AN/PRC 152
FALCON III
Multi-Band Handheld Radio

Student Guide v10.07.16

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Logistics Readiness Center
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Introduction to the AN/PRC-152 Falcon III Multi-band Handheld Radio
AN/PRC-152 Falcon III
Multi-band Handheld Radio

Course Objectives

At the conclusion of this course the student will be able to understand the terminology and operation of the AN/PRC-152 Falcon III Radio
Course Outline

- Introduction
- Basic Operation
- COMSEC
- VULOS Fixed Frequency Operation
- Dedicated UHF SATCOM
- SINCgars Frequency Hopping
- Retransmission Operations
- Other Modes and Capabilities
- OTAR
- Scan Mode
- Radio Programming Application (RPA)
AN/PRC-152 Safety Warnings

RF Radiation Hazard

Transmitting Automatically

- RF Radiation Hazard: Avoid contact and prolonged proximity exposure to transmitting antennas.

- Some SATCOM and VHF/UHF Line of Site (VULOS) data operations cause the radio set to transmit automatically without operator intervention. ARQ Data System Reception also causes the radio to transmit its acknowledgments. Avoid contact with all antennas or exposure directly in front of the SATCOM antenna.
Battery Safety Warnings

• Do not crush, disassemble, incinerate, or mutilate the lithium-ion battery

• Dispose of batteries properly

• Do not short circuit

• Use only approved battery chargers

• Never expose lithium batteries to water; this could cause a fire or explosion
Cautions

• Unauthorized frequencies

• Antenna and connector damage

• Controlled Cryptographic Item (CCI)

• Do not operate the AN/PRC-152 on unauthorized frequencies. The AN/PRC-152 frequency band coverage does not constitute authorization for indiscriminate use of any frequency.

• The AN/PRC-152 radio is a Controlled Cryptographic Item (CCI). Use appropriate security measures to protect it as dictated by your security manager or service regulations.
  – Double barrier locked storage devices for un-keyed storage
  – Store radio with function switch set to OFF
  – Filled radio takes on same classification as loaded keys
AN/PRC-152 Features (1)

- The AN/PRC-152 is available in two hardware configurations:
  - AN/PRC-152(V)1(C): Includes all features except internal GPS time synchronization.
  - AN/PRC-152(V)2(C): Includes all features including internal GPS time synchronization.
    - (V) Version
    - (C) CCI

- Supported Waveforms:
  - VHF/UHF Line of Sight (LOS) Fixed frequency FM and AM
  - SINCGARS Frequency Hopping
  - UHF Dedicated SATCOM
  - HAVEQUICK Frequency Hopping
AN/PRC-152 Features (2)

- LOS fixed frequency
- SINCGARS Frequency Hopping
- Dedicated UHF SATCOM
- HPW
- HAVEQUICK Frequency Hopping

- VULOS fixed frequency operation from 30 MHz to 511.99999 MHz Programmable in 100 Hz increments from the front panel. Amplitude Modulation (AM) from 30 MHz to 89.99999 MHz and Frequency Modulation (FM) from 30 MHz to 511.99999 MHz.
- Single Channel Ground and Airborne Radio System (SINCGARS) compatibility from 30 MHz to 87.975 MHz
- Dedicated UHF SATCOM (MIL-STD-188-181B) using 5 kHz Narrowband (NB) or 25 kHz Wideband (WB) satellite channels. 249 channel codes are preprogrammed into the radio; code 999 for non-standard frequencies.
- HPW (High Performance Waveform) is an optional modulation that uses KG-84C encryption. It is used with Harris Wireless Message Terminal software.
- HAVEQUICK frequency hopping in AM from 225 MHz to 399.975 KHz
AN/PRC-152 Features (3)

• Embedded US Type-1 COMSEC:
  
  • VINSON (KY-57/58)
  
  • Advanced Narrow Band Digital Voice Terminal (ANDVT)
  
  • KYV-5 (SINCGARS Enhanced Data Mode)
  
  • KG-84C
  
  • Fascinator (FED-STD-1023)

•  Embedded COMSEC:

  - VINSON: Voice and data at 16 kbps, 25 kHz wideband.
  
  - Advanced Narrow Band Digital Voice Terminal (ANDVT): Voice and data at 2.4 kbps.
  
  - KYV-5 (SINCGARS ESIP) uses VINSON COMSEC keys and allows Enhanced Data Mode data rates.
  
  - KG-84C is primarily data encryption. However, it can be used for voice on dedicated SATCOM channels. 2.4 kbps for voice, up to 56 kbps for data, 64 kbps with HPW.
  
  - Fascinator enables interoperability with FED-STD 1023 Fascinator encryption. Supports voice at 12 kbps and is similar to VINSON.
AN/PRC-152 Features (4)

- 99 programmable net presets
- BIT
- Optional Internal GPS
- Hold-Up-Battery (HUB)
- Military and Civilian Squelch

- 99 (01-99) programmable SYSTEM presets, VULOS\SATCOM, SINCGARS, or HAVEQUICK.
- Built-In Test (BIT) for operational tests and battery check.
- Internal GPS for Situational Awareness (SA) and Global Time of Day used in Frequency Hopping.
- Hold-Up battery (HUB), retains programming and data when the main battery is removed.
- Analog Noise, analog tone at 150 Hz, and Digital Squelch.
  - Civilian Plain Text LOS System Interoperability
  - CDCSS (Continuous Digital Controlled Squelch System) with 83 EIA codes
  - CTCSS (Continuous Tone Controlled Squelch System) with 41 EIA tones
AN/PRC-152 Features (5)

- Program presets via computer
- Radio Firmware is upgradable
- Side Data Port
- Automatic whisper microphone
- PT Override

- RF-6550M Falcon III Radio Programming Application (RPA) can be used to program the radio via computer.
- Software reprogrammable: Ability to integrate newer software into the radio without having to open the chassis
- Fully configurable DATA Interface: Synchronous data up to 56 kbps on the 32-pin side connector. 64 kbps with HPW.
- Automatic whisper microphone mode (10 dB boost on low input signals)
- PT Override function allows the operator to hear Plain Text Voice in Cipher Text mode.
Other Capabilities

• Scan Mode
• OTAR capable
• Emergency Beacon Mode
• External GPS Interface
• Remote Control

• The radio can scan up to 10 LOS Fix Frequency or dedicated SATCOM voice nets. It cannot scan Frequency Hopping nets.

• It is capable of Over-the-Air-Rekeying (OTAR) and Over-the-Air-Transfer (OTAT). This is where a distant radio can be rekeyed or a key can be transferred to a fill device attached to the distant radio.

• It is capable of transmitting a user programmed emergency locator beacon from 90 MHz to 511.99999 MHz; AM or FM. Beacon Mode Preset

• External GPS Interface on 32-pin side connector: Interfaces with PLGR, PLGR-II, and DAGR GPS devices. Also NMEA for civilian GPS compatibility.

• Remote Control: Asynchronous data connection using text based commands, HyperTerminal, or ProComm 32-pin side connector.
Frequency Band Characteristics (1)

VHF Low Band

30 MHz 89.99999 MHz

• VULOS & SINCGARS Waveforms
• Modulation: FM
• 5 watts maximum output power
• Standard 150 Hz tone squelch operation
• SINCGARS Frequency Hopping (FH) operation (30 - 87.975 MHz)
• VINSON, Fascinator & AES encryption on voice nets
• VINSON, KG-84C, & AES on data nets
• AES is not Type-1 COMSEC
Frequency Bands
Characteristics (2)

VHF High/UHF Band

- VULOS & HAVEQUICK Waveforms
- Modulations: FM & AM
- 5 watts maximum output power
- Standard noise squelch operation
- VINSON, Fascinator & AES encryption on voice nets
- VINSON, KG-84C, & AES on data nets
- ANDVT on voice & data nets from 225 to 511.99999 MHz only
- Beacon transmit Mode
Frequency Bands
Characteristics (3)

SATCOM

<table>
<thead>
<tr>
<th>Down Link</th>
<th>Up Link</th>
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</thead>
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<tr>
<td>243 MHz</td>
<td>292 MHz</td>
</tr>
<tr>
<td>270 MHz</td>
<td>318 MHz</td>
</tr>
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</table>

- Dedicated UHF SATCOM
- Modulations: FSK, SBPSK, CPM, & HPW
- 5 watts maximum output power
- VINSON on 25 kHz WB voice or data
- Fascinator on 25 kHz WB voice
- ANDVT on 5 kHz NB voice or data
- KG-84: Up to 56 kbps data encryption with FSK, SBPSK, & CPM. 64 kbps with HPW
Other Characteristics

- Shuts down at 60 C
- Takes approximately 27 seconds to start up
- Takes approximately 2-3 seconds to change nets
- Takes approximately 2-3 seconds to change PT/CT
- Takes approximately 6 seconds to change Waveform nets
- Radio warms up 10 degrees in first two minutes automatically; normal for software processing

AN/PRC-152 Interoperability

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<th>USE Modulation</th>
<th>Remarks</th>
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<tr>
<td>AN/PSC-3</td>
<td>35 W</td>
<td>225 - 399.995 MHz</td>
<td>SATCOM</td>
<td>Non-ICOM, Manpack</td>
</tr>
<tr>
<td>AN/PSC-5</td>
<td>18 W</td>
<td>30 - 400 MHz</td>
<td>VHF/UHF-FM/AM</td>
<td>ICOM, VINSON, AN/PRC-152</td>
</tr>
<tr>
<td>5C</td>
<td></td>
<td>30 - 420 MHz</td>
<td>SATCOM/LOS/AM/RF</td>
<td></td>
</tr>
<tr>
<td>5D</td>
<td></td>
<td>30 - 512 MHz</td>
<td>HOII/ SING GARS</td>
<td></td>
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<tr>
<td>MST-20</td>
<td>22 W</td>
<td>225 - 399.995 MHz</td>
<td>SATCOM/LOS/AM/RF</td>
<td>Non-ICOM</td>
</tr>
<tr>
<td>LST-5D</td>
<td>2-18 W</td>
<td>225 - 399.995 MHz</td>
<td>SATCOM/LOS/AM/RF</td>
<td>ICOM</td>
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<tr>
<td>LST-5C</td>
<td>2-18 W</td>
<td>225 - 399.995 MHz</td>
<td>SATCOM/LOS/AM/RF</td>
<td>Non-ICOM</td>
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<td>AN/PRC-126</td>
<td>1 W</td>
<td>30 - 87.975 MHz</td>
<td>LOS-FM</td>
<td>Securable, VINSON</td>
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<td>AN/PRC-112</td>
<td>1 W</td>
<td>225 - 269.975 MHz</td>
<td>VHF/AM/AM/AM</td>
<td>Search/Rescue</td>
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<td>AN/PRC-113</td>
<td>2 or 10 W</td>
<td>116 - 149.975 MHz</td>
<td>VHF/AM-Ground to Air</td>
<td>2 channels preset ID Code</td>
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<td>AN/PRC-117B</td>
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<td>30 - 88 MHz</td>
<td>VHF/AM/AM/AM</td>
<td>Non-ICOM</td>
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<td>AN/PRC-117C</td>
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<td>116 - 175 MHz</td>
<td>VHF/AM/AM/AM</td>
<td>ICOM</td>
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<td>AN/PRC-117D</td>
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<td>225 - 420 MHz</td>
<td>VHF/AM/AM/AM</td>
<td>Non-ICOM</td>
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<td>AN/PRC-117F</td>
<td>20 W</td>
<td>30-512 MHz</td>
<td>VULOS, SATCOM</td>
<td>ICOM, VINSON, AN/PRC-152</td>
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<td>AN/PRC-1138</td>
<td>1,10,20 W</td>
<td>2.0 - 60.0 MHz</td>
<td>HOII/ SING GARS</td>
<td>FM 30 – 60 MHz</td>
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<td>AN/PRC-119AD/E/F</td>
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<td>30 - 87.975 MHz</td>
<td>VHF-AM</td>
<td>SING GARS MANPACK</td>
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<td>AN/VRC-87 to 92</td>
<td>55 W</td>
<td>30 - 87.975 MHz</td>
<td>VHF-FM</td>
<td>SING GARS-ICOM</td>
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<tr>
<td>Motorola SABER</td>
<td>2.5/6 W</td>
<td>138 - 174 MHz</td>
<td>VHF-FM</td>
<td>Vehicle mounted</td>
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<td>Harris 5900V</td>
<td>10 W</td>
<td>30 - 108 MHz</td>
<td>VHF-FM</td>
<td>LOS FM Fascinator Encryption</td>
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<td>AN/PRC-148</td>
<td>8 W</td>
<td>30 - 512 MHz</td>
<td>VHF-JHF AM/AM/FM</td>
<td>Multi-Band Inter-team Radio</td>
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AN/VRC-110 Vehicular Adapter Amplifier

Frequency Range: 30 to 512 MHz

Output Power:
- 30-90 MHz: 5, 20 or 50 watts on J3 antenna port
- 90-512 MHz: 20 watts with 50 watts in SATCOM bands on J4 antenna port.
- Separate VHF and UHF antenna ports and automatic port switching.

Input Power: +20 VDC to +32 VDC

The system’s “jerk-and-run” capability allows the AN/PRC-152 radio to be quickly removed while remaining powered on.

An integrated handheld battery charger provides simultaneous operation and charging of the handheld radio battery.
Optional VAA Deployment

Transit Case System
AN/PRC-152
Basic Operation
AN/PRC-152 Basic Operation

Objectives:

• Equipment description and purpose of controls, indicators and connectors.

• Radio interface navigation, displays, menu trees and keyboard interaction.

• Hold-up Battery (HUB) installation and replacement.
Included Items

AN/PRC-152(V)1(C) Radio Assembly without GPS

AN/PRC-152(V)2(C) Radio Assembly with GPS

Rechargeable Lithium-Ion Battery

The GPS Antenna is for the (V)2(C) model only. It is an active antenna and draws power from the battery.

The VHF Blade Antenna is 38.6 inches long and covers 30 MHz to 108 MHz. It has a higher gain then the Whip Antenna.

The VHF/UHF Whip Antenna is 13.5 inches long and covers 30 MHz to 511.99999 MHz.

Operator Quick Reference Guide
Optional Items

H-250 Handset
Headset
Single bay battery charger
Six bay battery charger
Side Connector to DB25 Synchronous Data Cable
USB Field Programming Cable with adapter
Holster
Handheld Accessory Bag
UHF HH Whip Antenna, 225 MHz to 450 MHz
SATCOM Antenna Kit (RF-3080 AT001)
Retransmit Cable
System Setup

- Attach the battery by seating it on the base of the radio at an angle to the base then twist the battery clockwise until it locks in place.

- Depending on the frequencies being used (e.g. SINCGARS, SATCOM, etc) screw the correct antenna to the TNC (Threaded N-Connector).

- If using the internal GPS, ensure the connectors are free of loose metal filings, and then screw the antenna into the connector.

- Optional handset or headset can be attached to the 6-pin audio connector on the top.
Controls, Indicators, and Connectors (1)

1: Volume Control: Increase or decrease volume

2: PTT: Push-To-Talk switch

3: Monitor: Toggles squelch on and off

4: GPS Antenna Connector: For (V)2(C) model only.

5: 6-Pin Audio/Fill Connector: Connection for optional handset or data device

6: Cipher Switch: PT places the radio in Plain Text mode (non-encrypted). LD places the radio off line ready to load COMSEC and TRANSEC variables. CT places the radio in Cipher Text mode (encrypted).

7: Function Knob: OFF turns the radio off. 1 – 5 selects system preset 1 – 5. S places the radio in scan mode. F places the radio in Front Panel mode that allows access to all keypad functions and system presets. Z is used to Panic Zeroize the Radio.

8: Antenna Connector: 50-ohm Threaded N-Connector
9: Built-in Microphone
10: Built-in Speaker
11: LCD Display
12: Keypad
14: Battery Latch: Slide up to unlock battery.
Keypad (1)

1/ CALL: Initiates specific action depending on current operating mode.
   – HAVEQUICK: Time-of-Day (TOD) sync request transmit or receive
   – HAVEQUICK: Guard Receiver Access
   – SINCgars FH: Cue, COLDSTART ERF, and Normal ERF
   – SATCOM Receive Signal Strength Indicator (RSSI) Test

2/ LT: Accesses the KDU backlight intensity and contrast control menu.

3/ Mode: Selects the operational mode (Beacon, Clone, and OTAR)

5/ ZERO: Will Zeroize radio’s (Black data) Returns radio configuration to default

6/ Up Arrow: Scrolls up through menus/choices.
Keypad (2)

- **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.

- **9/ Down Arrow**: Scrolls down through menus/choices.

- **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 system presets.

- **Left/Right Arrows**: Moves the cursor when editing text, page up/down through menus, and Operational Overrides on the main system preset screen.
Hold-Up Battery

The HUB battery is a 3 volt lithium type battery used to retain the radio programming and COMSEC variables.

When a charged main battery is connected, Memory is held up by it, and the HUB is automatically disconnected to extend its life.

The HUB is a 3 VDC commercially available lithium coin-type battery (Harris # B41-0019-008; Panasonic #BR3032).

When HUB battery is replaced Split Key will need to be reloaded.

If key is not reloaded radio will not accept TYPE 1 COMSEC.
Transmit Power Levels

- **HIGH** - 5 Watts
- **MEDIUM** - 2 Watts
- **LOW** - 0.25 Watts
- **USER** - Custom power level: Used to set the transmit power to a custom level in the range of 0 to 13 dB down from full power (5 Watts). Power output adjusts from +17 dBm (0.25 watts) to +37 dBm (5 watts) to allow for proper output within authorized Effective Isotropic Radiated Power (EIRP) levels.

Power levels will be different if used in a Vehicular Amplifier Adapter (VAA).
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AN/PRC-152
COMSEC
AN/PRC-152 Basic Operation

Objectives:

• COMSEC Mode capabilities and limitations.

• Loading COMSEC keys.

• Zeroizing COMSEC keys and radio parameters.

Warning!

Fill Devices and the AN/PRC-152

• Do not connect ANY Fill Device to ADF connector until the radio cipher switch is placed to the LD position. Attaching the Fill Device prematurely causes the AN/PRC-152 to key and transmit.

• Upon finishing procedures in LD position, disconnect the Fill Device before returning to PT or CT.
Embedded Encryption
Device Compatibility

KY-57 VINSON

KY-99A ANDVT

KG-84

Operation in any of the embedded COMSEC modes requires COMSEC keys be loaded.
VINSON (KY-57) Encryption

VINSON (KY-57) is 25 kHz wideband COMSEC and is the normal voice encryption mode for all bands and modes except five kHz Narrowband SATCOM.

- Converts analog voice to encrypted data at 16 kbps using CVSD (Continuously Variable Slope Delta) modulation

SINCGARS in SDM (Standard Data Mode) Data rates RS232, 600, 1200, 2400, 4800, & 16kbps. EDM (Enhanced Data Mode) data rates are denoted by an N; 1200N, 2400N, 4800N, & 9600N.

- It Supports OTAR operations

The Radio can store 25 VINSON Traffic Encryption Keys (TEK), 1 VINSON KEK, & 1 TrKEK. TrKEK is a transfer KEK. It is used to decrypt black TEKs loaded into the radio. KYV-5 & Fascinator share VINSON COMSEC storage.
Advanced Narrowband Digital Voice Terminal (ANDVT)

Encryption (KY-99)

Supports voice and data encryption on NB 5 kHz SATCOM channels

- Only selectable when programming a Dedicated SATCOM Net
- Voice data rate is always 2400 bps.
- Data rates of 1200 or 2400 bps.
- Uses LPC-10 or MELP digital voice encoding with automatic detection and switching
- Training frames settings must match on all radios, default is 20.
- **Does not** support OTAR operations!
- The Radio can store 25 ANDVT TEKs, & 1 TrKEK.
KG-84C is used for data only encryption. Using MS181 SATCOM modulation the radio can support up to 9600 bps on 5 kHz channels and up to 56 kbps on 25 kHz channels. Also used with AM & FM modulations in LOS.

HPW also uses KG-84C up to 56 kbps.

The Radio can store 25 KG-84C TEKs, & 1 TrKEK.

**Does not** support OTAR operations!
Operational Modes and Associated COMSEC type

LOS fixed frequency - **VINSON**

Frequency Hopping
- SINCGARS – **VINSON**
- HAVE QUICK – **VINSON**

Dedicated UHF SATCOM
- NB 5 kHz – **ANDVT**
- WB 25 kHz - **VINSON**
- HPW - **KG-84C**

Under normal circumstances, the above listed COMSEC type is used for the net type. However, each net type can use more than one type of COMSEC.

- LOS fixed frequency
  - Below 225 MHz: VINSON, Fascinator, KG-84C, and AES
  - Above 225 MHz: ANDVT, VINSON, Fascinator, KG-84C, and AES

- Dedicated UHF SATCOM
  - 5 kHz: ANDVT & KG-84C
  - 25 kHz: ANDVT, VINSON, Fascinator, & KG-84C
  - HPW: KG-84C.

- Frequency Hopping
  - SINCGARS: VINSON
  - HAVE QUICK: VINSON
The AN/PRC-152 can accept COMSEC Fills using either DS-101 or DS-102 protocol. DS-101 is a newer interface used by FILL User Application Software. FILL UAS can be installed into and AN/CYZ-10 and is used for single COMSEC keys. DS-102 is the interface type of the Common Fill Device Family that includes the KYX-15, KOI-18, KYK-13, & the MX-18290. RBECS DTD Software (RDS) uses the DS-102 protocol and is installed into a AN/CYZ-10. The SKL can use either DS-101 or DS-102 protocol.

When loading individual COMSEC keys many different devices can be used.

- CYZ-10 DS-101 (FILL UAS)
- MX-18290
- KYK-13
- KYX-15
- KOI-18

CYZ-10 RDS is for loading a SINCgars FH LOADSET. If the COMSEC is in RDS, individual keys can be loaded by selecting the COMSEC menu in RDS and KYK-13 for a fill device on the radio. MX-18290 holds both single TEKs and SINCgars TSKs.
AES is TYPE-3 COMSEC, all the other keys are TYPE-1 COMSEC.

There are 25 TEKs per crypto type per Waveform; 300 maximum.

Only one TrKEK per waveform regardless of crypto type.

Only two KEKs can be loaded;

1. VULOS VINSON KEK,
2. SINCGARS VINSON KEK.

Therefore Over-The-Air Rekeying (OTAR) can only be performed in VULOS or SINCGARS CT VINSON preset.
Loading Single COMSEC Key (1)

Selecting KYK-13 for a fill device allows the operator to load single COMSEC keys from many devices such as a KYK-13, an SKL, or an AN/CYZ-10.

- Place the Cipher Switch to **LD**. Attach the fill device.
- Select **FILL**
- Enter **PASSWORD** (The first time when accessing this menu.)
- Select WAVEFORM FOR KEY:
  - VULOS
  - SINCGARS
  - HPW
  - HAVEQUICKII
  - DSS Public Key
- (If loading a single key for SATCOM or Line of Sight (LOS), select **VULOS**.)
- Select FILL DEVICE: **KYK-13**
- **PRESS ENT TO INITIATE FILL** is displayed
Loading Single COMSEC Key (2)

AN-CYZ-10 RDS settings

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<thead>
<tr>
<th>Send Set</th>
<th>Receive Comsec</th>
<th>Database Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>vG</td>
<td>Ld</td>
<td>Rv</td>
</tr>
<tr>
<td>Ak</td>
<td>MK</td>
<td>vU</td>
</tr>
</tbody>
</table>

Select:
Tek  Kek

Select key  qUit
USKAT1234  XMT

Press [Load] on RT

If using RDS (Radio) software from a AN/CYZ-10 use the following steps:

1. Select **COMSEC**
2. Select **LD**
3. Select the key type (**TEK** or **KEK**)
4. If necessary press the P DN (page down) to locate the correct key
5. Press the ENTR button to 'tag' the key. **XMT** will be in the lower right. Be sure to tag only one key. Pressing the ENTR button again will un-tag the key.
6. Select **qUit**
7. Connect ANCD to RT is displayed on the AN/CYZ-10, press ENTR or the down arrow button
8. **Sending TEK USKAT1234** (for example) is displayed.
If using an AN/PYQ-10 SKL use the following steps:

1. After you have logged into the SKL select the **Keys** Tab.
2. Select the correct key then press the **LOAD** icon in the top right of the screen. There may be more than one Edition under a short title, expand the tree and select the correct Edition.
3. Select **DS-102** for the Protocol and **KYK-13** for the Activation Mode. Press **OK**.
4. Press **OK** at the Ready to Send Key screen.
5. When the Status screen displays Press INITIATE Button…, press the **ENT** button on the radio.
Loading Single COMSEC Key (4)

- When you press ENT, the radio will display ‘FILL IN PROGRESS’.
- If the transfer was successful, select the CRYPTO MODE:
  - VINSON
  - FASCINATOR
  - ANDVT
  - KG84
- Select the KEY TYPE: TEK then the KEY NUMBER: 01. The key number will advance to the next empty position the next time a key is loaded.
- Select the CLASSIFICATION:
  - SECRET
  - TOP SECRET
  - CONFIDENTIAL
  - UNCLASSIFIED
- LOAD ANOTHER KEY YES. Select YES and the screen returns to the WAVEFORM FOR KEY screen. Select NO and the screen returns to the first FILL MENU screen.
- Disconnect the fill device and place the Cipher Switch to PT.
Problems Loading COMSEC

- If “BAD FILL PRESS ANY KEY” appears, check the radio settings and J1 connections before repeating process.
  - Check FILL Device type and FILL Device protocol.
  - Check Fill cable connections before repeating process.
  - Ensure O Ring in fill cable is secure.
  - Clean cable connections.
  - Attempt to reload radio.

- If “COMSEC FAULT” is flashing, turn both the fill device and radio OFF, disconnect the fill device, turn the radio back on and try the procedure again.
Reviewing KEY Information

- To review key information, press 7/OPT key and select VIEW KEY INFO.
- Select the Waveform (VULOS, SINCgars, HPW, etc)
- Select the key type (TEK, KEK, TRKEK)
- Scroll up or down to view what key positions have been loaded under each Crypto Mode and their classification.
- SINCgars HOPSETs, TSKs, and LOCKOUTs can also be viewed.
A radio loaded with COMSEC takes on the classification of the COMSEC.

To interactively ZEROIZE radio Press 5/ ZERO key:

ZEROIZE ALL will delete all COMSEC, TRANSEC, and programming data.

DEACTIVATE MISSION PLAN will reset the System Presets and configurations to default. Mission plans loaded from the PC Radio Programming Application will not be deleted and can be reloaded.

SELECTIVE ZEROIZE allows the operator to delete individual keys by selecting the Waveform, Type, Crypto Mode, then the key to be deleted.

ERASE MISSION PLANS deletes mission plans loaded from the PC Radio Programming Application.

To panic Zeroize the radio rotate the Function Switch to Z and press the Volume Up bottom on the side of the radio. This performs the same function as ZEROIZE ALL. The radio must be turned off after Panic Zeroizing. The radio will display a CRYPTO ALERT PANIC ZEROIZE message when turned back on.
Practical Exercise

AN/PRC-152
COMSEC
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AN/PRC-152 VULOS
LOS Fixed Frequency Operation
VULOS Fixed Frequency

Objectives:

• Program the AN/PRC-152 for LOS fixed frequency operation
• Operate the AN/PRC-152 in a LOS fixed frequency net

VULOS Fixed Frequency
Practical Considerations

• Most ground to ground station communications are FM
  – Tone Squelch below 90.000 MHz
  – Noise Squelch above 90.000 MHz
• Ground to Air Communications are AM
  – VHF-High - 116.000 MHz to 150.000 MHz
  – UHF - 225.000 MHz to 399.995 MHz
  – Noise Squelch
• Press the PGM button
• Arrow down to highlight SYSTEM PRESETS, press ENT
• Select SYSTEM PRESET CONFIG
• Select the SYSTEM PRESET NUMBER
• Enter a PRESET DESCRIPTION (optional)
• Scroll to select VULOS for PRESET WAVEFORM
• Select GENERAL CONFIG
• Enter a PRESET NAME (up to 11 characters)
• Select LOS for PRESET TYPE
Los Fixed Frequency Programming Below 90 MHz (2)

- Select FREQUENCY
  - Enter the frequency. The range is 30.0000 MHz to 511.9999 MHz.
  - Select NO for RECEIVE ONLY. YES will prevent the radio from transmitting.
  - USE RX FREQ for TX FREQUENCY. To enter a different frequency select EDIT TX FREQ
  - Press ENT. The TX Frequency cannot be edited when USE RX FREQ was selected.
- Select COMSEC
  - Select VINSON for CRYPTO MODE. VINSON is the normal crypto mode for most military communications.
  - Select the CRYPTO KEY position (e.g. TEK01)
• Select TRAFFIC

• Set TRAFFIC MODE to VOICE. Selecting DATA allows data at 16 kbps.

• VOICE MODE cannot be edited, press ENT

• MODULATION TYPE also cannot be edited, press ENT.

• Select 8.0 KHz for FM DEVIATION. Use 6.5 KHz for SINCGARS compatibility. 5.0 KHz is the third choice.

• Select TX POWER. Choices are HIGH (5 watts), MEDIUM (2 watts), LOW (0.25 watts), & USER. User allows for 14 power levels from 0 DB down (equal to 5 watts) to 13 DB down (equal to 0.25 watts) from full power. Medium (2 watts) is 4 DB down.
• Select SQUELCH

• Select TONE for SQUELCH TYPE. OFF, NOISE, CTCSS, & CDCSS are the other choices. Noise is normally used above 90 MHz. CTCSS is Continuous Tone Coded Squelch System and has 42 codes plus a user entry. CDCSS is Continuous Digital Coded Squelch System and has 83 codes. CTCSS & CDCSS are for civilian radio compatibility.

• Select EXIT.

• Select SYSTEM PRESET CONFIG to program another Preset or press the PGM button to exit programming mode.
Main Operational Screens (1)

- TX/RX Indicator: T for Transmit, R for Receive. Some Waveforms can automatically transmit.
- BAT/VOL meter: BAT: Battery meter displays by default and has 5 levels. VOL: Volume meter is display for 4 sec when volume up/down is pressed. VAA indicates the radio is connected to a Vehicular Amplifier Adapter.
- Waveform Type: VULOS, SNGCR, HPW, etc.
- Squelch Indicator: TON, NOI, DIG, TCS, DCS, or BSY.
- Crypto Type: VINSON, ANDVT, etc. PT RX is displayed indicating Plain Text Override; receiving PT while in CT.
- Cipher Type: PT, CT, or LD.
- Preset # and Name: Current System Preset. (Can be over-ridden).
- Next Indicator: Indicates more than one screen is available. Press the 0 or circle arrow button to change screens.
- RX / TX Power: Displays transmit power level or receive signal-detected level. Fills bottom to top for TX and left to right for RX.
- Preset Type: LOS or SAT. (Can be over-ridden).
- Traffic Type: Voice or Data. (Can be over-ridden).
- Modulation Type: Below 90 MHz, FM only. (Can be over-ridden above 90 MHz).
- Channel Number: Satcom channel number only. (Can be over-ridden in Satcom).
- Crypto Key: 01 to 25. (Can be over-ridden).
Main Operational Screens (2)

Second Operational Screen

- Receive & Transmit Frequencies: If Receive Only was set to YES during programming, then RX ONLY will be displayed for the Transmit frequency. (Can be over-ridden).

- Channel #: Same as the first screen, the Satcom channel number.
Third Operational Screen

Voice:

- Bandwidth: Varies dependent on the option code. Can be 25 K, 12.5 K, or 5 K.

- Option Code: The code defines a set of data parameters. The defined parameters are Bandwidth, Modulation Mode, Bits per Second Rate, Interleave Depth, and Forward Error Correction. Below 90 MHz the option code cannot be edited; it is 132 in CT and 201 PT. Above 90 MHz 200 for PT AM, and 202 for CT AM are now available.

- Voice Mode: CLR for 16 k Plain Text, CVSD for 16 k wideband Cipher Text, LPC and MELP are for ANDVT 2400 bps voice

- Interleave Depth: Specifies the interleave depth.
Main Operational Screens (4)

Third Operational Screen cont..

Data:

- **BPS Rate:** Bits Per Second used for transmitting and receiving data and digital voice. Using VINSON CRYPTO MODE the rate is 16 kbps only. Change the CRYPTO MODE to KG-84 and the frequency to 225 MHz or higher and 23 Option Codes become available with rates between 1200 bps to 56 kbps.

- **Data Mode:** Specifies the data synchronization mode, (SYNC or ASYNC)
Main Operational Screens (5)

Large Font Screen

Fourth Operational Screen

• This is the last screen of each system preset. The screen will remain on the large font screen when changing system presets.

• The user can scroll through the complete list of system presets from any of the screens by using the PRE + or - keys. To select a new preset, press ENT while viewing that preset, or simply wait four seconds and the system preset will change automatically.

• The bottom two screens are common COMSEC programming errors. Invalid Crypto Mode indicates the Cipher Switch is in the CT position however, the Crypto Mode was set to NONE. Move the Cipher Switch to PT.

• TEK Not Found indicates that an empty Crypto Mode or Crypto Key position was assigned to the preset.
Options (VULOS CONFIG)

- Press 7/OPT button and select VULOS CONFIG.
- This menu allows the operator to modify the COMSEC and SQUELCH without entering the program mode and taking the radio Offline.
- The COMSEC and SQUELCH menus are identical to the ones in the program mode.
- The Cipher Switch must be in CT to be able to change COMSEC mode/key from the option menu.
Practical Exercise

AN/PRC-152 VULOS
LOS Fixed Frequency Programming
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AN/PRC-152 VULOS
Dedicated UHF SATCOM
Dedicated UHF SATCOM

Objectives:

• Program the AN/PRC-152 for 25 kHz Wideband (WB) SATCOM and 5 kHz Narrowband (NB) SATCOM.

• Operate the AN/PRC-152 in a dedicated UHF SATCOM net.
Military UHF Satellites are in geosynchronous orbits at a range of 22,300 miles, appearing almost stationary to users on the earth.

Uplink is the transmit frequency to the satellite.

Downlink the receive frequency from the satellite.

Uplink and Downlink frequencies are different. The satellite cannot transmit and receive on one frequency, there must be frequency separation.

Area of coverage for a satellite is called the footprint. Each footprint area current has two online satellites located in it.

There are four footprints for UHF SATCOM operations:

Satellites are commonly referred to by their longitudinal position such as ‘the 172 east bird’ or the ‘105 west bird’.

Usually no more than 4 satellites are ‘visible’. 
25 kHz Dedicated SATCOM Characteristics

- 25 kHz channels are called Wide Band channels
- VINSON COMSEC most commonly used.
- Non-secure SATCOM is not permitted
- Voice quality similar to telephone or LOS radio
- 33.6 MHz is the common offset between the uplink and downlink with the uplink being the higher

5 kHz Dedicated SATCOM Characteristics

- 5 kHz channels are called Narrow Band channels
- ANDVT COMSEC most commonly used
- Non-secure SATCOM is not permitted
- Voice quality is poor due to slower data rate of LPC-10 encoding used by ANDVT
- MELP encoding makes ANDVT COMSEC communications more understandable
Dedicated SATCOM Programming (1)

1. Press the PGM button
2. Arrow down to highlight SYSTEM PRESETS, press ENT
3. Select SYSTEM PRESET CONFIG
4. Select the SYSTEM PRESET NUMBER
5. Enter a PRESET DESCRIPTION (optional)
6. Scroll to select VULOS for PRESET WAVEFORM (Both Single Channel LOS and SATCOM are VULOS)
7. Select GENERAL CONFIG
8. Enter a PRESET NAME (up to 11 characters)
9. Select SATCOM for PRESET TYPE
1. Select FREQUENCY

2. Enter the Channel code. There are 247 channel codes that correspond to a set of pre-defined transmit and receive frequencies. Codes 248, 249, & 999 allow for user defined frequencies. The screens for user defined frequencies are the same as the LOS screens.

3. Select NO for RECEIVE ONLY. YES will prevent the radio from transmitting.

4. Select COMSEC

5. For CRYPTO MODE select VINSON for 25 kHz wideband or ANDVT for 5 kHz narrowband.

6. Select the CRYPTO KEY position (e.g. TEK01)
If ANDVT was selected for the Crypto Mode, there are 3 additional screens. Training Frames, ANDVT RX Priority, & Voice Autoswitch. TRAINING FRAMES are the number of redundant data transmissions the radio transmits before re-establishing the handshake. Valid settings are 6, 9, 12, 15, 20, 30, & 60. All radios in a net need to be set the same.

ANDVT RX PRIORITY adds a 4 second transmit inhibit in the absence of the End Of Message flag. (ENABLE or DISABLE)

VOICE AUTOSWITCH enabled allows the radio to automatically switch between MELP & LPC voice modes based on the incoming transmission. (ENABLE or DISABLE)

Select TRAFFIC.

Set TRAFFIC MODE to VOICE. Selecting DATA allows data at 16 kbps.

VOICE MODE cannot be edited, press ENT

The OPTION CODE also cannot be edited. 132 is the option code for both Voice and Data at 16 k.

Select 8.0 KHz for FM DEVIATION. 6.5 KHz & 5.0 KHz are the other choices.
* If ANDVT was selected for the CRYPTO MODE then the TRAFFIC MODE choices are VOICE AND DATA or DATA. Select VOICE AND DATA.

* The DATA MODE cannot be edited.

* For VOICE MODE select either LPC 2400 or MELP 2400. MELP provides better voice quality.

* LPC CODEBOOK choices are ENGLISH, DUTCH, and ARABIC. This will be displayed even if MELP is selected.

* The OPTION CODE cannot be edited. For VOICE AND DATA the code is 010. For DATA, the option code is 008 and the rate is 1200.

* TX POWER settings are the same as LOS, HIGH, MEDIUM, LOW, & USER.

* In SATCOM, SQUELCH TYPE and FM TRANSMIT TONE are both DISABLED and cannot be changed. SATCOM uses Digital Squelch that is automatically set.
The Operational Screens are similar to the LOS screens.

- **Squelch Indicator**: Even though SATCOM uses digital squelch, because Squelch Type is disabled the Indicator displays ---.

- **Preset Type**: LOS or SAT. (Can be over-ridden).

- **Modulation Type**: FSK, SBPSK, or CPM. FSK for 25 k wideband VINSON, SBPSK for 5 k narrowband ANDVT, and CPM for most KG-84 data rates.

- **Channel Number**: Satcom channel number is now displayed. (Can be over-ridden).

- **Crypto Key**: 01 to 25. (Can be over-ridden). CRYPTO TYPE is also changed when overriding the Crypto Key.
Main Operational Screens (2)

**Second Operational Screen**

Similar to the LOS screen

- **Receive & Transmit Frequencies**: (Can not be over-ridden).

- **Channel #**: Same as the first screen, the Satcom channel number. (Can be over-ridden).
Main Operational Screens (3)

VINSON VOICE

• Bandwidth
• Option Code
• Voice Mode
• Forward Error Correction
• Interleave Depth

VINSON DATA

• BPS Rate
• Data Mode

Third Operational Screen

• The third operational screen is also very similar to the LOS Screen
• For VINSON Voice and Data, only the modulation type has changed.
Main Operational Screens (4)

ANDVT VOICE AND DATA

ANDVT DATA

Third Operational Screen cont..

- For ANDVT Voice and Data, the bandwidth, rate, modulation, option code, and voice mode have changed.

- Voice mode can be LPC or MELP.

- Voice mode is the only item that can be over-ridden.

- If Traffic is set to DATA, then nothing can be over-ridden.
Main Operational Screens (5)

Fourth Operational Screen

- The fourth screen is the same as in LOS.
- In SATCOM the same Preset Config Errors can occur.
- Since Non-secure communication is not allowed, KEYLINE IGNORED will be displayed when the PPT button is pushed.
- In any Data mode, KEYLINE IGNORED will be also being displayed when the PPT button is pushed.
Options (VULOS Config)

- The VULOS Options for SATCOM are identical to the LOS Options.
Satellite Antenna Pointing

The following equipment and mission planning data is needed:
- Magnetic compass
- Satellite position
- Azimuth to the Satellite
- Elevation angle for the antenna

Azimuth and elevation data is found with:
- Pointing graph slide rules
- Mission planning software systems

Slide rule calculators do not compensate for magnetic declination.
Pointing Graph Slide Rules

- Move the slide so the vertical line is over the satellite position at the top of the graph.
- Locate your position on the earth.
- Concentric circle lines determine antenna elevation. This ranges from 0 to 90 degrees.
- Radial lines are used to determine the azimuth to point the antenna. This is a Grid azimuth and must be converted to a magnetic azimuth.
The SATCOM Ping Test reports the Receive Satellite Signal Strength between 0 and 100 percent. The test transmits a small burst signal to the satellite and measures the received power returned from the satellite. The SATCOM Ping Test can be used to aid in antenna pointing.

- Execute a SATCOM Ping Test and note the RX Strength.
- Adjust the antenna azimuth and execute the test again. Repeat until the strongest signal is obtained.
- Repeat the test adjusting the antenna elevation.

- UNABLE TO PING CHECK RADIO CONFIG error will be displayed if no COMSEC is assigned to the Preset.

- The Ping Test is unavailable in LOS.
Practical Exercise

AN/PRC-152 VU19LOS
Dedicated UHF SATCOM
AN/PRC-152
SINCGARS Frequency Hopping
SINCGARS Frequency Hopping (FH)

Objectives

• Explain Basic SINCGARS operations

• Load SINCGARS FH Data

• Program the AN/PRC-152 for SINCGARS Frequency Hopping operation.

• Operate the AN/PRC-152 in the SINCGARS FH mode.

• Interoperate with other types of SINCGARS Radios
SINCGARS FH (1)

Characteristics & Definitions

• Operates in the VHF-Low band from 30 to 87.975 MHz

• 25 kHz channel spacing

• 2320 possible frequencies

• Hopping rate of 100 frequencies per second

• VINSON or KYV-5 COMSEC

SINCGARS is an acronym for Single Channel Ground and Airborne Radio System

SINCGARS Frequency Hopping (FH) provides Electronic Counter-Counter Measures (ECCM) qualities of anti-jam and Limited Probability of Intercept (LPI).

An ECM or Electronic Counter Measure is jamming. The SINCGARS radio counters jamming by continually changing frequencies 100 times per second over a 57 mHz bandwidth. The hopping also leads to the fact that the enemy cannot intercept the radios transmissions because it is not on one frequency long enough to be detected.

With a channel spacing of 25 kHz, there are 2320 possible frequencies between 30 to 87.975 MHz. The average SINCGARS Hopset contains around 1200 frequencies. The radio hops on these frequencies in a random pattern determined by a Transmission Security Key (TSK). This is why time is very important. If a radios’ clock is too far off from other radios, it will not be able to communicate with them.

Supports secure voice and data using VINSON KY-57 compatible encryption. KYV-5 is used for enhanced data rates.
SINCGARS FH (2)

Characteristics & Definitions

• 1000 Net IDs
• Loadset, Lockouts & ESETs
• Hot Start Net Opening
• Cold Start Net Opening

Net IDs (000-999) are used to divide the Hopset in multiple networks by changing the starting point in the Hopset. There are 1000 net IDs per TSK. A SINCGARS Loadset can have one to six TSKs.

Lockout set is a set of frequencies that are not allowed in the Hopset. For example civilian TV stations that exist in the SINCGARS operational range.

An ESET (Electronic Set) contains SINCGARS FH data, a TSK, and a net ID.

A SINCGARS Loadset contains up to five TEKs, one KEK, six ESETs, and any Lockout sets. A Loadset is loaded into the radio in one-step using and AN/CYZ-10 or an AN/PYQ-10 (SKL). Sometimes this is referred to as an ICOM Fill, (Integrated COMSEC Fill).

Hot Start Net Opening is a method of entering a SINCGARS FH Net by loading a radio with the FH Loadset and accurate time.

Cold Start Net Opening is a method of opening a SINCGARS FH net where member stations load the FH Loadset then the Master station transmits the FH data and net time to each member radio.
Characteristics & Definitions

- Manual & CUE Frequency
- Electronic Remote Fill (ERF)
- Late Net Entry (LNE)

The Manual frequency is a single channel frequency used for the Cold Start Net Opening procedure. The CUE frequency is a single channel frequency that allows a radio not in a SINCGARS FH net to contact the MASTER station of the SINCGARS FH net.

Electronic Remote Fill (ERF) is a procedure by which the net master station starts or updates a FH net by transmitting the Hopset to net member radios. ERF is used when a member’s radio is more then 60 seconds off net time.

Late Net Entry (LNE) is a method to enter or re-enter the FH Net when radio Time of Day (TOD) has slipped by more than four seconds, but not more than one minute from that of the net master TOD. There are 4 ways to do a LNE; manually reload time, Hot Start, CUE & ERF, and Passive LNE. Passive LNE can only be performed when the member radio is less then 60 seconds off net time.
The net time includes the Julian date. The Julian date is only 2 digits. There are 2 different Julian calendars, one for a regular year and one for leap year. The next leap years are 2012, 2016, & 2020.
SINCGARS FH Setup Steps

• Load the SINCGARS Loadset
• Program SINCGARS Configuration
• Program SINCGARS FH System Presets
• Select SINCGARS Net to be used
• Set GTOD for ZULU time
It is best to load the SINCGARS FH Loadset before programming SINCGARS NETS.

1. Place the Cipher switch in the LD position.
2. Connect the fill device to the AUDIO/FILL connector.
3. Select either CYZ-10 [MODE 2/3] or PYQ [SKL mode 2/3] for the FILL DEVICE.
4. The radio displays INITIATE FILL AT FILL DEVICE.
5. Prepare the Fill Device.
Using RDS, software from an AN/CYZ-10 use the following steps.

1. Select Send.
2. Select Radio.
3. Select iCom.
4. Follow instructions to until (Connect to RT AUD/FILL Connector) is displayed, press ENTR.
5. (Set FCTN Switch to LD on RT) is displayed, press ENTR

(Do you want to include time?) If the correct date and time are in the DTD, select Y; otherwise select N.

The DTD will display (Press [LOAD] on RT) for a few seconds then change to display each of the 6 COMSEC keys as they are loaded. Then the DTD will load each of the 6 ESETs, one at a time.

If there were no errors, the DTD will display (ICOM transfer successful). At this time, you can disconnect the AN/CYZ-10.
If using an AN/PYQ-10 SKL (Simple Key Loader), use the following steps. The radio setup is the same as with the AN/CYZ-10.

After you have logged into the SKL select the Eqs Tab.

1. Select RT-1523 or SINCgars then press the LOAD icon in the top right of the screen.
2. At the SINCgars Mode screen, select ICOM Transfer and Include Time (if needed). Press OK.
3. At the Connect To screen, connect the SKL to the RT then press Next>>
4. At the Profiles screen, ensure the radio displays INITIATE FILL AT FILL DEVICE, then press Send on the SKL.
6. If the connect is good and there are no errors, the SKL will display ‘Sending TEK #1 - #5, KEK #6, Sending Cold Start TSK, Sending Hopset #1 - #6 and 8 Lockouts.

When complete the SKL will display ‘Re-load equipment’. At this time, you can disconnect the SKL.
Loading SINCgars FH Data (4)

Once the transfer begins from either Fill Device, the radio displays CLASSIFICATION.

1. Select SECRET, press ENT.

2. When the transfer is complete, a summary of the Loadset will be displayed. The summary shows the number of TEKs, KEks, HOPSETs, TSKs, and Lockouts loaded and if Time of Day (TOD) was loaded. Press ENT when done reviewing the summary.

3. Select YES to LOAD ANOTHER KEY or NO to exit.

4. Place the Cipher Switch to PT.
Whether using an AN/CYZ-10 or an AN/PYQ-10 SKL, the COMSEC keys are stored in the first 5 SINCgars VINSON TEK slots and the only SINCgars VINSON KEK slot.

The HOPSETs are stored in the first 6 SINCgars HOPSET compartments.

Press the OPT key and select VIEW KEY INFO. Select SINCgars for the WAVEFORM and HOPSET for the TYPE. The operator can view the default FH Net ID loaded into each compartment.
Program SINCGARS Configuration (1)

MASTER / MEMBER configuration.

The Net Control Station (NCS) or Alternate NCS should be setup as a MASTER radio. All other radios in the net should be set as Members. The radio defaults to Member, to change the radio to Master do the following:

1. Press the PGM button
2. Select SINCGARS CONFIG
3. Select MASTER/MEMBER
4. Change to MASTER

Next, the CUE needs programmed.

1. Select CUE CONFIGURATION
2. Enter the CUE frequency (30 to 87.975 MHz)
3. Set the CUE SQUELCH TYPE to TONE
4. For Master set ENABLE CUE NOTIFY to YES, Members set it to NO.
Program SINCGARS Configuration (2)

HOPSET / LOCKOUT menu is used to change Net IDs and view Net IDs.

Select HOPSET / LOCKOUT

COPY HOPSET is used to change the Net ID in a Hopset Compartment and to create additional Net IDs in the empty compartments.

1. Select COPY HOPSET
2. At COPY HOPSET FROM, scroll to select a compartment, press ENT.
3. At COPY HOPSET TO, enter the compartment number you wish to create the Net ID in (01 to 25). COPY HOPSET TO defaults to the first empty compartment.
4. At NEW HOPSET ID, enter the 3 digit Net ID
5. Select VIEW HOPSETS and scroll down to view what Net ID is in what compartment.
Now that the SINCGARS Configuration is complete, the System Presets can be programmed.

From the COPY HOPSET menu, press the CLR button twice. If you have exited the programming menu, press the PGM button.

1. Select SYSTEM PRESETS
2. Select SYSTEM PRESET CONFIG
3. Select a SYSTEM PRESET NUMBER
4. Enter a PRESET DESCRIPTION (Optional)
5. Select SINCGARS for PRESET WAVEFORM

There are two choices for OPMODE,
1. FREQUENCY HOPPING and
2. SINGLE CHANNEL.

The following menus are the same no matter what is selected here. Select FREQUENCY HOPPING.
1. Enter a PRESET NAME (Optional)
2. Select the CRYPTO KEY.
Select the TX POWER LEVEL. The TX Power Level choices are the same as LOS, HIGH, MEDIUM, LOW, & USER.

Select VOICE for TRAFFIC MODE. Two other choices are DATA and DATA/VOICE.

If either is selected then the BAUD RATE must be selected. Choices are RS232, 600, 1200, 1200N, 2400, 2400N, 4800, 4800N, 9600N, & 16000. DTE DATA MODE is set to SYNCHRONOUS and cannot be changed.

Select the HOPSET COMPARTMENT. The Net ID is displayed next to the Compartment number if you cannot remember the compartment with the correct Net ID.

If SINGLE CHANNEL was selected for OPMODE, then enter a SC FREQUENCY.

Note:
The OPMODE can be changed from the main operational screen. Therefore, each SINCgars System Preset can be programmed with a Net ID and a SC Frequency.

Select TONE for the SC SQUELCH TYPE. NOISE and OFF are available.
The Operational Screens are similar to the LOS screens.

- Waveform Type is now SNCGR
- Even though SINCgars uses Tone Squelch, DIG is displayed.
- The Preset number, OPMODE, TRF, NET ID, and KEY can all be overridden.
- Changing the Net ID from the operational screens performs the same function as Hopset Copy back to the same compartment.
Main Operational Screens (2)

**Second Operational Screen**

**FH OPMODE:**

- CMP is the Hopset Compartment (01-25)
- LNE is Late Net Entry (OFF or ON)
- RATE is only displayed in DATA or DATA/VOICE.
- CMP, NETID, LNE, and RATE can all be over-ridden.

**SC OPMODE:**

Similar to the 2nd LOS screen (RATE instead of CHAN)
Main Operational Screens (3)

Third and Fourth Operational Screens

FH OPMODE:

The third screen displays the Cue Frequency, CUE notify and the Type (Master or Member). All three can be over-ridden.
The fourth screen is the same large font screen as in LOS and SATCOM.

SC OPMODE:

In single channel, OPMODE the third screen is the large font screen.
Press 7/OPT button and select SINCGARS OPTIONS.

There are two options:
1. SINCGARS GTOD
2. RETRANSMIT ROLE.

To set the time select SINCGARS GTOD. There are two choices:
1. USER ENTRY
2. GPS SYNCHRONIZATION.

If USER ENTRY is selected, press ENT again to modify the GTOD. Type in the Julian Day, arrow over and type in the hours, minutes, and seconds from an accurate time source. The next time ENT is pressed the GTOD clock will start.

If GPS SYNCHRONIZATION was selected, there are two possible screens:

1. SUCCESSFUL
2. GPS SIGNAL MISSING

The GPS is defaulted to sleep after 15 minutes of use and needs to be woken for GPS SYNCHRONIZATION to be successful.
If no communications on the SINCGARS FH net have been heard, it is possible that the GTOD in the radio is not within +/- four seconds needed to remain in sync with the net. If it still is within +/- one minute, the passive LNE function can resync the Member stations GTOD with the Master station.

Press the Circle Arrow button and go to the Second Operational screen.

Press the left or right arrow button until OFF is highlighted, change it to ON and press ENT.

Do not attempt to transmit. Wait for the reception of communications from any station on the SINCGARS FH net. When the radio reestablishes time with the net, the LNE display indicator automatically switches to OFF when GTOD synchronizes with the net.

If GTOD resync does not occur, change LNE back to OFF then perform the CUE procedure to contact the Master station.
The CUE frequency is a single channel frequency that allows a radio not in a SINCGARS FH net to contact the MASTER station of the SINCGARS FH net.

1. Press the CALL button
2. Select CUE; the screen changes to the CUE channel. MUST CUE IN PT will flash at the bottom of the screen.
3. Place the Cipher switch to PT
4. Press the PTT button for about 5 to 10 seconds
5. Return the Cipher switch to CT and wait for the Master station to respond.
6. Request a Cold Start ERF from the Master station.
7. When instructed to prepare for receipt of a Cold Start ERF on the Manual frequency, press the CLR button.
8. Select COLD START ERF
9. Enter the Manual Frequency, the radio displays COLD START ERF AWAITING RECEPTION.
If the Cold Start ERF was successfully received, the screen displays: HOPSET RX OK: Fxxx STORE IN: 07 [EMPTY] xxx being the Net ID. The radio selects the first empty HOPSET Compartment; change it to the Compartment currently assigned to the System Preset being Cold Started.

1. Select YES for ASSIGN TO PRESET

2. Scroll to select the System Preset being Cold Started. The screen will return to COLD START ERF AWAITING RECEPTION.

3. Press CLR twice to exit to the Main Operational screen then perform a radio check with the Master station.
Master station responding to a CUE and Cold Start ERF request.

When a station CUEs the Master station, CUE INCOMING will flash at the bottom of the screen and a beep will be heard from the speaker.

1. Press the CALL button
2. Select CUE; the screen changes to the CUE channel. As a Master station, MUST CUE IN PT will not flash at the bottom of the screen.
3. Reply to the CUEing station in CT.
4. Press CLR once then select COLD START ERF.
5. Select TRANSMIT. RECEIVE is the other choice.
6. Select the HOPSET Compartment to be transmitted.

The screen will show the ERF being transmitted then complete.

7. Press the CLR button 3 times to return to the Main Operational screen and perform a radio check.
SINCGARS Normal ERF (1)

The Normal ERF procedure is used to update Frequency Hopping data during normal operation. The Master station loads the new FH data but does not delete the old data from the radio. The Master station must inform the Member stations when the new FH data will take effect. A normal ERF is not sent over the Manual Frequency but over an active FH Net.

The Normal ERF procedure is very similar to the Cold Start ERF.

Master station:
1. Press CALL button
2. Select NORMAL ERF
3. Select TRANSMIT
4. Select the HOPSET Compartment to be transmitted.
5. The screen will show the ERF being transmitted then complete.
6. Press the CLR button 2 times to return to the Main Operational screen
Member station:
1. Press CALL button
2. Select NORMAL ERF
3. When the Normal ERF is received, store it in an empty Compartment.
4. Assign it to a System Preset when required
5. Press the CLR button 2 times to return to the Main Operational screen
Here are some SINCGARS error screens that may be encountered when programming the radio before the SINCGARS Loadset has been loaded.

The Preset may be configured correctly but the assigned HOPSET Compartment is empty.

1. Copy HOPSET error (ERROR NO HOPSET FILLED)
2. View HOPSET error (NO HOPSETS FILLED)
3. View LOCKOUT error (NO LOCKOUTS FILLED)
4. The first Operational screen (no Net ID)
5. The second Operational screen (no TOD, Compartment, or Net ID)
Practical Exercise

AN/PRC-152
SINCGARS Programming
AN/PRC-152
RETRANS Operations
RETRANS Operations

Objectives

• Planning considerations for retransmission operations.

• Configure the AN/PRC-152 for retransmission operations.
RETRANS Operations

• Used with SINCGARS waveform only

• Two RETRANS methods:
  ➢ Black Digital
    ✓ Not within 20%
    ✓ Not harmonics
  ➢ Range Extension
    ✓ Radios spaced far apart

Retransmission option is only available from a SINCGARS preset.

A Black Digital retransmit station consists of two radios and a Retransmit cable. The radios are programmed with different Single Channel frequencies or Net IDs. Single channel frequencies cannot be closer than 20% of each other or a harmonic. For example: if 40 MHz is used the second frequency cannot be less than 48 MHz or be 80 MHz (the 1st harmonic). No COMSEC is loaded in the retransmit radios; they are operated in Plain Text and just pass the encrypted digital signal through the retransmit cable. All outstations are in Cipher Text.

A Range Extension retransmit station has one radio programmed to receive signals on a SINCGARS net and the second radio is programmed to retransmit that signal on the same SINCGARS Net. Only SINCGARS Frequency Hopping is supported using Range Extension. The retransmit radios are also in PT and the out stations are in CT. Place the radios as far apart as possible. If using a VAA, place the antennas as far apart as possible.
Required Equipment for Retransmission (1)

- Two AN/PRC-152s with antenna and battery pack
- Retransmit Cable, 12041-7130-A1, 50 feet.

Before connecting or disconnecting the retransmit cable to the 32-pin side data connector, both radios must be powered off.
Required Equipment for Retransmission (2)

- Two AN/PRC-152s with VAA and antennas
- Retransmit Cable, 12041-7130-A2, 32 inches

Before connecting or disconnecting the retransmit cable to the 32-pin front data connector, both radios must be powered off.
1. Program each AN/PRC-152 with the required SINCGARS retransmission plan.

2. Perform a communications check on each AN/PRC-152 and establish CT communications with distant radio stations in each net.

3. Turn off radios and connect the retransmission cable to both radios.

4. Turn on both radios and set the Cipher switch to PT.

5. Press OPT button, select RETRANSMIT ROLE.

6. For Black Digital, select RETRANSMIT STATION on both radios. For Range Extension, select SAME NET ID-RX ONLY on one radio and SAME NET ID-TX ONLY on the second radio.

The radio will display RXMT on screen. The Traffic mode is now Data.
Retransmission Configuration (2)

Placing the Cipher Switch to CT will take the radio out of Retransmit.
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AN/PRC-152
Other Modes and Capabilities
Other Modes and Capabilities

Objectives

• Have a basic understanding of the modes, capabilities and option menu of the AN/PRC-152.
Options Menu

• Lock Keypad
• Radio Options
• TX Power Options
• System Clock
• GPS Options
• Battery Information
• SA Options
• Data Mode
• Mission Plan
• Network Status
• System Information
• Test Options
Keypad Lock

To lock the keypad:

1. Press the OPT button
2. Select LOCK KEYPAD

Locking the keypad does not disable the side buttons. Monitor (squelch) button, PTT, and Volume control are always activated. Also, the NEXT button is still active.

To unlock the keypad:

1. Press any locked button to display PRESS 1379 TO UNLOCK
2. Press keys 1, 3, 7, and 9.
Radio Options (1)

There are six items under Radio Options:
1. Satcom Burstmode,
2. Radio Silence
3. Radio Speaker
4. Auxiliary Power
5. Preset Autosave
6. RF Faults Persist.

High power for SATCOM is 5 watts. Turning SATCOM BURSTMODE ON increases the power to approximately 10 watts. KEY: PTT BURSTMODE: ON will be displayed on the bottom line of the screen when the PTT button is pressed. BURSTMODE is for emergency use only. It cannot be enabled when the radio is a preset type other then SATCOM and when in a VAA.

When RADIO SILENCE is turned ON, it prevents the radio from automatically responding to incoming signals. The R in the upper left of the screen will flash and KEYLINE IGNORED will be displayed when the PTT button is pressed.

The RADIO SPEAKER option allows the operator to disable the internal speaker. When a handset or headset is attached, the radio speaker is normally disabled.
**AUXILIARY POWER** allows the operator to configure the auxiliary power output to the side connector. Choices are OFF, 5 VOLTS, and 8 VOLTS.

**PRESET AUTOSAVE** is a read only status of the current Preset Autosave setting. (ON or OFF). When ON, any manual changes to a system preset will be automatically saved. This setting can be changed from Program mode.

**RF FAULTS PERSIST** has two settings, ON and MOMENTARY. When set to ON, an RF fault screen requires the operator to press CLR or ENT to clear the screen. MOMENTARY displays the RF fault screen for 3 seconds then automatically clears it.
TX Power Options and System Clock

**TX POWER OPTIONS** is used to set the transmit power level. TX POWER OPTIONS has the same submenu and choices as TX POWER LEVEL in programming System Presets. However, the radio is still online and can transmit and receive.

The System Clock is a separate setting from the TOD (Time-of-day) configuration for SINCGARS. The Date, Time, and UTC Offset are status only and cannot be edited. To change the System Clock, enter programming mode, select RADIO CONFIG, and then SYSTEM CLOCK.
The GPS antenna is an active antenna that draws power from the main battery. The GPS is defaulted to sleep after 15 minutes to conserve power. If the GPS is sleeping, press ENT to wake it. It will start SEARCHING for satellites and show in the lower left how many satellites have been found. Once enough satellites have been found (at least four), the GPS status will change to TRACKING.

Once the GPS is TRACKING, additional screens will be available. GPS Position: in either latitude / longitude or MGRS, GPS Heading/Velocity, GPS Altitude/FOM, GPS Datum/Key Stat, and GPS Satellite Info.

If the GPS loses tracking and goes to sleep, a POSITION TIME STAMP screen will be displayed before the GPS Position screen. This indicates the date and time of the last known position info.
Battery Information, SA Options, and Data Mode

BATTERY INFORMATION will show the actual DC voltage of the main battery and a status of NOMINAL, HIGH, or LOW.

If mounted in a VAA it will display the VAA system voltage. This is the voltage supplied to the VAA not the radio.

When the main battery is disconnected from the radio, the HUB is used to maintain system time and crypto. The life of the HUB can be extended by keeping a charged main battery connected.

SA TRANSMIT allows the operator to enable or disable the SA feature if it has been configured to AUTO in the programming menu. If SA Transmit is configured to off or the GPS Status is either DISABLED or NOT INSTALLED, then DISABLE will be displayed and cannot be changed.

DATA MODE allows the operator to change the side data port mode of operation. SYNC/ASYNC and PPP are the two options.
Mission Plan is used to load system parameters and presets into the radio.

Mission Plan files can be loaded using RF-6650M Radio Programming Application.

Select **ACTIVATE MISSION PLAN**, scroll through the plan files and select one, **ACTIVATE PLAN: YES**.

Mission Plan History displays the name of the last plan used along with the date and time activated.

Network Status allows the operator to view the current state of the network and port configuration parameters. Currently the only networking port type is the Remote Data PPP port. The state is either **ONLINE** or **OFFLINE**. IP address and Peer IP address can also be viewed.
Under the System Information menu the versions, serial number, part number, VAA serial number, SW options, elapsed time, current databases, and TCXO tuning are accessible.

- Versions displays the version of Hardware modules installed, software packages installed, and Information Security loaded.
- Serial Number displays the radio serial number and VAA serial number is attached to one.
- Part number displays the part number of the radio.
- SW options displays any optional waveforms installed in the radio.
- Elapsed time displays hours up and times keyed.
- Current databases display platform and waveform version numbers.
- TCXO Tuning is used to change the transmit frequency calibration. This is Depot level maintenance only!
Test Options

- Test Options will access the Self Test, SW Validation, Keypad Test, Memory Test, and MIC Test menus.

- **SELF-TEST** runs the Built-In Test for all hardware modules.

- **SW VALIDATION** runs the red and black file systems through the crypto to verify that the software has not been changed since it was first installed.

- **KEYPAD TEST** allows the operator to verify front panel key operation.

- **MEMORY TEST** validates integrity of the radio's volatile memory.

- **MIC TEST** provides a bar graph meter to verify the audio input level.
AN/PRC-152
OTAR Operations
OTAR Operations

Objectives

• Have a basic understanding of OTAR Operations with the AN/PRC-152.
The AN/PRC-152 is capable of transmitting a Manual Over-the-Air ReKey (MK OTAR). It is able to receive both a MK OTAR and an AK OTAR (Automatic). AK operations require that all receiving AN/PRC-152s be loaded with the same KEK used to send the rekey.

The AN/PRC-152 allows the operator to load the OTAR TEK in advance and transmit it multiple times without having the Fill Device attached.

1. Place the Cipher switch to LD, attach the fill device.

2. Select LOAD OTAR TEK. The display reads INITIATE FILL AT FILL DEVICE.
OTAR Operations (TX MK) (2)

If using an AN/CYZ-10:

Turn AN/CYZ-10 on and load RADIO application.

1. Select Comsec
2. Select MK
3. At Select key screen, use the P DN button to page down and find the correct TEK, press the ENTR button.
4. DTD reads: Connect to RT and press [SEND], press SEND.
5. SEND. Display will show:
   [Transfer in progress],
   [Sending TEK xxxxxx], then
   [1 key transferred]
If using an AN/PYQ-10 SKL:

1. After logging into the SKL program, select File.
2. Select OTAD - Manual Rekey (MK)
3. At the Select and equipment screen, select Generic MK.
4. Perform MK-RV? Select Yes
5. Generate new replacement TEK? Select No
6. Load outstation KEK to NCS? Select No
If using an AN/PYQ-10 SKL:

7. At the Select a replacement TEK: screen, select the new TEK that needs to be transmitted to the receiving stations, press Next>>


9. If no errors the SKL displays Operation Successful.

10. Press OK, then Finish.

11. The SKL give you the option to send the key again. Select No.

12. Load original KEK back to NCS? select No.
Once the key has been transferred from the Fill Device the display changes to the CLASSIFICATION screen. KEY RECEIVED will be displayed at the bottom for a few seconds.

1. Select the Classification, SECRET. An OTAR FILL SUMMARY will be displayed.

2. Press ENT or CLR then disconnect the fill device.

3. Move the Cipher switch to CT. The radio returns to the last System Preset. Notify the net to prepare to receive and MK OTAR.

4. Press the MODE button (3).

5. Select OTAR TRANSMIT, then YES. The radio displays OTAR MK TRANSMIT SUCCESSFUL.

6. Press the clear button and Poll the net to see if any station needs the OTAR retransmitted.
When notified by the Net Control Station to prepare for a MK OTAR perform the following steps.

Press the MODE button (3).

Select OTAR RECEIVE.

Select RECEIVE MK. The radio displays OTAR RX MK AWAITING RECEPTION.

When the display shows KEY RECEIVED, press ENT.

Select the WAVEFORM, CRYPTO MODE, KEY TYPE, and KEY NUMBER. The radio defaults to the first empty Key Number.

When KEY STORE SUCCESSFUL is displayed, press CLR / ENT to return to the operational system preset.
Practical Exercise

AN/PRC-152
MK OTAR
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AN/PRC-152
Scan Operations
The AN/PRC-152 can scan up to 10 voice nets in LOS fixed frequency Plain Text, VINSON Cipher Text, and 25 kHz Dedicated SATCOM VINSON. It cannot scan frequency-hopping nets, KG-84, ANDVT, Fascinator, and AES COMSEC.

1. Press the PGM button.
2. Select SYSTEM PRESETS.
3. Select SYSTEM SCAN CONFIG.
4. ENABLE SCAN: YES
5. VULOS is the only waveform that can be scanned, press ENT.
6. Select SCAN LIST
7. Enter a Preset number
8. YES to ADD ANOTHER PRESET. NO when finished adding.
Scan Operations (2)

1. Select PRIORITY. Select a PRIORITY TX PRESET. The Priority Transmit Channel is the net that the radio will transmit on when it is actively scanning and the PTT button is pushed. If the radio is paused on a different net, it will transmit on that net when the PTT button is pushed. A Priority Transmit Channel may be programmed by the operator. If one is not assigned, the first net in the scan list defaults to the priority transmit channel.

2. RECEIVE PRIORITY SCANNING is either ENABLED or DISABLED. If ENABLED, select the PRIORITY RX PRESET. Priority Receive Channel is scanned every other time during the scan sequence.

3. Select HANG/HOLD TIME. Hang Time is the length of time the dwells on a net after the received signal ends before returning to scanning. Enter 1 to 99 seconds. Hold Time is the length of time the radio dwells on a net before returning to scan even if still receiving a signal. If HOLD TIME is ENABLED, enter 1 TO 99.

4. Press PGM to exit and return to the Operational Screen.
Scan Operations (3)

Rotate the Function Switch to S. The display changes to SCANNING.... SCAN at the top of the screen will be flashing indicating the radio is in automatic scan mode.

When the radio receives a signal or is transmitting, the screen will display the channel and SCAN will be flashing indicating the radio is in automatic scan mode.

Press the CLR button to enter manual scanning. SCAN at the top will stop flashing while in manual scanning.
Practical Exercise

AN/PRC-152
Scan
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Falcon III
Radio Programming
Application
RF-6550M
Falcon III Radio Programming Application (1)

Objectives

• Have a basic understanding of the Radio Programming Application for the AN/PRC-152.
The RF-6550M Falcon III Radio Programming Application is a PC based software used to program Harris AN/PRC-117F, 117G, & AN/PRC-152 radios. A programming plan is created that contains configuration parameters for multiple stations and nets. The plan can be saved to file and transferred to other computers.

During program installation, do not forget to install NRDI (Network Radio Driver Installer). This installs a COM port specifically for Harris radio communication.

**Menu Items:**

**File Menu:** Start a new plan, Open a plan, Save, & Save As.
A password can be added to the Plan so unauthorized personnel do not have access.

**View Menu:** The Tool Bar and Status Bar can be turned off & on.
Menu Items: continued

**Radio Menu:**
Program is used to load the plan into a radio.

**Generate DSS Keys:** Used to generate Digital Signature Standard Public and Private key pairs. DSS keys are used for file authentication and not loaded into the radio.

Generate Plan Report: Creates and displays a radio programming plan report. The report can be saved to file or printed.

**Tools Menu:** Under Options, you can uncheck items that you do not use to remove clutter from the programming tabs. Such as Radio types: (AN/PRC-117G, AN/PRC-152); Net types: (HAVEQUICK, STC, Beacon, P25, ANW2); and Radio Features: (Beacon mode, GPS info, Preset Net Lock, etc).
Stations Tab:

Under **Create Station**, select a radio type from the drop down box then click Create, give the Station a name.

Config button allows individual configurations for Radio Config, HPW address, Data Port, Situational Awareness, P25, Scan List, DAMA, & Accessories.

Radios must be added to a DAMA net before DAMA radio configuration is available. If programming a simple LOS, SINCGARS, or Dedicated SATCOM net, the radio configuration can be left at default setting.

DAMA is an optional waveform that may not be installed.
Select the Nets Tab.

1. Under Create Net, select a net type from the drop down box then click Create.

2. Give the Net a name.

3. Net # is the net Preset number (00-99)

4. Configure Net Membership lists all the stations from the Stations Tab. A check mark indicates the station has been added to the net.

5. Click Details to define the net properties. e.g. Frequency, Power, COMSEC, Data/Voice, & Squelch.

Net Properties:

General Net properties: Set the transmit & receive frequencies, and the power level.
Net Properties: continued

COMSEC: Select the Crypto Mode then the TEK ID.

Data/Voice (Traffic): Setting can be left at default for normal voice traffic.

Squelch: Select the applicable Squelch Type.

Advanced: Some net types have no properties to configure.
Global Radio Config Tab

These settings will apply to all radios in the Plan. For normal operations all setting under Global Radio Config can be left at default.

Preset Net Lock applies a password to a block of Net Presets to prevent the operator from changing the Net specifications on the radio.

Un-checking unwanted items under Tools, Options will remove items from this tab.
Global Network Config tab

Scan List parameters can be defined under VULOS

ERF Coldstart & CUE frequencies, Master & Member stations can be defined under SINCGARS

Same thing here! Un-checking unwanted items under Tools, Options will remove items from this tab.
Once the plan has been completed, radios can be programmed.

1. From the Radio Menu select Program or click on the Program Radio button on the Toolbar.

2. Select the station you wish to program.

3. Create a file name up to 20 characters.

4. Under Transfer Location, the connected radio will be seen as a folder destination. Select the radio or a folder on the computer to save the mission file to.

5. Select the default or a custom Private Key.

6. Click on the Generate Mission Plans button. The Mission Plan File will be loaded into the radio.

The Mission Plan File is in temporary memory and must be installed. Click the Installation Instructions button in the lower left of the Mission Plan Generation window. Follow these instructions to complete Mission Plan File upload.
Practical Exercise

Falcon III
Radio Programming Application
For comments or suggestions on this book, please email us at:

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Subject Line: Books