UNITED STATES MARINE CORPS

FIELD MEDICAL TRAINING BATTALION
Camp Lejeune, NC 28542-0042

FMSO 108

Communicate with a VHF Radio

TERMINAL LEARNING OBJECTIVE.

1. Given a SL-3 complete VHF radio with a fill, a frequency or net ID, and a distant station, while wearing a fighting load, **operate a VHF field radio** to establish communication with the distant station. (HSS-MCCS-2015)

ENABLING LEARNING OBJECTIVES

1. Without the aid of reference, and in writing, identify the nomenclature of the VHF field radio, within 80% accuracy, per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015b)

2. Without the aid of reference, and in writing, identify the components of the VHF field radio, within 80% accuracy, per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015a)

3. Without the aid of reference and given a list, identify VHF radio assembly procedures without error, per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015c)

4. Without the aid of reference and given a list, identify proper phonetic terms within 80% accuracy and per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015d)

5. Without the aid of reference and in writing**,** identify the control functionality of the VHF radio controls in order to transmit field communications per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015e)

6. Without the aid of reference and given a list of steps, sequence the procedures to load single channel frequencies on a VHF field radio without any errors, per MCRP 3-40-3_ Multi-Service Communications Procedures. (HSS-MCCS-2015f)

7. Without the aid of reference and given a list, identify trouble shooting procedures to reestablish field communications per TM 11-5820-890-10-6. (HSS-MCCS-2015g)

1. **NOMENCLATURE OF THE SINCGARS (AN/PRC-119A)** The Single Channel Ground & Airborne Radio Systems (SINCGARS)**.** This radio is in a family of VHF-FM combat net radios designed to provide the primary means of command and control for combat, combat service, and combat service support units.

Single Channel (SC) Mode – When using the single channel mode of operation, the radio communicates using a single frequency. For the SINCGARS radio, this single channel can be selected by use of the Receiver-Transmitter keyboard (like a telephone keypad). The advantage of SINCGARS is that eight (8) individual single channel frequencies can be loaded into the radio, and the operator can select any one of those channels by flipping a switch.

Frequency Hopping (FH) Mode – Another method of secure transmissions is using the SINCGARS in the FH mode. This mode reduces the enemy's capability to jam your traffic or to use direction-finding equipment to establish your location. When properly loaded with data, the SINCGARS hops (cycles) through more than 100 frequencies per second during transmissions in the FH mode. When communicating in the FH mode, the communicating stations must be on the same net. This means that they both must be operating on the same time (clock) and have the same data loaded and on the same hop-set (channel). Up to six (6) channels can be loaded for FH operations at any given time.

Remote Operations – The SINCGARS radio can be operated by the use of remote equipment

Retransmission – The radio is capable of conducting retransmission operations in conjunction with other radios. Because of the SINCGARS capabilities (SC and FH) the retransmit function allows a wider use of retransmitting functions than with older radios.

Frequency Range – The SINCGARS operates in the VHF range from 30.000 to 87.975 MHz.

Range – One of the features of the SINCGARS radio is the operator's ability to select the power output of the radio by use of a selector switch. This feature allows you to reduce your electronic footprint by operating in a lower power or to reach far away stations using a higher setting. The switch has four positions: LO, M, HI, and PA. The maximum transmission ranges for each of the settings is as follows:

(1) LO (low power) – 200 to 400 meters

(2) M (medium power) – 400 meters to 5 kilometers

(3) HI (high power) – 5 kilometers to 10 kilometers

(4) PA (power amplifier) – 10 kilometers to 40 kilometers.

Only vehicle-mounted radios equipped with a power amplifier can utilize this setting. Manpack and vehicle radios not equipped with the power amplifier can only use settings LO, M, and HI. When using the SINCGARS radio, the operator should always attempt communication with the lowest setting first, thereby reducing the radios electronic signature. Once communication is established, the operator should maintain the lowest possible setting. PA should only be used when necessary to achieve communication.

2. **COMPONENTS OF THE MANPACK CONFIGURATION (AN/PRC-119A)**

The Manpack configuration is made up of the following components: (Figure 1)

1. Receiver-Transmitter (RT) – This is the common item of all of the configurations. The RT is actually the SINCGARS radio itself
2. Handset- This is used for transmitting voice communication. The handset looks the same as the handsets you may have worked with operating other radios.
3. Manpack Antenna- The antenna radiates/receives the signals.
4. Battery Box – The battery box connects to the bottom of the RT and provides housing for the battery that powers the RT in the Manpack configuration.
5. Battery – Connects to a fitting in the battery box and supplies primary power to the RT for operation.
6. Field Pack – The pack carries the RT and the components.

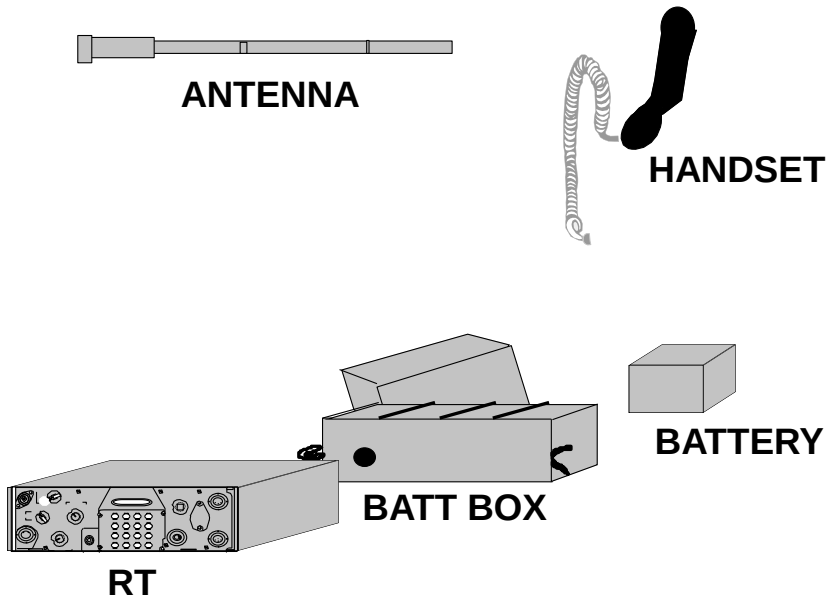


Figure 1 Components

3. **ASSEMBLY OF THE AN/PRC-119** (Figures 2-3) Visually inspect battery box for dirt and damage. If the battery has been previously used, note battery life if it is written on the battery.

a. Stand RT on front panel guards, place battery box on RT and secure it to latches
b. Place battery in battery box and mate connectors
c. Close battery box cover and secure latches
d. Return radio in upright position

e. If used battery was installed, enter the battery life condition into the radio by performing the following

(1) Set FCTN to LD

(2) Press BATT then CLR

(3) Enter number recorded on side of battery

(4) Press STO

(5) Set FCTN switch to SQ ON

f. Screw whip antenna into base, only hand tighten

g. Carefully mate antenna base with RT antenna connector. Make sure you line up the grooves and only hand tightened. It is important not to tighten by other means.

h. Attach handset by lining up red dots and then pressing and turning clockwise.

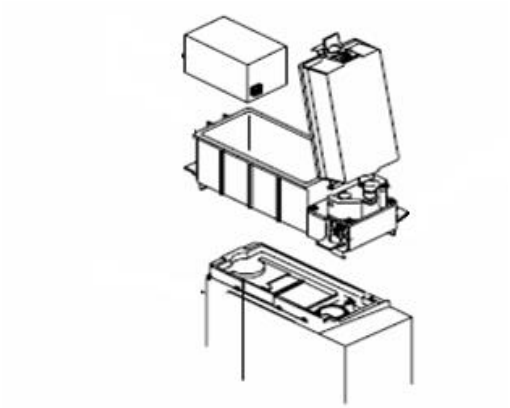


Figure 2

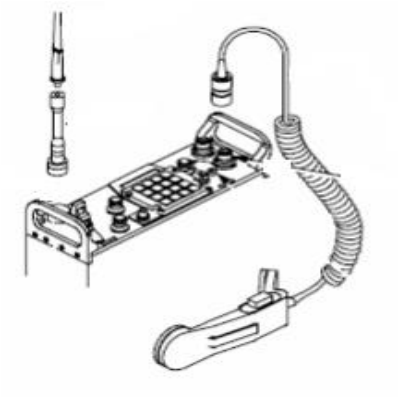


Figure 3

4. **PHONETIC TERMS**. The phonetic alphabet identifies spoken letters through a set of easily understood words. Each of these words begins with the letter being identified. The phonetic alphabet is used to:

A: ALPHA	**D: DELTA**	**G: GOLF**	**J: JULIET**	**M: MIKE**
B: BRAVO	**E: ECHO**	**H: HOTEL**	**K: KILO**	**N: NOVEMBER**
C: CHARLIE	**F: FOXTROT**	**I: INDIA**	**L: LIMA**	

O: OSCAR	**R: ROMEO**	**U: UNIFORM**	**X: X-RAY**
P: PAPA	**S: SIERRA**	**V: VICTOR**	**Y: YANKEE**
Q: QUEBEC	**T: TANGO**	**W: WHISKEY**	**Z: ZULU**

Transmit isolated letters such as E5K, which is transmitted ECHO-FIFE-KILO.

a. Transmit each letter of an abbreviation such as ITB, which is transmitted INDIA-TANGO-BRAVO.

b. Spell unusual or difficult words such as HOSE, which is transmitted HOTEL-OSCAR-SIERRA-ECHO.

c. The following list depicts the pronunciation of each letter in the phonetic alphabet:

Phonetic Numerals. The specific pronunciation of numerals has been determined in order to avoid misinterpreted transmissions. The following are the pronunciations of the phonetic numerals 0 through 9:

0: ZE-RO	**3: TREE**	**6: SIX**	**9: NINER**
1: WUN	**4: FOW-ER**	**7: SEV-EN**	
2: TOO	**5: FIFE**	**8: ATE**	

Procedure Words (Pro Words). Procedure words are pronounceable words or phrases, which have been assigned a meaning for the purpose of expediting message handling over radios or field telephones. Understanding the following PROWORDS and their respective definitions is the key to clear and concise communication procedures.

This Is: This transmission is from the station whose designation immediately follows.

Over: This is the end of my transmission to you, and a response is necessary. Go ahead and transmit.

Out: This is the end of my transmission to you and no answer is required or expected. Since the phrases OVER and OUT have opposite meanings, they are never used together.

Roger: I have received your last transmission satisfactorily and understand it.

Wilco: I have received your last transmission and will comply. Since the meaning of ROGER is included in that of WILCO, these two prowords are never used together.

Say Again: I did not receive or understand your last transmission, repeat all of your last transmission, or use with ALL AFTER or ALL BEFORE. Do not substitute SAY AGAIN for REPEAT, which is a proword specific to call for fire.

Say Again: I am repeating the transmission or portion indicated.

All After: The portion of the message to which I have referred is all that which follows _____.

All Before: The portion of the message to which I have referred is all that which precedes _____.

Wait Over: I must pause for a few seconds.

Wait Out: I must pause for longer than a few seconds. I will call you back.

Read Back: Repeat this entire transmission back to me.

I Read Back: The following is my response to your instruction to read back.

Correction: I have made an error in this transmission. Transmission will continue with the last word correctly sent.

Radio Check: I want a response indicating the strength and readability of my transmission.

(1) A response of ROGER indicates transmission is loud and clear.

(2) A response of WEAK BUT READABLE indicates a weak signal but I can understand.

(3) A response of WEAK AND GARBLED indicates a weak signal and unreadable.

(4) A response of STRONG BUT GARBLED indicates a strong signal but unreadable.

5. FUNCTIONALITY OF THE AN/PRC-119 CONTROLS

Although the SINCGARS radio demands more of the operator than turning the radio on, operator tasks primarily involve entering data using the keyboard, turning knobs and following instructions from the net control station. In order to operate the radio, the operator needs to understand terminology of the radio so that when he receives instructions over the radio, he can follow them. Additionally, the primary function of each control will aid the operator in achieving a properly functioning radio.

NOTE: Anytime the operator moves a switch to a setting with a box around the letters, the knob must first be pulled before it is turned. This feature ensures that the knob is not accidentally moved to the position.

Receiver-Transmitter (RT) - Most of the controls that the operator will use are placed on the face of the RT.(See fig. 4)

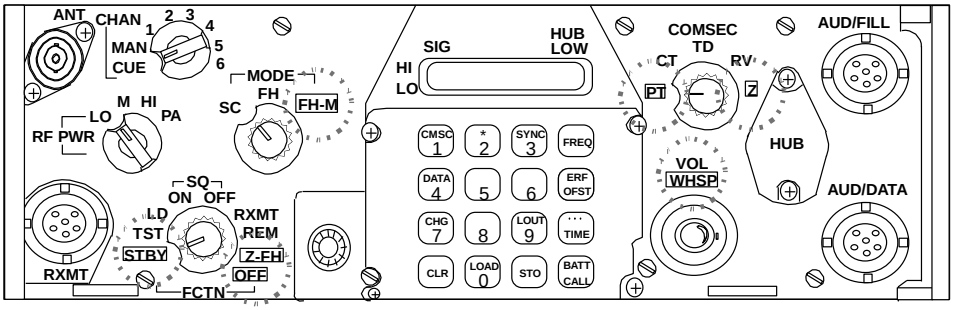
(1) FCTN (function) Switch – The function switch sets the RT function. The function switch has four operating positions (SQ ON, SQ OFF, REM and RXMT) and five other positions (STBY, TST, LD, Z-FH and OFF). The function of each position is as follows:

(a) SQ ON (squelch on) – This turns on the RT and the squelch. This feature will prevent the rushing noise from being heard in the handset/helmet. This is the normal operating position for the SINCGARS radio.

(b) SQ OFF (squelch off) – This turns on the RT but not the squelch. This position is used when communicating in the SC mode with radios having a different squelch system.

(c) REM (remote) – This position actually disables all of the RTs front panel controls and allows the remote device used with the radio to have complete access to the controls.

(d) RXMT (retransmit) – This position is used when the radio is operating in the retransmit mode.



NOTE: PULL TO TURN

Figure 4. Face of Receiver Transmitter

(e) STBY (stand by) - The STBY position will cut the primary (battery/vehicle) power to the RT. The RTs battery (hub battery) will maintain the memory of the radio including frequencies and times. This position is used as an alternative to OFF when the operator is concerned about conserving power during non-operating periods, but wants to retain all of the data loaded for operations occurring in the near future (same day).

(f) TST (test) - When this position is selected, the RT conducts a self-test of its internal circuits. At the completion of the test, the radio will display results. Whenever the radio is put into operation, the operator should conduct a self-test.

(g) LD (load) - Putting the radio in this position allows the operator to load frequencies, data and COMSEC into the radio. In order to load any of this information into

the radio for use, the operator must ensure that LD is positioned so the radio will receive the input.

(h) Z-FH (zero-FH) - Placing the function switch in this position and waiting five (5) seconds will clear all of the frequency hopping (FH) data within the radio.

(i) OFF - Turns off all of the power to the RT. When the radio is in the OFF position for more than five (5) seconds, the memory is completely cleared. This switch is used when it is the operator's intent to take the radio completely out of action.

Mode Switch - Sets the receiver-transmitter mode. The mode switch has three (3) settings that allow the operator to select the mode of operation.

(1) SC (single channel) - Placing the mode switch in this position places the RT in the single channel mode of operation.

(2) FH (frequency hopping) - This position allows the operator to use the RT in the FH mode.

(3) FH-M (frequency hopping master) - This setting places the RT in frequency hopping master mode. This mode is used only by the net control station (NCS). The NCS is basically the foundation of a FH net. If more than one station use the FH-M mode, then communication can be lost. Operators do not use this position.

COMSEC Switch - Sets the RT to the COMSEC mode. This switch has five (5) settings that allow the operator to use or manage COMSEC data.

(1) PT (plain text) - Placing the switch at this setting places the RT in the plain text, not a secure, mode of transmission.

(2) CT (cipher text) - This setting allows the operator to use cipher, secure, transmissions when placed to this position.

(3) TD (time delay) - Places the RT in secure mode. This setting is used when necessary to compensate for transmission delays due to the distance between communication links. This setting is also used when operating some data devices with the SINCGARS in order to compensate for the data rate differences.

(4) RV (receive variable) - This setting is used when receiving remote fill of the COMSEC key.

(5) Z (zero) - Used to clear the COMSEC fills. When turned to Z, the fills in channel 1-5 are instantly cleared. After 5 seconds in the Z position, the key in channel 6 is cleared.

CHAN (channel) Switch - Selects manual, preset and cue frequencies. Operating this switch allows the operator access to any of the frequencies loaded into the channels. This switch is the means that the operator changes frequencies that are preset.

(1) MAN (manual) - This position selects the loaded manual frequency. The manual frequency is used during FH operations and will be discussed later.

(2) CUE - This setting selects the loaded CUE frequency. This frequency is also used in FH operations and will be discussed later.

(3) 1 through 6. These are the channels that may be loaded with operating frequencies or hopsets. COMSECs are also loaded into these channels.

RF Switch - Adjusts power level of transmissions. As earlier discussed, the SINCGARS has a variable power output. This is the switch that enables the operator to change the power output of the radio.

SIG (signal) Display - Shows appropriate signal strength. The signal display is contained in the left hand part of the LED (Light emitting diode) display. There is a bar that lights from LO to HI adjacent to the letters. The RF switch setting determines the signal output that is displayed on the SIG display.

HUB/LOW (Hold Up Battery) Display - Indicates the power level of the HUB battery. The hub battery is the source of energy for the stand by mode. This indicator notifies the operator when the HUB battery is low, empty or missing. A diamond shape symbol will flash if the HUB battery is weak. If the diamond shaped symbol appears as a steady light, the battery is extremely weak or missing.

DIM Control- Adjusts display brightness. The knob is turned clockwise to brighten the display and counterclockwise to dim the display.

VOL/WHSP (volume/whisper) control - Adjusts audio volume. Clockwise increases volume, counterclockwise to decrease volume. Pulling the knob out allows the operator to receive as normal, but give the operator the additional feature of being able to talk very softly and still transmit.

Keyboard Display - Displays keyboard information and other data to the operator. A variety of information is displayed in response to keyboard functions and operation of the radio.

Keyboard - Used for entering, holding and checking data. By using the knobs and the keyboard in conjunction, the operator is able to complete all functions required when operating the radio. The keyboard is laid out similar to a telephone keypad. Some of the keys have dual functions.

(1) FREQ (frequency) Button - This button is used to check the data entered in the RT. Additionally, this button is used to load and clear the frequencies.

(2) ERF (electronic remote fill) Button - Used only by the NCS (net control station) to transmit fills to other stations.

(3) OFST (offset) Button - This button is used during SC operations when it becomes necessary to offset SC frequencies.

(4) TIME Button - This button is used by the NCS to load and check the FH time clock. A requirement of operating an FH net is that all stations have the same time set. The NCS is responsible for this, and the time button is one of the NCS tools.

(5) BATT (battery) Button - This button is used with the Manpack configuration to check the battery life of the primary battery. This button, when pressed, will show the life remaining on the battery.

(6) CALL Button - The call button is used to communicate with the remote when running remote operations.

(7) STO (store) Button - This button is used for data loading. Pushing this button when required transfer data from the holding (temporary) memory to the permanent memory. When loading ERF data this button is used.

(8) LOAD Button - This button will load information into the holding memory and retrieve information from the permanent memory into the holding memory.

(9) CLR (clear) Button - Clears data from the keyboard display if a mistake was made.

(10) LOUT (lockout) Button - Used by the NCS when managing an FH net.

(11) CHG (change) Button - This button is used in conjunction with other buttons in order to change data when required.

(12) SYNC (late entry) Button - During FH operations, this button is used when performing late entry procedures.

(13) DATA Button - The SINCGARS radio can operate in the data mode where this button selects the data rate. During this period of instruction, we will only discuss the voice mode of operation.

(14) CMSC (COMSEC) Button - Pressing this button causes the COMSEC key to be displayed.

(15) Number Buttons - Used to enter numerical data such as SC frequencies, and channel numbers.

AUD/FILL (audio/fill) Connector - Connects to fill devices or handsets. When loading FH data or COMSEC data, the fill device is hooked to this connector via cable. Handsets can be attached to this connector as necessary.

AUD/DATA (audio/data) Connector - Connects to external data devices during data operations and handsets during normal operations.

ANT (antenna) connector - Connects to the manpack antenna or vehicle antenna cable. If the RT is to be functioning with PA, the antenna connector connects the RT to the PA. The PA will connect to the antenna.

RXMT (retransmit) Connector - Connects to another RT during retransmit operations.

6. LOADING SINGLE CHANNEL FREQUENCIES ON THE SINCGARS RADIO

The most basic of SINCGARS operation is operating the radio in the single channel (SC) mode. When operating in the SC mode, the user is using the radio to communicate on a single frequency. The procedures for loading SC frequencies require setting the proper switches, pressing the correct number keys and storing the information in the channel desired. As discussed earlier, the SINCGARS radio is capable of accepting up to 8 single channel frequencies. Those frequencies are loaded in the manual, cue and 1 through 6 channels. The procedures for loading frequencies into the channels are identical with the exception of which channel is selected during the procedure. The first channel we will load is the manual channel.

TURNING ON THE RT (Receiver-Transmitter)

(1) Place mode switch to SC

(2) Place RF power switch to desired level

(3) Place channel switch to MAN

(4) Place COMSEC switch to CT

(5) Place volume switch to desired level

(6) Move FCTN switch to TST, complete test by following instructions on display window. When test is complete move FCTN switch to either STBY or SQ ON.

Loading SC Frequencies - Following are the procedures for loading single channel frequencies. The procedures are to be performed in order. In order to load additional channels with frequencies, go to step (3), change to the desired channel and repeat steps (4) through (8). Continue repeating those steps for each new channel desired.

(1) Set COMSEC switch to (P.T.) Plain Text prior to load.

(2) Set the function switch to load - The load setting allows the operator to input data to the radio.

(3) Set the mode switch to single channel (SC) - When loading single channel frequencies, the setting is appropriately set on SC.

(4) Set channel switch to desired channel - This step is different for each channel loaded. This setting will change the manual frequency. Turn the channel switch to the desired channel to change other frequencies.

(5) Press FREQ (frequency) button on keypad - This procedure displays the current frequency of the channel selected, or "00000" if there is not a frequency currently entered into the channel.

(6) Press the CLR (clear) button - After pressing the FREQ button and displaying the current frequency, pressing the CLR button will clear that frequency and display five lines "_ _ _ _ _". At this point, the radio is ready to accept frequencies.

(7) Enter the numbers of the new (desired) frequency - Using the keypad, the display will show each number replacing a line as you enter the number. If you make a mistake, push the CLR button and the five blank lines will reappear. An important note is that if there is no keyboard action for 7 seconds, the display will go blank, and you will have to reenter the numbers.

(8) Press the STO (store) button- The display will blink and the frequency you just entered is moved to the permanent memory in the channel selected.

(9) Set function switch to SQ ON or OFF (squelch on) - Placing the radio in SQ ON puts the radio into the normal SC operating position. Now the operator can call another channel using the handset.

Transmitting with the SINCGARS radio - When the push-to-talk button is activated (handset or helmet), the operator talks, and the radio transmit in the voice mode. The radio will transmit on the frequency that is entered into the channel that is selected on the channel switch. Transmissions should be no longer than 3 to 5 seconds.

(1) Changing Channels - In order to transmit on a different frequency, the operator simply moves the channel switch to the channel containing the desired frequency. Each time that the channel switch is turned to a new channel, the frequency entered into that channel is displayed for the operator's reference.

Clearing Single Channels - When the radio is turned OFF for more than 5 seconds, the memory is cleared. If the operator desires to clear a SC of a frequency without turning the radio OFF, thus clearing all channels, the following procedures are used

(1) Set the MODE switch to SC

(2) Set the CHAN switch to the channel to be cleared. The frequency will be displayed allowing the operator to confirm that the frequency is to be cleared.

(3) Press the FREQ button

(4) Press the CLR button. The display will show five blank lines.

(5) Press the LOAD button, the press the STO button.

(6) Pressing STO will enter NO, or a cleared, frequency into the RT.

7. TROUBLESHOOTING THE AN/PRC-119 CONTROLES

The troubleshooting tables found in TM11-5820-890-10-6 Pg's. 58-74 allow you to check out common malfunctions of your equipment. The table lists the common malfunctions which you may find during the operation or maintenance of the radio, or its components. You should perform the tests/inspections and corrective actions in the order listed. This outline cannot list all malfunctions that may occur, or all the tests, inspections and corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify your supervisor.

2.3. TROUBLESHOOTING FLOWCHARTS.

Chart 1

VARIABLE WILL NOT LOAD.
(Sheet 1 of 1)

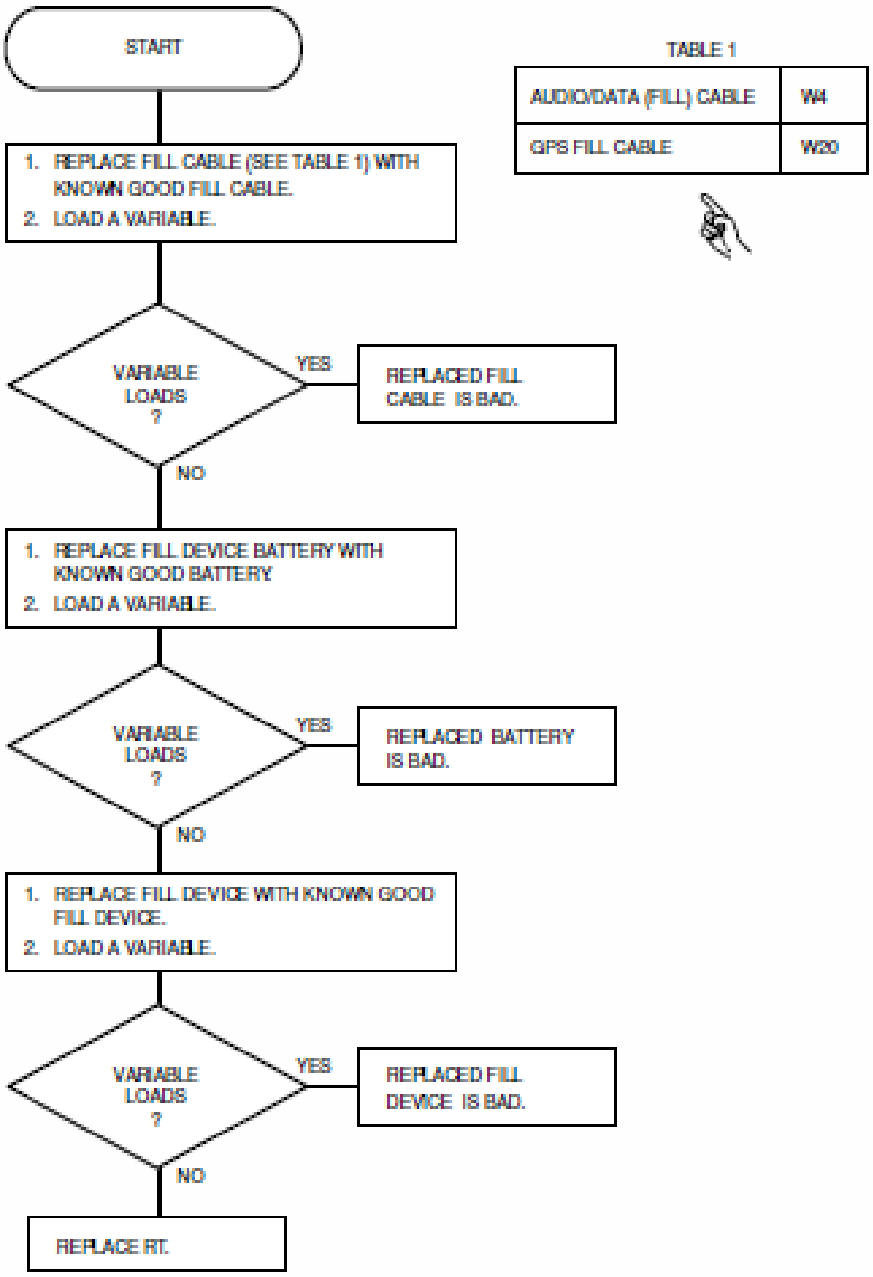


TABLE 1

AUDIO/DATA (FILL) CABLE	W4
GPS FILL CABLE	W20

REFERENCES:

Multi-Service Communications Procedures and Tactical Radio Procedures in Joint Environment
Operator's Pocket Guide for SINCGARS Ground ICOM Radios

Field Communication Review

1. What does it mean when the squelch is switched to the “on” position?

1. What happens to the memory in a SINCGARS if it is turned off for more than 5 seconds?

2. Define the term “over” as it relates to Field Communication.

3. Provide the phonetic term for the following letters:
   G-
   O-
   R-
   E-
   D-
   S-
   O-
   X-