MAINTENANCE MANUAL LBI-31597

MOBILE RADIO

GENERAL ELECTRIC CMX-8630

TWO-WAY MOBILE RADIO

TABLE OF CONTENTS

CMX-8630

800 MHz, 30-WATT

TWO-WAY FM MOBILE RADIO COMBINATION

GENERAL ELECTRIC

TABLE OF CONTENTS

CAUTION

Although the highest DC voltage in this mobile equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

NOTE

This equipment has been tested and found to comply with the technical specifications in Part 15, Subpart J of FCC rules for a Class A and Class B computing device.

TYPICAL SPECIFICATIONS*

SYSTEM

FCC Identification Number	AXA9WN CMX8630
Frequency Range	
Transmitter	806.0125 MHz - 825.9875 MHz (851.0125 - 870.9875 MHz Repeater talk-around)
Receiver	851.0125 MHz - 870.9875 MHz
Battery Drain	
Receiver @ 13.8 VDC	
Squelched	0.9 Ampere
Unsquelched	1.5 Amperes
Transmitter @ 13.6 VDC	11.0 Amperes
Frequency Stability	±0.00025%
Channel Spacing	25 kHz @ 12.5 kHz increments
Frequency Capacity	20 Channels maximum
Maximum Frequency Separation	20 MHz
Temperature Range	-30°C (-22°F) to +60°C (140°F)
Duty Cycle	100% Receive, 20% Transmit
Dimension, Less Accessories (H X W X D)	6.9 cm x 19 cm x 24 cm (2.7 x 7.5 x 9.5 inches)
Weight, Less Accessories	2.70 Kg (6.0 pounds)

TRANSMITTER

Power Output	30 Watts
Conducted Spurious	Meets FCC
Modulation	±5.0 kHz
Audio Sensitivity	55 to 120 millivolts
Audio Frequency Characteristics (Per RS-152R)	Within +1 dB to -5 dB of a 6 dB/octave pre-emphasis from 300 Hz to 2500 Hz per EIA standard and ±1 dB to -6 dB from 2500 Hz to 3000 Hz.
Distortion	Less than 3% (1000 Hz) Less than 5% (300 Hz to 3000 Hz)
Deviation Symmetry	0.5 kHz maximum
RF Output Impedance	50 ohms
Carrier Attack Time	30 ms (max)
Audio Attack Time	50 ms (max)

RECEIVER

Audio Output (to 4-ohm speaker)	3 Watts (less than 5% distortion) (EIA)
Sensitivity	
12 dB SINAD (EIA Method)	0.3 uV
20 dB (Quieting Method)	0.4 uV
Selectivity	
EIA Two-Signal Method	-70 dB ±25 kHz
Spurious Response	-70 dB
Intermodulation	-70 dB
Modulation Acceptance	±7 kHz
Frequency Response	Within +1 dB and -8 dB of a standard 6 dB per octave de-emphasis curve from 300 Hz to 2000 Hz EIA
RF Input Impedance	50 ohms
Receiver Attack Time	100 ms (max)
Receiver Recovery Time	100 ms (max)

* These specifications are intended primarily for use of the serviceman. Refer to the appropriate Specifications Sheet for the complete specifications.

COMBINATION NOMENCLATURE

DIGITS 1&2	DIGIT 3	DIGIT 4	DIGIT 5	DIGITS 6&7
Product Code	Radio Type	Frequency	Features	Power Output
CM	**X** Wide Band	**8** 800 MHz	**6** Full Feature	**30** 30 Watts

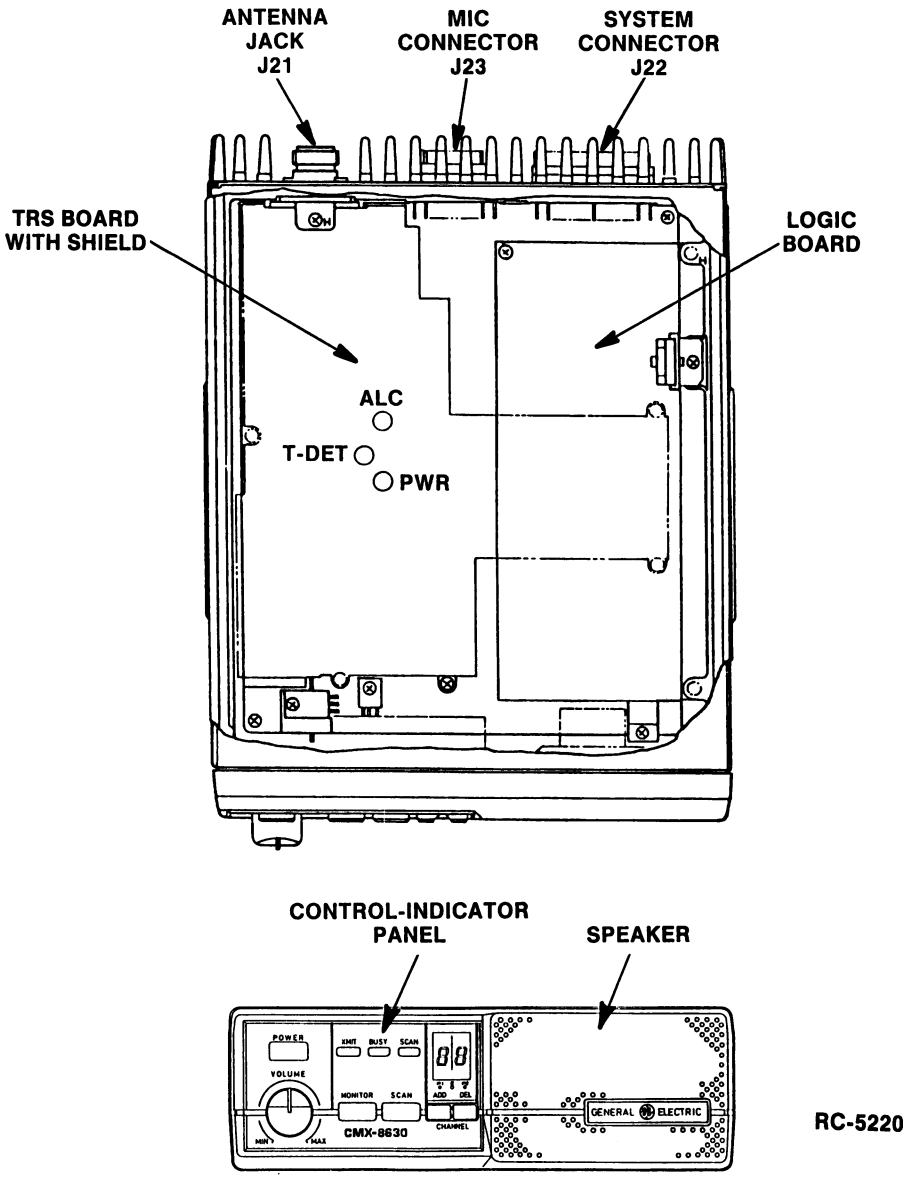

Figure 1 - Mobile Layout Diagram

DESCRIPTION

The General Electric CMX-8630 series mobile radios are synthesized wideband radios utilizing microcomputer technology to provide highly reliable, high quality and performance two way radios. The radios operate in the 806-870 MHz range, and provide an RF power output of 30 watts with an allowable channel separation of 20 MHz transmit and 20 MHz receive. The channel separation does not apply in repeater talk-around applications as the transmit and receive frequencies are the same.

The small size of the CMX-8630 makes it ideal for front mounting in conventional vehicles, with all operating controls and indicators located on the recessed front panel. The standard radio combination is equipped with:

- Microcomputer control
- RF channel synthesizer
- Up to 20 RF channels
- Seven segment channel display
- 20 channel scan with two channel priority
- Channel Guard (CTCSS)
- Carrier Control Timer (CCT)
- ±0.00025% (2.5 PPM) frequency stability

The radio circuitry consists of a transmitter/receiver/synthesizer (TRS) board, a logic board, and a control panel. The TRS board mounts at the bottom of the "U" frame with the logic board mounted in the top section of the chassis above the TRS board. The front cover attaches to the front of the "U" frame. Refer to Figure 1 for the Mobile Layout Diagram.

No power supply is required since the highest supply voltage used in the radio is provided by the vehicle battery. The radio is designed for operation in 12-Volt, negative ground vehicular systems.

Access to the TRS board and logic board is easily obtained by removing the two screws in the rear of the top cover and removing the cover. All modules and tuning controls are accessible with the top cover removed. However, it may be necessary to remove the logic board to gain access to all controls on the TRS board.

Access to the control and indicator circuitry can be obtained by removing the four screws securing the front panel to the chassis.

TRS BOARD

Transmitter

The transmitter consists of a synthesizer, exciter and a broadband, fixed-tuned driver module and power amplifier. In the receive mode, the exciter output also serves as the receiver first mixer injection.

The RF power output level is internally adjustable for rated power. Once the level is set, a sensing control circuit holds the power constant over temperature and/or voltage variations within specified limits.

Drive for the transmitter and the receiver 1st mixer injection are derived from a phase lock loop (PLL) circuit.

Receiver

The dual conversion receiver consists of a 800 MHz front end section and two mixer/IF sections operating at 45 MHz and 455 kHz. The receiver also contains a squelch and audio section. The audio section provides a 3-Watt audio output into a 4-ohm load.

Frequency Synethsizer

The synthesizer consists of a synthesizer chip, dual modulus counter, a reference oscillator, and a voltage controlled oscillator (VCO). The synthesized frequency is controlled by the personality EEPROM and applied to the transmit/receive board.

LOGIC BOARD

The logic board controls the operation of the radio. The logic board contains the microprocessor and the EPROM for the microprocessor codes, the personality EEPROM, Channel Guard encode-decode circuitry, audio filtering and watchdog timer. The logic board also contains the receiver squelch IC and squelch control, and the transmit modulation sensitivity controls.

An electrically erasable PROM (EEPROM), on the logic board, stores the binary data for the transmit and receive frequencies, Channel Guard tones and CCT timing periods. The EEPROM is field programmable and each channel can be individually programmed or re-programmed for the desired transmit and receive frequency, CG tone or CCT timing.

CONTROL PANEL

The control panel is made of highly durable plastic with rounded corners and recessed controls and indicators for passenger safety requirements. The control panel also contains the built-in speaker. A description of the control and indicator functions is contained in the OPERATION section that follows.

PRIORITY SCAN

The microprocessor controls the scan and display circuits to select up to 20 channels to be scanned. Two priority channels (P1 and P2) can be programmed from the front panel controls. The main priority channel is selected any time the P1 signal is present. A second level priority channel (P2) is selected each time the P2 signal is present, preempted only by priority channel 1 (P1). All other channels selected for scanning are preempted by both priority channels.

Instructions for programming the priority scan channels is contained in the OPERATION section of this manual.

MICROPHONE

The mobile radio uses a dynamic microphone with a built-in transistorized pre-amplifier. The microphone is housed in a sturdy case, and the extendable coiled cord plugs into a jack at the back of the radio. The microphone is secured to the radio by menas of a strain relief hook on the microphone cable.

HOOKSWITCH

A hookswitch is provided with the radio to hold the microphone. Removing the microphone from the hookswitch disables the Channel Guard, enabling the operator to monitor the channel before sending a message. Removing the microphone while in the SCAN mode will also disable scan until the microphone is placed back into the hookswitch. Hookswitch leads connect to J23-9 and J23-8.

CHANNEL GUARD

Channel Guard provides a means of restricting calls to specific radios through the use of a continuous tone coded squelch system (CTCSS). Tone frequencies range from 67.0 Hz to 210.7 Hz. The Channel Guard tone frequencies are software programmable, and are listed in the Programmers Manual.

CARRIER CONTROL TIMER

The carrier control timer turns off the transmitter after the microphone push-to-talk (PTT) switch has been keyed for a pre-adjusted time period. The timer can be programmed to time out and sound an alert tone in increments of 30 seconds to 7.5 minutes.

EXTERNAL SPEAKER (Optional)

An optional 3-watt, 4-ohm speaker is available for use with the radio. The speaker is supplied with a mounting bracket and mounting hardware. The speaker leads connect to J23-10 (Hi) and J23-8 (Lo) jack on the back of the radio.

PROGRAMMING

The radio is field programmable using Universal Radio Programmer (URP) TQ2310. Programming is accomplished by connecting the URP to the radio using programming cable TQ2347. The programmer connects to J22 and J23 at the back of the radio.

OPERATION

This section provides a description of the control and indicator functions as well as the basic procedures for transmitting and receiving messages, and for programming the priority scan channels.

Complete operating instructions for the radio are provided in the Operator's Manual.

CONTROLS

The radio control panel contains the VOLUME control, POWER, MONITOR and SCAN switches, and the CHANNEL select (ADD-DEL) switches. The switch functions are:

POWER Button In - Applies power to radio unit. Digital display lights.

Button Out - Turns radio unit off.

VOLUME Controls audio (speaker) level.

MONITOR Momentary type switch to disable squelch and Channel Guard when pressed. Allows user to hear channel activity or noise.

SCAN Enables or disables the scan function. Also when used with the CHANNEL switches provides the "ADD" and "DEL" functions for scan programming.

CHANNEL Uses momentary type ADD, DEL switches to select channels.

ADD Press ADD button to select channels in ascending sequence.

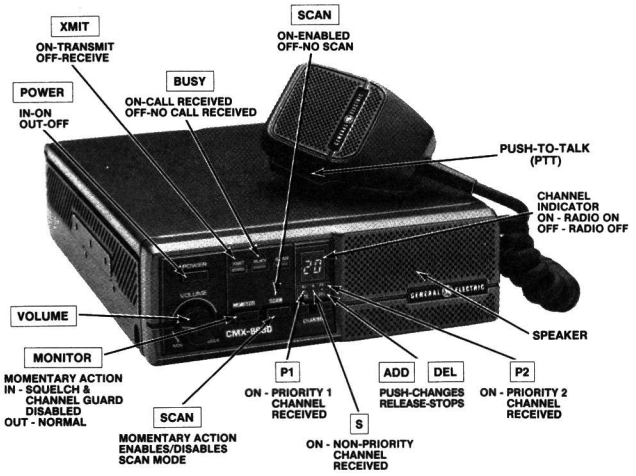

Figure 2 - Controls and Indicators

When used in conjunction with SCAN button, adds a channel to scan program.

DEL Press DEL button to select channels in descending sequence.

When used in conjunction with SCAN button, deletes a channel from scan program.

Channels may be selected one step at a time or progressively if either button is held in. Rollover will occur in ascending or descending order.

INDICATORS

The radio indicators include XMIT, BUSY, SCAN, P1, P2 and S. The indicator functions are:

XMIT (Transmit) When lit, indicates the message is being transmitted.

BUSY When lit, indicates the channel is in use.

SCAN When lit, indicates radio is in scan function.

P1 When lit, indicates that the channel displayed is the Priority 1 channel.

P2 When lit, indicates that the channel displayed is the Priority 2 channel.

S When lit, indicates that the channel displayed is a Non-Priority channel.

Channel Indicator

The Channel Indicator displays the following conditions:

- When SCAN is off, the channel selected is shown.
- When SCAN is on, the last selected channel before scan is activated is shown when no signal is being received. When a scan channel is being received and audio is present in the speaker, the receive channel is shown (normal display option).

SENDING AND RECEIVING MESSAGES

To receive a message:

1. Confirm that radio is turned on (digital display lit). If not, depress POWER button.
2. If SCAN indicator is lit, press and release SCAN button. The radio is no longer in the scan mode and the SCAN indicator will no longer be lit.
3. Select desired channel by pressing either the ADD or DEL button until channel is indicated in digital display.
4. Press and hold MONITOR button and adjust VOLUME control for the desired listening level. Release MONITOR button.
5. Radio is now ready to receive a message.

To send a message:

1. Confirm that radio is turned on (digital display lit). If not, depress POWER button.

2. If SCAN indicator is lit, press and release SCAN button.

3. Select desired channel by pressing either the ADD or DEL button until channel is indicated in digital display.

4. Press and hold MONITOR button and adjust VOLUME control for the desired listening level. Release MONITOR button.

5. Decide what you want to say. If you intend a lengthy message (or several messages), the vehicle engine should be running to maintain the battery charge.

6. Observe the BUSY indicator or press the MONITOR button to determine that the channel is not in use.

7. Remove microphone from hookswitch, press the PTT button and identify yourself. The XMIT indicator will light each time the PTT button is pressed.

8. Release the PTT button and wait for an answer to your call. Then, complete your message.

SCAN MODE

Press and release SCAN button to enable the scan function. The SCAN indicator should light and the following conditions apply:

- Only programmed scan channels will be received.
- As long as no signal is being received, the digital display will indicate the pre-scan selected channel. If S, P1 or P2 indicator is not lit, no signal will be received on this channel, since it has not been programmed for scan.
- When a signal is received, scanning stops and the display indicates the channel received and the priority level.
- Removing microphone from hookswitch locks the radio onto the received scan channel. Pressing the PTT button on microphone allows transmission on the received scan channel.
- Scan resumes, after a few seconds delay, when the microphone is returned to the hookswitch. Pre-scan channel will again be displayed and will be the transmit channel until another channel is detected.

SCAN PROGRAMMING

The scan channels are selected and priority channels programmed using the SCAN pushbutton in conjunction with the ADD and DEL pushbuttons.

Non-Priority

1. Confirm that radio is turn on (digital display lit). If not, depress POWER button.

2. If SCAN indicator is lit, press and release SCAN button to disable scan function.

3. Select desired channel using the ADD or DEL button.

4. Press and hold SCAN button; then press the ADD button once to add the channel to the scan sequence. The S indicator will light to indicate that the channel is now in the scan program.

5. Release SCAN button.

6. Repeat Steps 2 thru 5 for each channel (up to 20) to be added to the scan function.

Priority 2*

1. Perform Steps 1 thru 3 of the Non-Priority procedure.

2. Press and hold SCAN button; then press the ADD button twice. The selected channel will now become the Priority 2 channel and the P2 indicator will light to indicate that the channel is now in the scan program as Priority 2.

3. Release SCAN button.

Priority 1*

1. Perform Steps 1 thru 3 of the Non-Priority procedure.

2. Press and hold SCAN button; then press the ADD button three times. The selected channel will now become the Priority 1 channel and the P1 indicator will light to indicate that the channel is now in the scan program as Priority 1.

3. Release SCAN button.

* If a Priority 1 or 2 scan channel already exists when programming a new Priority 1 or 2 scan channel, the old Priority 1 or 2 channel becomes a Non-Priority channel.

DELETE SCAN CHANNELS (S, P1, P2)

1. Confirm that radio is turned on (digital display lit). If not, depress POWER button.
2. If SCAN indicator is lit, press and release SCAN button to disable scan program.
3. Select desired channel to remove from scan function using the ADD or DEL button.
4. Press and hold SCAN button, then press the DEL button once. This removes the selected channel from the scan program. All scan indicators (S, P1, P2) will be off.
5. Release SCAN button.
6. Repeat preceding Steps 2 thru 5 for each channel to be removed from the scan program.

MAINTENANCE

Maintenance information required to service the radio is contained in the Service Section of this manual. Service information in the Service Section includes:

- System Interconnections
- Mechanical Layout Diagrams
- Disassembly Procedures
- IC and Chip Component Replacement Procedures
- Receiver Voltage Readings
- Test Point Voltage Readings
- Transmitter and Receiver Alignment Procedures
- Troubleshooting Procedures
- Receiver Test Procedures