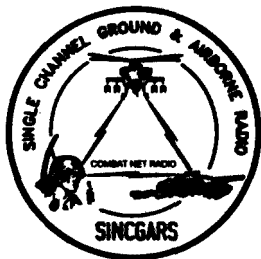


TM 11-5820-890-10-5

SINGGARS ICOM AND NON-ICOM  
GROUND RADIO

NET CONTROL STATION (NCS)  
POCKET GUIDE



RADIO SETS

MANPACK RADIO  
(AN/PRC-119/119A)

VEHICULAR RADIOS  
(AN/VRC-87/87A-C  
THRU AN/VRC-92/92A)

NCS ROADMAP

FLOW CHARTS

RESPONSIBILITIES

NCS NOTES

SYN C T I M E

TROUBLESHOOTING

RXMT REMINDERS

Approved for public release; distribution is unlimited.

Headquarters, Department of the Army

1 APRIL 1993

# **+** ***ELECTRICAL*** **+** ***SHOCK***

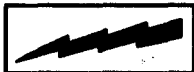
## **SAFETY STEPS**

- 1** DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL.
- 2** IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL.
- 3** SEND FOR HELP AS SOON AS POSSIBLE.
- 4** AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION.
- 5** FOR ARTIFICIAL RESPIRATION, REFER TO FM 21-11.

### **WARNING**

RF ENERGY IS PRESENT NEAR THE ANTENNA DURING TRANSMISSION. MAINTAIN AT LEAST 30 INCHES BETWEEN VEHICULAR ANTENNA AND PERSONNEL DURING TRANSMISSIONS.

### **WARNING**



### **HIGH VOLTAGE**

EXISTS AT CONNECTOR J1 ON VEHICULAR MOUNTING ADAPTER. AVOID PERSONAL INJURY; BE SURE J1 IS COVERED OR CAPPED WHEN NOT IN USE.

#### **DEATH OR SERIOUS INJURY CAN RESULT:**

- When antenna tip caps are not installed on antennas.
- When a tied-down antenna hits a fixed object such as an overhead bridge, tree limb, etc. Flying antenna parts might strike nearby personnel.

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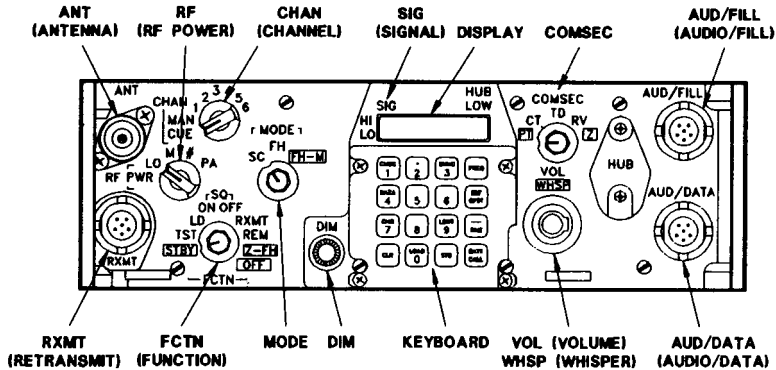
## **SCOPE**

This pocket guide is intended for use by SINCGARS Net Control Stations, both ICOM and Non-ICOM versions of the radio. Where controls differ, ICOM is shown first, followed by Non-ICOM in parenthesis; i.e.; ERF (SEnd).

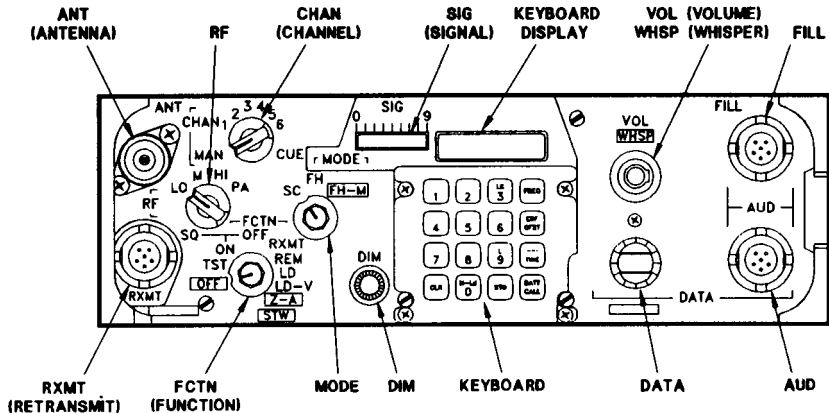
It covers the NCS tasks and provides flow charts showing the stops required to perform NCS functions. This pocket guide is based on the assumption that NCS personnel are well-trained and experienced SINCGARS operators, that they have access to Operator's Manuals and Pocket Guides. The purpose of this NCS pocket guide is to provide the NCS soldier a hand memory jogger covering major NCS requirements.

Whenever more information is needed, NCS personnel are encouraged to refer to TM 11-5820-890-10-1/2/3/4.

# ICOM RT FRONT PANEL



# NON-ICOM RT FRONT PANEL



## NET CONTROL STATION (NCS) ROADMAP

<u>TASK 1:</u> PREPARE FOR NET OPENING	<u>TASK 2:</u> CHANGE NET ID	<u>TASK 3:</u> LOAD SYNC TIME BY KEYPAD	<u>TASK 4:</u> OPEN THE NET
[1-1]  <u>Advise</u> net of time and details for net opening	[2-1]  <u>Set</u> RT controls to proper positions	[3-1]  <u>Obtain</u> Julian date and Zulu time to be used	[4-1]  <u>Set</u> RT controls to proper positions
[1-2]  <u>Obtain</u> COMSEC key, SC freqs, FH data to be used	[2-2]  <u>Clear</u> last two digits of stored hopset	[3-2]  <u>Enter</u> sync time into NCS radio	[4-2]  <u>Alert</u> members to stand by for net opening
[1-3]  <u>Clear</u> NCS radio of all COMSEC, FH, & sync time	[2-3]  <u>Enter</u> last two digits of Net ID		[4-3]  <u>Send</u> ERF to net members
[1-4]  <u>Load</u> COMSEC, SC, FH, & sync time needed for net opening	[2-4]  <u>Store</u> Net ID		[4-4]  <u>Confirm</u> members' receipt of ERF
			[4-5]  <u>Perform</u> communications check

## **NET CONTROL STATION (NCS) ROADMAP (Con't)**

<u>TASK 5:</u> ANSWER CUE CALLS	<u>TASK 6:</u> PROVIDE NET UPDATE	<u>TASK 7:</u> CONDUCT RXMT OPERATION
[5-1]  <u>Be alert</u> to "CUE" messages	[6-1]  <u>Obtain</u> new FH data	[7-1]  <u>Plan</u> for use of RXMT station
[5-2]  <u>Direct</u> ALT NCS to respond to CUE callers (SOP)	[6-2]  <u>Alert</u> net members of net update	[7-2]  <u>Establish</u> contact from NCS to forward unit thru RXMT station
[5-3]  <u>Answer</u> CUE caller (ALT NCS or NCS)	[6-3]  <u>Send</u> update ERF using operational channel	[7-3]  <u>Keep</u> RXMT operators informed
[5-4]  <u>Advise</u> CUE caller to reply	[6-4]  <u>Confirm</u> members receipt of ERF	
[5-5]  <u>Respond</u> to CUE caller's requirement	[6-5]  Check communications (now or when change is effective)	

## TASK 1: PREPARE FOR NET OPENING

Task 1-1	Actions	Results
<p><u>Advise</u> net of time and details for net opening</p>	<p>(1) Determine time net is to open, and announce to all net members</p> <p>(2) Designate Alt NCS(s) as required to meet mission operations</p>	<p>Operators know when they must be standing by their prepared radio for net opening</p> <p>Allows Alt NCS(s) to prepare to operate as NCS when required</p>
Task 1-2	Actions	Results
<p><u>Obtain</u> COMSEC key, SC freqs, and FH data to be used for net operations</p>	<p>(1) Ensure that unit SOP, SOI, and/or NCS announcement provide correct information</p>	<p>Provides operators the guidance required to load radios in preparation for net opening</p>
Task 1-3	Actions	Results
<p><u>Clear</u> NCS radio of all COMSEC keys, FH data, and sync time</p>	<p>(1) Set RT COMSEC (KY-57) to Z to clear COMSEC</p> <p>(2) Set FCTN to Z-FH(Z-A) and wait 2 sec to clear SC freqs and FH date</p> <p>(3) Set FCTN to OFF (STBY) and wait 2 sec to clear RT of sync time</p>	<p>NCS RT is now clear of all COMSEC, SC freqs, FH date, and sync time</p>



Task 1-4	Actions	Results
<p><u>Load</u> all COMSEC, SC freqs, FH data, and sync time needed for net opening</p>	<p>(1) Load proper COMSEC key, store CHAN 1-6 (or TEK Chan 6 if directed)</p> <p>(2) Load CUE and MAN freqs, plus SC freqs in CHAN 1-6 as needed for net operations</p> <p>(3A) Load TSK and obtain sync time via ERF from higher NCS (and store Chan 1); <u>OR</u></p> <p>(3B) Load sync time by use of RT keypad; then load proper hopset in CHAN 1 (and TSK for Non-ICOM radios)</p> <p>(4) Change to correct net ID (if required)</p> <p>(5) Store all data in permanent memory</p>	<p>Allows use of any channel in secure mode</p> <p>Alt NCS(S) will also load CUE frequency</p> <p>Also loads NCS RT for operations in higher net</p> <p>NCS radio is properly loaded for net opening</p>

## TASK 2: CHANGE NET ID

Task 2-1	Actions	Results
<u>Set</u> RTcontrols to proper positions	(1) FCTN to LD  (2) MODE to FH-M  (3) CHAN to where hopset is stored	Prepares radio for change of net ID
Task 2-2	Actions	Results
<u>Clear</u> last two digits of stored hopset	(1) Press FREQ  (2) Press CLR	Display shows stored hopset, "F X X X"  Display shows " F X _ _ "
Task 2-3	Actions	Results
<u>Enter</u> last two digits of net ID	(1) Enter next to last digit of net ID  (2) Enter last digit of net ID	Display shows " F X X _ "  Display shows " F X X X "
Task 2-4	Actions	Results
<u>Store</u> net ID	(1) Press STO (Sto/ENT)	Display blinks; net ID is stored

### TASK 3: LOAD SYNC TIME BY KEYPAD

Task 3-1	Actions	Results
<p><u>Obtain</u> date-time to be used</p>	<p>(1) Determine Julian Date (two digits) from Opr's TM, App A</p> <p>(2) Determine time from designated official source</p>	<p>Ensures nets are using same date in sync time</p> <p>Keeps operational nets within 1 hour of each other</p>
Task 3-2	Actions	Results
<p><u>Enter</u> sync time into NCS radio</p>	<p>(1) Press TIME</p> <p>(2) Press CLR</p> <p>(3) Enter new Julian date</p> <p>(4) Press STO (Sto/ENT)</p> <p>(5) Press TIME again</p> <p>(6) Press CLR again</p> <p>(7) Enter hours and minutes</p> <p>(8) Press STO (Sto/ENT)</p>	<p>Display shows "X X"</p> <p>Display shows "_ _"</p> <p>Display shows "XX"</p> <p>Display blinks; date is stored</p> <p>Display shows "XX XX"</p> <p>Display shows "_ _"</p> <p>Display shows "XX XX"</p> <p>Display blinks; times is stored</p>

## TASK 4: OPEN THE NET

Task 4-1	Actions	Results
<p><u>Set</u> RT controls to proper positions</p>	<p>(1) CHAN to MAN</p> <p>(2) MODE to FH-M</p> <p>(3) COMSEC to CT</p> <p>(4) FCTN to LD</p>	<p>Prepares radio for alert of net members</p>
Task 4-2	Actions	Results
<p><u>Alert</u> net members to stand by for net opening</p>	<p>(1) Call on MAN in CT</p> <p>(2) Have Alt NCS follow up for any member who does not respond</p>	<p>Ensures that all, or most, net members are ready to receive the ERF at the time it is sent</p>
Task 4-3	Actions	Results
<p><u>Send</u> ERF</p>	<p>(1) Press LOAD (H*Ld)</p> <p>(2) Enter channel number where required data is stored</p> <p>(3) Press ERF (SEnd)</p> <p>(4) Press STO (Sto/ENT) and number of channel where data is to be stored</p>	<p>Display shows "HF XXX", blinks, beeps</p> <p>Display shows "SEND"</p> <p>Display shows "STO"; beep is heard</p>

Task 4-4	Actions	Results
<u>Confirm</u> receipt of ERF	(1) Allow operators time to store the ERF  (2) Require operators to acknowledge receipt and storage	Prevents needless repeats  Unit SOP should prescribe procedure
Task 4-5	Actions	Results
<u>Perform</u> communications check	(1) Direct operators to set CHAN to operational channel, and set FCTN to SQ ON  (2) Make communications check with all net members  (3) Have Alt NCS follow up for any member who does not respond	Net opening is complete except for checking communications        Saves NCS time and efforts for other requirements

## TASK 5: ANSWER CUE/CUE + ERF CALLS

Task 5-1	Actions	Results
<u>Be alert</u> to "CUE" messages	(1) Note "CUE" message in RT display	Enables non-net stations and users of non-FH radios to contact you
Task 5-2	Actions	Results
<u>Ensure</u> Alt NCS responds to CUE callers	(1) By SOP or direction, have Alt NCS answer CUE calls	Permits NCS to stay in control of net while Alt NCS answers CUE caller
Task 5-3	Actions	Results
<u>Answer</u> CUE caller (Alt NCS or NCS)	(1) Set CHAN to CUE  (2) Leave COMSEC at CT  (3) Leave MODE at FH (FH-M for NCS)  (4) Contact CUE caller	Minimizes control changes required to answer CUE call
Task 5-4	Actions	Results
<u>Advise</u> CUE caller to reply	(1) Have CUE caller contact you on MAN, CT	Minimizes SC, PT communications

Task 5-5	Actions	Results
<p><u>Respond</u> to CUE caller's questions/requirements</p>	<p>(1) If net entry is desired, require authentication</p> <p>(2) Set MODE to <u>FH-M</u> with CHAN at MAN</p> <p>(3) Retrieve data and send ERF</p> <p>(4) Return <u>MODE to FH</u></p> <p>(5) If <u>net is quiet</u>, check communication; if <u>net is busy, DO NOT DO CHECK</u></p>	<p>Per unit SOP</p> <p>Must be in FH-M to send an ERF; no interference with NCS in FH-M <u>when Alt NCS is on MAN CHAN</u></p> <p>Alt must return to FH before returning to the operational channel</p> <p>Minimizes interruption of operational net</p>

NOTE: When a station in [PT] calls one in CT, the receiving operator can read the message but hears beeping in the background. This tells the receiving operator that the sender has COMSEC set to [PT] rather than to CT.

## **TASK 6: PROVIDE NET UPDATES**

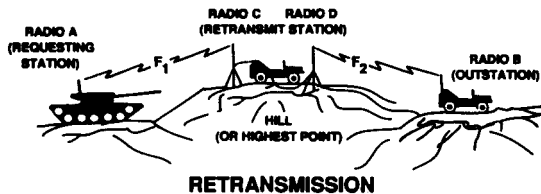
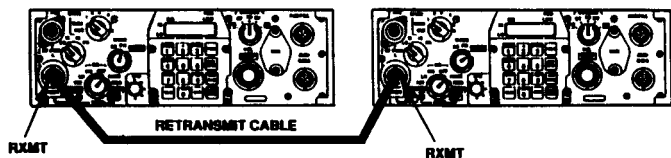
Task 6-1	Actions	Results
<u>Obtain</u> new FH date	<p>(1) As required, get new data via ERF, or from fill device, and change net ID by keypad</p> <p>(2) Determine when update data is effective</p>	<p>Loads NCS radio with required new data</p> <p>Net members need this information</p>
Task 6-2	Actions	Results
<u>Alert</u> members of net update	<p>(1) Direct operators to stand by for net update on operational channel</p> <p>(2) Direct operators <u>where</u> to store update, and <u>when</u> net will make change</p> <p>(3) Advise Alt NCS to remain on current channel and follow up after change</p>	<p>NCS waits for quiet opening in net operation</p> <p>Operators need to know <u>where</u> to store and <u>when</u> to change</p> <p>Maintains net operations even if some stations are out of net at time of change</p>



Task 6-3	Actions	Results
<p><u>Send</u> net update as ERF, using operational channel</p>	<p>(1) Press LOAD (H*Ld) and number of channel where data is stored</p> <p>(2) Press ERF (SEnd)</p> <p>(3) Press STO (Sto/ENT) and number of channel to restore data</p>	<p>(NCS waits for quiet spot in net operations)</p> <p>Restores data in NCS radio permanent memory</p>
Task 6-4	Actions	Results
<p><u>Confirm</u> members receipt</p>	<p>(1) Allow operators time to store update ERF</p> <p>(2) Have operators acknowledge receipt and storage of ERF</p>	<p>(30 seconds is normally adequate)</p> <p>Alt NCS follows up on members who do not acknowledge</p>
Task 6-5	Actions	Results
<p><u>Check</u> communications (now or when change is effective)</p>	<p>(1) At proper time, change to new channel</p> <p>(2) Check communication on new channel</p> <p>(3) Have Alt NCS follow up for any stations not responding</p>	<p>Alt NCS continues to monitor old channel until change is complete</p> <p>SOP</p> <p>Ensures no stations are omitted from change</p>

## TASK 7: CONDUCT RXMT OPERATIONS

Task 7-1	Actions	Results
<p><u>Plan</u> for use of RXMT station</p>	<p>(1) Be alert to units getting out of range or beyond obstacles</p> <p>(2) Have RXMT crew ready to perform RXMT mission</p> <p>(3) Ensure RXMT operators have proper SC/FH data for RXMT operation</p> <p>(4) Dispatch RXMT crew as soon as need is decided</p>	<p>Helps prevent breaks in command communications</p> <p>Allows team preparation time</p> <p>Gives team time to move to RXMT site</p>



Task 7-2	Actions	Results
<p><u>Establish</u> contact between NCS and forward unit, through RXMT station</p>	<p>(1) RT-C contacts NCS on net channel or on assigned RXMT channel</p> <p>(2) RT-D contacts RT-B on unit's operational or CUE frequency</p> <p>(3) If CUE is used, RT-B responds and both D and B change to MAN</p> <p>(4) RT-D then sends ERF to RT-B with RXMT data</p> <p>(5) RXMT operators set RT-C and RT-D to RXMT</p> <p>(6) NCS confirms NCS-forward unit contact through RXMT station</p>	<p>Verifies link between NCS and RXMT</p> <p>Can be on unit's operational channel if RXMT has data loaded</p> <p>RT-B CUE and MAN were loaded in preparation for RXMT</p> <p>Prepares forward unit for RXMT operation</p> <p>Either CT Or PT may be used</p> <p>RXMT operation is now ready to begin</p>
Task 7-3	Actions	Results
<p><u>Keep</u> RXMT crew informed</p>	<p>(1) Advise of tactical situations that may threaten RXMT crew</p> <p>(2) Alert crew when range or obstacles may require RXMT station to displace</p> <p>(3) Ensure RXMT operators are included in net updates</p>	<p>Helps RXMT crew maintain security of the RXMT site</p> <p>May be necessary to employ a second RXMT crew (maybe airborne) in some situations</p> <p>ERF must be manually passed by RXMT station</p>

## NCS Responsibilities

Opening and closing a net

Maintaining net discipline

Controlling net access

Knowing who is a member of the net

Imposing net controls

*"A good NCS is key to FH net operations"*

### **LOADING FH SYNC TIME BY ERF:**

- a. Prepare radio, request ERF from-higher net NCS.
- b. Store ERF in unused channel (eg, Chan 2).
- c. To store ERF in unit operating channel (eg, Chan 1):
  - Set MODE to **[FH-M]** and CHAN to 2;
  - Press LOAD (H\*Ld), and read "HLD\_";
  - Enter "2", and read "HFxxx";
  - Press STO (Sto/ENT), read "STO\_", and press "1".
- d. ERF and sync time of higher net is now stored in unit operating channel.
- e. Change to unit net ID, and open unit net.
- f. You (NCS), net members, and higher net are on same sync time.

## **NCS NOTES**

- o Be sure to consider line of sight requirements; watch out for hills, buildings, power lines, other obstacles between you and other stations.
- o For net opening, members require COMSEC, TSK (TRANSEC), and MAN frequency; NCS requires those plus CUE, hopset/net ID, and sync time.
- o If appropriate, operator loading errors may be eliminated by having a unit NCO or communications specialist load COMSEC and FH data into all radios prior to scheduled net opening.
- o You will probably never be required to handle a lockout set; if you ever do, obtain assistance from your unit communications specialists.
- o Remember that net openings occur before the start of operations when operators needing help can obtain it readily; once operations begin, there is little or no further need for net opening procedures.
- o Always minimize the amount of time you or your Alternate NCS operate on the CUE frequency; it is Single Channel.
- o In net openings, and in responding to Cue/Cue + ERF calls, make maximum use of the MAN frequency in secure (CT) mode.
- o Be sure to designate one or more Alternate NCS and make them responsible for Cue/Cue + ERF responses; with probable displacement immediately thereafter.
- o Pre-load one or more NCS radios with the FH data and sync time required for anticipated communications; enables you to contact those stations by merely changing channels.

## SNYC TIME SUMMARY

- All radios in an FH net must have the same time, plus or minus 4 seconds.
- The NCS radio, operating in FH-M, pulls all net radios to the NCS sync time.
- Use of late net entry feature (SYNC/L.E.) widens sync time window to 1 minute.
- When an ERF is sent, sync time of sender is entered into receiver's radio if sync times are within one hour of each other.
- A stations may receive and store ERF and sync time in other than operational net channel without impacting net sync time.
- NCS may obtain sync time via ERF from higher NCS or by entering it by use of the keypad.
- NCS radio should be cleared of all data **and** sync time before receiving net sync the via ERF.
- Loading sync time by keypad causes sync time stored in any channel to be changed.
- SINCGARS RTs retain sync time for at least 24 hours when set to STBY (OFF); sync time is lost when radio is set to OFF (STW).
- Sync time is an NCS function and responsibility; operators should never set or check sync time; NCS provides sync time to net members ERF.

***"Playing" with sync time is a sure way to destroy communications***

## NCS NET TROUBLESHOOTING

Check NCS radios using Operator Checklist.

Ensure NCS has LOS with at least one net member.

Make sure all members have the most recent FH data.

Check distance to net stations; use RXMT when required.

Transmit often enough to maintain sync time of the net.

Ensure the NCS radio is the only one using FH-M.

Have Alt NCS respond quickly to CUE calls to minimize net interference.

Respond quickly to enemy jamming.

When operating from a location or vehicle having multiple radios,  
make maximum possible use of OE-254 antennas at  
greatest attainable distances.

## *RXMT REMINDER FOR NCS*

- o LOS is needed between you and the RXMT station, and from the RXMT station to the forward/distant element being contacted.
- o Overall best solution is for RXMT station to use two OE-254 antennas, with maximum possible separation.
- o Next best solution is for RXMT station to use one OE-254 and one vehicular antenna, again with maximum separation.
- o Two vehicular antennas may be used for SC mode only; cannot be used for FH mode.
- o For FH mode, RXMT station requires two net IDs, as designated in your SOI or SOP.
- o For SC mode, RXMT station requires two designated SC frequencies that are at least 10 MHz apart.
- o Neither CUE nor ERF will pass automatically through an RXMT station; both require manual action on part of RXMT crew.
- o When in FH mode, RXMT radios may be set either PT or CT for secure message to pass from station A to B; but RXMT crew can hear transmission only when RTs are set to CT.
- o When net is operating in SC and CT, RXMT radios must be set to PT, preventing RXMT crew from hearing transmissions. (You need to switch to PT in order to contact the RXMT crew.)
- o Many Army aircraft have RXMT capability; use when needed.
- o Employment of RXMT capability is essential in some situations; NCS has primary responsibility for RXMT use.

***"Proper use of RXMT requires NCS planning and direction. "***



## ABBREVIATIONS USED

ALT	Alternate
CHAN	Channel
CLR	Clear
COMSEC	Communication Security
CT	Ciper Text
ENT	Enter
ERF	Electronic Remote Fill
FCTN	Function
FH	Frequency Hopping
FH-M	Frequency Hopping Master
FREQ	Frequency
ID	Identification
LD	Load
LD-V	Load-Variable
L.E.	Late Entry
LOS	Line of Sight
MAN	Manual
PT	Plain Text
RT	Receiver-Transmitter
RXMT	Retransmit
SC	Single Channel
SOL	Signal Operating Instrutions
SOP	Standing Operating Procedures
SQ ON	Squelch On
STBY	Stand By
STO	Store
STW	Stow
TSK	Transmission Security Key
TRANSEC	Transmission Security
Z	Zero

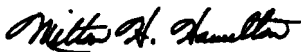
## **WARNING**

- A lithium battery used with your manpack radio contains pressurized sulfur dioxide gas. The gas is toxic, and the battery **MUST NOT** be abused in any way which may cause the battery to rupture.
  - **DO NOT** heat, short circuit, puncture, mutilate, or disassemble batteries.
  - **DO NOT USE** any battery which shows signs of damage, such as bulging, swelling, disfigurement, a brown liquid in the plastic wrap, a swollen plastic wrap, etc.
  - **DO NOT** test lithium batteries for capacity.
  - **DO NOT** recharge lithium batteries.
  - **DO NOT** dispose of lithium batteries with ordinary trash/refuse. Turn in discharged batteries to local supply.
- 
- If the battery compartment becomes hot to the touch, if you hear hissing or burping (i.e. battery venting), or smell irritating gas (sulfur dioxide), **IMMEDIATELY TURN OFF** the equipment and leave the area.
1. Allow the equipment to cool at least one hour.
  2. Remove and replace battery after the equipment has cooled to the touch.
  3. If there is a safety incident, or if you believe a safety hazard exists, notify you local Safety Office/Officer, file a Product Quality Deficiency Report, SF Form 368, and notify the CECOM Safety Office, Ft. Monmouth, NJ at AV 995-3112.
- 
- **DO NOT** use a Halon type fire extinguisher on a lithium battery fire.
  - In the event of a fire near a lithium battery(ies), rapid cooling of the lithium battery(ies) is important. Flood the equipment with water, or use a carbon dioxide CO<sub>2</sub> extinguisher. Control of the equipment fire, and cooling, may prevent the battery from venting and potentially exposing lithium metal. In the event that lithium metal becomes involved in fire, the use of a graphite based Class D fire extinguisher is recommended.
  - **DO NOT** store lithium batteries in unused equipment.
  - **DO NOT** store lithium batteries with other hazardous materials. Keep them away from open flame or heat.

By Order of the Secretary of the Army

**Gordon R. SULLIVAN**  
*General, United States Army*  
*Chief of Staff*

Official:



**MILTON H. HAMILTON**  
*Administrative Assistant to the*  
*Secretary of the Army*

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