CHAPTER 5

R-123M TRANSCEIVER

SECTION I

GENERAL

5-1. Item Description

The R-123M is one of the newest frequency modulated (FM) radios designed and manufactured in the Soviet Union. It is a compact transceiver that has a frequency range of 20 to 51.5 MHZ and is used primarily in armored vehicles. The R-123M can be continuously tuned over its entire frequency range or there is a switch that allows the operator to select any one of four preset frequencies. The two antennas used with the R-123M are a 4 meter whip, used when the vehicles is in motion, and a 10 meter telescopic, used when the vehicle is utilized as a stationary command post or communications site. The R-123M has no internal speaker; therefore, a headset or combat vehicle communications helmet must be used. The various voltages that are required to operate the transceiver are provided by a transistorized power supply which is in turn connected to the vehicle's 24 volt DC supply.

5-2. Capabilities

The R-123M is a medium range transceiver with a transmitting range of 16 to 55 km (10 to 35 miles), depending on which type of antenna is used and the setting of the radio's squelch control. Its preset frequencies provide quick and accurate tuning and it has excellent frequency stability. Because of the modular design of the R-123M, repairs can usually be accomplished quickly by the substitution of defective assemblies (modules).

5-3. Limitations

The antenna loading indicators of the R-123M will give several indications during the antenna loading procedure. Because of this, it is possible for the operator to load the antenna improperly, causing the radio to transmit far below its maximum power output. Also, it is extremely difficult to read the scale on the frequency indicator dial because of a combination of inadequate dial illumination and the use of a frosted glass dial window.

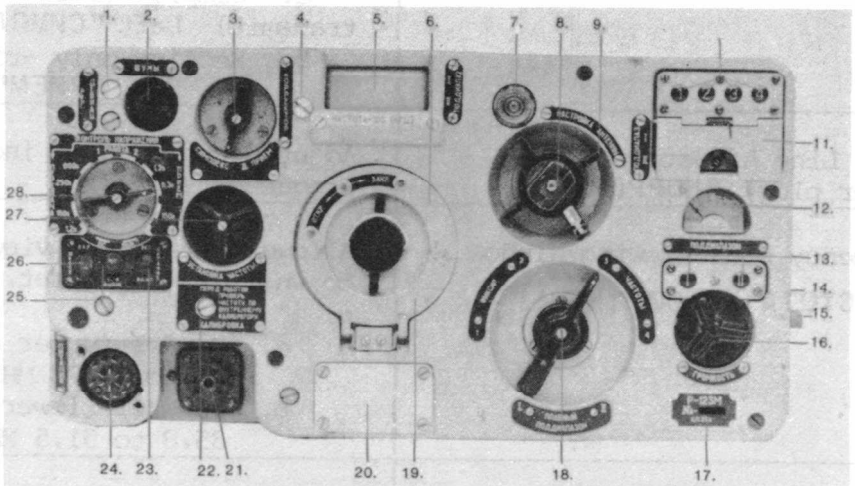
5-4. Remarks

The R-123M is ruggedly constructed and is capable of extended field use with few electronic failures. Learning to operate the R-123M is not difficult; however, some instruction would be required in the preset frequency tuning and antenna loading procedures. Several US Army radios operate within the same frequency range and can be netted with the R-123M; among them are the AN/VRC-12 family, AN/PRC-77, AN/PRR-9, and the AN/PRT-4A. The R-123M was preceded by the R-123. These radios are very similar in appearance; the only major difference between them is that the R-123 has a voice operated transmission (VOX) mode of operation. The R-123M is now used extensively by the Soviet Union and Warsaw Pact Armies and is included in all the new armored vehicles exported by the Soviet Union.

CONTROLS, INDICATORS, CONNECTIONS

5-5. General

The descriptions of functions listed in table 5-1 are keyed to figure 5-1 below:



1. DEVIATION ADJUSTMENT (UNDER PLUG)
2. SQUELCH CONTROL KNOB
3. MODE SELECTOR SWITCH
4. INDEX LINE ADJUSTMENT (UNDER PLUG)
5. FREQUENCY DIAL VIEWING WINDOW
6. PRESET LOCKING SCREWS (UNDER COVER)
7. RF INDICATOR LAMP
8. ANTENNA LOADING CONTROL LOCKING NUT
9. ANTENNA LOADING CONTROL KNOB
10. PRESET CHANNEL INDICATOR
11. PRESET CHANNEL BAND SELECTOR (UNDER COVER)
12. INDICATOR METER
13. BAND INDICATOR
14. ANTENNA CONNECTOR LOCKING SCREW
15. GROUND CONNECTOR
16. VOLUME CONTROL KNOB
17. DATA PLATE
18. PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH
19. PRESET LOCKING SCREW ACCESS COVER
20. OPERATING FREQUENCY CARD
21. INTERCOM CONNECTOR
22. CALIBRATION ADJUSTMENT (UNDER PLUG)
23. POWER SWITCH
24. POWER INPUT CONNECTOR
25. TONE CALL BUTTON
26. DIAL LIGHT SWITCH
27. FREQUENCY TUNING KNOB
28. VOLTAGE CHECK/OPERATE SWITCH

NEG. NO. R-123-70

Figure 5-1. R-123M transceiver.

Table 5-1. R-123M Function Listing

Control, Indicator or Connection	Function
1. Deviation Adjustment (under plug) "ДЕВИАЦ. РЕГ."	Used for correcting or adjusting transmitter deviation. Repair shop use only.
2. Squelch Control Knob "ШУМЫ"	Selects amount of noise squelch desired. Zero to max clockwise.
3. Mode Selector Switch	Selects modes of operation: a. Simplex (receive and transmit) Left "СИМПЛЕКС" b. Receive only -right. "Д. ПРИЕМ"
4. Index Line Adjustment (under plug) "КОРРЕКТОР"	Adjusts position of index line in frequency viewer.
5. Frequency Dial Viewing Window "ЧАСТОТА Х 1ØØ (КГЦ)"	Allows operator to view frequency to which radio is set. a. Band I (upper numbers) 20 to 35.75 MHZ b. Band II (lower numbers) 35.8 to 51.5 MHZ
6. Preset Locking Screws (under cover)	Used by operator to lock chosen operating frequency into the preset tuning mode.
7. RF Indicator Lamp	Shows amount of RF transmitted by degree of illumination.
8. Antenna Loading Control Locking Nut	Secures antenna loading control knob
9. Antenna Loading Control Knob "НАСТРОЙКА АНТЕННЫ"	Used to adjust antenna loading to frequency being used for maximum RF output.

Table 5-1. R-123M Function Listing (cont)

Control, Indicator or Connection	Function
10. Preset Channel Indicator	Shows which of four preset frequencies (if any) are being used.
11. Preset Channel Band Selector (under cover)	Selects in which band (upper or lower) preset frequencies may be chosen. a. Band I (up) 20 to 35.75 MHZ b. Band II (down) 35.8 to 51.5 MHZ
12. Indicator Meter	Shows operating condition of internal circuits/amount of RF output when loading antenna.
13. Band Indicator "ПОДДИАПАЗОН"	Shows operator which band is being used.
14. Antenna Connector Locking Screw	Secures antenna cable to radio.
15. Ground connector "ЗЕМЛЯ"	Connection point for antenna ground.
16. Volume Control Knob "ГРОМКОСТЬ"	Adjusts audio output to CVC helmet.
17. Data Plate	Contains radio model number and serial number.
18. Preset Channel/Continuous Tune Selector Switch	Selects preset 1,2,3 or 4; also continuous tuning on Band I or II.
19. Preset Locking Screw Access Cover	Provides access to present locking screws. a. Open "ОТКР." b. Closed "ЗАКР."
20. Operating Frequency Card	Place for writing operating and alternate frequencies.

Table 5-1. R-123M Function Listing (cont)

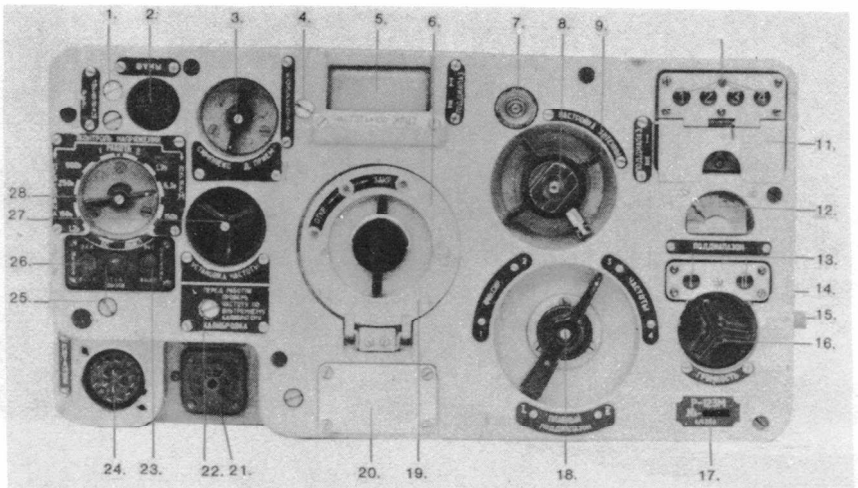
Control, Indicator or Connection	Function
21. Intercom Connector "P-124"	Connection for intercom system if used. May be used for direct connection of CVC helmet with proper chest plate switch.
22. Calibration Adjustment (under plug) "КАЛИБРОВКА"	Used for fine adjustment of transmitter frequency. For repair shop personnel use only.
23. Power Switch "ПИТАНИЕ"	On/Off switch for power to radio. a. On (up) "ВКЛ" b. Off (down) "ВЫКЛ"
24. Power Input Connector "ПИТАНИЕ"	Connection for BA-26 power supply.
25. Tone Call Button "ТОН ВЫЗОВ"	When (3) in simplex, produces tone over the air for signaling. When (3) in receive, produces tone for adjustment of frequency dial index line.
26. Dial Light Switch "ШКАЛА"	On/Off switch for dial light. a. On (up) "ВКЛ" b. Off (down) "ВЫКЛ"
27. Frequency Tuning Knob "УСТАНОВКА ЧАСТОТЫ"	For continuous tuning operation, changes frequency to which R-123M is set.
28. Voltage Check/Operate Switch "КОНТРОЛЬ НАПРЯЖЕНИИ"	Selects internal circuits, receive or transmit side of power supply and radio, and power output (RF) for display on indicator meter. a. Operate (RF) "РАБОТА" b. Transmitter cicuits "ПЕРЕДАЧА" c. Receiver circuits "ПРИЕМ"

SECTION III

OPERATING INSTRUCTIONS

5-6. Pre-operating Actions

The operating procedures and steps mentioned in tables 5-2 and 5-3 are keyed to figure 5-2 below:



1. DEVIATION ADJUSTMENT (UNDER PLUG)
2. SQUELCH CONTROL KNOB
3. MODE SELECTOR SWITCH
4. INDEX LINE ADJUSTMENT (UNDER PLUG)
5. FREQUENCY DIAL VIEWING WINDOW
6. PRESET LOCKING SCREWS (UNDER COVER)
7. RF INDICATOR LAMP
8. ANTENNA LOADING CONTROL LOCKING NUT
9. ANTENNA LOADING CONTROL KNOB
10. PRESET CHANNEL INDICATOR
11. PRESET CHANNEL BAND SELECTOR (UNDER COVER)
12. INDICATOR METER
13. BAND INDICATOR
14. ANTENNA CONNECTOR LOCKING SCREW
15. GROUND CONNECTOR
16. VOLUME CONTROL KNOB
17. DATA PLATE
18. PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH
19. PRESET LOCKING SCREW ACCESS COVER
20. OPERATING FREQUENCY CARD
21. INTERCOM CONNECTOR
22. CALIBRATION ADJUSTMENT (UNDER PLUG)
23. POWER SWITCH
24. POWER INPUT CONNECTOR
25. TONE CALL BUTTON
26. DIAL LIGHT SWITCH
27. FREQUENCY TUNING KNOB
28. VOLTAGE CHECK/OPERATE SWITCH

NEG. NO. R-123-70 (copy 171)

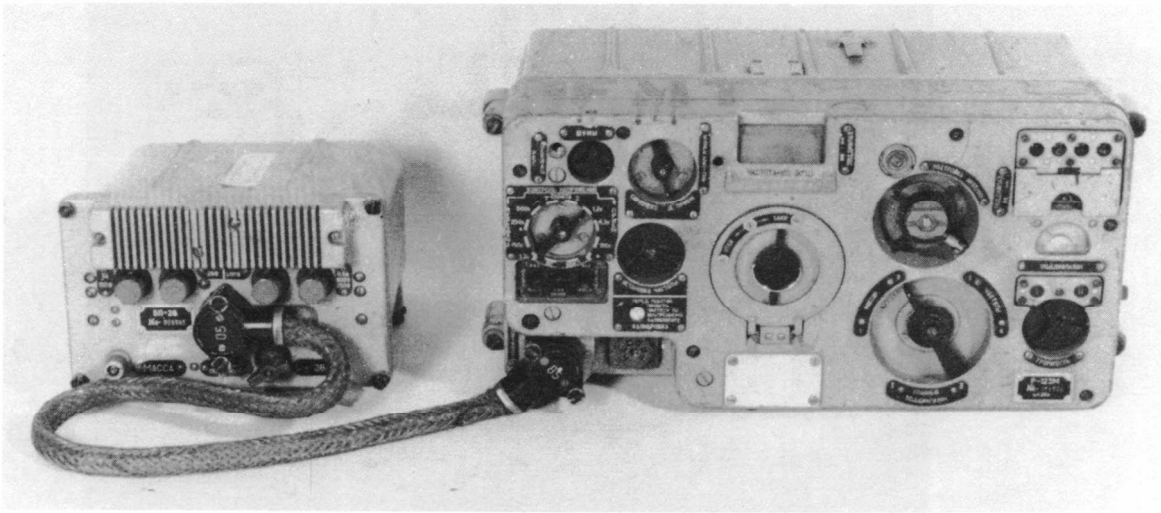
Figure 5-2. R-123M transceiver.

Table 5-2. Operating Instructions

Pre-operating Actions

STEP

1. Before proceeding, insure that the POWER SWITCH (23) is in the off (down) position. Connect the power supply, BA-26, to the R-123M with the cable provided as shown in figure 5-3. Use a screwdriver to secure the cable ends to the power supply and radio.



NEG. NO. R-123-69

Figure 5-3. Connection of power supply to R-123M.

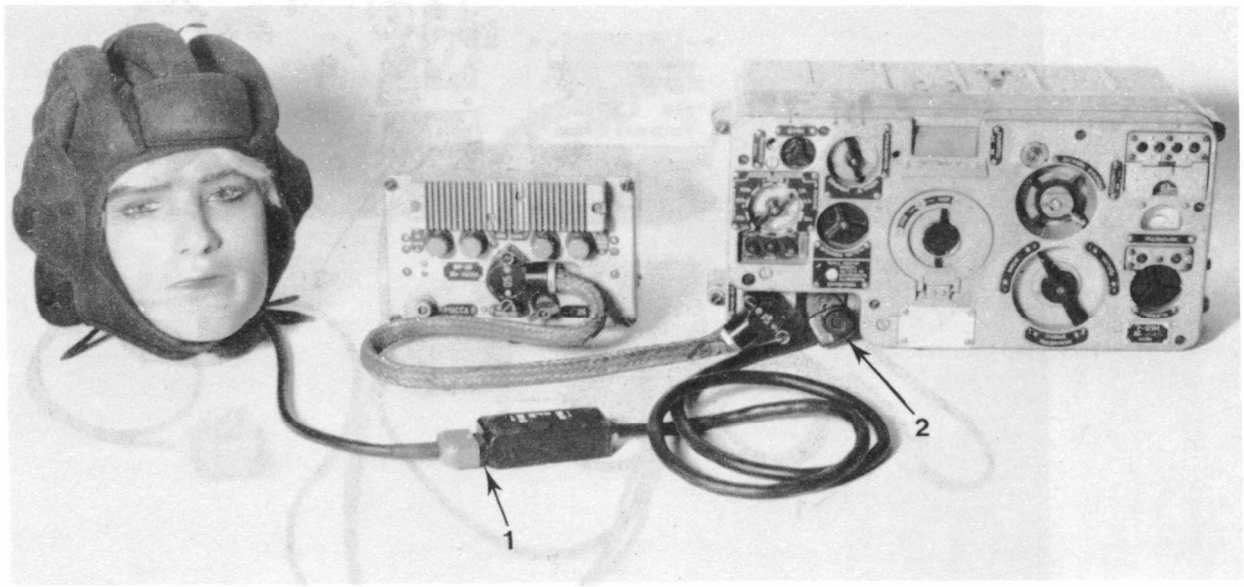
If the R-124 intercom is to be used, proceed to step #3. If the CVC and chest plate switch are to be connected directly to the radio without a R-124 system, proceed to step 2.

Table 5-2. Operating Instructions (cont)

Pre-operating Actions

STEP

2. Connect the CVC helmet to the chest plate switch (1) as shown in figure 5-4 below. Connect the chest plate switch to the right-hand connection marked P-124 on the R-123M radio (2). Proceed to step 4.



NEG. NO. R-123-66

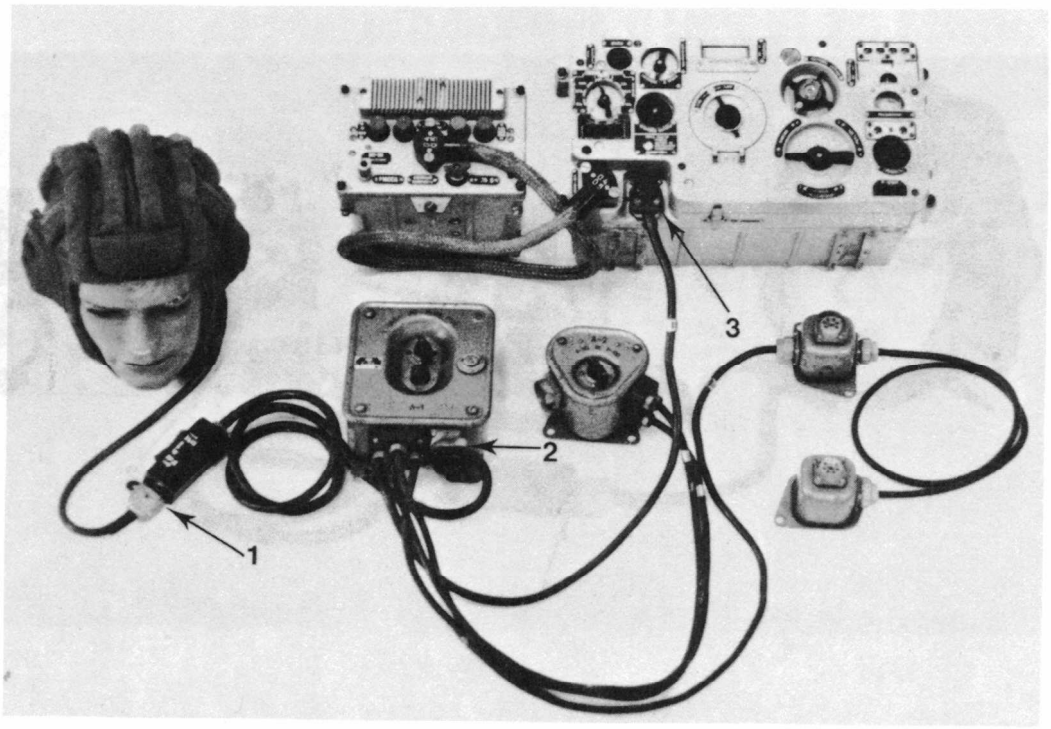
Figure 5-4. Connection of CVC to chest plate switch and radio.

Table 5-2. Operating Instructions (cont)

Pre-operating Actions

STEP

3. Connect the CVC helmet to the chest plate switch as shown in figure 5-5 below (1). Connect the chest plate switch to the A-1 box of the R-124 intercommunications system (2). Connect the R-124 intercom to the right-hand connector of the R-123M (3).



NEG. NO. R-123-63

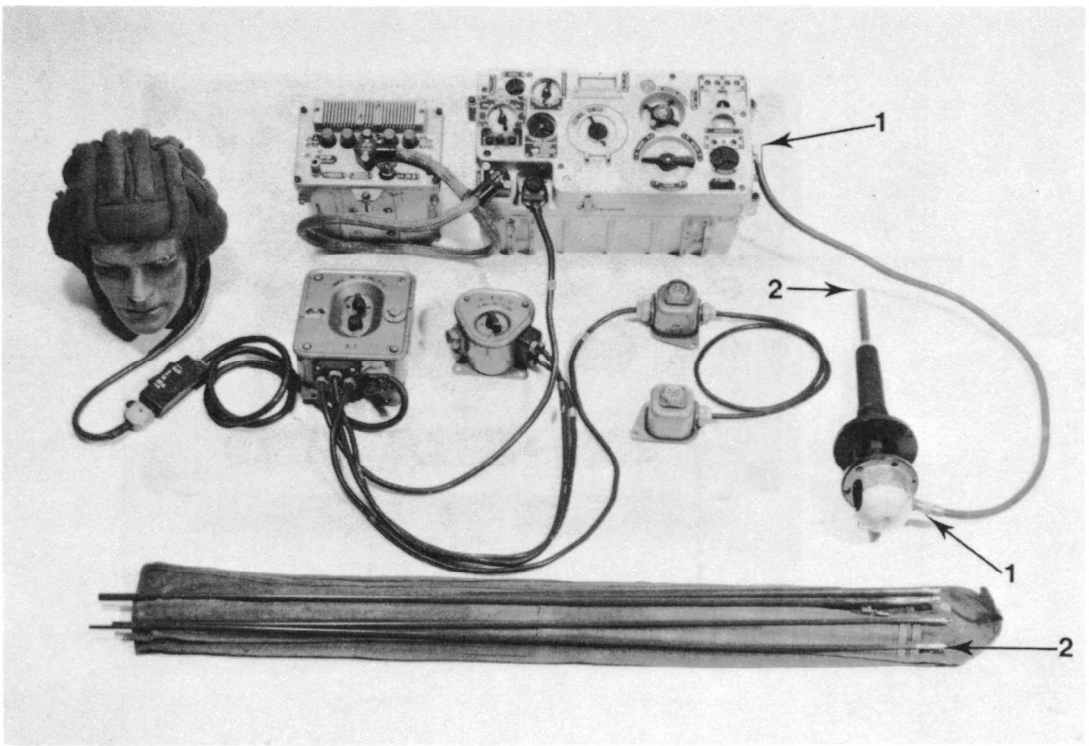
Figure 5-5. Connection of CVC to R-124 and R-124 to R-123M.

Table 5-2. Operating Instructions (cont)

Pre-operating Actions

STEP

4. Connect the antenna base to the antenna connection point (1) located on the right-hand side of the R-123M and secure with the ANTENNA CONNECTOR LOCKING SCREW (14). Connect all four sections of the antenna to the antenna base (2).



NEG. NO. R-123-61

Figure 5-6. Connection of antenna sections and antenna base.

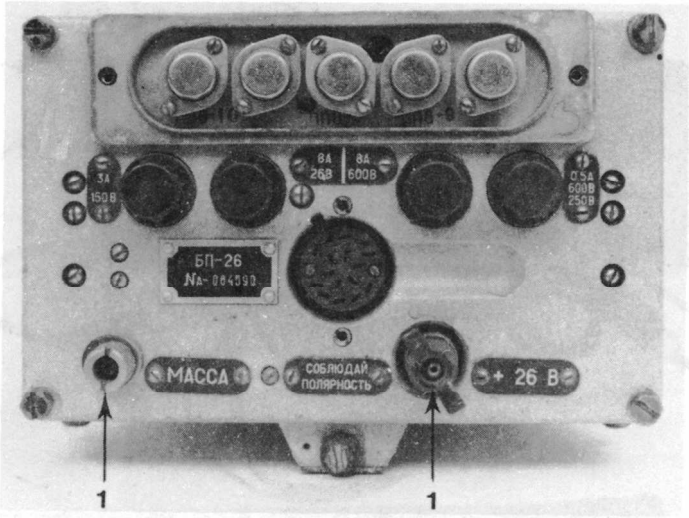
CAUTION: If the R-123M and R-124 systems are not to be mounted in a vehicle, insure all units (radio, power supply, antenna base, R-124) are connected to a good earth ground.

Table 5-2. Operating Instructions (cont)

Pre-operating Actions

STEP

5. Insure that the power source to be used (power supply, battery, vehicle power system) is turned off. Connect radio power supply to power source utilizing at least 12 gauge wire paying particular attention to the polarity markings (1). The BA-26 power supply is designed to provide proper operating voltages to the R-123M radio with an input voltage of 24 ± 4 volts DC.



NEG. NO. R-123-9

Figure 5-7. Power supply connection points.

5-7. Procedures

Table 5-3. Operating Instructions

Procedures

STEP

1. Insure that the POWER SWITCH (23) and the DIAL LIGHT SWITCH (26) are in the off (down) position.

2. Insure that the cable from the antenna receptacle (right-hand side panel) is connected to an antenna base or proper dummy load.

3. Put on and fit the CVC helmet.

4. Set the MODE SELECTOR SWITCH (3) to the Simplex (left) position.

5. Insure that the ANTENNA LOADING CONTROL LOCKING NUT (8) is tightened (clockwise) until snug.

6. Turn the SQUELCH CONTROL KNOB (2) counterclockwise (off).

7. Turn the VOLUME CONTROL KNOB (16) all the way clockwise.

8. Turn the VOLTAGE CHECK/OPERATE SWITCH (28) to the receiver circuits portion of the scale; 1,2B (approximately the one o'clock position).

9. Turn the power source on. The input voltage to the R-123M power supply should be 24 $\pm$ 1 volts DC for best operation.

10. Turn the POWER SWITCH (23) and the DIAL LIGHT SWITCH (26) to the on position (up). At this time the FREQUENCY DIAL VIEWING WINDOW (5) and the INDICATOR METER (12) will light. After the tubes are heated, a rushing noise will be heard in the earphones. Adjust the VOLUME CONTROL KNOB (16) for the desired volume level.

11. Check the power supply in the receive mode by noting the reading on the INDICATOR METER (12) and turning the VOLTAGE CHECK/OPERATE SWITCH (28) clockwise to the 6,3B and the 150B positions. The needle on the INDICATOR METER (12) should be in the shaded portion of the scale for all three readings.

CAUTION: The receiver and transmitter are tuned simultaneously. Do not operate the transmitter without using an antenna or dummy load. Transmitting into an antenna base without connecting an antenna may damage the transmitter portion of the radio.

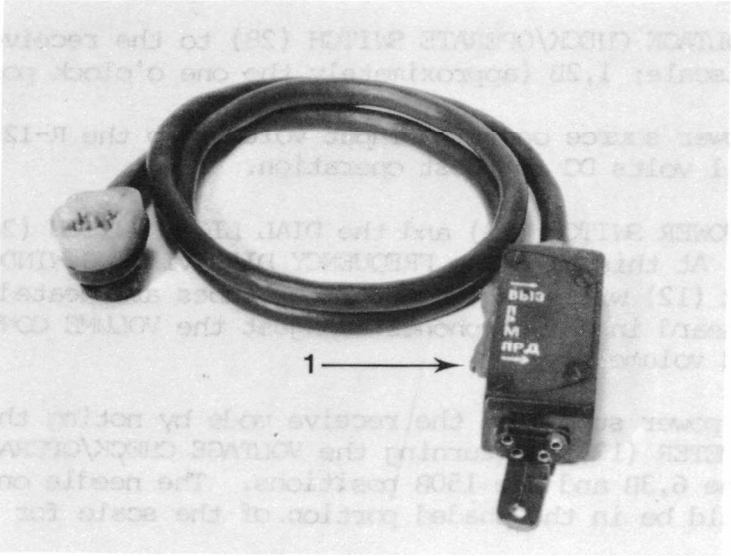
Table 5-3. Operating Instructions (cont)

Procedures

STEP

12. Check the power supply in the transmit mode by placing the VOLTAGE CHECK/OPERATE SWITCH (28) to the 1,2B position on the transmitter circuits portion of the scale (approximately the 7 o'clock position). The INDICATOR METER (12) should read in the shaded portion of the scale.

13. Place the VOLTAGE CHECK/OPERATE SWITCH (28) in the 150B position by rotating the switch clockwise. Momentarily place the chest plate switch in the transmit position (figure 5-8). Note the reading on the INDICATOR METER (12); it should be in the shaded portion of the scale. Release the chest plate switch.



NEG. NO. CVC-10

Figure 5-8. Chest plate switch for R-123M. Depressing lower portion of the rocker switch (1) will key radio for transmission.

Table 5-3. Operating Instructions (cont)

Procedures

STEP

14. Place the VOLTAGE CHECK/OPERATE SWITCH (28) alternately in the 250B and 600B positions by rotating the switch clockwise. To obtain an indication it is necessary to momentarily depress the chest plate switch to transmit. Both the readings should be in the shaded portion of the scale.

15. Place the VOLTAGE CHECK/OPERATE SWITCH (28) in the operate #1 (PAbOTA 1) position.

16. Place the PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH (18) in either the I or II position. Position I will be used if the desired operating frequency is between 20 and 35.75 MHZ and position II will be selected if the desired operating frequency will be between 35.8 to 51.5 MHZ. Band selections are also shown by the BAND INDICATOR (13) lights.

17. Rotate the FREQUENCY TUNING KNOB (27) while looking into the FREQUENCY DIAL VIEWING WINDOW (5) and select the frequency listed below that is the closest to the desired operating frequency.

Frequencies for Index Line Adjustment

Band I: 22.050 MHZ 28.350 MHZ 34.650 MHZ

Band II: 36.225 MHZ 40.950 MHZ 42.525 MHZ 45.675 MHZ 48.825 MHZ

These frequencies are noted on the frequency dial with an extended graduation line capped by an arrowhead.

18. Set the MODE SELECTOR SWITCH (3) to the receive only position (right).

19. Depress and hold the TONE CALL BUTTON (25). A tone should be heard in the earphones. Rotate the FREQUENCY TUNING KNOB (27) until a zero beat is obtained. While rotating the FREQUENCY TUNING KNOB (27) the tone should be heard to progress from a higher pitch to a lower pitch then to a higher pitch again. The proper setting of the FREQUENCY TUNING KNOB (27) is the point at which the tone is at its lowest pitch or totally absent.

Table 5-3. Operating Instructions (cont)

Procedures

STEP

20. Note the relative positions of the index line and the frequency graduation line thru the FREQUENCY DIAL VIEWING WINDOW (5). If the index line is within 1/5 of a frequency graduation (5 KHZ), no adjustment of the index line is necessary. Proceed to step 21 after releasing the TONE CALL BUTTON (25). If the index line is not within 1/5 of a graduation (5 KHZ) the following adjustments must be made:

a. Release the TONE CALL BUTTON (25). Using a screwdriver, remove the INDEX LINE ADJUSTMENT (4) plug.

b. Insert the screwdriver into the hole disclosed and contact the index line adjustment. Rotate the adjustment right or left until the index line exactly corresponds to the selected frequency graduation line.

Note: This adjustment is quite stiff. Care should be exercised to not change the frequency setting while adjusting the index line.

c. Remove the screwdriver and replace the INDEX LINE ADJUSTMENT (4) plug.

d. Double check the setting by repeating steps 19 and 20. When no adjustment is required, proceed to the next step.

21. Return the MODE SELECTOR SWITCH (3) to the Simplex position (left).

22. Set the PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH (18) to the preset #1 position.

23. Set the PRESET CHANNEL BAND SELECTOR (11) to correspond with the desired band. Frequencies between 20.0 and 35.75 MHZ are set on Band I (switch up) and frequencies between 35.8 and 51.5 MHZ are set on Band II (switch down). Band selections are indicated by the BAND INDICATOR lights (13).

24. Open the PRESET LOCKING SCREW ACCESS COVER (19) on the front panel and loosen the PRESET LOCKING SCREW (6) marked "1" by turning the locking screw counterclockwise until the slot is at right angles with the red circle. To release the preset locking screw, use the special key (not shown) attached to the case of the radio.

Table 5-3. Operating Instructions (cont)

Procedures

STEP

25. Turn the FREQUENCY TUNING CONTROL (27) to the desired frequency by aligning the desired frequency with the indicator line within the FREQUENCY DIAL VIEWING WINDOW (5). While holding the FREQUENCY TUNING KNOB (27) turn the PRESET LOCKING SCREW (6) clockwise with the special key until it is aligned with the red circle.

26. Loosen the ANTENNA LOADING CONTROL LOCKING NUT (8) two or three turns counterclockwise.

27. Put the chest plate switch in the transmit position and hold. Turn the ANTENNA LOADING CONTROL KNOB (9) for maximum deflection on the INDICATOR METER (12) and maximum brilliance on the RF INDICATOR LAMP (7). Note: Several peaks will be noted on the indicator meter while loading the antenna. Tune to the maximum peak, and the maximum brilliance on the indicator lamp. For a more sensitive meter to help choose between peaks, turn the VOLTAGE CHECK/OPERATE SWITCH (28) to the operate #2 (PAbOTA 2) position. After determining the most advantageous loading position, return the VOLTAGE CHECK/OPERATE SWITCH (28) to the operate #1 (PAbOTA 1) position. Release the chest plate switch.

28. While holding the ANTENNA LOADING CONTROL KNOB (9), tighten the ANTENNA LOADING CONTROL LOCKING NUT (8). Double check this step by depressing the chest plate switch to the transmit position. If the indication on the INDICATOR METER (12) is not the same as noted in step 27, loosen the ANTENNA LOADING CONTROL LOCKING NUT (8) and repeat step 27. If proper loading has been accomplished release the chest plate switch and proceed.

29. Repeat steps 21 thru 28 to preset frequencies on settings 2, 3, and 4. Note: Only two frequencies may be preset on Band I or Band II. Example: If the PRESET CHANNEL BAND SELECTOR (11) is set at Band I position for preset #1 and #2, only Band II frequencies may be selected for presets #3 and #4. Any combination of bands and presets may be used (i.e., preset #1 may be set on either Band I or Band II) but only two preset frequencies may be selected on Band I and two preset frequencies may be selected on Band II.

30. You are now ready to operate in the preset mode. Any time you want to select a preset frequency, simply turn the PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH (13) to the desired preset number.

Table 5-3. Operating Instructions (cont)

Procedures

STEP

31. To operate in the continuous tune mode, turn the PRESET CHANNEL/CONTINUOUS TUNE SELECTOR SWITCH (18) to the lower positions, annotated I and II. "I" corresponds to Band I frequencies and "II" corresponds to Band II frequencies.

32. Turn the FREQUENCY TUNING KNOB (27) to the desired frequency.

33. Load the antenna by accomplishing steps 26 - 28.

34. You are now ready to operate in the continuous tune mode. The tuning controls are very sensitive; therefore, the continuous mode should not be selected if the radio is to be moved or subjected to vibrations.

CAUTION: Observe a 1:3 transmit to receive ratio; i.e., 3 minutes transmit to 9 minutes receive, to minimize the possibility of overheating the power supply and power output tubes.

SECTION IV

OPERATOR MAINTENANCE

5-8. Procedures

The operator-user of the R-123M transceiver has the responsibility for performing operator maintenance on the transceiver, power supply, CVC helmet and associated equipment. These responsibilities include but are not limited to the following:

a. Transceiver	Visual inspection of external case, connectors, dials, and switches. Check for proper operation of controls, indicator lights and indicator meter. Correct all deficiencies found if possible.
b. Power Supply	Visual inspection of external case and connectors. Insure all connector pins are complete and not bent. Check fuses for continuity. Inspect inter-connection cable for cracks, broken insulation and abnormal bends.
c. Antenna	Insure antenna is complete, not bent or broken. Inspect connector and insure it is free of corrosion. Check that the antenna base makes good common gound connection with radio.
d. Cables	Check that CVC cables or intercommunications cables are not frayed, broken or abnormally bent. Insure all pins on male connectors are present.
e. Helmet	Inspect cables, connectors, throat microphones and earphones for proper condition. Canvas and leather parts of the helmet should be kept free from moisture, oil or other liquids if possible. Allow wet headset to dry before storage.