This Manual is provided by

CBTricks.com

Someone who wanted to help you repair your equipment scanned this manual.

If you would like to help us put more manuals online support us.

Supporters of CBTricks.com paid for the hosting so you would have this file.

CBTricks.com is a non-commercial personal website was created to help promote the exchange of service, modification, technically oriented information, and historical information aimed at the Citizens Band, GMRS (CB "A" Band), MURS, Amateur Radios and RF Amps.

CBTricks.com is not sponsored by or connected to any Retailer, Radio, Antenna Manufacturer or Amp Manufacturer, or affiliated with any site links shown in the links database. The use of product or company names on my web site is not endorsement of that product or company.

If your company would like to provide technical information to be featured on this site I will put up on the site as long as I can do it in a non-commercial way.

The site is supported with donation from users, friends and selling of the Galaxy Service Manual CD to cover some of the costs of having this website on the Internet instead of relying on banner ads, pop-up ads, commercial links, etc. to pay my costs. Thus I do not accept advertising banners or pop-up/pop-under advertising or other marketing/sales links or gimmicks on my website.

ALL the money from donations is used for CBTricks.com I didn't do all the work to make money (I have a day job).
This work was not done for someone else to make money also, for example the ebay CD sellers.

Thank you for any support you can give.

Service Manual

CENTURION SSB

AND

CENTURION +

23 CHANNEL CB TRANSCEIVER

AM-SINGLE SIDE BAND

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.

TABLE of CONTENTS

SUBJECT	PAGE NO.
INTRODUCTION	4
SPECIFICATIONS	5
SERVICE INSTRUCTIONS	6
TEST EQUIPMENT REQUIREMENTS	7
PRELIMINARY TESTS	11
RECEIVER SECTION VERIFICATION TESTS	12
SYNTHESIZER	12
Eleven MHz Frequency Measurement	12
USB, 8 MHz Frequency Measurement	12
LSB, 8 MHz Frequency Measurement	13
Mixer and Filter Coil Adjustments	13
USB (X16) and (X17) Frequency Adjustment	14
AM 2nd Local Oscillator Adjustment	14
RF COILS AND TRANSFORMERS	17
T1, T2, T3, T9, T10 and T11 Adjustment	17
SSB Gain Adjustment	18
AM 2nd IF Alignment	18
SENSITIVITY	18
AM Mode	18
SSB Mode	19
S-Meter Calibration	19
SSB Gain	20
SQUELCH ADJUSTMENT	20
SSB Mode	20
AM Mode	21
FREQUENCY RANGE TEST	21
AGC MEASUREMENT	22
BANDWIDTH AT 6 DB	22
RECEIVER PERFORMANCE OBSERVATION	23
SSB SENSITIVITY	23
SSB SIGNAL TO NOISE RATIO	23
SSB AUDIO/POWER OUTPUT	24
SSB S-METER	24
SSB RF GAIN	24
AM SENSITIVITY OBSERVATION	24
AM SIGNAL TO NOISE RATIO	24
AM AUDIO OUTPUT	25
AM S-METER	25
TRANSMITTER SECTION ADJUSTMENTS	25
RF SECTION ALIGNMENT	26

TABLE OF CONTENTS

SUBJECT	PAGE NO.
SSB MODE ADJUSTMENT	26
SSB POWER OUTPUT MEASUREMENTS	28
SSB CARRIER SUPPRESSION MEASUREMENT	29
AM MODE POWER OUTPUT MEASUREMENTS	29
METER ADJUSTMENTS	29
TVI TRAP ADJUSTMENT	29
TRANSMITTER PERFORMANCE TEST	30
FREQUENCY TOLERANCE MEASUREMENT	30
POWER OUTPUT MEASUREMENT (WITHOUT MODULATION)	31
POWER OUTPUT MEASUREMENT (WITH MODULATION)	31
SSB POWER OUTPUT MEASUREMENT	31

FIGURES and DIAGRAMS

FIGURE 1,	FRONT PANEL CONTROLS AND INDICATORS	10
FIGURE 2,	REAR PANEL CONNECTIONS	10
FIGURE 3,	FREQUENCY SYNTHESIS CIRCUIT BOARD LAYOUT	16
FIGURE 4,	MAJOR COMPONENTS, TOP VIEW	32
FIGURE 5,	INTERNAL POTENTIOMETERS AND TEST POINTS LOCATION DIAGRAM	33
FIGURE 6,	RF COILS TRANSFORMERS AND CRYSTALS LOCATION DIAGRAM	34
FIGURE 7,	TRANSISTORS LOCATION DIAGRAM	35
FIGURE 8,	DIODES AND INTEGRATED CIRCUITS LOCATION DIAGRAM	36
FIGURE 9,	REAR SECTION COMPONENT LOCATION DIAGRAM	37
FIGURE 10,	POWER SUPPLY COMPONENT LOCATION DIAGRAM	38
FIGURE 11,	FUNCTIONAL BLOCK DIAGRAM	39
FIGURE 12,	SCHEMATIC DRAWING	40

CHARTS and TABLES

TROUBLESHOOTING CHART	8
FREQUENCY SYNTHESIS CHART	15
TRANSISTOR AND IC VOLTAGE CHART	41
REPLACEMENT PARTS LIST	42
WARRANTY	Back Cover

INTRODUCTION

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

SERVICE and FACTORY MAINTENANCE

Should your CENTURION 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 COURIER CENTURION is an AM single side band transmitter and receiver, designed to operate in the 26 to 27 MHz Citizens Band. The set operates from 117V AC, 50/60 Hz Power, for base station installations or from 13.8V DC for mobile operation.

RECEIVER

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

TRANSMITTER

The transmitter utilizes three crystal controlled oscillators to produce the desired 23 channel frequencies. The power output stage is a high gain RF Power transistor, conservatively rated to produce the 3.5 watt carrier and 15 watts PEP (peak envelope power) on SSB (single side band) operation.

GENERAL SPECIFICATIONS

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

Frequency Control
Synthesizer Technique

Frequency Tolerance
Channel Frequency ±500 Hz

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

Operating Temperature
-20°C to +50°C.

Primary Power (Input Voltage)
117VAC, 50/60 Hz or
13.8VDC (EIA Standard).

Antenna
50 ohm coaxial.

Dimensions
H = 7-1/4 IN; W = 15-13/16 IN;
L = 16-3/4 IN.

Weight
20 lbs, 8 oz.

RECEIVER SPECIFICATIONS

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

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

Selectivity
SSB = ±2.1 KHz at 6 db
AM = ±3 KHz at 6 db

Spurious Rejection
More than 60 db

1st I.F.
AM & SSB 7.8 MHz

2nd I.F.
AM & SSB 455 KHz

Clarifier Range
±600 Hz

Audio Output
6 watts

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

TRANSMITTER SPECIFICATIONS

Input Power
SSB = 15 watts PEP
AM = 5 watts

Output Power
SSB = 10 watts PEP
AM = 3.5 watts

Modulation Capability
100%

Frequency Response
400 Hz to 3 KHz at 3 db

Spurious Harmonic Suppression
60 db

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

Output Impedance
50 ohms unbalanced

SERVICE INSTRUCTIONS

The Centurion 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 Centurion.

Study the Centurion owner's manual, the schematic, functional block diagram and other illustrations found in this manual before making any repairs or any 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 their temperature, vibration, stability and other characteristics.

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

VERIFICATION TEST

The following tests are prepared to verify the performance of the transceiver after Service has been performed which required the replacement of parts, repair of malfunctioning circuits or adjustments.

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

Details on how to connect and disconnect test equipment are not always given, however, ALWAYS TURN THE POWER OFF before connecting or disconnecting test equipment.

TEST EQUIPMENT REQUIREMENT

The following items of test equipment, or EQUIVALENT, are required to properly service the CENTURION 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, 0-16VDC, 5 Ampere.
* Spectrum Analyzer, Hewlett Packard Model 8554/8552A/141T.
* Millivolt Meter, Ballantine Model 300D.
* RF Signal Generator, Meguro Model MSG-228S.
* 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.

TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE
1. Unit dead. Indicator lights will not glow when power switch is on.	a. Defective power source. b. Fuse blown. c. Power switch defective. d. L19, CH (power choke) open.
2. DC Fuse blows after replacement.	a. Power source polarity reversed. b. TR27, TR28, D64 or C212 shorted.
3. AC Fuse blows after replacement.	a. Clock winding shorted. b. C228 or C229 shorted. c. Power transformer defective.
4. No audio when in the AM Mode. S Meter indicates reception of signals. Carrier is modulated when transmitting.	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 (shorted).
5. No audio when in the SSB Mode. S Meter indicates reception of signals. Carrier is modulated when transmitting.	a. TR8, D18, D19 or D81 defective. b. PA/CB switch section S4-3 defective.
6. Poor reception when in the AM Mode.	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. f. Regulated Power Supply Voltage too low.
7. Very low background noise. Transmitter operates normally.	a. Channel Selector switch defective or has dirty contacts. b. Low power supply voltage, less than 10 volts. c. Squelch circuits defective (TR18, TR19, VR10, C118 or D32). d. AGC circuits defective (TR20, D23, C120, or VR3). e. Partially shorted speaker. f. Low power supply voltage, less then 10 volts.

TROUBLESHOOTING CHART

	TROUBLE	PROBABLE CAUSE
8.	Very low background noise. - Low transmit power.	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).
9.	Squelch function inoperative. - AM receiver does not silence.	a. TR18, TR19, VR10, C118, D32, C100 or C101 defective, possible open circuit.
10.	Squelch function inoperative. - AM receiver will not awaken.	a. TR18, TR19, VR10, C118, D32, D100 or C101 shorted.
11.	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.
12.	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, TR32 or TR24 defective.
13.	Receiver does not operate. - Failure in SSB Mode only.	a. D10, D11, D14, D15, IC1, TR8, D18, D19, D20 or D21 defective (open).
14.	Noise Blanker does not function.	a. TR7 or C58 defective. b. D7, D8, D9 or C62 defective (shorted). c. Blanker switch S3 defective.
15.	Unable to adjust regulated power supply.	a. TR32, TR33, or TR34 defective. b. VR21 defective. c. D69 shorted or open.
16.	Clock will not operate.	a. Motor defective.
17.	Alarm does not ring.	a. Microswitch defective. b. Controls set wrong.

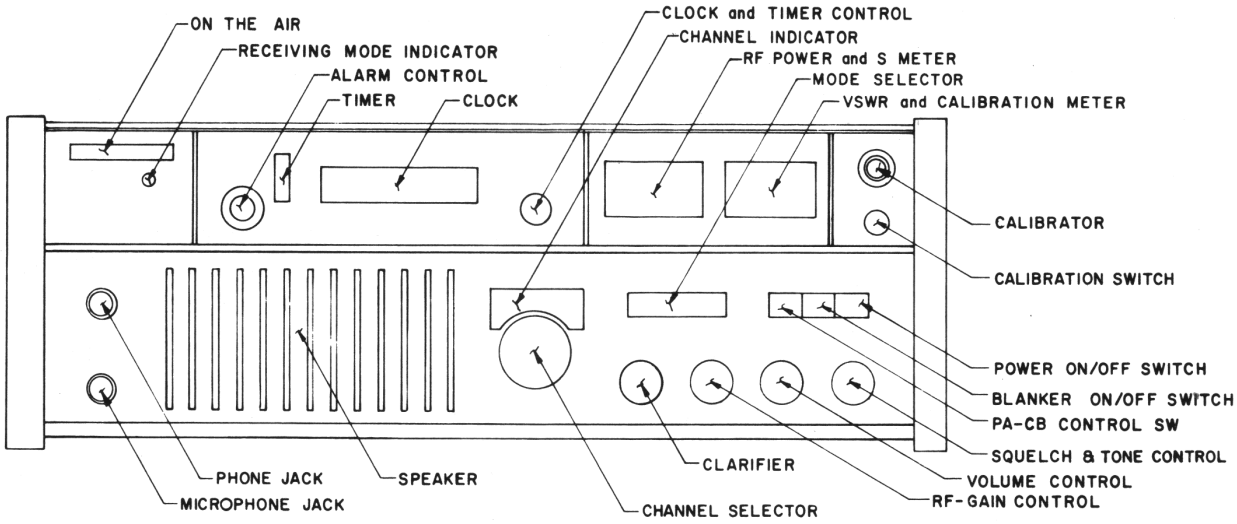

FIGURE 1, FRONT PANEL CONTROL and INDICATORS

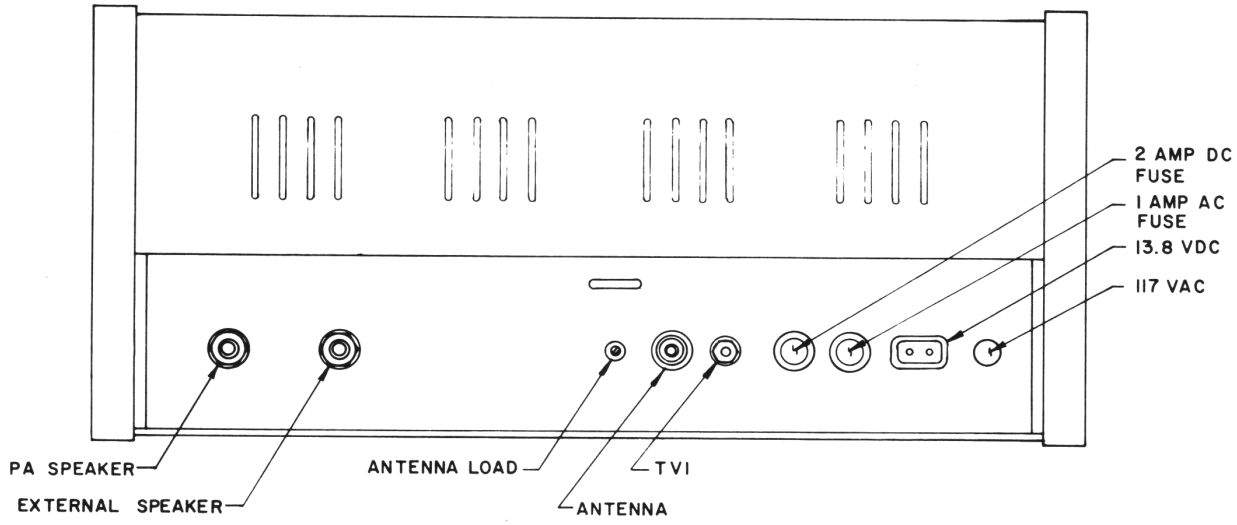

FIGURE 2, REAR PANEL CONNECTIONS

PRELIMINARY TESTS

1. POWER SUPPLY ADJUSTMENTS

   A. AC Power (TURN THE POWER SWITCH TO THE OFF POSITION)

      1) Remove the TOP cover from the transceiver and connect an AC voltmeter across the clock winding terminals (See Figure 3). Set the meter to indicate 117 volts AC at center scale.

      2) Insert the AC power cord into a 117 volt, 50/60 Hz power outlet. Turn the transceiver POWER switch and clock switch to ON and observe that the panel lights glow and the clock operates.

      3) The meter should indicate 105 to 125 volts. Turn the POWER switch to OFF.

      4) Connect a DC voltmeter (-) lead to TP5 and the (+) lead to the DC fuse connection on the inside of chassis. Set the meter to indicate 13.8 volts at center scale.

      5) Turn the POWER switch and the clock switch to ON. The meter should indicate 13 to 16 volts. Adjust VR21, if necessary, to obtain 13.8 ±0.2 volts. Turn the power switch to OFF.

   B. DC Power

      1) Disconnect the AC power cord from the AC power outlet. Insert the DC power cord plug into the transceiver DC receptacle on the rear of the chassis (See Figure 2).

      2) Connect the black (-) and red (+) to a regulated DC power source adjusted to 13.8 ±0.2 volt.

      3) Connect a DC voltmeter (-) lead to TP5 and the (+) lead to the DC fuse connection on the inside of the chassis. Set the meter to indicate 13.8 volts at center scale.

      4) Turn the POWER switch to ON and read 13.8 ±0.2 volts on the meter.

NOTE:

Throughout the following test the AC power source is used, however, the DC supply may be used if more convenient. After completion of service on the transceiver, perform normal operational check to assure that the transceiver functions properly on both power sources.

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 3)

   A. Eleven MHz Frequency Measurement

      1) Remove the top cover ONLY from the transceiver.

      2) 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

      3) Connect a calibrated frequency counter probe to TP2 and the ground to TP1. Turn the transceiver POWER switch ON.

      4) 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 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 4 and 6)

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 +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 +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 cricuit 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 3). These crystal controlled oscillators generate the 69 channel frequencies (23 AM, 23 USB and 23 LSB) used by the Centurion 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 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	7.7085MHz	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 "	"	"

DEFINITIONS

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)
F4= 1st IF Frequency (AM & USB)
F5= 1st IF Frequency (USB 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.

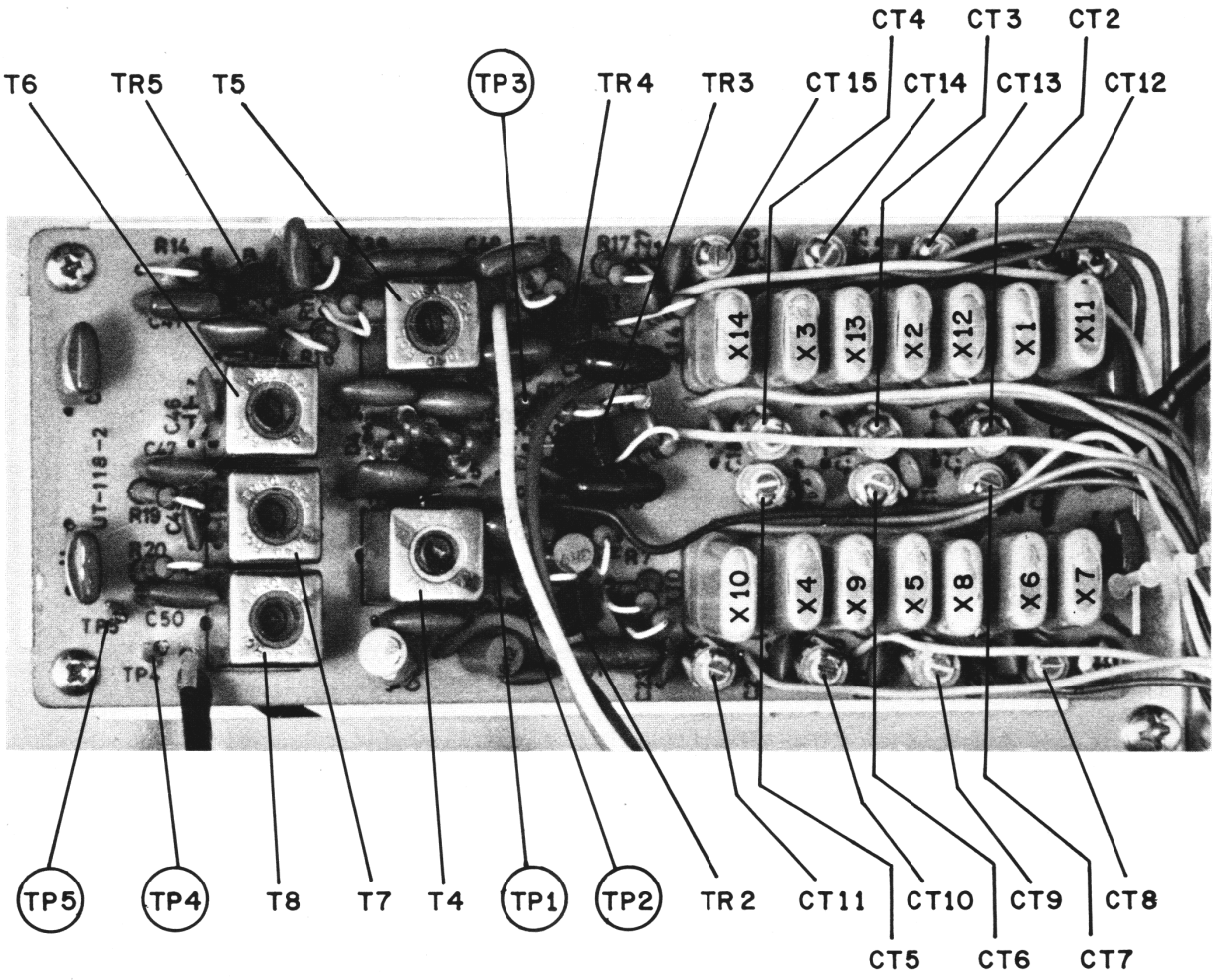

FIGURE 3, FREQUENCY SYNTHESIS CIRCUIT BOARD LAYOUT

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 (0 db), 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 (-6 db), 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 (-6 db) 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 (+50 db).

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 (+50 db).

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. 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 (-10 db), 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 to the maximum (CW) position.

5) Set the signal generator output to 500 microvolts (60 db).

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 (-10 db).

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 2 volts RMS on the VTVM.

C. Decrease the signal generator output to obtain 10 db drop in the audio output.

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 mW 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 (2 VRMS across the 8 ohm load).

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.

RECEIVER PERFORMANCE OBSERVATION

After service has been performed on the receiver section of the transceiver, the following performance observations should be made to assure that the receiver operates within the manufacturers specifications. The transceiver should be completely assembled with the top and bottom covers attached. Connect a DC power supply adjusted to 13.8 volts and to the required test equipment as indicated for the particular test.

1. SSB SENSITIVITY

   A. Set the transceiver front panel controls as follows:

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

   B. Connect a 50 ohm RF generator to the antenna connector and set the frequency to 27.116 MHz (1 KHz above channel 13). DO NOT MODULATE!

   C. Connect an 8 ohm non-inductive load across the EXT SPK jack (use an H.H. Smith #480 phono plug, or equivalent). Connect across the 8 ohm load an AC VTVM and set to measure 2.0 volts at center scale.

   D. Turn the POWER switch ON and observe that the CHANNEL INDICATOR, S-METER and green RECEIVE lights all glow.

   E. Adjust the signal generator output to obtain 2.0 volts on the AC VTVM. The signal generator output should be approximately 0.15 microvolts (-10 db).

   F. Set the MODE switch to LSB and the signal generator frequency to 27.114 MHz (1 KHz below channel 13). Repeat the same observation as in (E) above.

   G. Perform the same observation for each of the other 22 channels, as in (E) and (F). The difference in sensitivity between the highest and the lowest reading for all 23 channels should not be greater than 3 db.

2. SSB SIGNAL TO NOISE RATIO

   A. Set the signal generator frequency to 27.116 MHz (1 KHz above channel 13) and adjust the output voltage to 0.15 microvolts (-10 db).

   B. Adjust the transceiver VOLUME control to obtain 2.0 volts on the AC VTVM.

   C. Change the signal generator frequency to 27.125 MHz (channel 14). The reading on the AC VTVM should be approximately 0.8 volts (-2 db).

3. SSB AUDIO/POWER OUTPUT

   A. Set the signal generator to 27.116 MHz and the output voltage to 1000 microvolts (66 db).

   B. Turn the MODE switch to USB and the VOLUME control full CW position. The audio output voltage should be approximately 6.9 volts (6 watts).

4. SSB S-METER

   A. Set the S-Meter switch to S/RF. Adjust the signal generator output to obtain a S-9 reading on the S-Meter. The generator output voltage should be 150 to 300 microvolts (50 +6/-0).

5. SSB RF GAIN

   A. Set the signal generator output to 0.5 microvolts (0 db) and the frequency to 27.116 MHz.

   B. Turn the transceiver BLANKER switch to ON and the RF GAIN to full CW position. Rotate the VOLUME control to obtain 2.0 volts on the AC VTVM.

   C. Turn the RF GAIN control full CCW position and readjust the signal generator output to obtain 2.0 volts on the AC VTVM.

   D. The signal generator output should be 30 to 75 microvolts (40 ±4 db).

6. AM SENSITIVITY OBSERVATION

   A. Set the transceiver front panel controls as follows:

MODE	to	AM
CHANNEL	to	13
VOLUME		MAXIMUM (CW)
SQUELCH		MINIMUM (CCW)
RF GAIN		MAXIMUM (CW)
POWER		ON

   B. Adjust the signal generator frequency to 27.115 MHz (channel 13) and modulate 30% at 1 KHz.

   C. Adjust the signal generator output voltage to obtain 2.0 volts on the AC VTVM. The signal generator output voltage should be approximately 0.4 microvolts (-2 db).

7. AM SIGNAL TO NOISE RATIO

   A. Adjust the signal generator output voltage to 0.5 microvolts (0 db). Turn the transceiver VOLUME control CCW to obtain 2.0 volts on the AC VTVM.

   B. Turn the signal generator modulation OFF and observe that the audio output voltage as read on the AC VTVM decreased 10 db (0.63 volts).

   C. Modulate the signal generator 30% at 1 KHz and adjust the output to 10,000 microvolts (86 db).