 11.100 " | " | " | " | " | 19.2765 " | 19.2735 " | " | " |
| 27.125 " | 11.150 " | " | " | " | " | 19.3265 " | 19.3235 " | " | " |
| 27.175 " | 11.200 " | " | " | " | " | 19.3765 " | 19.3735 " | " | " |
| 27.225 " | 11.250 " | " | " | " | " | 19.4265 " | 19.4235 " | " | " |
| 26.985 MHz | 11.000MHz | 8.1865MHz | 8.1835MHz | 7.7985MHz | 7.8015MHz | 19.1865MHz | 19.1825MHz | 7.7985MHz | 7.8015MHz |
| 27.035 " | 11.050 " | " | " | " | " | 19.2365 " | 19.2335 " | " | " |
| 27.085 " | 11.100 " | " | " | " | " | 19.2865 " | 19.2835 " | " | " |
| 27.135 " | 11.150 " | " | " | " | " | 19.3365 " | 19.3335 " | " | " |
| 27.185 " | 11.200 " | " | " | " | " | 19.3765 " | 19.3735 " | " | " |
| 27.005 MHz | 11.000MHz | 8.2065MHz | 8.2035MHz | 7.7985MHz | 7.8015MHz | 19.2065MHz | 19.2035MHz | 7.7985MHz | 7.8015MHz |
| 27.055 " | 11.050 " | " | " | " | " | 19.2565 " | 19.2535 " | " | " |
| 27.105 " | 11.100 " | " | " | " | " | 19.3065 " | 19.3035 " | " | " |
| 27.155 " | 11.150 " | " | " | " | " | 19.3565 " | 19.3535 " | " | " |
| 27.205 " | 11.200 " | " | " | " | " | 19.4065 " | 19.4035 " | " | " |
| 27.255 " | 11.250 " | " | " | " | " | 19.4565 " | 19.4535 " | " | " |

AM = Amplitude Modulation of the normal CB channel.
 USB = Upper Side Band.
 LSB = Lower Side Band.
 R = Receiving Mode.
 T = Transmitting Mode.
 IF = Intermediate frequency.
 F1 = 11 MHz Crystal.
 F2 = 8 MHz Crystal (AM & USB).
 F3 = 8 MHz Crystal (LSB only).

DEFINITIONS
 F4 = 1st IF frequency (AM & USB).
 F5 = 1st IF frequency (LSB only).
 F6 = F1 + F2.
 F7 = F1 + F3.
 F8 = 7 MHz Crystal (USB).
 F9 = 7 MHz Crystal (LSB).
 TP2 = Synthesizer Test Point (11 MHz).
 TP4 = Synthesizer Test Point
 TP8 = Side Band Crystal Frequencies
 Test Point

The FREQUENCY SYNTHESIS CHART lists and identifies the various radio frequencies generated within the transceiver during the receiving and transmitting modes. These frequencies may be monitored from the test points shown at the top of the chart. The chart may be useful when troubleshooting the frequency generating circuits.

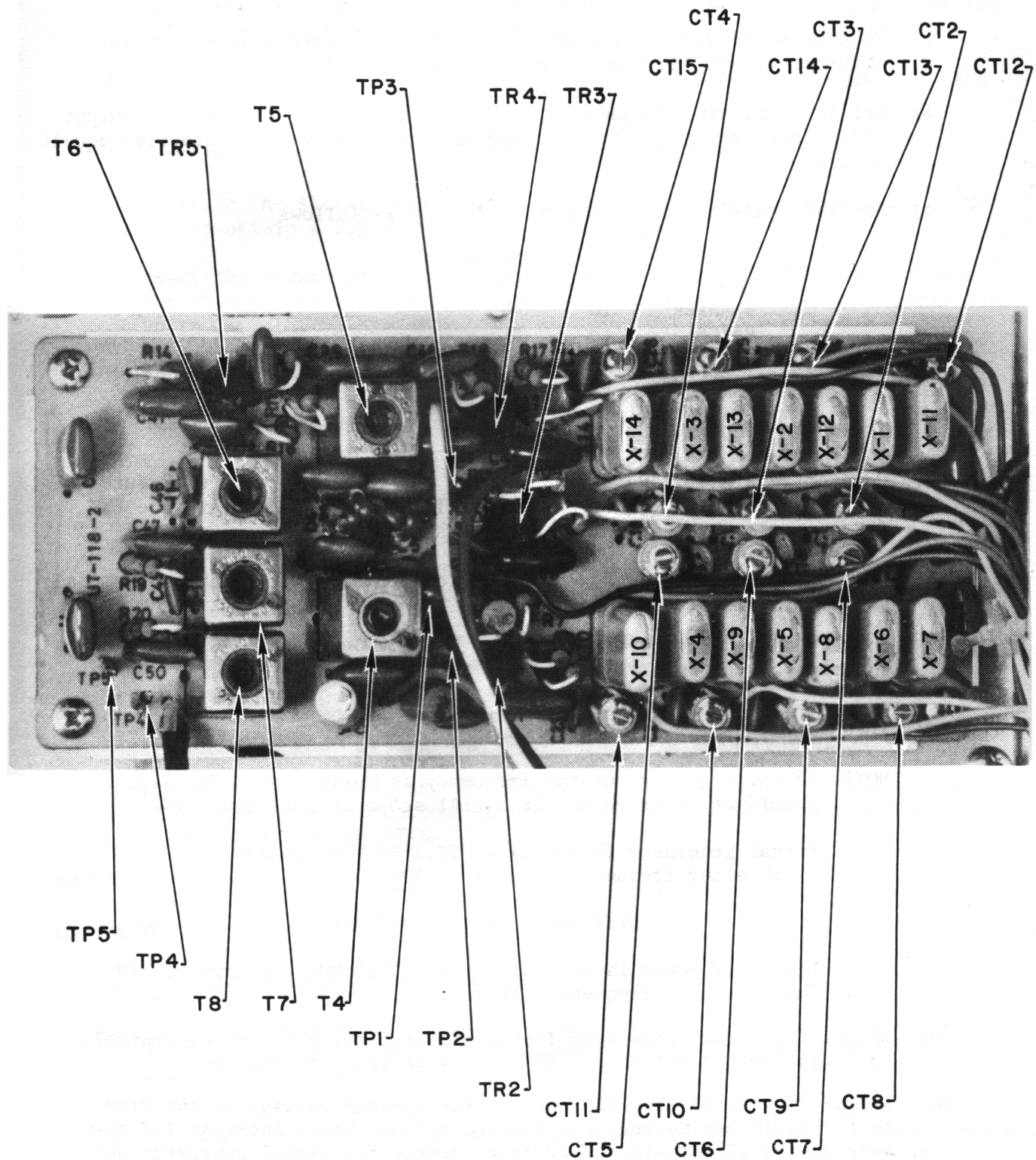


FIGURE 2, FREQUENCY SYNTHESIS CIRCUIT BOARD LAYOUT

2. RF COILS AND TRANSFORMERS

A. T1, T2, T3, T9, T10 and T11 Adjustments

- 1) Turn the transceiver POWER to OFF.
- 2) Connect an RF signal generator, with a 50 ohm impedance output to transceiver antenna connector on the rear panel.
- 3) Set the generator frequency to 27.115 MHz (channel 13) and the output to 0.5 microvolts (0 db). Throughout these tests 0.5 microvolts equals Zero db.
- 4) Set the transceiver front panel controls as follows:

| | | |
|-----------|----|-----------------|
| CHANNEL | to | Channel 13 |
| MODE | to | USB |
| BLANKER | to | ON |
| PA/CB | to | CB |
| CLARIFIER | to | Center position |
| SQUELCH | to | MINIMUM (CCW) |
| RF GAIN | to | MAXIMUM (CW) |
| VOLUME | to | MAXIMUM (CW) |

- 5) Connect an 8 ohm, 5 watt, load across the terminals of a miniature phone plug (Pomona Electronics Model 1285), and insert into the EXT SPK connector on the rear of the transceiver chassis.
- 6) Connect an AC VTVM across the 8 ohm load, probe to the center terminal, and set the meter scale to 2 volts.
- 7) Connect an oscilloscope to the same connections as the AC VTVM and set the controls to observe a 1 KHz, 2 volt, wave form.
- 8) Turn the transceiver POWER to ON.

NOTE: If the signal generator frequency is varied, an audio signal should be observed on the oscilloscope as analyzed below:

Signal generator frequency = 27.1150 MHz (channel 13)
Synthesizer frequency (TP2) = 19.3065 MHz

Difference = 7.7985 MHz

This difference is beat with the 7.7985 MHz USB crystal X10.
The resultant frequency, therefore is zero.

- 9) Adjust the signal generator frequency, with the fine tuning control, to 27.116 MHz to obtain a 1 KHz signal on the oscilloscope.
- 10) Adjust T1, T2, T3, T9, T10 and T11 for maximum voltage on the VTVM. As the coils are peaked, the voltage output should increase (if they were out of alignment). Therefore, reduce the signal generator output voltage to maintain a maximum of 2 volts on the VTVM.

- 11) Repeat step 10 several times until the optimum core positions are reached. After final adjustment the signal generator output should be very close to 0.2 microvolts (-8 db).

B. SSB Gain Adjustment

- 1) With test setup as in 2.A11), turn the BLANKER switch to ON, and set the signal generator output to 0.5 microvolts (0 db).
- 2) Adjust the transceiver VOLUME control to give a 2.0 volt reading on the VTVM.
- 3) Turn the RF gain control to the minimum (CCW) position.
- 4) Increase the signal generator output to 50 microvolts (40 db) and adjust VR7 to obtain a 2.0 volt reading on the VTVM.
- 5) Reset the signal generator output to 0.5 microvolts (0 db) and advance the VOLUME control to full CW position. Observe that the VTVM reads 2.0 volts.

C. AM 2nd IF Alignment

- 1) Set the transceiver controls as follows:

| | | |
|---------|----|---------------|
| BLANKER | to | ON |
| PA/CB | to | CB |
| MODE | to | AM |
| VOLUME | to | 1/4 CW |
| SQUELCH | to | MINIMUM (CCW) |
| POWER | to | ON |

- 2) Connect the VTVM across the 8 ohm load as in step 2.A6) and set to the 2 volt scale and set the signal generator as in 2.A3).
- 3) Adjust the signal generator to 27.115 MHz and modulate 30% with 1 KHz and adjust the output voltage to obtain a 1.0 volt reading on the VTVM.
- 4) Adjust T12, T13, T14, and T15 for maximum reading on the VTVM. Reduce the signal generator output as the coils are peaked to maintain a 1.0 volt reading on the VTVM.

3. SENSITIVITY

A. AM MODE

- 1) Turn the transceiver POWER to OFF.
- 2) Connect an RF signal generator (50 ohm impedance) to the transceiver antenna connector. Adjust the frequency to 27.115 MHz (channel 13), and set modulation to 30% at 1 KHz. Set the output voltage to 0.5 microvolts (0 db).
- 3) Terminate the EXT SPK output with an 8 ohm non-inductive load and connect across the load with an AC VTVM. Set the meter scale to read 3 volts full scale.

4) Set the transceiver front panel controls as follows:

| | | |
|---------|----|---------------|
| MODE | to | AM |
| BLANKER | to | ON |
| PA/CB | to | CB |
| SQUELCH | to | MINIMUM (CCW) |
| VOLUME | to | MAXIMUM (CW) |
| RF GAIN | to | MAXIMUM (CW) |
| POWER | to | ON |

- 5) Adjust the signal generator output voltage to obtain a 2.0 volt reading on the VTVM.
- 6) If the generator output voltage is greater than 0.5 microvolts (0db), adjust VR3 and VR5 to increase the sensitivity. Recheck the measurement after making the adjustments.

B. SSB MODE

- 1) Set the transceiver MODE switch to USB.
- 2) Adjust the signal generator frequency to 27.116 MHz (increase the frequency 1 KHz) and adjust the output voltage to obtain a 2.0 volt reading on the VTVM.
- 3) If the generator output voltage is greater than 0.25 microvolts (-6db), adjust VR1 to increase the sensitivity. Recheck the measurement after making the adjustment.
- 4) Set the MODE switch to LSB.
- 5) Adjust the signal generator frequency to 27.114 MHz (decrease the frequency 2 KHz, from previous setting).
- 6) Adjust the generator output voltage.
- 7) Adjust the signal generator frequency to 27.114 MHz (decrease the frequency 2 KHz, from previous setting).
- 8) Adjust the generator output voltage to obtain a 2.0 volt reading on the VTVM.
- 9) The signal generator output voltage should be 0.25 microvolts (-6db) or less. Recheck sensitivity measurement in step 3, above, and adjust VR1 to balance the USB and LSB measurements.

C. S-Meter Calibration

- 1) SSB Mode
 - a. Set the transceiver S-RF/CAL/SWR to S-RF position (up).
 - b. Adjust the signal generator output voltage to 150 microvolts (+50db).
 - c. Adjust VR11 to obtain a reading of 9 on the S-Meter scale.
- 2) AM Mode
 - a. Adjust the signal generator frequency to 27.115 MHz and the output voltage to 150 microvolts (+50db).

b. Adjust VR2 to obtain a reading of 9 on the S-Meter scale.

D. SSB Gain

- 1) Adjust the signal generator output to 0.5 microvolt (0 db).
- 2) Adjust the transceiver VOLUME control (front panel) to obtain 2.0 volts on the VTVM.
- 3) Turn the RF Gain control (front panel) to the minimum (CCW) position, the MODE switch to USB and the SQUELCH to minimum (CCW) positions.
- 4) Adjust the signal generator frequency to 27.116 MHz and the voltage output 50 microvolts.
- 5) Adjust VR7 to obtain a 2.0 volt reading on the VTVM.
- 6) Readjust the signal generator output to 0.5 microvolts (0 db).
- 7) Turn the RF Gain control full CW position and observe a reading of 2.0 volts on the VTVM.

4. SQUELCH ADJUSTMENT

A. SSB MODE

- 1) Test setup should be the same as in 3A. Connect the RF generator to the antenna connector and the AC VTVM to the 8 ohm load across the EXT SPK jack.
- 2) Turn the transceiver RF Gain control maximum (CW), the MODE switch to USB, the VOLUME control to full CCW, the SQUELCH to minimum (CCW) and the BLANKER to ON.
- 3) Adjust the signal generator output to 1.0 microvolt (6 db).
- 4) Turn the VOLUME control CW to obtain a 2.0 volt reading on the VTVM.
- 5) Turn the SQUELCH control maximum (CW) position.
- 6) Increase the signal generator output voltage to 500 microvolts (+60 db).
- 7) Adjust VR6 to open the squelch circuit and obtain a reading of 2.0 volts on the VTVM.
- 8) Disconnect the signal generator and remove the 8 ohm load from the EXT SPK jack. Turn the VOLUME control to maximum (CW) position.
- 9) Adjust the SQUELCH control to a point where the noise stops.

- 10) Reconnect the signal generator to the antenna connector, set the frequency to 27.116 MHz and modulate with 1 KHz at 30%. Adjust the voltage output to the point where the audio is heard again in the transceiver speaker. Signal generator output voltage should be approximately 0.15 microvolts (-10db), or less.

B. AM MODE

- 1) Set the MODE switch to the AM position, the SQUELCH control to the minimum (CCW) position and the RF Gain to the maximum (CW) position.
- 2) Adjust the signal generator frequency to 27.115 MHz, modulate 30% at 1 KHz and set the output voltage to 1.0 microvolt (6 db).
- 3) Adjust the transceiver VOLUME control to obtain 2.0 volts on the VTVM.
- 4) Adjust the SQUELCH control the maximum (CW) position.
- 5) Set the signal generator output to 500 microvolts (60db).
- 6) Adjust VR9 to the point where the VTVM reads 2.0 volts.
- 7) Disconnect the signal generator from the antenna connector, the 8 ohm load and VTVM from the EXT SPK jack.
- 8) Turn the VOLUME control to maximum (CW) position and adjust the SQUELCH control from the maximum (CW) position to a point where the noise stops.
- 9) Reconnect the signal generator and set the frequency to 27.115 MHz, modulate 30% at 1 KHz.
- 10) Adjust the signal generator output to the point where the audio signal is heard in the transceiver speaker. Voltage should be approximately 0.15 microvolts (-10db).

5. FREQUENCY RANGE TEST

- A. Set the transceiver front panel controls as follows:

| | | |
|---------|----|---------------|
| VOLUME | to | Minimum (CCW) |
| SQUELCH | to | Minimum (CCW) |
| MODE | to | AM |
| RF GAIN | to | Maximum (CW) |
| CHANNEL | to | 13 |
| POWER | to | ON |

- B. Set the RF signal generator to 27.115 MHz and modulate 30% at 1 KHz. Adjust the output attenuator to 6 db (1 microvolt).
- C. Turn the VOLUME control CW until 0.5 volts is obtained on the AC VTVM.
- D. Vary the frequency of the signal generator until a peak is observed on the voltmeter. The change from the center frequency should not be greater than ± 1 KHz.

6. AGC MEASUREMENT

- A. Connect the signal generator and wattmeter as in step 2. Set the generator frequency to 27.115 MHz. Adjust the output attenuator to 86 db (10,000 microvolts).
- B. Adjust the transceiver VOLUME control to obtain 0.5 volts on the VTVM.
- C. Decrease the signal generator output to obtain -10 db (0.15 microvolts) on the wattmeter.
- D. The difference in the signal generator output reading should be between 70 db and 80 db [(86 db - 6 db) = 80 db].

7. BANDWIDTH AT 6 db

- A. Connect the signal generator and wattmeter as in step 2. Set the signal generator frequency to 27.115 MHz and the transceiver CHANNEL selector to 13. Set the VOLUME control to the maximum (CW) position.
- B. Increase the signal generator output until 500 mV of audio is indicated on the wattmeter. Adjust the signal generator frequency to obtain the peak power point, then adjust the output back to 500 mW.
- C. Turn the transceiver VOLUME control to the minimum (CCW) position.
- D. Change wattmeter scale to 150 mW. Increase the VOLUME control to obtain 100 mW or 0 db.
- E. Increase the signal generator output 6 db. Increase the frequency until the audio output of the transceiver drops to 0 db (100 mW).
- F. The difference in the frequency obtained in B and in E is the positive frequency bandwidth and should be between 2.5 and 3 KHz (positive bandwidth).
- G. Return the signal generator frequency to the peak frequency obtained in B and decrease the frequency until 0 db (100 mW) of audio is obtained. The difference between this frequency and the frequency obtained in F is the negative frequency bandwidth and should be 2.5 to 3 KHz (negative bandwidth).
- H. The sum of the values calculated in F and G should be 5 KHz ± 1 KHz.