UNITED STATES MARINE CORPS
THE BASIC SCHOOL
MARINE CORPS TRAINING COMMAND
CAMP BARRETT, VIRGINIA 22134-5019

COMMUNICATION EQUIPMENT PRACTICAL APPLICATION I AND II W150003 / W250003 STUDENT HANDOUT

Communication Equipment Practical Application (PA)

Introduction

Radio is our primary means of communication in a fast moving, tactical situation. Attempts at sending messages over the radio without guidelines would quickly degenerate into chaos.

Importance

The Marine Corps has established doctrine delineating exactly who will talk to each other on the radio; this doctrine is a guideline for communications planners. How to talk on the radio has been standardized for the sake of brevity and conciseness. Preparing and writing (referred to as drafting) a message has also been standardized for the sake of brevity and accuracy.

In This Lesson

In this lesson, you will learn about different radio nets, voice radio procedures, tactical message drafting, preventive maintenance of communications equipment, and troubleshooting communications equipment. You will also learn how to properly set up a gun loop using two different types of field telephone systems.

This lesson covers the following topics:

Communication Equipment Practical Application (PA) (Continued)

Learning Objectives

TERMINAL LEARNING OBJECTIVE(S)

TBS-COMM-2101 Given a radio, perform basic radio operations to ensure equipment is functional without compromising communications.

TBS-COMM-2101 Given a radio, perform basic radio operations to ensure equipment is functional without compromising communications.

ENABLING LEARNING OBJECTIVE(S)

TBS-COMM-2101c Given a radio transmitter with SL-3 components and a CEOI, conduct a communications check to establish radio communications.

TBS-COM-2101d Given a radio transmitter with SL-3 components and a CEOI, communicate a message that is properly received/understood.1

TBS-COMM-2101a Given a radio transmitter with SL-3 components, assemble a VHF radio without omission.

TBS-COMM-2101b Given a radio transmitter with SL-3 components and a CEOI, program a VHF radio to communicate a message.

TBS-COMM-2101c Given a radio transmitter with SL-3 components and a CEOI, conduct a communications check to establish radio communications. (TBS-COMM-2101c)

TBS-COMM-2101d Given a radio transmitter with SL-3 components and a CEOI, communicate a message that is properly received/understood.

TBS-COMM-2101e Given a radio transmitter with SL-3 components, troubleshoot a VHF radio to re-establish communications.

TBS-COMM-2101f Given a radio transmitter with SL-3 components, maintenance requirements, and preventive maintenance (PM) equipment, maintain a radio set to support sustained operation.

Voice Radio Discipline

As stated previously, a radio net is two or more stations operating on the same frequency for the specific purpose of exchanging information. Voice radio procedures begin with proper discipline on the net.

The Net Control Station (NCS) enforces this discipline by controlling the radio net. The NCS is responsible for

- Overall supervision of the net.
- Opening and closing the net.
- Granting and denying entry to the net.
- Correcting errors made on the net.
- Maintaining discipline on the net.
- Maintaining the radio that acts as the master-timing source for all stations on the SINCGARS radio net.

Voice radio discipline includes not only proper discipline on the net, but also proper

- Methods of control for nets.
- Radio procedures.
- Message drafting.

Call Signs

The radio stations on the net are identified by call signs; the following table describes the two types of call signs:

- Administrative.
- Tactical.

Type of Call Sign	Description
Administrative	• Used in non-tactical situations where security is not critical. • Normally do not change on a regular basis (pilots often have an intra-squadron call sign that they use on the squadron-common radio net). • TBS uses on the range safety net.
Tactical	• Used as unit designators on secure radio nets. The units originate them, but these call signs must be approved at the national level to ensure that in a large scale conflict call signs will not be duplicated. • Are assigned down to the platoon level. • Can be an alphanumeric call sign (e.g. “A9G”) or a call word (e.g. “Ripper”). **Note**: A collective call sign is a letter-numeral-letter designator (such as O8I) or a call word used to call all of the stations on the net.

Methods of Control for Nets

The following table below describes the methods of control for different types of nets:

- Free.
- Directed.

Methods of Control for Nets (Continued)

Type of Net	Description of Control
Free	• Member stations. • Do not have to request permission from the NCS to transmit. • Required to advise NCS when they have to drop off the net for any reason. • Is the most commonly used tactical net at the small unit level. • NCS opens at a predetermined time: o All stations monitor the frequency. o NCS transmits the net call sign. o Stations answer in alphabetical order. o NCS notifies the net that their transmissions have been heard. o Net is now open for traffic.
Directed	• NCS strictly controls all traffic. • Member stations must request permission from NCS to transmit any traffic to stations other than NCS.

Example Free Net Transmission

An example of free net transmission is:

"R3T (ROMEO THREE TANGO) this is Y9I (YANKEE NINE INDIA), over."

The receiving station would then say:

"Y9I (YANKEE NINE INDIA) this is R3T (ROMEO THREE TANGO), over."

Contact has been established between the stations.

Radio Procedures

Voice Techniques

The use of proper voice techniques will enhance the quality and speed of transmissions:

- Speak clearly, distinctly, and without personal quirks or accents.
- Speak at the speed of the lowest operator and in understandable phrases.
- Use a normal voice level; don't yell.

Profanity

Using profanity over a radio is a violation of the rules of the Federal Communications Commission (FCC).

Phonetic Alphabet

The following table shows the phonetic alphabet.

A…Alpha	J…Juliet	S…Sierra	2…Too
B…Bravo	K…Kilo	T…Tango	3…Tree
C…Charlie	L…Lima	U…Uniform	4…For-er
D…Delta	M…Mike	V…Victor	5…Fife
E…Echo	N…November	W…Whiskey	6…Six
F…Fox	O…Oscar	X…X-ray	7…Sev-en
G…Golf	P…Papa	Y…Yankee	8…Ait
H…Hotel	Q…Quebec	Z…Zulu	9…Nine-er
I…India	R…Romeo	1…Wun	0…Zer-row

Radio Check

A distant station uses a radio check to test the radio's signal strength and readability. The authorized transmissions, in order, for a radio check are

1. *"(CALLSIGN), this is (CALLSIGN), radio check, over."*

2. The response depends on the quality of the signal strength and readability of the transmission. The following table shows the choice of responses based on the quality.

If the quality was…	**Then the response should be**
Good	*"(CALLSIGN), this is (CALLSIGN), roger, over."*
Weak signal, but understandable	*"(CALLSIGN), this is (CALLSIGN), weak but readable, over."*

Weak signal, and hard to understand	*"(CALLSIGN), this is (CALLSIGN), weak and garbled, over."*
Strong signal, but unreadable	*"(CALLSIGN), this is (CALLSIGN), strong but garbled, over."*

3. *"(CALLSIGN), this is (CALLSIGN), roger, out."*

PRC-117F

DESCRIPTION

- Advanced multi-band, multi-channel radio
- Operates from 30.0000 MHz to 511.9999 MHz
- Uses SINCGARS, VULOS, and various other waveforms.

COMPONENTS

- RT-1796 – Receiver / Transmitter
- BATTERY BOX - Houses one or two BA-5390/U, BA-5590/U, BB-590/U, BB-390A/U or BB-2590/U.
- 3 FT TAPE/ 10FT WHIP VHF ANTENNA - (30 MHz - 89.99999 MHz)
- VHF/UHF Flex Antenna - (90 MHz - 511.99999 MHz)
- MODIFIED H-250 - Manufactured with no metal parts to reduce the risk of electrical shock or damage.
- 6-FOOT KDU EXTENSION CABLE - Utilized to control the RT via the KDU
- ANTENNA BAG - Utilized to store accessories

CONTROLS

CONTROLS

CIRCULAR ARROW/ 0 KEY

- Toggles operational display pages.
- Used to enter the number 0.

CONTROLS

CALL/ ABC/ 1 KEY

- Initiates a specific action depending on the current operating mode
- Used to enter the letters A, B, C.
- Used to enter the number 1.

CONTROLS

LIGHT/ DEF/ 2 KEY

- Accesses the KDU backlight control menu.
- Used to enter the letters D, E, F.
- Used to enter the number 2.

CONTROLS

MODE/ GHI/ 3 KEY

- Allows the operator to change the operating mode.
- Used to enter the letters G, H, I.
- Used to enter the number 3.

CONTROLS

SQUELCH/ JKL/ 4 KEY

- Accesses the squelch menu for the current net preset.
- Used to enter the letters J, K, L.
- Used to enter the number 4.

CONTROLS

ZEROIZE/ MNO/ 5 KEY

- Accesses the radios zeroize menu.
- Used to enter the letters M, N, O.
- Used to enter the number 5.

CONTROLS

UP ARROW/ PQR/ 6 KEY

- Used to scroll up through display fields.
- Used to enter the letters P, Q, R.
- Used to enter the number 6.

CONTROLS

OPTION/ STU/ 7 KEY

- Provides access to the option menus which are mode dependent. .
- Used to enter the letters S, T, U.
- Used to enter the number 7.
- Radio stays online while in option menus

CONTROLS

PROGRAM/ VWX/ 8 KEY

- Provides access to the programming menus.
- Used to enter the letters V, W, X.
- Used to enter the number 8.
- Radio is offline from communication modes while in programming menus

CONTROLS

VOLUME UP/DOWN KEY

- Increases volume.
- Decreases volume.

CONTROLS (CONTINUED)

CONTROLS

DOWN ARROW/ YZ?/ 9 KEY

- Used to scroll down through display fields.
- Used to enter the letters Y, Z, and the character ?.
- Used to enter the number 9.

CONTROLS

CLEAR KEY

- Used as an abort key to cancel an operation.
- Used to back up through a menu chain.
- Used to clear a message displayed on the front panel.

CONTROLS

ENTER KEY

- Used to select menu choices.
- Locks in entry field data.

CONTROLS

PRESET SELECTION KEY

- Scrolls through the preset nets.
- Stops at top and bottom of net presets.
- May say NET on some radios.

CONTROLS

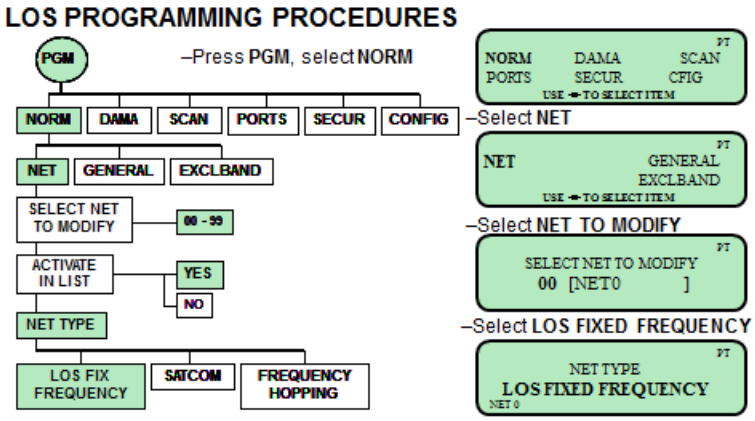
LEFT/RIGHT ARROW KEYS

- Used to scroll left through display fields.
- Used to scroll right through display fields.

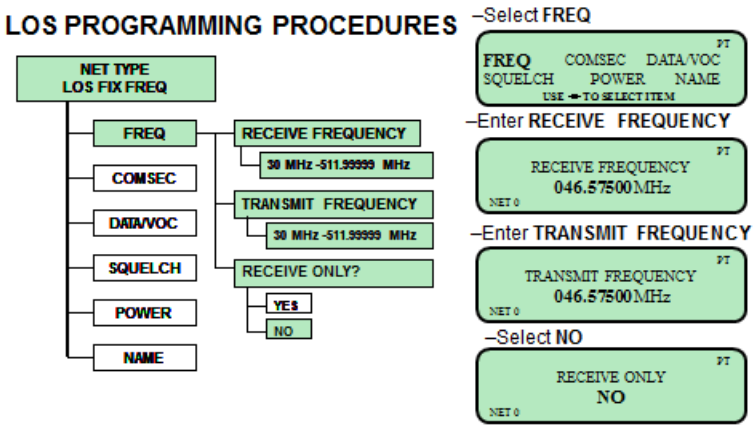
VULOS PROGRAMMING

- VHF, UHF, LOS
- VULOS is a fixed frequency that can be unsecure or secure.
- VULOS can be utilized to talk AM AND FM to both Ground (30.000-89.999 MHz) FM, and Air (225-512 MHz) AM.

NORMAL MODE PROGRAMMING PROCEDURES (VULOS)



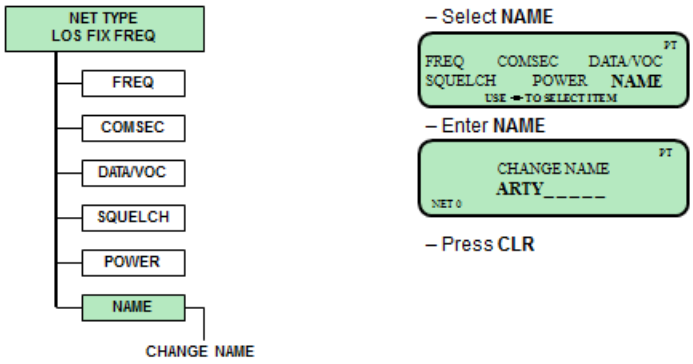
NORMAL MODE PROGRAMMING PROCEDURES (VULOS)



VULOS PROGRAMMING (CONTINUED)

NORMAL MODE PROGRAMMING PROCEDURES (VULOS)

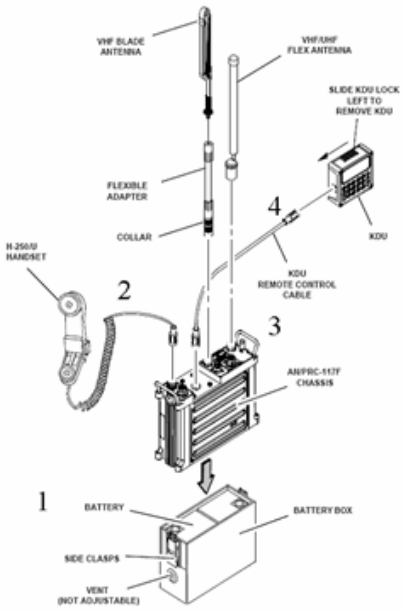
LOS PROGRAMMING PROCEDURES



Installation

Installation

Step	Action
1	Place Batteries in battery box and connect the battery box to the RT.
2	Attach the Hand set.
3	Select the appropriate Antenna and attach it to the radio.
4	If remote Keypad is required, install the KDU Control Cable.

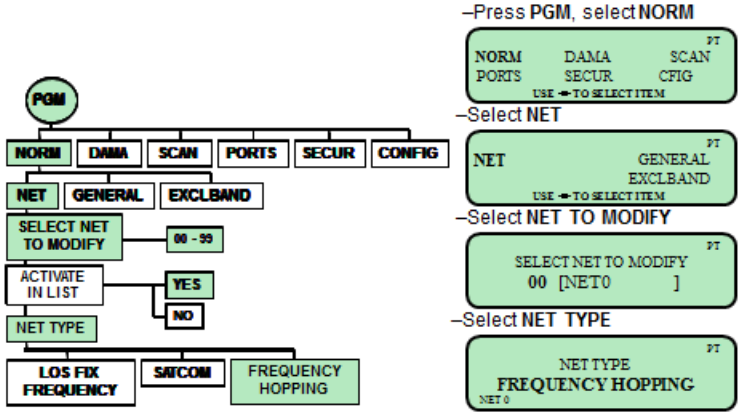


- **Turn radio off and reverse steps (steps 4, 3, 2, 1) for proper tear down.**

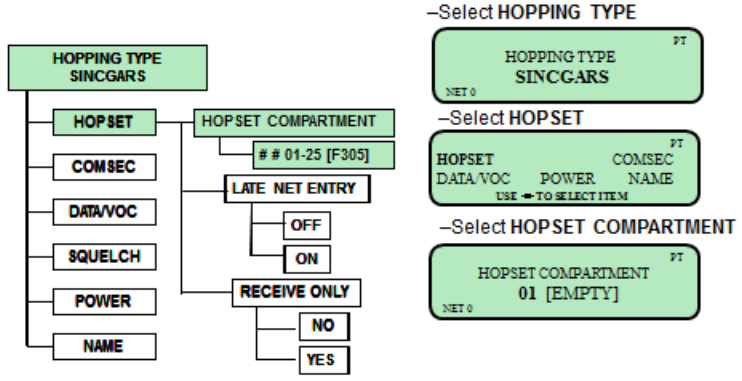
SINCGARS PROGRAMMING

- SINCGARS- Single Channel Ground Air Radio Systems
- The 5 Variables of FH are Time, Net ID, HOPSET, TEK, and TSK
- When programming a radio, you are responsible for programming the Net ID and Time.
- Time
- Allows each radio to begin hopping in sync through the cycling sequence. (Needs to be +/- 4 seconds in order to communicate).
- Net ID
  - ✓ Provides the starting point for the cycling sequence.

SINCGARS PROGRAMMING PROCEDURES

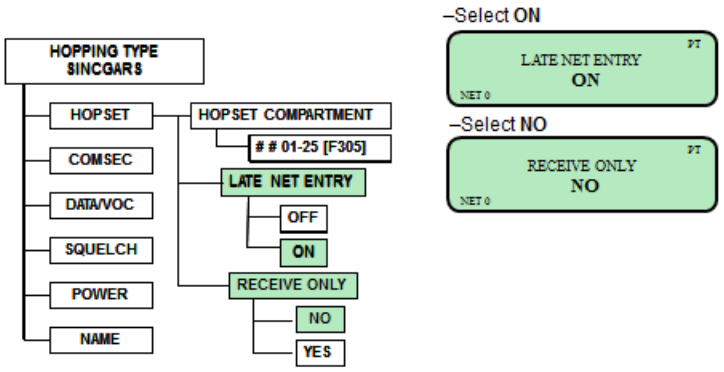


SINCGARS PROGRAMMING PROCEDURES

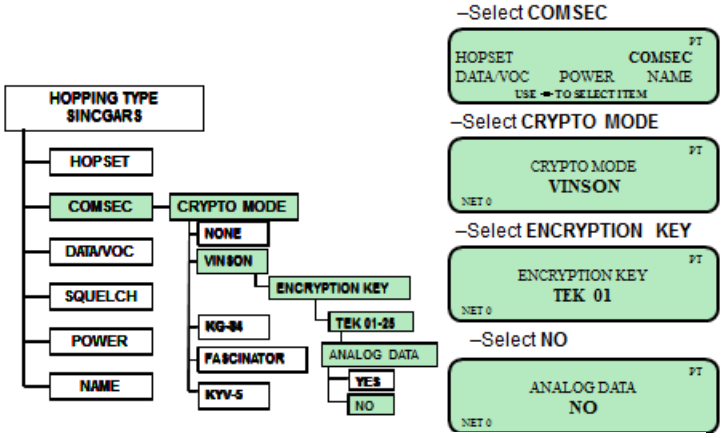


SINCGARS PROGRAMMING (CONTINUED)

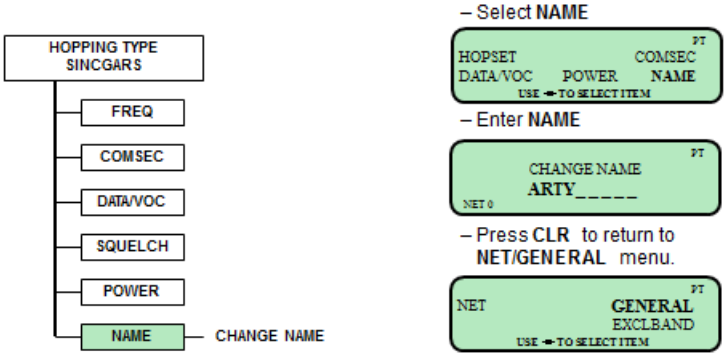
SINCGARS PROGRAMMING PROCEDURES



SINCGARS PROGRAMMING PROCEDURES

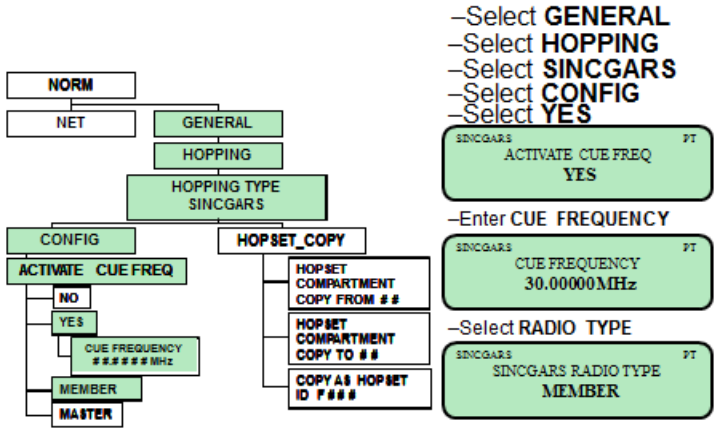


SINCGARS PROGRAMMING PROCEDURES

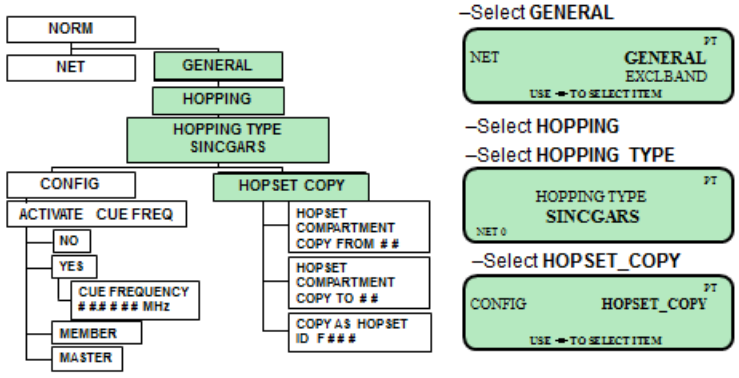


SINCGARS PROGRAMMING (CONTINUED)

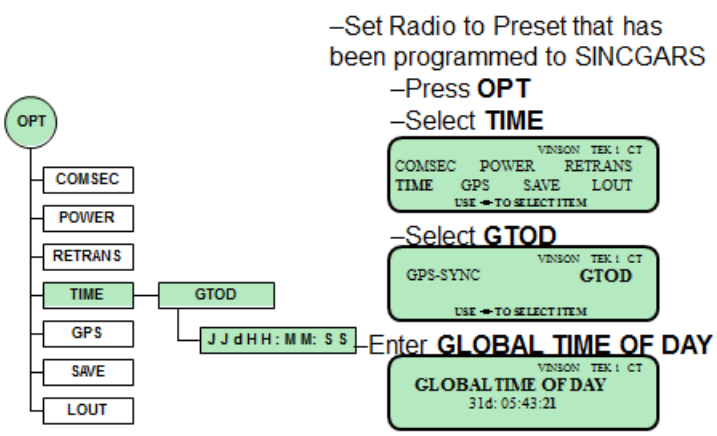
SINCGARS PROGRAMMING PROCEDURES



SINCGARS PROGRAMMING PROCEDURES



SINCGARS PROGRAMMING PROCEDURES



JULLIAN DATE CALENDER

Regular years:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	001	032	060	091	121	152	182	213	244	274	305	335
2	002	033	061	092	122	153	183	214	245	275	306	336
3	003	034	062	093	123	154	184	215	246	276	307	337
4	004	035	063	094	124	155	185	216	247	277	308	338
5	005	036	064	095	125	156	186	217	248	278	309	339
6	006	037	065	096	126	157	187	218	249	279	310	340
7	007	038	066	097	127	158	188	219	250	280	311	341
8	008	039	067	098	128	159	189	220	251	281	312	342
9	009	040	068	099	129	160	190	221	252	282	313	343
10	010	041	069	100	130	161	191	222	253	283	314	344
11	011	042	070	101	131	162	192	223	254	284	315	345
12	012	043	071	102	132	163	193	224	255	285	316	346
13	013	044	072	103	133	164	194	225	256	286	317	347
14	014	045	073	104	134	165	195	226	257	287	318	348
15	015	046	074	105	135	166	196	227	258	288	319	349
16	016	047	075	106	136	167	197	228	259	289	320	350
17	017	048	076	107	137	168	198	229	260	290	321	351
18	018	049	077	108	138	169	199	230	261	291	322	352
19	019	050	078	109	139	170	200	231	262	292	323	353
20	020	051	079	110	140	171	201	232	263	293	324	354
21	021	052	080	111	141	172	202	233	264	294	325	355
22	022	053	081	112	142	173	203	234	265	295	326	356
23	023	054	082	113	143	174	204	235	266	296	327	357
24	024	055	083	114	144	175	205	236	267	297	328	358
25	025	056	084	115	145	176	206	237	268	298	329	359
26	026	057	085	116	146	177	207	238	269	299	330	360
27	027	058	086	117	147	178	208	239	270	300	331	361
28	028	059	087	118	148	179	209	240	271	301	332	362
29	029		088	119	149	180	210	241	272	302	333	363
30	030		089	120	150	181	211	242	273	303	334	364
31	031		090		151		212	243		304		365

Leap year:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	001	032	061	092	122	153	183	214	245	275	306	336
2	002	033	062	093	123	154	184	215	246	276	307	337
3	003	034	063	094	124	155	185	216	247	277	308	338
4	004	035	064	095	125	156	186	217	248	278	309	339
5	005	036	065	096	126	157	187	218	249	279	310	340
6	006	037	066	097	127	158	188	219	250	280	311	341
7	007	038	067	098	128	159	189	220	251	281	312	342
8	008	039	068	099	129	160	190	221	252	282	313	343
9	009	040	069	100	130	161	191	222	253	283	314	344
10	010	041	070	101	131	162	192	223	254	284	315	345
11	011	042	071	102	132	163	193	224	255	285	316	346
12	012	043	072	103	133	164	194	225	256	286	317	347
13	013	044	073	104	134	165	195	226	257	287	318	348
14	014	045	074	105	135	166	196	227	258	288	319	349
15	015	046	075	106	136	167	197	228	259	289	320	350
16	016	047	076	107	137	168	198	229	260	290	321	351
17	017	048	077	108	138	169	199	230	261	291	322	352
18	018	049	078	109	139	170	200	231	262	292	323	353
19	019	050	079	110	140	171	201	232	263	293	324	354
20	020	051	080	111	141	172	202	233	264	294	325	355
21	021	052	081	112	142	173	203	234	265	295	326	356
22	022	053	082	113	143	174	204	235	266	296	327	357
23	023	054	083	114	144	175	205	236	267	297	328	358
24	024	055	084	115	145	176	206	237	268	298	329	359
25	025	056	085	116	146	177	207	238	269	299	330	360
26	026	057	086	117	147	178	208	239	270	300	331	361
27	027	058	087	118	148	179	209	240	271	301	332	362
28	028	059	088	119	149	180	210	241	272	302	333	363
29	029	060	089	120	150	181	211	242	273	303	334	364
30	030		090	121	151	182	212	243	274	304	335	365
31	031		091		152		213	244		305		366

PRC-152

CHARACTERISTICS

AN/PRC-152 CHARACTERISTICS

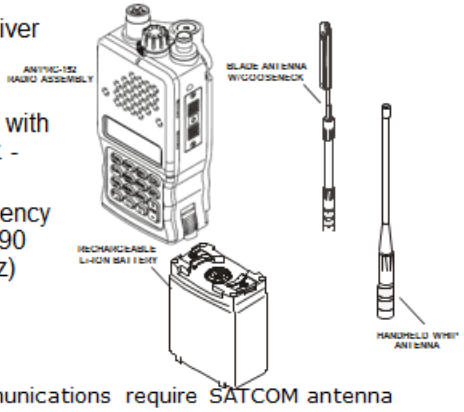
PURPOSE

The AN/PRC-152 is a standardized, lightweight, tactical, hand held radio that provides secure communications in the 30-512 MHz frequency spectrum.

SYSTEM COMPONENTS

SYSTEM COMPONENTS

- ✓ AN/PRC-152 Transceiver
- ✓ Battery
- ✓ Very High Frequency (VHF) Blade Antenna with Flex Adapter (30 MHz - 89.99999 MHz)
- ✓ VHF/Ultra High Frequency (UHF) Flex Antenna (90 MHz - 511.99999 MHz)



•NOTE: Satellite communications require SATCOM antenna

SYSTEM COMPONENTS (CONTINUED)

SYSTEM COMPONENTS

PRC-152 to BB-2590 adapter (Not SL-3)

Headset

Radio Pouch

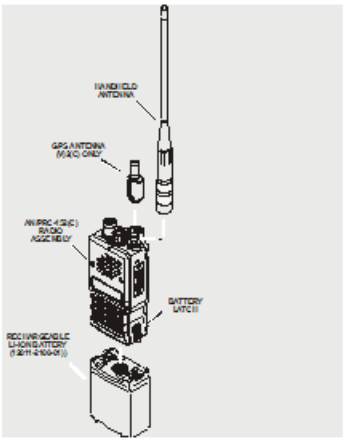
AV-2040 SATCOM Antenna

SYSTEM COMPONENTS

- ✓Power Settings
  - ✓ LOW - 0.25 Watts
  - ✓ MEDIUM - 2 Watts
  - ✓ HIGH - 5 Watts

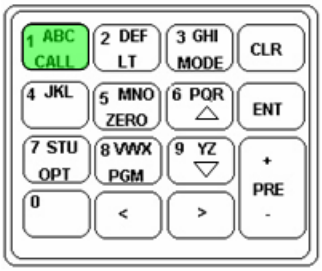
INSTALLATIONS

Installation



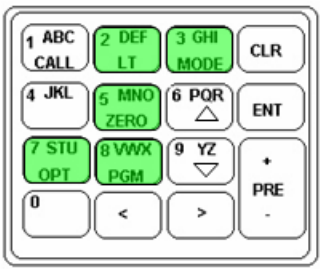
KEYPAD DISPLAY UNIT

Keypad Display Unit



- ✓ **1/ CALL - Initiates specific action depending on current operating mode.**
- ✓ **SINCGARS FH Cue, COLDSTART, and Electronic Remote Fill (ERF)**

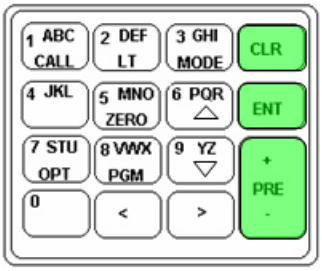
Keypad Display Unit



- ✓ **2/ LT - Accesses the KDU backlight intensity and contrast control menu.**
- ✓ **3/ Mode Selection Menu** Selects the operational status
- ✓ **5/ ZERO – Will Zeroize radio's (Black data). Returns radio configuration to default.**
- ✓ **7/OPT-** Accesses option menu for the current operating mode and net. Radio stays on-line while changes are made.
- ✓ **8/PGM -** Accesses the radio's programming menus. Radio is offline, no communications are possible when in programming mode.

KEYPAD DISPLAY UNIT (CONTINUED)

Keypad Display Unit



- ✓ **CLR - Returns a field to its previous value, or activates the previous menu.**
- ✓ **ENT - Selects scroll field choices or locks in entry field data.**
- ✓ **PRE +/- Scrolls through the nets selected to be activated in list.**
  - ✓ While in PGM mode, pressing PRE + will immediately return you to the main net page.

FUNCTION KNOB

Function Knob Control Positions

- ✓ Radio Function Knob
  - ✓ OFF – Turns the radio off
  - ✓ 1 to 5 - Enables operation in the first 5 preset nets
  - ✓ S – Scan (Not in FH MODE)
  - ✓ F - Full capability from the front panel
  - ✓ Z - Zeroize radio

Function Knob Control Positions

- ✓ Cipher Switch
  - ✓ PT - Plain Text mode
  - ✓ LD – Load Radio
  - ✓ CT – Cipher Text mode

VHF, UHF, LINE OF SIGHT (VULOS)

VHF, UHF, LINE OF SIGHT

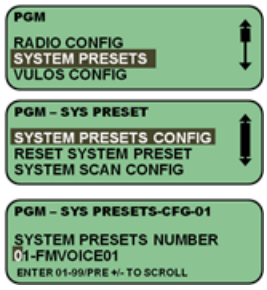
A VULOS fixed frequency net allows the user to receive and transmit voice and/or data using fixed receive and transmit frequencies. **ANTENNA TYPE, ANTENNA HEIGHT, OUTPUT POWER, TERAIN, EXTERNAL TERRAIN,** and **OBSTRUCTIONS** between PRC-152 radios are all factors in range of communications. A planning range of up to five miles (8 kilometers) should be used in VULOS operation. VULOS can be operated in either **PLAIN TEXT (PT)** or **CIPHER TEXT (CT)** mode. – Paragraph A.5, page A-14, HARRIS AN/PRC-152 Operating Manual

VULOS PROGRAMMING

Installation / Programming

- ✓ Single Channel Operations in Plain Text

Step	Action
1.	Turn RT on radio will conduct self test.
2.	Mode switch to PT.
3.	Press Key pad #8 (Program button)
4.	Select SYSTEM PRESETS Press ENT.
5.	Select SYSTEM PRESET CONFIG, Press ENT.
6.	Select SYSTEM Preset NUMBER (01-99 user defined) press ENT

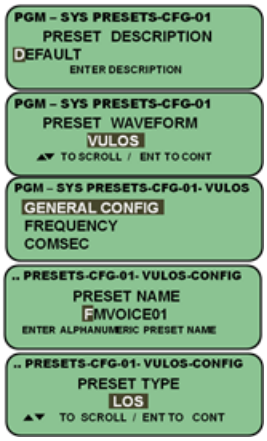


VULOS PROGRAMMING (CONTINUED)

Installation / Programming

✓ Single Channel Operations in Plain Text

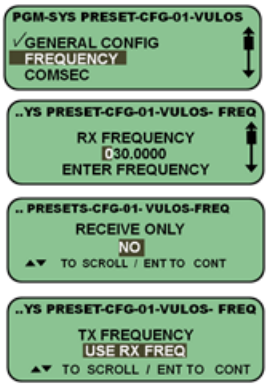
Step	Action
7.	PRESET DESCRIPTION
8.	PRESET WAVEFORM Select VULOS and press ENT
9.	Select General & press ENT
10.	Name your net
11.	Select LOS



Installation / Programming

✓ Single Channel Operations in Plain Text

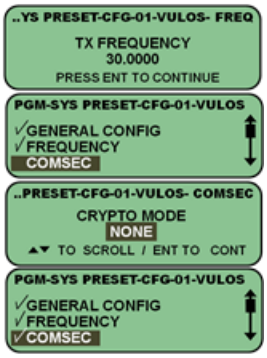
Step	Action
12.	Select FREQUENCY & press ENT.
13.	Enter the RX FREQUENCY
14.	Select NO on receive only and press ENT.
15.	TX FREQUENCY, USE RX FREQ Press ENT



Installation / Programming

✓ Single Channel Operations in Plain Text

Step	Action
16.	Verify Frequency and Press ENT
17.	COMSEC select None and press ENT

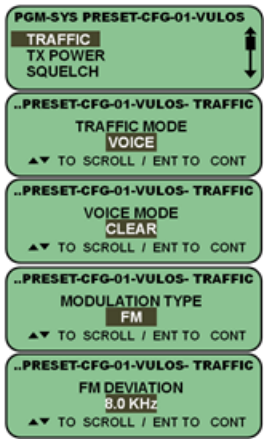


VULOS PROGRAMMING (CONTINUED)

Installation / Programming

✓ Single Channel Operations in Plain Text

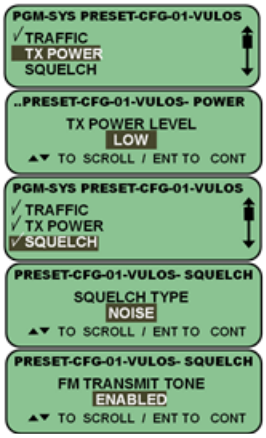
Step	Action
18.	Traffic select **VOICE** and press ENT
19.	Voice Mode select **CLEAR** press ENT
20.	Modulation Select **FM** and press ENT
21.	FM Deviation select **8.0 KHz** and press ENT



Installation / Programming

✓ Single Channel Operations in Plain Text

Step	Action
22.	TX Power select **LOW** and press ENT
23.	SQUELCH select **NOISE** for SQUELCH TYPE and press ENT
24.	FM TRANSMIT TONE **ENABLED** and press ENT



Installation / Programming

✓ Single Channel Operations in Plain Text

Step	Action
25.	Scroll and Select EXIT and Press ENT
26.	Press CLR 2X to the MAIN SCREEN
27.	Set the Radio on the PRESET you programmed.
28.	Conduct UNSECURE Radio check.

SINGLE CHANEL GROUND AND AIRBORNE RADIO SYSTEMS (SINCGARS)

SINCGARS FREQUENCY HOPPING

Single Channel Ground and Airborne Radio System (SINCGARS) Frequency Hopping operates in the VHF-LOW frequency range (30.0000 MHz to 87.9750 MHz). A SINCGARS Frequency Hopping net typically uses a MASTER SINCGARS radio as the Net Control Station to maintain Time of Day synchronization and control SINCGARS net operational procedures. All other radios in the net are normally MEMBER stations. All PRC-152 radios in a SINCGARS Frequency Hopping net must have the VINSON Traffic Encryption Key and SINCGARS NET ID programed to the System Preset. -
Paragraph B.1, page B-1, HARRIS AN/PRC-152 Operating Manual

SINCGARS PROGRAMMING

Installation / Programming

HOPSET COPY and assigning NET ID's

Step	Action
1.	Turn the RT Mode switch to CT.
2.	Press PGM (#8) Select SYSTEM PRESET Press ENT
3.	Select SYSTEM PRESET CONFIG & press ENT.
4.	Select SYSTEM PRESET NUMBER press ENT.
5.	PRESET DESCRIPTION Select Default or rename the description and Press ENT.

Installation / Programming

HOPSET COPY and assigning NET ID's

Step	Action
6.	PRESET WAVEFORM Select SINCGARS and PRESS ENT
7.	OPMODE Select FREQUENCY HOPPING and Press ENT
8.	PRESET NAME -Name your Preset and Press ENT
9.	CRYPTO KEY Select the TEK (TEK01) press ENT.
10.	TX POWER Level Default ("HIGH") Press ENT

SINCGARS PROCEDURES (CONTINUED)

Installation / Programming

HOPSET COPY and assigning NET ID's

Step	Action
11.	TRAFFIC MODE Voice Press ENT
12.	HOPSET COMPARTMENT Select Compartment Number (IE;01) and press ENT; Match Compartment Number to channel number to avoid duplicating Compartments.
13.	SC FREQUENCY (30.000) Press ENT
14.	SC SQUELCH TYPE Select TONE and Press ENT

Installation / Programming

HOPSET COPY and assigning NET ID's

Step	Action
15.	Press CLR 1 time,
16.	Select SINCGARS CONFIG Press ENT
17.	Select HOPSET/LOCKOUT press ENT
18.	Select COPY HOPSET Pres ENT
19.	COPY HOPSET FROM (select the compartment you with to copy from) Press ENT

Installation / Programming

HOPSET COPY and assigning NET ID's

Step	Action
20.	COPY HOPSET TO (Enter the Hopset Compartment you wish to copy to) Press ENT
21.	NEW HOPSET ID Enter the NET ID you wish to assign to this Compartment and Press ENT
22.	CLR out to the Main MENU

SINCGARS GLOBAL TIME OF DAY (GTOD)

Installation / Programming

Setting Time

Step	Action
1.	Press OPT (#7) key.
2.	Scroll to SINCGARS OPTIONS press ENT.
3.	Select SINCGARS GTOD & press ENT.
4.	Select USER ENTRY Press ENT

Installation / Programming

Setting Time

Step	Action
5.	Manually input TOD Press ENT (input last 2 digits of Julian date, 2 digits for hrs, 2 digits for min, & 2 digits for sec). press ENT Ensure the time matches GPS time.
6.	Press CLR X3.
7.	Put your Radio on the preset 01

JULLIAN DATE CALENDAR

Regular years:												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	001	032	060	091	121	152	182	213	244	274	305	335
2	002	033	061	092	122	153	183	214	245	275	306	336
3	003	034	062	093	123	154	184	215	246	276	307	337
4	004	035	063	094	124	155	185	216	247	277	308	338
5	005	036	064	095	125	156	186	217	248	278	309	339
6	006	037	065	096	126	157	187	218	249	279	310	340
7	007	038	066	097	127	158	188	219	250	280	311	341
8	008	039	067	098	128	159	189	220	251	281	312	342
9	009	040	068	099	129	160	190	221	252	282	313	343
10	010	041	069	100	130	161	191	222	253	283	314	344
11	011	042	070	101	131	162	192	223	254	284	315	345
12	012	043	071	102	132	163	193	224	255	285	316	346
13	013	044	072	103	133	164	194	225	256	286	317	347
14	014	045	073	104	134	165	195	226	257	287	318	348
15	015	046	074	105	135	166	196	227	258	288	319	349
16	016	047	075	106	136	167	197	228	259	289	320	350
17	017	048	076	107	137	168	198	229	260	290	321	351
18	018	049	077	108	138	169	199	230	261	291	322	352
19	019	050	078	109	139	170	200	231	262	292	323	353
20	020	051	079	110	140	171	201	232	263	293	324	354
21	021	052	080	111	141	172	202	233	264	294	325	355
22	022	053	081	112	142	173	203	234	265	295	326	356
23	023	054	082	113	143	174	204	235	266	296	327	357
24	024	055	083	114	144	175	205	236	267	297	328	358
25	025	056	084	115	145	176	206	237	268	298	329	359
26	026	057	085	116	146	177	207	238	269	299	330	360
27	027	058	086	117	147	178	208	239	270	300	331	361
28	028	059	087	118	148	179	209	240	271	301	332	362
29	029		088	119	149	180	210	241	272	302	333	363
30	030		089	120	150	181	211	242	273	303	334	364
31	031		090		151		212	243		304		365

Leap year:												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	001	032	061	092	122	153	183	214	245	275	306	336
2	002	033	062	093	123	154	184	215	246	276	307	337
3	003	034	063	094	124	155	185	216	247	277	308	338
4	004	035	064	095	125	156	186	217	248	278	309	339
5	005	036	065	096	126	157	187	218	249	279	310	340
6	006	037	066	097	127	158	188	219	250	280	311	341
7	007	038	067	098	128	159	189	220	251	281	312	342
8	008	039	068	099	129	160	190	221	252	282	313	343
9	009	040	069	100	130	161	191	222	253	283	314	344
10	010	041	070	101	131	162	192	223	254	284	315	345
11	011	042	071	102	132	163	193	224	255	285	316	346
12	012	043	072	103	133	164	194	225	256	286	317	347
13	013	044	073	104	134	165	195	226	257	287	318	348
14	014	045	074	105	135	166	196	227	258	288	319	349
15	015	046	075	106	136	167	197	228	259	289	320	350
16	016	047	076	107	137	168	198	229	260	290	321	351
17	017	048	077	108	138	169	199	230	261	291	322	352
18	018	049	078	109	139	170	200	231	262	292	323	353
19	019	050	079	110	140	171	201	232	263	293	324	354
20	020	051	080	111	141	172	202	233	264	294	325	355
21	021	052	081	112	142	173	203	234	265	295	326	356
22	022	053	082	113	143	174	204	235	266	296	327	357
23	023	054	083	114	144	175	205	236	267	297	328	358
24	024	055	084	115	145	176	206	237	268	298	329	359
25	025	056	085	116	146	177	207	238	269	299	330	360
26	026	057	086	117	147	178	208	239	270	300	331	361
27	027	058	087	118	148	179	209	240	271	301	332	362
28	028	059	088	119	149	180	210	241	272	302	333	363
29	029	060	089	120	150	181	211	242	273	303	334	364
30	030		090	121	151	182	212	243	274	304	335	365
31	031		091		152		213	244		305		366

MASTER/MEMBER

Installation / Programming

MASTER or MEMBER

Step	Action
1	Press PGM (#8) Select SINCGARS CONFIG press ENT.
2	Select MASTER/MEMBER press ENT.
3	SINCGARS RADIO TYPE Choose Member and Press ENT.
4	Press CLR 2X to go to main screen.

PRC-150

CHARACTERISTICS

The PRC-150(C) is an advanced High Frequency (HF) radio which operated from 1.6 MHz to 29.9999 MHz using skywave (Upper Sideband [USB], Lower Sideband [LSB], Continuous Wave [CW], Amplitude Modulation Equivalent [AME]) modulations with selectable low (1.0 watt), medium (5.0 watts), and high (20.0 watts) output power. The PRC-150(C) also operates from 20.0000 MHz to 59.9999 MHz in FM with maximum power of 10.0 watts. Communications can take place with manpack, moble, and fixed-site radio configurations. – Paragraph 1.3, page 1-2, HARRIS AN/PRC-150(C) ADVANCED TACTICAL HF RADIO OPERATION MANUAL

OPERATING MODES

OPERATIONS	
FIX	Program on radio
HOP	Program on radio
ALE	Program on radio/ built on computer
3G	Built on computer
3G+	Built on computer

FIX

Normal single channel operations can be performed from FIX radio mode. Channels which have not been programmed will contain a default setting that will display 2.0 MHz. When FIX radio mode is selected, the three letter designator (**FIX**) will be displayed on the top row of the Liquid Crystal Display (LCD) in the preset screen. – Paragraph 3.17, page 3-27, HARRIS AN/PRC-150(C) ADVANCED TACTICAL HF RADIO OPERATION MANUAL

Channel 000 is the only channel that allows you to change and program from the face plate

Programming steps for FIX on channel

1. From the preset (main) screen, press the “0” button x1 to display the channel preset screen.
2. Press the right arrow key until the channel number (**CH###**) is highlighted and press [**ENT**].
3. Press **[0][0][0]** to select the manual channel and press [**ENT**].
4. Press the right arrow key until the receive frequency (**R**) is highlighted and press [**ENT**].
    a. **NOTE**: An alternate method to **STEP 5** is not press [**ENT**] and use left and right arrow keys to scroll the digit, then use up/down arrow keys to scroll the digit up or down. Press [**ENT**] when finished.
5. Enter a new receive frequency using the keypad and press [**ENT**]. The transmit frequency automatically defaults to the receive frequency at this point.
6. Enter a new transmit frequency (if different from the receive frequency) using the keypad and press [**ENT**]. To keep the transmit frequency the same as the receive frequency; press [**ENT**] without entering a new transmit frequency.
7. Press the right arrow until the (**MOD**) setting is highlighted. Using u/down arrow keys, scroll to the desired setting **Upper Sideband (USB)** and press [**ENT**].
8. Press the”0” to return to the system preset (main) screen.

GROUNDING

1. Grounding Rods. A good electrical ground is needed for two reasons: first, as a safety ground to protect the operator and his equipment, and second, it is needed by some antennas to help them function properly. Most radio sets come with a ground rod that should provide a sufficient ground if used properly in good soil. Used properly means the ground rod is free from oil or corrosion and is driven into the ground so that the top of the rod is below ‘the surface. To ensure a good electrical connection, the top of the ground rod and the end of the ground strap should be clean and bright. A clamp or nut and bolt should be used to make a good mechanical and electrical connection at the ground rod. The end of the ground strap and the radio ground connection should both be cleaned before connection is a made.

GROUNDING (CONTINUED)

2. Underground Pipes. If a ground rod is not available, a water pipe, concrete reinforcing rod, metal fence post (the protective paint coating must-be removed), or any length of metal can be used. If a water System uses a metal pipe, a good ground can be established by clamping the ground strap to the water pipe. Underground pipes, tanks, and metal building foundations will also work.
WARNING: NEVER USE ANY PIPING OR UNDERGROUND TANKS THAT CONTAIN **FLAMMABLE** MATERIALS (NATURAL GAS, GASOLINE, ETC).

3. Dry Soil. In dry soil, electrical grounds can be improved by adding water and chemicals to the soil. Two common chemicals are Epsom Salts and common table salt. Epsom salts are preferred because it is not as corrosive as table salt. Make a solution of five pounds of chemical to five gallons of water and slowly pour the solution in a hole dug around the ground rod. Water should be added periodically to keep the area damp. If water is not available, urine can be used.

4. Multiple Grounding Rods. Multiple ground rods can also be used to improve electrical grounds. If enough rods are available, a "star ground" can be built. A single rod is driven in the center of a circle approximately 20 feet in diameter. Along the outside of the circle, additional ground rods are driven. The ground strap from the radio is connected to the center ground rod which in turn is connected to the rods along the outside of the circle. The rods on the outside of the circle should also be connected together.

5. Other Methods of Grounding.
a. Trench. If for some reason you cannot get the ground rod hammered into the ground, dig a shallow trench and lay the rods in it and cover them with soil. Soak the area with plenty of water to improve the electrical ground. Connections to the radio are still as before.
b. Hitching rail. Drive two ground rods into the soil about 6 feet apart. Run a length of wire between them at about 12 inches high. You can then attach several radios to this wire. However, be aware of interference between the radios.
6. Counterpoise
   a: Counterbalance
   b: an equivalent power or force acting in opposition.
   c: a state of balance.

GROUNDING (CONTINUED)

Most HF antennas require a good ground in order to be efficient. When an antenna has its base on the ground, the earth below it acts like a large reflector and supplies the other half of the antenna. If the earth is dry and sandy (like the desert) or frozen and covered with snow (like the Arctic) then it is hard to obtain a good ground. Using a counterpoise is a good substitute.

A counterpoise is constructed at least 4 lengths of wire (slash wire will suffice). Each piece of wire to be about a quarter wavelength long and laid out like the spokes of a wheel under the Antenna. All the spokes are joined together in the center and then attached to the ground terminal of the radio. (see fig 4)

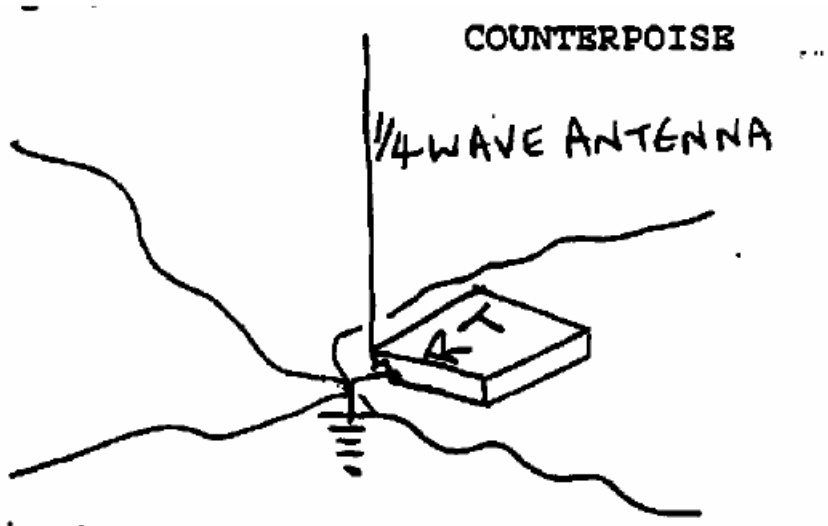


fig 4.

HF FIELD EXPEDIENT ANTENNAS

TWO SITUATIONS

1. **HASTY**
    a. Used when a conventional antenna is not available or the original antenna is broke
    b. Constructed with available materials
    c. Built very rapidly

2. **DELIBERATE**
    a. Designed for a specific purpose
    b. Normally, at least, partially constructed prior to deployment
    c. Often larger and more complex than HASTY

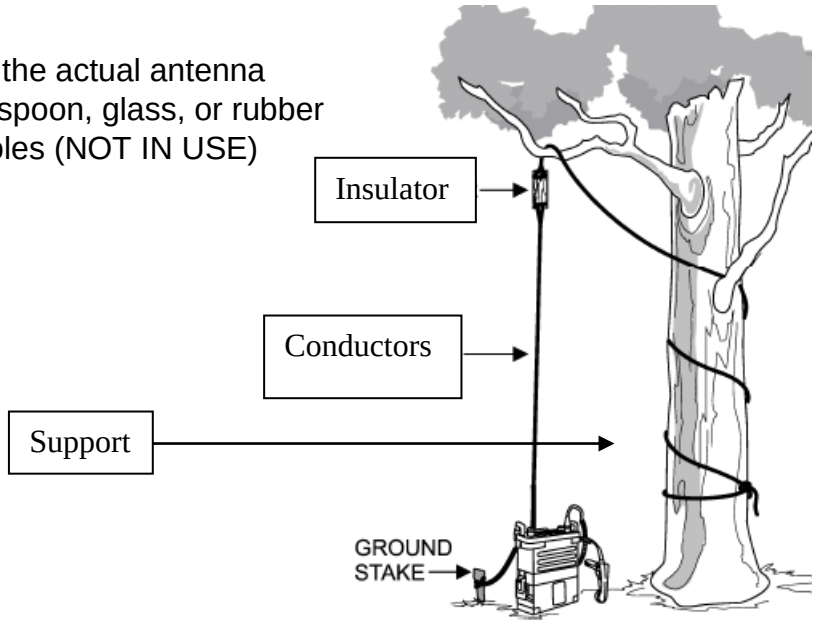
THINGS TO CONSIDER

When choosing a type of field expedient antenna, there are four things to consider

- Construction time
- Tactical requirements
- Antenna and site size
- Antenna visibility

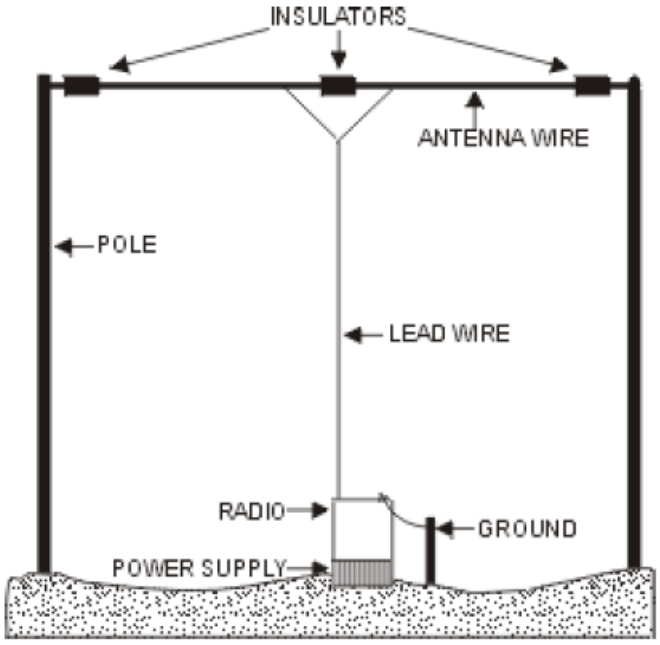
MATERIALS

- Conductors – material for the actual antenna
- Insulators – plastic, MRE spoon, glass, or rubber
- Supports – trees, utility poles (NOT IN USE)



HORIZONTAL HALF-WAVE DIPOLE (DOUBLET)

The horizontal half-wave dipole (also known as the doublet) is frequently used for short to medium HF sky wave paths (up to about 1,500 kilometers). It is usually installed at one-quarter wavelength of the operating frequency above ground. The major drawback of this antenna is the unusually long length required (up to 71meters [233 feet] at 2 MHz). NOTE: A 2 percent or greater error in length means less efficiency and a loss of radiated power.



SLOPING "V"

1. DESCRIPTION. This antenna is a medium to long range skywave antenna that requires only one support. This is an ideal antenna for long range communications training/trials, i.e. from New York to San Diego

a. The polarization of the antenna is almost horizontal due to the long lengths used for medium and long range communications.

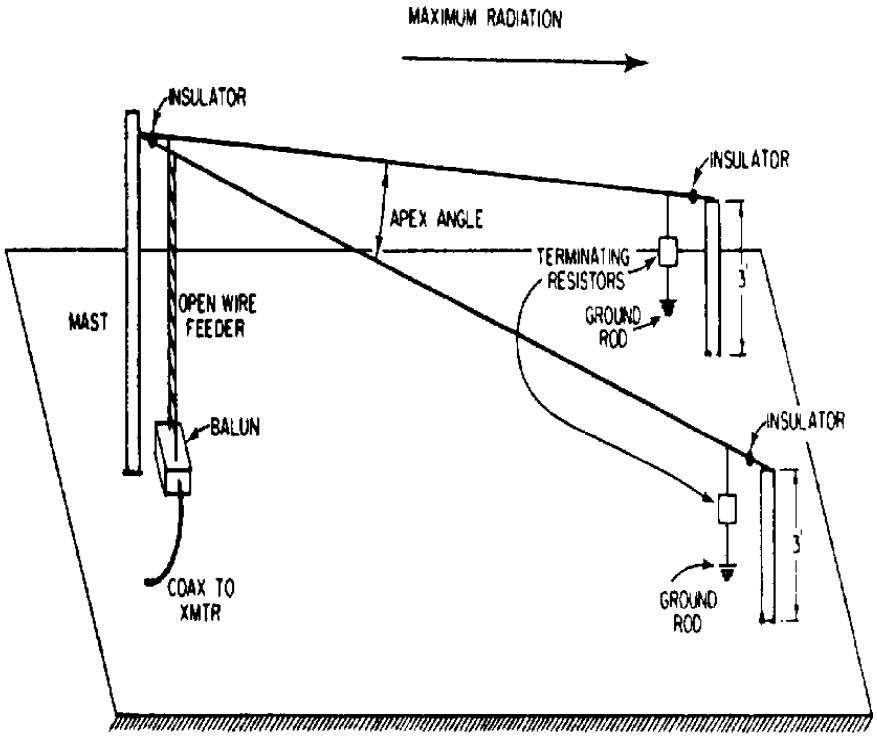
b. Although this antenna can be trailed for shorter ranges using 1/4 wavelengths on each leg, it is designed to use 500 foot lengths on each leg to give it the ability, with the right frequencies, to work medium to long range skywave.

c. This is primarily a skywave antenna that—produces little surface wave. If, however, you are attempting to use it for short range skywave and the angle between the antenna and the ground is more than 45 degrees, some surface wave will be produced.

d. Changing the angle of the apex, i.e. the angle between the 2 wires will change the angle of take-off which will result in a change in the working range:
700 to 1000 miles 60 degrees
1000 to 1500 miles 45 degrees
+1500 miles 30 degrees

Placing 300 ohm terminating resistors on the end of each wire will make the antenna directional.

SLOPING "V" (CONTINUED)



FORMULAS

1. WF-16 WIRE (Christmas tree wire)
   a. ¼ wavelength (FT) = 234 / Freq. (MHz)
   b. ½ waveform (FT) = 468 / Freq. (MHz)
   c. 1 wavelength (FT) = 936 / Freq. (MHz)

2. WD-1 WIRE
   a. ¼ wavelength (FT) = 225.5 / Freq. (MHz)
   b. ½ wavelength (FT) = 451 / Freq. (MHz)
   c. 1 wavelength (FT) = 902 / Freq. (MHz)

Preventive Maintenance and Operation Checks for Harris Multi-Channel Radios

Often radio communications are lost in the field due to a lack of radio maintenance or some other easily correctable problem.

Maintenance Checklist To maintain your radio in good working order,

- Inspect radio for any damage.
- Test all knobs to be sure they are all present and are working properly.
- At least once a day, clean all the connectors using a pencil eraser to prevent corrosion build-up to ensure a good contact between connectors for the

  - Antenna.
  - Handset.
  - Fill device.
  - Battery.

- No matter what the forecast is, waterproof the radio and handset using plastic bags and duct or electrical tape to ensure the radio is protected from inclement weather.
- Inspect the whip and the tape antennas for cracks or tears.

- Inspect the pins in both of the antennas to ensure that they are not bent.
- Inspect SL-3 bag to be sure no holes are in it and all of the SL-3 is present. At a minimum, the bag should contain

  - 3 foot tape antenna.
  - 10 foot whip antenna.
  - H-250 handset.
  - Hard base.
  - Flex base.

Troubleshooting

If you lose communications in the field, follow this checklist of actions to troubleshoot the Harris Multi-Channel Radios (SINCGARS):

- Is the radio on?
- Is the volume turned up loud enough to hear; is the display turned up bright enough to see?
- Do you have the right net identification (ID) or frequency?
- Do you have the right crypto? (Are all channels loaded with the same TSK, TEK, hop set, time, and net ID? If not, try scrolling COMSEC fill.) Ensure Julian date is correct as well.
- Check the connectors (handset and antenna, pm).
- Check batteries (main battery and hold-up battery [HUB]).
- Check antenna to ensure it is connected properly. Relocate to higher terrain.
- You may be required to zero your radio, and re-load with all 5 required variables needed to frequency-hop.
- Perform a radio check for each frequency/NET ID you will be using.
- Inspect the readout to see if the diamond-shaped light is on. If it is blinking, your HUB is low; if solid, your HUB is dead. This can cause a loss of crypto depending on the state of your main lithium battery.
- Above all else, *use a common sense approach when troubleshooting!*

Summary

Understanding the radio nets organic to an infantry battalion and using proper radio procedures are critical to properly employing combined arms and helping guard unit survivability. When the tactical situation is urgent and the need for quick and accurate communications is critical (e.g., upon enemy contact), key people or "actuals" should talk directly to one another on the radio whenever possible. Remember, *if you can't communicate, you can't command!*

References

Reference Number or Author	Reference Title
MCRP 3-40.3C	Antenna Handbook
MCRP 3-11.1A	Commander's Tactical Handbook
MCRP 3-40.3A	Multiservice Communications Procedures for Tactical Radios in a Joint Environment (Tactical Radios)
MCRP 3-40.3B	Radio Operator's Handbook
MCWP 3-11.1	Infantry Company Operations
MCWP 3-40.3	MAGTF Communications System
PUBLIC. NUMBER: 10515-0283-4200 REV. P	AN/PRC-152 MULTIBAND HANDHELD RADIO OPERATION MANUAL
PUBLIC. NUMBER: 10515-0109-4100 REV. N	AN/PRC-117F (V)(C) MANPACK RADIO OPERATION MANUAL

Glossary of Terms and Acronyms

Term or Acronym	Definition or Identification
AO; Air O	Area of Operations; Air officer
Arty	Artillery
Bn	Battalion
C^3	Command, control, and communications
CAS	Close air support
Co	Company
COC	Combat operations center
CONF	Confidential
CP	Command post
DTG	Date-time group
FAC	Forward air controller
FCC	Federal Communications Commission
FDC	Fire direction center
FiST	Fire support team
FO	Forward observer
FSCC	Fire support coordination center
HUB	Holdup battery
ID	Identification
ISR	Intelligence, Surveillance, Reconnaissance
LP	Listening post
NCS	Net control station
O	Immediate
OP	Observation post
P	Priority
PA	Practical application
Plt	Platoon

Glossary of Terms and Acronyms (Continued)

Term or Acronym	Definition or Identification
POC	Point of contact
R	Routine
RTO	Radio telephone operator
SP	Security patrol
TAC	Tactical
TACP	Tactical air control party
TAD/HD	Tactical air direction/helo direction
TOPSEC	Top secret
UNCLAS	Unclassified
VHF	Very high frequency
Z	Flash

Notes