THALES

OPERATION AND MAINTENANCE INSTRUCTIONS WITH ILLUSTRATED PARTS BREAKDOWN

ORGANIZATIONAL LEVEL

AN/PRC-148(V)1(C) and AN/PRC-148(V)2(C)

MULTIBAND INTER/INTRA TEAM RADIO
(INCLUDES SINCGARS, HAVEQUICK, ANDVT, RETRANSMISSION)

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CONFIGURATION NOTICE: This document contains technical information pertinent to the THALES PRC6991 MULTIBAND RADIO SET. The information contained herein is for the support of the THALES PRC6991 MULTIBAND RADIO SET.

FEBRUARY 25, 2004

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SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedure, and do not appear elsewhere in this manual. These Safety Summaries are recommended precautions that all personnel must understand and apply during any given phase of operation and maintenance. Each chapter has other specific warnings and cautions.

KEEP AWAY FROM LIVE CIRCUITS

Personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside equipment with power turned on. Under certain conditions, dangerous voltages may exist when the power switch is in the off position due to charges retained by capacitors. To avoid injury, always remove power and discharge and ground a circuit before touching it.

VOLTAGES WITHIN THIS EQUIPMENT ARE HIGH ENOUGH TO ENDANGER LIFE.

(Applies to battery chargers only)

Covers are *not* to be removed except by persons qualified and authorized to do so and these persons should always take extreme care once the covers have been removed.

HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE (HERO)

DO NOT operate the radio within 10 feet (3 meters) of any type of fuzed ordnance. Operating the radio in close proximity to ordnance MAY induce or otherwise couple currents and/or voltages of magnitudes large enough to initiate electroexplosive devices or other sensitive explosive components of weapon systems, ordnance, or explosive devices.

CAUTION - LITHIUM ION BATTERIES

Li-ion batteries have a very high energy density. Exercise precaution when handling and testing. Do not short circuit, overcharge, crush, mutilate, nail penetrate, apply reverse polarity, expose to high temperature or disassemble. High case temperature resulting from abuse of the cell could cause physical injury.

FOREWORD

NOTE: THIS MANUAL CONTAINS INFORMATION THAT IS CURRENT AS OF THE DATE SHOWN ON THE FRONT COVER. ADDITIONAL FUNCTIONALITY IS BEING DEVELOPED FOR THE RADIO AND THE APPEARANCE OF OPERATING SCREENS IS SUBJECT TO CHANGE FROM THOSE SHOWN HEREIN.

The radio operation (man-machine interface) shown in this manual reflects radio software Revision V, Version 2.33 and PC Programmer Revision F, Version 1.05. Some screens may not correspond to those in earlier radio software or PC Programmer versions.

Conventions used in this manual: Words and symbols shown in brackets [ ] correspond to the markings shown on the radio keys.

This manual for the Multiband Inter/Intra Team Radio (MBITR) and its associated accessories meets the technical content requirements of Contract USZA22-97-D-0019, Statement of Work, Attachment 1, COTS Manual Evaluation Checklist and MIL-HDBK-1221.

a. Chapter 1 - General Information. This chapter provides general information for the MBITR including equipment description and purpose.

b. Chapter 2 – Operating Instructions. This chapter provides complete operating instructions for the MBITR.

c. Chapter 3 - Principles of Operation. This chapter provides a basic theory of operation for the MBITR.

d. Chapter 4 - Maintenance. This chapter provides instructions required for on-equipment and off-equipment preventive and corrective maintenance of the MBITR.

e. Chapter 5 - Illustrated Parts Breakdown (IPB). The IPB provides an illustrated parts list for the MBITR.

f. Chapter 6 – Vehicle Adapter. This appendix provides information on the MBITR Vehicle Adapter.

g. Chapter 7 – Special Power Adapter Interface (SPAI). This appendix provides information on the SPAI.

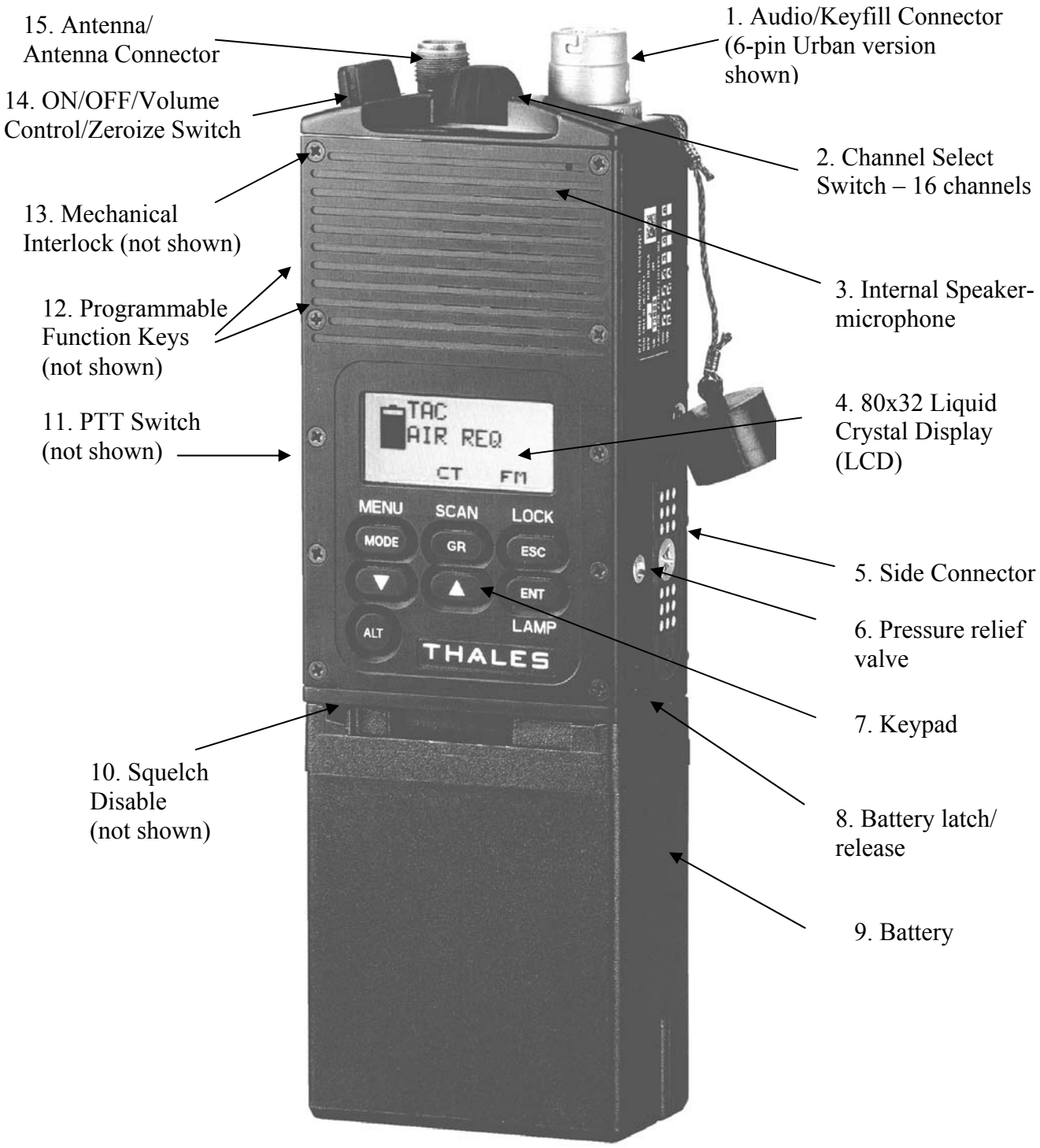
h. Chapter 8 – Battery Chargers. This appendix provides information on the single unit and six unit battery chargers.

i. Chapter 9 - Definitions - The glossary provides a definition of the special terms and abbreviations used in the technical order.

j. Chapter 10 – MBITR Made Easy – Step-by-step illustrated instructions on performing most radio operations.

k. Alphabetical Index - The index provides cross-references to applicable paragraphs, figures, or tables.

Figure 1-1 MBITR Unit (Urban) with battery



CHAPTER 1 GENERAL INFORMATION

1.1 MBITR Description

The Multiband Inter/Intra Team Radio standard system, hereinafter referred to as the MBITR or AN/PRC-148, consists of the following equipment:

- Multiband Inter/Intra Team Radio (MBITR) Receiver-Transmitter Unit or "RTU"
- Rechargeable lithium-ion batteries (2)
- Battery holder for non-rechargeable batteries (2)
- Receiver-transmitter holster
- Accessory carrying bag
- Antenna complement
  - 30-90 MHz and
  - 30-512 MHz
- Audio device/Keyfill adapter (maritime version only).

1.1.1 Receiver-Transmitter Unit

The MBITR is a portable, battery operated transceiver (see Figure 1-1) capable of providing both secure and non-secure communications. There are two versions: the Maritime version (AN/PRC-148 (V) 1(C)) is immersible in 20 meters of salt water for 2 hours, the Urban version (AN/PRC-148 (V) 2(C)) is immersible in 2 meters of salt water for 30 minutes. The MBITR operates in clear (analog) and secure (digital) voice and secure (digital) data. The radio includes:

- an NSA-approved cryptographic module for Type 1 encryption of voice or data,
- an 80 x 32 pixel graphics display (4, Figure 1-1),
- a backlit keypad (7, Figure 1-1),
- an internal speaker/ microphone (3, Figure 1-1),
- a side connector (5, Figure 1-1),
- a squelch disable button (10, Figure 1-1),
- a dual purpose audio/key fill connector (1, Figure 1-1),
- an antenna connector (14, Figure 1-1), and
- a battery connector.

The Basic MBITR operates over a 30-512 MHz frequency range with either frequency modulated (FM), or amplitude modulated (AM) radio frequency (RF) output, with a user-selectable power output from 0.1 to 5 watts. The radio can interoperate with both 12 kbps (FED-STD-1023) and 16 kbps (VINSON-compatible) equipment. The Basic radio is software upgradeable to add the following capabilities: SINCGARS, HAVEQUICK, ANDVT, and retransmission.

1.1.1.1 Physical characteristics

Table 1-1 Physical Characteristics

Characteristic	Measurement
Weight	2.2 lb., including battery and antenna
Dimensions	2.625”W x 7.75”H x 1.50”D, including battery
Power output	Programmable on a channel by channel basis to 0.1, 0.5, 1, 3 or 5 watts (FM or narrowband FM), 1 or 5 watts (AM/HAVEQUICK), or 1, 3, or 5 watts (SINCGARS).

1.1.1.2 Operating Characteristics.

The MBITR has the following operating characteristics:

a. Can store up to 100 preset channels organized in 10 groups of 16 channels each,
b. Is SINCGARS voice and SIP data interoperable,
c. Is HAVE QUICK I/II interoperable,
d. Is ANDVT interoperable,
e. Can transmit voice in a whisper mode, and
f. Can transfer configuration information to other MBITRs by means of a cloning cable.

1.1.2 Batteries

The MBITR has both rechargeable and non-rechargeable battery power sources.

1.1.2.1 Rechargeable Battery Pack

The MBITR (AN/PRC-148) standard equipment includes two each rechargeable lithium-ion battery packs. Each battery pack consists of a self-contained unit capable of quick replacement on the radio by the operator. The battery connects to the MBITR through a reliable, easily operated bayonet twist-on mechanism. The center terminals are sealed from moisture by an O-ring when on the radio. Always check that the O-ring is undamaged and in place before attaching a battery to the radio. At ambient temperature (21° C), the battery can provide over eight hours of battery life at the 5 watt transmit power level with an 8:1:1 (Stby: Rx: Tx) duty cycle. Some degradation of performance may occur across temperature extremes (high or low). Lithium-ion batteries may be disposed of locally, without environmental damage, at the end of their service life. Each rechargeable battery pack is provided with a twist-on battery cover to protect the battery terminals from impact damage and from moisture when the battery is not attached to the radio. **The cover should be attached if the battery is likely to be immersed in water.** (See paragraph 4.4 for information on battery maintenance.) The PRC6991ABS(BBS)-BAS, or basic, configuration includes one lithium-ion battery pack.

1.1.2.2 Battery Holder (Non-rechargeable)

The MBITR (AN/PRC-148) standard equipment includes two each battery holders that allow the use of military standard or commercially available disposable, non-rechargeable lithium batteries (BA-5123/U or Duracell commercial model DL-123A or DL-2/3A). The battery holder is approximately the same size and shape as the rechargeable battery pack (slightly longer), uses the same bayonet twist-on connection to the radio, and provides over eight hours of battery life at 5

watt transmit power level with an 8:1:1 (Stdby:Rx:Tx) duty cycle. The PRC6991ABS(BBS)-BAS configuration does not include battery holders.

1.1.3 Holster and Accessory Carrying Bag

The MBITR comes with a holster case with belt loops and clips that can be used to carry the RTU (with attached battery) on a pistol belt, rucksack, or load carrying equipment. The MBITR also has an accessory carrying bag that can hold the RTU, spare battery, the antenna complement, the audio adapter device, and one of the available audio accessories.

1.1.4 Antennas

Two antennas are supplied with the MBITR: a 30-90 MHz blade antenna and a 30-512 MHz whip antenna. The antennas are attached via a TNC connector on the top of the RTU. A protective screw-on cap (p/n 2100420-501) is attached to the connector at the base of each antenna to protect the connector from dirt and moisture when the antenna is not attached to the radio. The caps should be attached if the antennas may be immersed in water.

1.1.4.1 30-90 MHz Blade Antenna

The 30-90 MHz blade antenna is capable of operating from 30 to 90 MHz with a minimum gain of -10 dBi.

1.1.4.2 30-512 MHz Broadband Antennas

The helical whip broadband antenna covers the 30-512 MHz frequency band. The broadband antenna has a minimum gain of -30 dBi at the low end and a typical gain of -10dB above 50 MHz.

1.1.5 Audio/Keyfill Adapter Device

The maritime version has a 10-pin deep submersible audio connector. The radio is supplied with an audio/keyfill connector adapter device (P/N 3600190-501) that allows the use of military standard (U-283/U) six-pin connectors, such as that required for keyfill devices. When the adapter is attached to the radio, the complete assembly is only immersible to 2 meters

1.2 Accessories

The MBITR communications system has a selection of accessories not supplied as part of the basic MBITR. These include several audio accessories, band-specific antennas, a vehicle adapter, a Special Power Adapter Interface (SPAI) with a cable for DC input to the SPAI, battery chargers, a PC-based (Windows) radio programmer, and interface cables for digital data operation, GPS data, radio cloning, and retransmission.

1.2.1 Audio Accessories

There are several different audio accessories available for the radio that provide reliable operation in all operating modes and across the entire MBITR frequency band:

- a maritime headset with the 10-pin submersible connector (p/n 1600503-5),
- an urban headset with the U-283/U six-pin connector (p/n 1600567-1 and alternate part 1600504-1),
- a conventional speaker-microphone (p/n 1600469-4),
- a commercial lightweight headset (p/n 1600551-2),
- a combined ear-mic headset (p/n 1600585-1), and
- a covert headset (p/n 1600584-1) with Wireless Earpiece (p/n 1600584-2).

NOTE: *There were performance issues in AM, HAVEQUICK, and SINCGARS (audio interference) with earlier combinations of radio hardware, radio software and the Maritime and Urban Headsets. These performance issues have been corrected for the following (or later) revisions: urban radio hardware – Revision H, Mod 3; maritime radio hardware – Revision G, Mod 3; radio software – revision T, Version 2.27; maritime headset (1600503-5) - Rev H or M1; urban headset (1600504-1) - Rev M1. All versions of the Urban Headset 1600567-1 work in all modes of radio operation.*

NOTE: *Due to the nature of the audio accessory, no sidetone capability is available in the Handheld Speaker/Microphone, p/n 1600469-4.*

1.2.2 Antennas

There are two high performance band-specific antennas available: a 136-174 MHz antenna (P/N SS-1600293-1) that provides improved performance (gain) in the upper VHF band and a 403-470 MHz antenna (P/N SS-1600294-1) that provides improved performance (gain) in the UHF band.

1.2.3 Vehicle Adapter

The MBITR Vehicle Adapter is used to expand the capabilities of the MBITR by:

- Including a 12-32 VDC power supply for operation with most vehicle electrical systems,
- Charging the radio's battery while the radio is inserted in the vehicle adapter, and
- Allowing rapid insertion and removal of the radio by using the radio side connector for interface.

Additional information on the vehicle adapter characteristics, installation, and operation is found in CHAPTER 6 of this manual.

1.2.4 Special Power Adapter Interface (SPAI)

The SPAI (4101310-501) is used with the Special Operations Power Supply (SOPS) to recharge the MBITR rechargeable batteries and power the MBITR. There are two input cables available (3500460-501 with flying leads and 1100533-501 connector kit with multiple interchangeable leads) that connect to external 12-32 volt DC power sources.

Additional information on the SPAI characteristics and operation is in CHAPTER 7 of this manual.

1.2.5 Battery Chargers

There are seven battery chargers available for use with the MBITR: two single unit chargers, four different six-unit chargers, and a two-unit tactical charger. All except the tactical charger are intended for use in a protected environment. The two single unit chargers (P/N 1600426-1 (obsolete) and 1600581-1) and two of the six-unit chargers (P/N 1600426-3 (obsolete) and 1600580-2) operate on 90 to 260 VAC power only. Two of the six-unit chargers (P/N 1600426-2 (obsolete) and 1600580-1) can operate on either 90 to 260 VAC or 10.5 to 32 VDC power. The two-unit tactical charger (P/N MA6751) is intended for vehicle mounting and operates on 10 to 32 VDC power only. Each battery charger charges the battery to full charge within three hours, automatically adjusting to the appropriate settings when the battery is inserted. The battery chargers communicate with the circuitry in the battery to monitor charge current, temperature, and voltage to prevent improper charging. Indicator LED's on the chargers provide status. Additional

information on the battery charger characteristics and operation is found in CHAPTER 8 of this manual.

1.2.6 PC-based Radio Programmer

The PC programmer (MA6941F) consists of a Windows-based software program and an RS-232 compatible cable (P/N 3500393-501) that connects from a computer serial port to the MBITR side connector to load the radio with its operating parameters. Some parameters are programmed globally to all channels within the radio and others are programmed on a channel by channel basis. Parameters that can be programmed through the radio programmer include the following:

- Global Settings:
  - Enable/disable keypad programming capability,
  - Assign programmable side key functions,
  - Transmit timeout,
  - Display backlight timeout,
  - Microphone HIGH/LOW gain,
  - Emergency channel information,
  - Situation Awareness settings,
  - Audio tone levels.
- Channel Settings:
  - Channel labels,
  - Operating frequencies (receive and transmit),
  - Squelch tones (receive and transmit),
  - Transmit power level,
  - Receive squelch threshold,
  - Encryption mode,
  - Traffic clock rate,
  - COMSEC key variable selection,
  - Fade bridging,
  - Repeater delay,
  - Initial crypto synchronization,
  - SINCGARS parameters:
    - SINCGARS Channel,
    - Single channel frequency,
    - Frequency offset, and
    - SINCGARS data rate
  - HAVEQUICK parameters:
    - Operating Frequency (Single Channel Mode only),
    - Frequency Hopping Net Selection,
    - Operational day, and
    - Word of Day segments (WOD) and Multiple WOD (MWOD) segments,
  - ANDVT parameters:
    - Delay,
    - Training frames.
- Group Settings:
  - Group labels,
  - Add/remove channels from a group,

- Scan Plan Settings:
  - Scan Plan labels
  - Set Priority Channels
  - Add/remove channels from a Scan plan.

A separate manual is included with each PC Programmer that provides detailed software installation and operation instructions.

1.2.7 Cables

There are additional cables available for use with the MBITR:

- Cloning cable (P/N 3500395-501) that allows the transfer of radio programming information from one radio into another radio,
- Digital data cable (P/N 3500396-501) that allows the MBITR to be connected to a digital data device for receipt and transmission of digital data (can also be used for Bit Error Rate (BER) testing),
- GPS cable (P/N 3500465-501) that allows the radio to be connected to a Precision Lightweight GPS Receiver (PLGR) for transfer of global positioning information (can also be used to load Time of Day (TOD) for HAVEQUICK),
- PDC cable (P/N 3500466-501) that allows the radio to be connected to a ViaSat VDC-400 Personal Data Controller (PDC) card for exchange of data,
- PDC Cable (P/N 3500545-501) that allows the radio to be connected to a ViaSat VDC-200 Compact Data Controller for exchange of data,
- SINCGARS Data Adapter Cable (p/n 3500562-501) that allows the radio to be used in place of a SINCGARS manpack radio for data transmission, and
- Retransmission cable (P/N 3500485-501) that allows two radios to be connected together to receive and retransmit voice or data traffic (retransmission mode) (supplied as part of a retransmission kit, p/n 1100540-501).

1.3 Transceiver Characteristics

The radio is tunable over a frequency range of 30-512 MHz, in either 5 or 6.25 kHz tuning steps, using 25.0 kHz channel bandwidth, 12.5 kHz when set for narrowband operation, and 5 kHz bandwidth when set for ANDVT. The radio automatically selects the correct tuning step size.

1.3.1 Transmitter Characteristics

The transmitter output consists of a single channel modulated carrier. The modulating source is analog or digitized voice and data signals at 12 and 16 kbps in 25 kHz channel spacing.

1.3.1.1 Programmable Transmit Time-out Timer

The radio has a programmable transmit time-out timer, with available settings of 30, 60, 90, and 120 seconds and infinite (no timeout).

1.3.1.2 Transmit Squelch Tones

When operating in clear FM, the radio is capable of transmitting standard EIA Continuous Tone Controlled Squelch System (CTCSS) squelch tones or the 150 Hz military squelch tone superimposed on the transmit carrier. The CTCSS tones available are as follows:

Table 1-2 Continuous Tone Controlled Squelch System (CTCSS) Available Tones (in Hz)

NONE/OFF		67.0	69.3	71.9	74.4	77.0	79.7	82.5	85.4	88.5	91.5
94.8	97.4	100.0	103.5	107.2	110.9	114.8	118.8	123.0	127.3	131.8	136.5
141.3	146.2	150.0	151.4	156.7	162.2	167.9	173.8	179.9	186.2	192.8	203.5
210.7	218.1	225.7	233.6	241.8	250.3						

NOTE: Whenever the 150.0 Hz tone is selected, the transceiver performance is adjusted to meet military standards for interoperability with legacy radios.

1.3.2 Receiver Characteristics

1.3.2.1 Clear Bypass Reception

For emergency situations, or when a radio has inadvertently lost encryption key, the radio circuitry is capable of receiving clear messages while set for secure mode operation.

1.3.2.2 Receive Squelch Tones

When operating in FM, the radio is capable of receiving standard EIA CTCSS squelch tones and the 150 Hz military squelch tone superimposed on the transmit carrier. The receive CTCSS tones are the same as those listed for transmit.

1.4 Communication Security (COMSEC)

The following describes the COMSEC characteristics of the MBITR, which is capable of secure communication by use of an NSA approved cryptographic module.

1.4.1 Compatibility

When operating in the 16 kbps secure voice mode, the radio is VINSON compatible. When operating in the 12 kbps secure voice mode, the radio is FED-STD-1023 compatible.

1.4.2 Tone Squelch Disable

When operating in the secure mode, the radio disables the transmission of any tone squelch (i.e., CTCSS) signals.

1.4.3 Encryption Device Keying

Encryption key fill is accomplished through the audio/keyfill connector. The Urban MBITR has a standard U-283/U six-pin connector that is fully compatible with the following key fill devices: KYK-13, KYX-15 and KOI-18 (common fill devices as described in CSESD-11I), and the AN/CYZ-10 (data transfer device (DTD) (as described in NSA 0N433965). The Maritime MBITR has a ten-pin connector that requires the use of the (supplied) ten-to-six pin adapter for the connection of the key fill devices.

1.4.4 TEMPEST

The MBITR and the SPAI conform to TEMPEST requirements for secure voice and data operation.

1.4.5 Algorithms

The MBITR is capable of using Saville and Padstone algorithms, selectable on a channel by channel basis. (Newer MBITR software versions (2.33 and higher) use only the Saville algorithm.)

1.4.6 Cryptographic Key Storage

The MBITR can store five traffic encryption keys (TEKs) and one key encryption key (KEK) when using the Saville algorithm or five TEKs when using the Padstone algorithm. TEKs are used to encrypt/decrypt secure message traffic. KEKs are used in Over-The-Air-Rekey (OTAR) (see paragraph 2.2.3.2.9) for the reception of new TEKs.

1.4.7 Zeroization

The MBITR can zeroize all encryption keys simultaneously through the panic zeroize control (see paragraph 2.1.1.3). The radio also allows selective zeroization of individual encryption keys through the front panel keypad.

1.4.8 Key Retention

To allow replacement of low batteries, the MBITR retains crypto key for at least 45 seconds after battery removal.

CAUTION

Be sure to turn the radio OFF before removing the battery. Failure to do so may cause loss of key and/or programming.

1.4.9 Fade Bridging

The MBITR provides fade bridging that is programmable, via the keypad or the PC programmer, from 0 to 4 seconds in one-second increments. Fade bridging allows the encryption recovery to "freewheel" during momentary signal loss so that encryption synchronization is not interrupted.

1.4.10 Initial Synchronization

The MBITR has initial synchronization that is programmable at NONE, 256 msec, 384 msec, and 1.06 second. Initial synchronization controls the length of the cryptographic preamble to increase the probability of initial cryptographic synchronization by the receiving radio over noisy channels.

1.5 SINCGARS Transmission Security (TRANSEC)

NOTE: SINCGARS operation is only available in those radios with the optional SINCGARS capability enabled. Use the "OPTIONS ENABLED" menu (paragraph 2.2.3.4.4) to check. The following describes the TRANSEC capabilities of the MBITR with SINCGARS option.

1.5.1 Frequency Range

When operating in the SINCGARS mode, the available MBITR operating frequency range is 30 to 87.995 MHz.

1.5.2 Operating Modes

The MBITR with SINCGARS functionality includes the operating modes of the Basic radio and those modes of operation listed below.

1.5.2.1 SINCGARS Single Channel (SC) Compatibility

The MBITR with SINCGARS functionality provides Single Channel (SC) clear FM analog voice operation, FM encrypted digital voice in 16 kbps CVSD mode, and over-the-air FM transfer of encrypted digital data. The SC Data Mode implements the SINCGARS Standard Data Mode (SDM) and Enhanced Data Mode (EDM).

1.5.2.2 SINCGARS Frequency Hopping (FH) Compatibility

The MBITR with SINCGARS functionality provides Frequency Hopping (FH) Plain Text Digital Voice operation, FH FM encrypted digital voice in 16 kbps CVSD mode, and, using the SINCGARS and SINCGARS SIP waveforms, FH over-the-air FM transfer of encrypted digital data. The FH Data Mode implements the SINCGARS SDM and EDM.

1.5.2.3 Half Duplex Operation

When operating in the SINCGARS mode, the MBITR is not capable of half-duplex operations, where receive and transmit operations are performed on different frequencies.

1.5.3 Squelch Tones

The SINCGARS MBITR supports the 150 Hz squelch tone. The radio does not support CTCSS operation when in SINCGARS mode of operation.

1.5.4 SINCGARS Electronic Counter Counter-Measures (ECCM) Remote Fill (ERF)

The MBITR is capable of "receive only" SINCGARS ECCM Remote Fill (ERF).

1.5.5 Encryption Device Keying

TRANSEC key fill is accomplished through the audio/keyfill connector. The Urban MBITR has a standard U-283/U six-pin connector that is fully compatible with the ECCM fill device (MX-18290/VRC) and the AN/CYZ-10 DTD. The Maritime MBITR has a ten-pin connector that requires the use of the (supplied) ten-to-six pin adapter for the connection of the key fill devices.

1.6 HAVEQUICK I/II Transmission Security

NOTE: HAVEQUICK operation is only available in those radios with the optional HAVEQUICK capability enabled. Use the "OPTIONS ENABLED" menu (paragraph 2.2.3.4.4) to check.
The following describes the TRANSEC capabilities of the MBITR with HAVEQUICK option.

1.6.1 Frequency Range

When operating in the HAVEQUICK I/II mode, the available MBITR operating frequency range is 225 to 399.975 MHz.

1.6.2 Interoperability

The HAVEQUICK I/II MBITR is interoperable in both single channel and ECCM modes with the AN/PRC-113 in clear and secure voice.

1.6.2.1 HAVEQUICK I/II Frequency Hopping (FH) Voice

Using the HAVEQUICK I/II waveforms, the MBITR provides Frequency Hopping (FH) AM clear analog voice operation and FH AM encrypted digital voice in 16 kbps CVSD mode.

1.6.3 Over-the-Air Time of Day

The MBITR can receive and transmit HAVEQUICK Time of Day (TOD) in single channel and frequency hopping modes.

1.6.4 Squelch Tones

The HAVEQUICK I/II mode does not support Continuous Tone Controlled Squelch System (CTCSS) operation or the 150 Hz squelch tone (used for SINCGARS interoperability).

1.6.5 COMSEC Compatibility

When operating in the HAVEQUICK I/II mode, the MBITR can operate in the VINSON COMSEC mode at 16 kbps. (HAVEQUICK I/II does not support 12 kbps operation.)

1.6.6 Net Support

The HAVEQUICK MBITR supports the following HAVEQUICK I/II nets:

- HAVEQUICK I Sectorized A-nets,
- HAVEQUICK I A-nets,
- HAVEQUICK I B-nets,
- HAVEQUICK I training nets,
- HAVEQUICK II NATO nets,
- HAVEQUICK II non-NATO nets, and
- HAVEQUICK II training nets.

1.7 ANDVT Operation

NOTE: Some uses of the MBITR with ANDVT channels require the use of a directional antenna with a minimum gain of 9dBi.
NOTE: ANDVT operation is only available in those radios with the optional ANDVT capability enabled. Use the "OPTIONS ENABLED" menu (paragraph 2.2.3.4.4) to check.

The following describes the additional characteristics of the MBITR with ANDVT option.

1.7.1 Frequency Range

When operating in the ANDVT mode, the MBITR operating frequency range is contiguous from 30.0 to 512.0 MHz.

1.7.2 Channel Bandwidth

The MBITR receiver/transmitter has a channel bandwidth of 5 kHz in ANDVT mode.

1.7.3 Interoperability

The ANDVT MBITR is interoperable in mode and frequency with the Advanced Narrowband Digital Voice Terminal (ANDVT), KY-99, KY-99A, PSC-5, and AN/PRC-117F.

1.7.4 Operating Modes

The MBITR in ANDVT mode supports the following operating modes.

1.7.4.1 Encrypted Digital Voice

The Receiver/Transmitter provides encrypted digital voice in 2400 bps LPC-10 mode that is modulated using Shaped Binary Phase Shift Keying (SBPSK). Digital voice squelch is based on the presence of a digital clock at the appropriate clock rate and cryptographic synchronization.

1.7.4.2 Digital Data

The Receiver/Transmitter provides over-the-air transfer of encrypted digital data at 2400 bps mode that is modulated using SBPSK. The Receiver/Transmitter is capable of interoperating with data terminal devices over an RS-232 interface at a synchronous data speed of 2400 bps. (The MBITR with older version software (version 2.28 and earlier) is not interoperable in data mode with the AN/PRC-117F – this capability is implemented in later versions.)

1.7.4.3 Simplex Operation

The Receiver/Transmitter is capable of simplex operation, where receive and transmit operations are performed on the same frequency.

1.7.4.4 Half Duplex Operation

The Receiver/Transmitter is capable of half-duplex operations, where receive and transmit operations are performed on different frequencies.

CHAPTER 2 OPERATING INSTRUCTIONS

Section I. CONTROLS AND INDICATORS

2.1 Controls, Indicators, and Connectors

2.1.1 Controls

The MBITR controls consist of the following: a backlit keypad (shown in Figure 2-1), a push-to-talk (PTT) switch, ON/OFF/Volume control/Panic zeroize rotary switch, a 16-position channel select rotary switch, a squelch override button, and two programmable function keys. The other controls and connectors are shown in Figure 2-2 and Figure 2-3.

2.1.1.1 Keypad

There are seven keys on the keypad, as shown in Figure 2-1. The three keys on the top row are *CONTROL* keys and the remaining four keys are *AUXILIARY CONTROL* keys. The Control keys allow the operator to change MBITR modes and channels with a minimum number of MBITR key operations. The Auxiliary Control keys allow access to additional MBITR functions as well as to confirm any Control key selections. Most keys have two functions: the second or *ALTERNATE* function is accessible by pressing and holding the ALT key while another key is pressed and released. The *PRIMARY* function is indicated by the marking on the key tops while the alternate function is printed on the MBITR case, either above the key (top row) or below the key (bottom row).

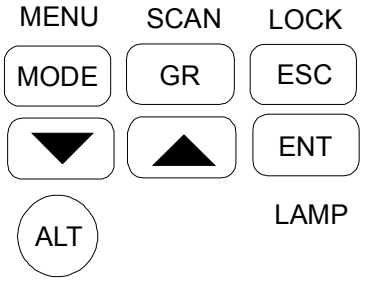


Figure 2-1 MBITR Keypad

Table 2-1 Key Assignments Table

KEY	FUNCTION	ALT FUNCTION
ALT	Press and hold to access ALT functions	Not Applicable
MODE	Opens Mode Select screen	Opens Programming Menus screen
GR	Opens Group Select screen	Opens Scan Operation screen
ESC	Closes current screen; returns to previous screen	Lock / Unlock keypad
▼	Decrement selection or value	Highlights character to left of current selection
▲	Increment selection or value	Highlight character to right of current selection
ENT	Confirm operation or selection	Backlight On / Off

2.1.1.2 Push-to-talk Switch

A push-to-talk (PTT) switch (7, Figure 2-2) is located in the middle of the left side of the radio. (All positions are given as if the display is facing the radio operator.) By pressing the UP or DOWN arrow keys on the keypad while pressing the PTT switch, the user can change the output power level setting. For the new setting to go into effect, the user must release the PTT and then press it again or rekey the audio accessory (if operating with External Audio).

2.1.1.3 ON/OFF/Volume Control/ Panic zeroize

ON/OFF/Volume control/Panic zeroize (6, Figure 2-3) is controlled by a mechanical rotary switch located on the left top of the radio. There is a mechanical interlock switch (5, Figure 2-2) located on the side of the radio immediately below the ON/OFF switch that the user must slide down and hold in order to turn the switch to the panic zeroize position.

2.1.1.4 16-Position Channel Select Rotary Switch

The channel select rotary switch (5, Figure 2-3) is located on the top middle of the radio. The specific channels associated with each position of the rotary switch are determined by the group selected by the operator (see paragraph 2.2.1 for information on channels and groups).

2.1.1.5 Squelch Disable Button

The squelch disable button (8, Figure 2-2) is located on the left side of the radio below the PTT switch. It toggles between squelched and unsquelched operation. By pressing and holding the button for a few seconds, the user activates the Squelch Opening Threshold Level Setting screen (Figure 2-14) on the display. The Squelch Level for the currently selected channel can be changed using the [▲] and [▼] keys on the keypad.

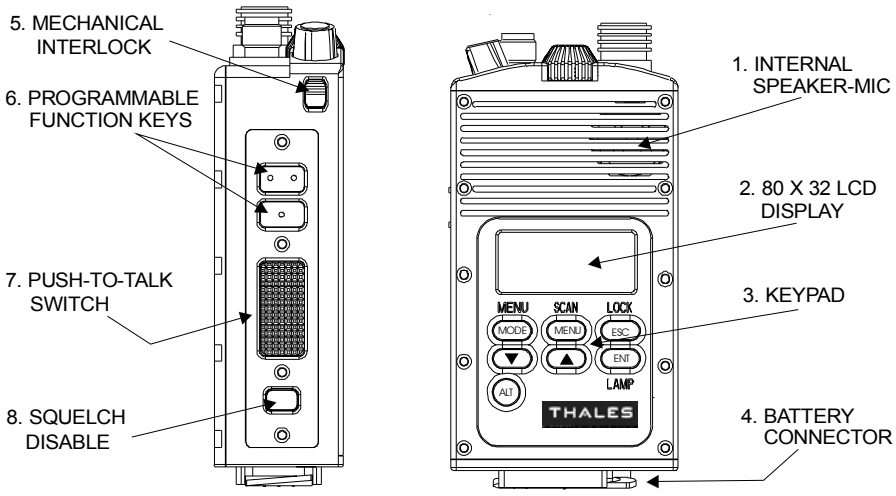


Figure 2-2 MBITR Controls and Connectors (Sheet 1)

2.1.1.6 Programmable Function Keys

The two programmable function keys (6, Figure 2-2) can be assigned different functions using the PC Programmer. Available functions are:

- Enable/Disable of Situational Awareness (SA),

- Enable/Disable of Scan,
- Enable/Disable of backlighting,
- Enable/Disable of AM Swept Tone Beacon,
- Toggle through scan plans,
- Toggle through groups,
- Display/Clear SA positional information,
- Select between internal, external, and sidetone audio,
- Switch between Single Channel and Frequency Hopping modes (SINCGARS and HAVEQUICK channels only), and
- Display/Clear the clock and date.

The keys can also be disabled. The PC Programmer manual contains additional details.

2.1.2 Indicators

2.1.2.1 Liquid Crystal Display (LCD)

The MBITR has an 80 x 32 pixel liquid crystal display (2, Figure 2-2) that uses both characters and graphics to provide the operator with radio operating and programming information. The display backlighting is activated by pressing the [ALT] and [ENT] ([LAMP]) keys. The intensity of the backlighting can be changed by continuing to hold the [ALT] and [ENT] keys after turning on the backlight. The lower level of backlighting is night vision goggle (NVG) compatible.

2.1.2.2 Clear Indicator

Operation in Plain Text (PT), or clear, mode is visually indicated on the display (9, Figure 2-5) and audibly indicated by pip tones at the beginning of each transmission or reception.

2.1.3 Connectors

2.1.3.1 Side Connector

The side connector (2, Figure 2-3) is an 18-pin-pin connector located on the right side of the radio. This connector is used for multiple functions, including interfacing with the Vehicle Adapter and the Radio Programmer, Cloning, and Data Mode cables. **To prevent damage to the radio while powered on, the side connector MUST be disabled before the radio is immersed in water** (see paragraph 2.2.3.3.1).

2.1.3.2 Audio/Key Fill Connector

The urban MBITR audio/key fill connector (1, Figure 1-1) is a standard U-283/U six-pin audio connector. This connector is used for encryption key fill and to interface with standard audio accessories (such as the H/250 handset). The maritime MBITR uses a ten-pin deep submersible audio connector (MKS-310-BCR)(4, Figure 2-3) and requires a ten-to-six pin adapter device (part number 3600190-1, supplied as part of the radio) to interface with standard audio accessories and key fill devices. The pinouts for each connector are shown in Figure 2-4.

2.1.3.3 Antenna Connector

The antenna connector (7, Figure 2-3) is a TNC female type connector on the top of the radio. It is recommended that an antenna ALWAYS be connected to the radio when transmitting. An antenna should be connected whenever the radio is immersed.

2.1.3.4 RF Connector

The RF Connector (1, Figure 2-3) is used for the RF connection to the Vehicle Adapter.

2.1.3.5 Battery Connector

The battery interfaces with the MBITR through a reliable, easily operated bayonet twist-on mechanism (4, Figure 2-2). The battery connection includes a release latch (3, Figure 2-3).

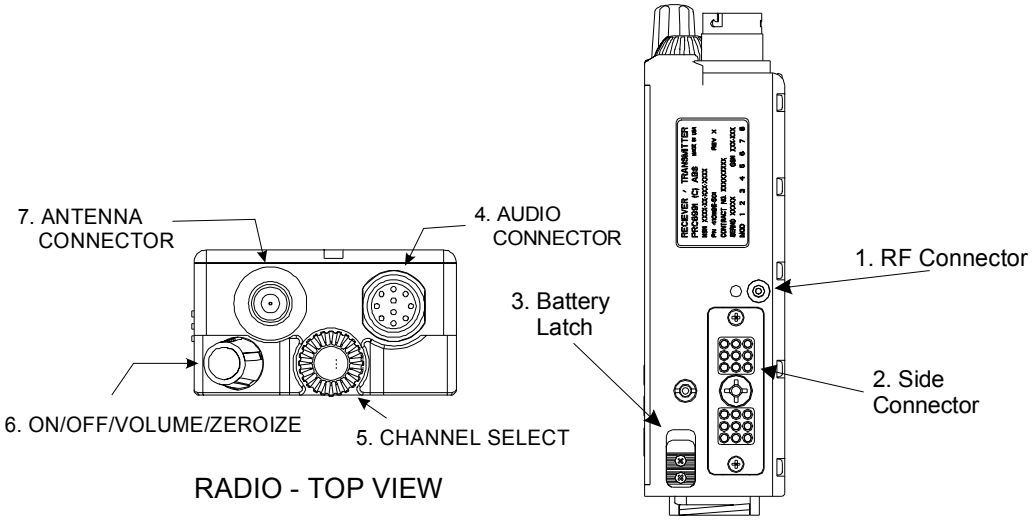


Figure 2-3 MBITR Controls and Connectors (Sheet 2)

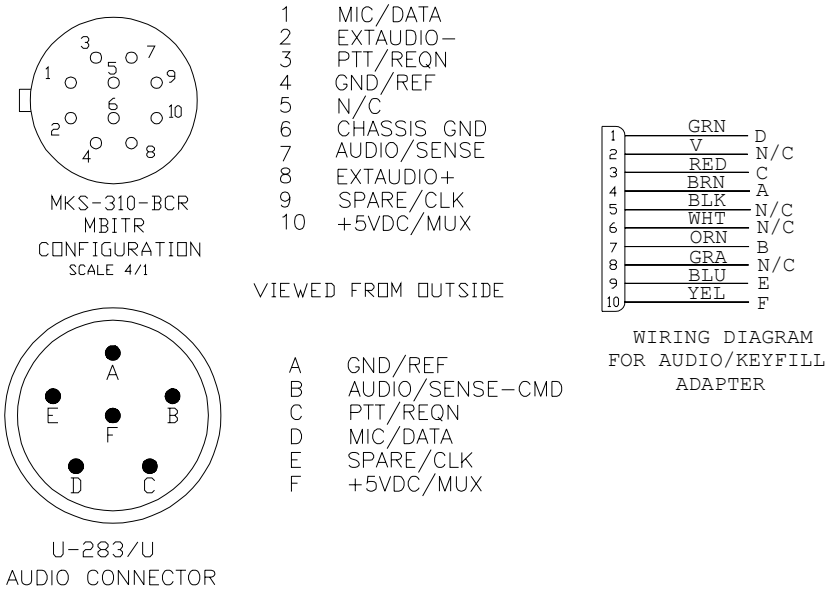


Figure 2-4 MBITR Audio/Keyfill Connector Pin-Out

Section II. OPERATION

2.2 Operating Procedures

2.2.1 MBITR Channels and Groups

The MBITR has a total of 100 programmable channels. Each channel may be programmed for a different frequency (for both receive and transmit) as well as other communications parameters. Each channel is identified by a 7 character alphanumeric label or by its default channel number (00 to 99) if no label has been programmed.

The MBITR programmed channels can be assigned to groups of up to 16 channels each (to correspond to the 16 positions on the Channel Select rotary switch). When a channel is assigned to a group, it is "mapped" to a Channel Select switch position. Channels can be assigned to more than one group. If a channel is NOT assigned to any group, the radio cannot operate on that channel. The radio can store up to ten (10) groups of channels. These groups may be assigned names of up to 3 characters. The user may select only **ONE** Group at any given time for MBITR operations. This Group will be referred to as the MBITR's "SELECTED GROUP." When compiling a list of channels to a group, channels are assigned by their default channel numbers.

2.2.2 Display Menus

2.2.2.1 DEFAULT Display Organization

When the radio is first powered up, it performs a Power-On Self-Test (POST) and displays "TESTING". When POST is completed, the display shows "THALES MBITR" and the software version. **NOTE**: If the radio fails POST, run the Built-In Test (paragraph 2.2.3.4.1) to identify the cause of failure. This display is then automatically replaced by the default standby display screen (see Figure 2-5). The display includes a battery "fuel gauge" indicator, the group label for the selected group, the selected channel label, the channel modulation type (AM, FM, NB, or PSK), and the security mode (PlainText (PT) or CipherText (CT). The display can also contain:

- a flashing "ERROR" indicator when an operational fault occurs,
- a flashing "UNLCK" indicator when the synthesizer is not locked on a frequency,
- a flashing "ALARM" indicator when a crypto fault occurs,
- a flashing "NOPWR" indicator for no RF output power,
- a flashing "TEMP" indicator for an over-temperature condition,
- a flashing "TRSEC" indicator if SINCGARS FH is selected, but no TRANSEC information (hopset/ lockout set) is loaded for the selected channel,
- a flashing "NOTOD" indicator if HAVEQUICK I/II FH is selected, but no TOD (Time of Day) is loaded,
- a flashing "NOWOD" indicator if HAVEQUICK I/II FH is selected, but a valid WOD (Word of Day) is not loaded,
- an "External Audio enabled" icon when the radio is set for external audio,
- a "Side Connector enabled" icon when the radio side connector is enabled,
- a "Half-duplex mode" icon that automatically appears when different receive and transmit frequencies are programmed for the selected channel,
- a "DATA" mode indicator when the radio is in digital data mode,

- a “RETRANS” indicator when the expedient retransmission mode is activated,
- a "SCAN" icon when the Scan function is active,
- an "SA" indicator for Situation Awareness enabled (radio must be in CT mode),
- a TRANSEC SINCGARS (SG) or HAVEQUICK (HQ) indicator with either a Single Channel (SC) or Frequency Hopping (FH) indicator (NOTE: Since SINCGARS and HAVEQUICK are limited to FM and AM frequencies, respectively, the display DOES NOT include Modulation Type when TRANSEC channels are displayed,
- a “LNE” indicator when SINCGARS Late Net Entry is activated (only available when a SINCGARS FH channel is the active channel),
- an "Emergency Beacon" icon when the radio is set for swept tone emergency beacon mode,
- an "Open Squelch" icon when the squelch disable button is pressed, and
- a “keypad locked” icon when the [ALT] and [ESC] keys are pressed, locking the keypad to prevent inadvertent keystrokes. The keypad can be unlocked by pressing [ALT] and [ESC] again.

All other (function) displays are accessed from the default display. These functions are invoked by MBITR key or switch operations or, in some cases, automatically by the MBITR, as in the Scan Mode. There are three groups of function screens that support the user interface: Operations screens, Function screens, and Programming screens, as described below.

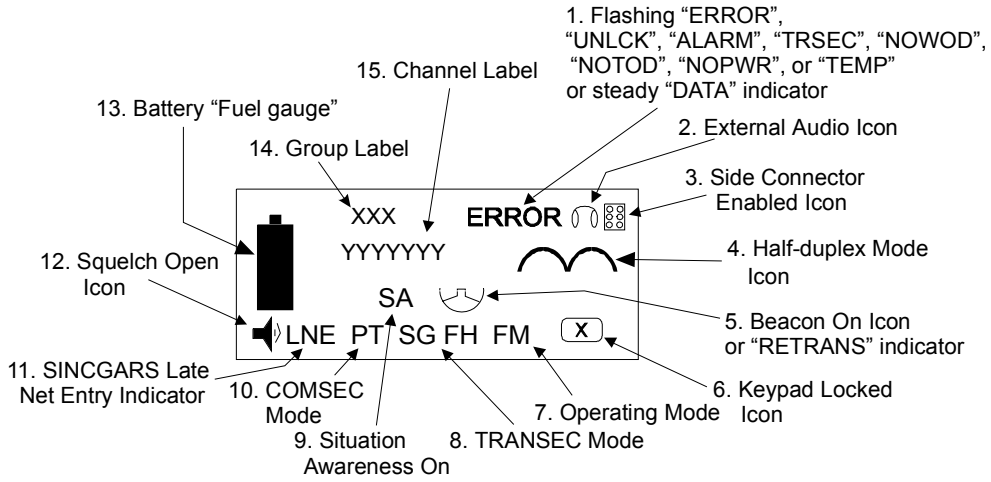


Figure 2-5 Default Display Screen

2.2.2.2 Alternate DEFAULT Display (Basic)

When the default display (Figure 2-5) is open, the user can switch to an alternate display by pressing [ENT]. The alternate display (Figure 2-6) for Basic channels shows the receive (RX) frequency (1) and CTCSS tone (3) and transmit (TX) frequency (2) and CTCSS tone (4) of the current channel. Press [ENT] or [ESC] to return to the default display.

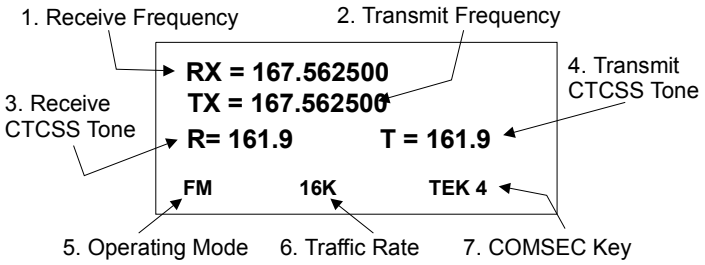


Figure 2-6 Basic Alternate Default Display

2.2.2.3 Alternate DEFAULT Display (SINCGARS)

For SINCGARS channels, there are different alternate displays for the Single Channel and Frequency Hopping modes. The Single Channel (SC) display includes the SINCGARS channel (1), Single Channel frequency (2), COMSEC key (3), data rate (4), modulation type (5), and frequency offset (6). The Frequency Hopping (FH) display includes the SINCGARS channel (1), SINCGARS Net ID number (2), COMSEC key (3), data rate (4), modulation type (5), and SINCGARS Net time (6).

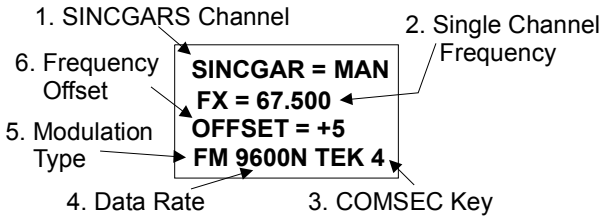


Figure 2-7 SINCGARS Alternate Display (SC)

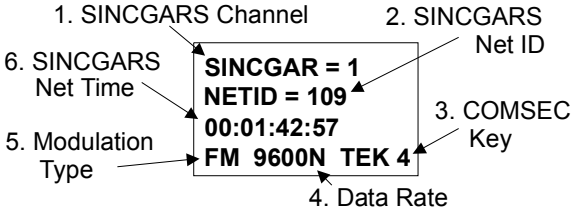


Figure 2-8 SINCGARS Alternate Display (FH)

2.2.2.4 Alternate DEFAULT Display (HAVEQUICK)

For HAVEQUICK channels, there are different alternate displays for the Single Channel and Frequency Hopping modes. The Single Channel (SC) display includes the HAVEQUICK Single Channel frequency (1), modulation type (2), traffic rate (3), and COMSEC key (4). The Frequency Hopping (FH) display includes the HAVEQUICK Net (1), modulation type (2), traffic rate (3), and COMSEC key (4).

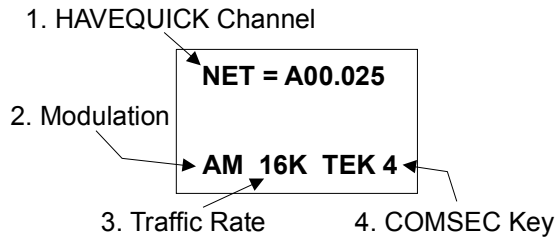


Figure 2-9 HAVEQUICK FH Alternate Display

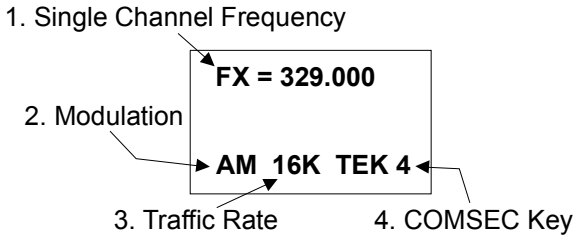


Figure 2-10 HAVEQUICK SC Alternate Display

2.2.2.5 Alternate DEFAULT Display (ANDVT)

For ANDVT channels, the alternate display (Figure 2-11) includes the receive (1) and transmit (2) frequencies, the delay (3) (period of time before the modulated signal is transmitted, the modulation type (4) (PSK), the data rate (5) (2.4 kbps), and the COMSEC key (6).

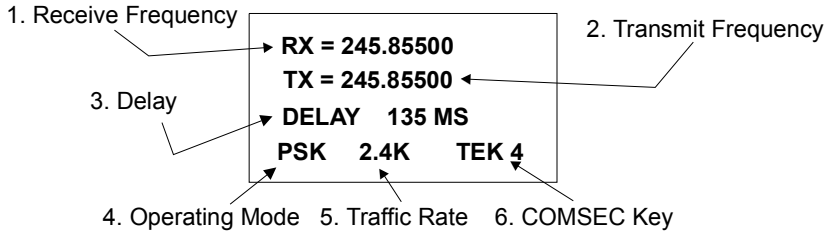


Figure 2-11 ANDVT Alternate Display

2.2.2.6 OPERATIONS Screens

The Operations screens are required for basic operation of the MBITR. These include the Receive (RX) status, Transmit (TX) status/Power, and Squelch adjust screens. These screens are displayed in response to PTT or Squelch switch operations on the MBITR. These screens display the receive signal level when traffic is being received, the squelch level when squelch is being set, or the transmit power level when the radio PTT is pressed.

Figure 2-12 Receive Screen

When a signal is being received, the standby screen changes to the Receive screen (Figure 2-12). (Note that the SC/FH indicator is only present on channels programmed as SINCGARS or HAVEQUICK.)

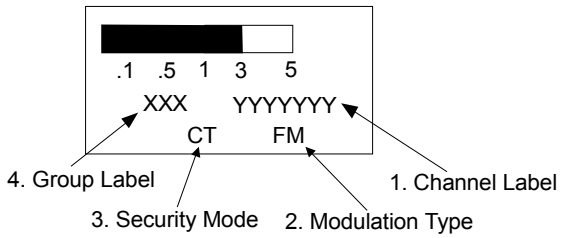


Figure 2-13 Transmit Screen

The radio displays the Transmit screen (Figure 2-13) whenever the radio is keyed, either from the PTT switch or from an external device, and power can be adjusted while keyed. To adjust the power level, press the [▲] or [▼] keys while the radio is keyed. To have the new power level activated, the radio must be unkeyed and then rekeyed.

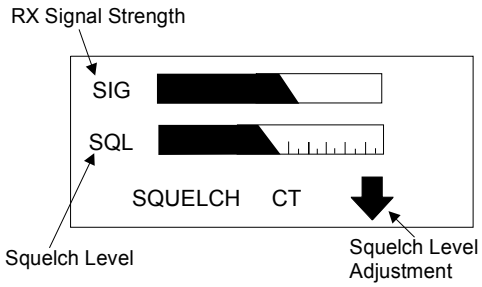


Figure 2-14 Squelch Adjust Screen

To adjust the squelch level, press and hold the Squelch Disable button (below the PTT switch) for a few seconds. The Squelch Adjust screen (Figure 2-14) will be displayed. To increase or decrease the squelch opening threshold, press the [▲] or [▼] keys, as was done for transmit power. To have the new level go into effect and be retained in the channel configuration, the user must press [ENT].

2.2.2.7 FUNCTIONS Screens

The Function screens (Mode Select and Group Select) are actually a subset of the Operations screens and are displayed in response to MBITR front panel switch operations. They present the operator with a small menu of options to select using the [▲] and [▼] keys. These selections must then be confirmed with an additional press of the [ENT] key. These Function changes are made with the MBITR online and immediately affect the way the MBITR is operating, e.g., Clear mode to Secure mode changes. They are also single level menu operations that require a minimum of switch operations to complete.

2.2.2.7.1 MODE Select

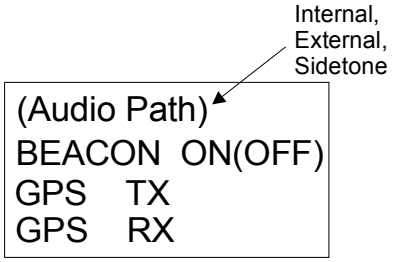


Figure 2-15 Mode Select Screen

To select the MBITR Operating Mode, press the [MODE] key on the front panel keypad. The menu of available parameters (Figure 2-15) appears on the display. The currently selected parameter is outlined. To move the selection outline, use the [▲] or [▼]. To change the selected parameter, press [ENT] to enable the change mode (the selection will be shown in reverse video (white on black)) and use the [▲] or [▼] to toggle the selection value. Press [ENT] to confirm the change and move the outline to the next line. The first line selects the audio path: internal audio, external audio, or external audio with sidetones enabled (INT/EXT AUDIO, SIDETONE). Select external audio when using a separate audio accessory. Selecting SIDETONE enables external audio with feedback during transmit. Otherwise, use internal audio. Internal audio should be selected when the radio is to be immersed unless an immersible headset is attached to the radio. The second line selects the emergency beacon operation (ON or OFF) and, when set to ON, opens the beacon activation screen for selecting the beacon channel. The next line selects display of the transmit (TX) of GPS/Situational Awareness data. The last line selects display of the received (RX) GPS/Situational Awareness data. At any point, the [ESC] key may be pressed to exit the menu without changing the currently selected (outlined) parameter.

2.2.2.7.2 Emergency Beacon

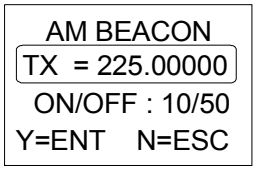


Figure 2-16 Emergency Beacon Select

When BEACON is set to ON, pressing [ENT] opens the Emergency Beacon menu (Figure 2-16). When the selection outline is around the "TX=" line, the user can scroll through the three available emergency channels with the [▲] and [▼] keys: military or civilian emergency beacon, or a non-standard frequency

emergency channel. The standard military and civilian emergency beacon frequencies (121.5 and 243 MHz) are pre-programmed into the radio. The user must program the non-standard emergency channel information before this channel can be used. (See paragraph 2.2.3.3.8 for emergency channel programming information.) Press [ENT] to confirm and activate the Emergency Beacon and return to the Mode Select screen. **CAUTION: Do not activate the standard military or civilian emergency beacon frequencies unless you are in a true emergency situation.**

The Emergency Beacon operation is separate and distinct from the channel selected using the top-mounted rotary switch. When the Emergency Beacon is activated, the user can still transmit and receive on the regular selected channel. The radio will receive whenever not actually transmitting on the Emergency Beacon. To interrupt the Emergency Beacon transmit, press [ESC]. This cancels the Emergency Beacon operation and allows normal use of the radio.

2.2.2.7.3 GPS Transmit

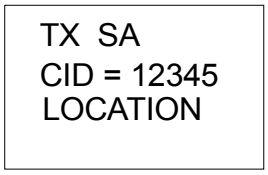


Figure 2-17 GPS Transmit

NOTE: The radio must be in CT mode to transmit or receive GPS information.

Pressing [ENT] with GPS TX selected opens the GPS transmit information screen. If a PLGR is attached, the GPS TX screen will display the Combat ID (CID) and current location (using the Military Grid Reference System (MGRS) notation). If no PLGR is attached, the display will read "LOCATION UNKNOWN".

2.2.2.7.4 GPS Receive

If message traffic with GPS information included has been received (indicated by RX SA on the default display), selecting the GPS RX screen will display the received location information. There are two screens of information for each CID – press the [ENT] key to show the second screen. The radio can display GPS data from the last ten unique radio receptions. Toggle through the ten unique receptions, designated by their Combat ID, by using the up and down arrow keys. Press [ESC] twice to return to the Default Display screen.

2.2.2.7.5 GROUP Select

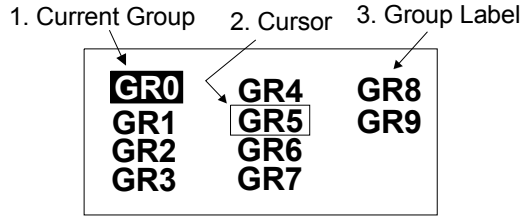


Figure 2-18 Group Select Screen

Press the [GR] key to open the GROUP Select menu (Figure 2-18). This menu displays the Group Labels for all 10 groups. The label of the currently selected group is shown in reverse video (white on black). To select a new group, press the [▲] or [▼] keys to move the selection outline. The selection outline will scroll through the first column to the top of the next column and from the last group to the first group. When the outline is on the desired group, press [ENT] to select the new group and return to the default screen.

2.2.3 PROGRAMMING Menu

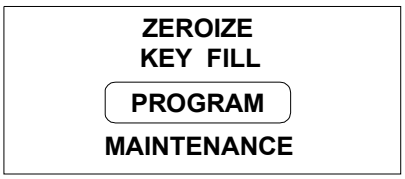


Figure 2-19 Main Menu Screen

The Programming screens are available through a menu structure and do not require user access during normal MBITR operations. These functions are for advanced channel and modes programming and restrict the MBITR operation (no Receive operations during programming). The Main Menu screen (Figure 2-19) is accessed by pressing [ALT] and [MODE].

2.2.3.1 Zeroize

The INFOSEC firmware allows the user to selectively zeroize individual COMSEC keys, individual TRANSEC hopsets, all COMSEC keys, all TRANSEC hopsets, or all radio parameters. ZEROIZE is one of the selections on the Main Menu.

2.2.3.1.1 Zeroize Screen

Figure 2-20 Initial ZEROIZE Screen

The initial ZEROIZE screen (Figure 2-20) permits the operator to select either CLEAR ALL, ZERO COMSEC, ZERO TRANSEC, or SET DEFAULTS functions.

2.2.3.1.2 CLEAR ALL Screen

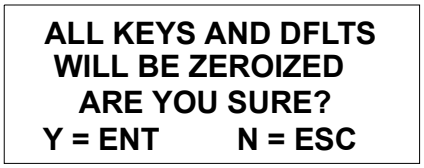


Figure 2-21 CLEAR ALL Screen

The CLEAR ALL screen (Figure 2-21) will zeroize all the COMSEC and TRANSEC key variables and will reset the radio to the factory defaults (Table 2-2). Press [ESC] to return to the Initial ZEROIZE Screen.

Table 2-2 Factory Default Values

Parameter	Value
Frequency	167.5625 MHz
Modulation	Alternating (by channel) AM and FM
Power	5 watts
Squelch Tone	None
Encryption	Plain

2.2.3.1.3 COMSEC Zeroize Screen

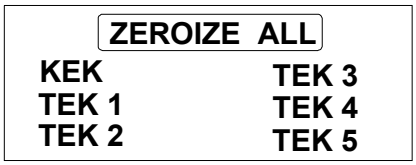


Figure 2-22 COMSEC Zeroize

Move the selection outline to ZERO COMSEC and press [ENT] to proceed with COMSEC zeroize (Figure 2-22). Use [▲] or [▼] to move the selection outline and [ENT] to confirm the selection. For selective zeroize, move the selection outline to the key location to be zeroized (either the Key Encryption Key (KEK) or Traffic Encryption Key (TEK) 1-5) and press [ENT]. Press [ESC] to return to the Initial ZEROIZE Screen.

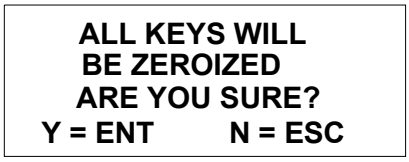


Figure 2-23 COMSEC Zeroize All

When ZEROIZE ALL is selected, the confirmation screen (Figure 2-23) will be displayed. Press [ENT] to immediately zeroize ALL COMSEC keys. The [ESC] key returns to Figure 2-22. When Zeroize All is successful, the display will revert to the Default Display (Figure 2-5) with the crypto alarm active (if mode is set to CT).

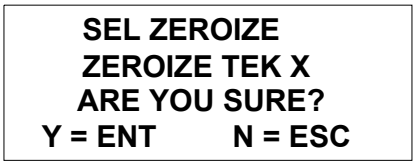


Figure 2-24 COMSEC Selective Zeroize

When an individual key location is selected, the confirmation screen (Figure 2-24) is displayed. Press [ENT] to zeroize the selected key. The [ESC] key returns to the COMSEC Zeroize Screen (Figure 2-22) with the same key selected. When Selective Zeroize is successful, the radio display returns to the COMSEC Zeroize screen with ZEROIZE ALL selected.

2.2.3.1.4 TRANSEC Zeroize Screen

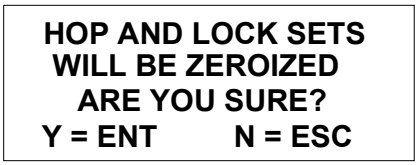


Figure 2-25 TRANSEC Zeroize Screen

Move the selection outline to TRANSEC and press [ENT] to proceed with TRANSEC zeroize (See Figure 2-25). Press [ENT] to immediately zeroize ALL TRANSEC hopsets and lockout sets (SINCGARS) and Word of Day data (HAVEQUICK) and revert to the Default Display (Figure 2-5). The [ESC] key returns to Figure 2-25.

2.2.3.1.5 Set Defaults Zeroize Screen

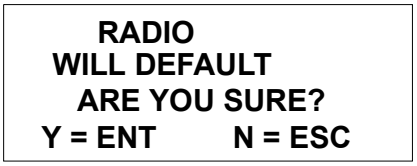


Figure 2-26 Radio Parameters Zeroize Screen

Set Defaults resets all global, group, and channel settings to the factory default values. Move the selection outline on the Radio Parameters Zeroize Screen to SET DEFAULTS and press [ENT] to proceed with the Set Defaults operation (See Figure 2-26). Press [ENT] to confirm resetting all radio parameters to factory default settings. Press [ESC] to return to the Initial ZEROIZE Screen.

2.2.3.2 Key Fill.

NOTE

Before beginning any Key Fill operation, ensure that the SIDE CONNECTOR is ENABLED and the radio is set for INTERNAL AUDIO.

2.2.3.2.1 General Key Fill Operation.

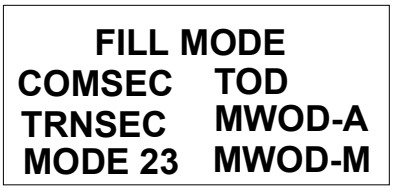


Figure 2-27 Key Fill Main Screen

The user must select Key Fill from the Main Menu (Figure 2-19) to display the main Key Fill screen (Figure 2-27). Select one of the key fill modes and then connect a key fill device (KOI-18, KYK-13, KYX-15, AN/CYZ-10, or MX-18290/VRC), either directly to the audio/keyfill connector on the Urban version or using the supplied audio adapter on the Maritime version.

NOTE: One of the Key Fill Mode screens MUST be selected BEFORE connecting the key fill device.

After turning off and/or removing the key fill device, press [ESC] to exit Key Fill mode.

The available fill modes are defined below: (*Note that SINCGARS and HAVEQUICK II operation require the corresponding software option in order to be active*.)

COMSEC: Enables the COMSEC key load function into the location selected.

TRNSEC: Enables the SINCGARS hopset load function into the channel selected from 1 through 6 and MAN (manual) or the lockout set into LOUT.

MODE 23: Enables both the COMSEC key load and TRANSEC hopset/lockout set load functions into all channels. (Requires use of AN/CYZ-10 Data Transfer Device).

TOD: Enables the HAVEQUICK I/II Time of Day load functions (load, transmit, emergency initialize).

MWOD-A: Enables the HAVEQUICK I/II Multiple Word of Day load from an external fill device (e.g., KYK-13.)

MWOD-M: Enables a manual load of the HAVEQUICK I/II data from the keypad and display.

2.2.3.2.2 COMSEC Key Fill Operation

Figure 2-28 COMSEC Keyfill

NOTE: If the crypto alarm sounds when "COMSEC FILL" is selected, press the PTT once or twice to clear the alarm.

When “COMSEC FILL” is selected, the screen shown in Figure 2-28 appears on the display, with KEY outlined and TEK X next to it (where X can be 1 through 5). The operator selects which key is to be filled by pressing [ENT] to enable changes (selection changes to reverse video (white on black)) and using the [▲] or [▼] keys to scroll through the key locations (the radio has 5 (Saville or Padstone) locations for Traffic Encryption Keys (TEKs)) (there is also a key location reserved for a Saville Key Encryption Key (KEK), which is used for Over-The-Air-Rekey (OTAR).) Only Saville is available for the KEK location. The display will read KEK when the Saville KEK location is selected. When the correct key location is shown, the user presses [ENT] to confirm the selection

and then uses the [▼] key to advance to the encryption algorithm field. The operator presses [ENT] to enable changes and then selects which algorithm (Padstone or Saville) is assigned to the key location by using the [▲] or [▼] keys). (The encryption algorithm is fixed at Saville in radio software version 2.33 and higher.) When the correct algorithm is displayed, the user presses [ENT] to confirm the selection. An encryption algorithm is assigned to a key fill location prior to loading a key into that location. Whenever that particular key is selected for use, the assigned algorithm is also selected (see Key Selection below). To successfully load key, the key location and algorithm must be selected and match information contained within the key being loaded or, in the case of "short" key, match the provided defaults. When the desired key location and algorithm are displayed, the operator presses the PTT switch to load key. The radio signals the keyfill device to begin to output the key. One of the following scenarios are possible: (1) Key is successfully loaded, (2) key is not successfully loaded, or (3) an invalid key is recognized (e.g., a Saville traffic key in location 1) and the radio alarms.

2.2.3.2.2.1 Scenario 1-Key loaded successfully
The display reverts to the key selection screen with the next key location automatically selected. The display automatically advances through locations TEK 1 through TEK 5 and KEK.

2.2.3.2.2.2 Scenario 2-Key not loaded successfully
If a key does not load successfully (due to such causes as not having a key loaded in the keyfill device or a bad connection between the keyfill device and the radio), the display will revert to the key selection screen (Figure 2-28) with the same key location displayed. Check that the keyfill device has a key loaded and that there is a good connection to the radio.

2.2.3.2.2.3 Scenario 3-Alarm Screen
If the key is recognized as an invalid key, the radio will register an alarm (see Default Display, Figure 2-5). The operator must press the PTT to clear the alarm.

When the alarm is cleared by pressing PTT, the process restarts with the COMSEC key fill screen. If the operator continually (more than three times in a row) experiences Scenario 2-Alarm, then either the key fill device is bad, the MBITR is bad, the key fill device has a bad key or no key, or the key fill device is turned off. The operator should turn off and remove the key fill device. Both the MBITR and the key fill device should be checked by the appropriate repair facility.

2.2.3.2.3 TRANSEC (SINCGARS) Key Fill Operation

TRANSEC FILL

CH 5
PRESS PTT TO LOAD

Figure 2-29 TRANSEC Fill Screen

The MBITR can provide anti-jam protection for transmissions through the use of a transmission security (TRANSEC) frequency hopset and frequency hopping algorithm. Select TRANSEC FILL and press [ENT] to display Figure 2-29. Then connect an Electronic Counter Counter-Measures (ECCM) fill device (MX-18290/VRC) to the audio/keyfill connector (use the audio/keyfill adapter on the maritime version).

2.2.3.2.3.1 Loading FH Frequency Sets

To load one of the SINCGARS hopsets (frequency sets), use the [▲] or [▼] keys to change the third line of the display to CH 1-6 or MAN, corresponding to SINCGARS channels 1-6 and Manual. Press the radio PTT switch.

2.2.3.2.3.2 Loading Lockout Set

To load the SINCGARS lockout set, use the [▲] or [▼] keys to change the third line of the display to LOUT, select the lockout set location on the ECCM fill device, and press the radio PTT switch.

2.2.3.2.4 MODE 2/3 Key Fill Operation

Figure 2-30 MODE 2/3 Key fill

Mode 2/3 Key fill is a method for loading all COMSEC keys and TRANSEC (SINCGARS) hopsets and lockout sets at one time. The device used for performing this key fill method is the AN/CYZ-10, Data Transfer Device (DTD), a hand held device used for display, key preparation, key transmission, key reception, key storage, and key accountability functions. The DTD should be set up for ICOM (Integrated COMSEC) fill. Then follow the instructions on the DTD screen. The DTD will display "Successful Transfer" when the COMSEC keys and SINCGARS loadset are loaded in the MBITR. Complete operating instructions for the DTD are contained in 0N477340, Data Transfer Device Users' Manual.

2.2.3.2.5 HAVEQUICK I/II TOD Fill

Figure 2-31 TOD Selection Screen

Time of Day (TOD) Fill is used to load a HAVEQUICK time of day, transmit a time of day, or perform an Emergency Initialization. To load, first ensure the radio is set to a HAVEQUICK SC channel. Then select TOD from the main keyfill menu and press [ENT]. The TOD selection screen (Figure 2-31) will open. Use the [▲] or [▼] keys to select one of the options and press [ENT].

Figure 2-32 TOD Fill Screen

If "PLGR TOD" is selected, the TOD Fill screen (Figure 2-32) will open. Enable the HAVEQUICK data port on the PLGR by setting HAVEQUICK to ON. The Time Figure of Merit (TFOM) must be less than or equal to 7 and the PLGR must be operating in either CONT or FIX modes. (See PLGR (AN/PSN-11) Operation manual for more information.) Attach the PLGR to the side connector (using a GPS cable, p/n 3500465-501) on the radio and press the radio PTT switch to load the Time of Day.

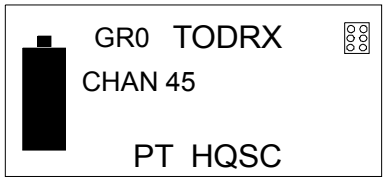


Figure 2-33 TOD RX Screen

If "RX TOD" is selected, the default screen with a flashing "TODRX" message will open (Figure 2-33). The radio is now ready to receive a transmitted Time of Day message. When a TOD message is received, the "TODRX" message will disappear. Pressing [ESC] will also remove the message.

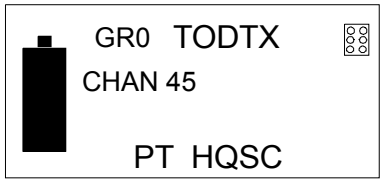


Figure 2-34 TOD TX Screen

If "TX TOD" is selected, the default screen with a flashing "TODTX" message will open (Figure 2-34), if the radio contains a HAVEQUICK TOD. Pressing the PTT will transmit the TOD.

If "EMER INIT" (Emergency Initialization) is selected, the radio is directed to start/restart its HAVEQUICK TOD clock and act as if the time has been received externally. The restart time will be: HOURS = 00, MINUTES = 00, SECONDS = 00, DAY = 0XX (if a day between 01 and 31 has been entered, otherwise = 000), YEAR = 80.

2.2.3.2.6 HAVEQUICK I/II MWOD-A Fill

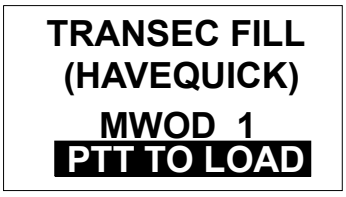


Figure 2-35 MWOD-A Screen

(NOTE: This function is currently disabled.) The MWOD-A (Multiple Word of Day) fill selection is used to load the HAVEQUICK I/II MWOD from an external device (such as a KYK-13 or KOI-18). When the fill screen (Figure 2-35) opens, the default location is MWOD 1. Use the [▲] or [▼] keys to scroll through the MWOD values (1-6) to the desired initial location. Press the radio PTT to load the first MWOD set. If the load is successful, the MWOD value on the screen will increment by one. Continue pressing the PTT until all the MWOD sets are loaded.

2.2.3.2.7 HAVEQUICK I/II MWOD-M Fill

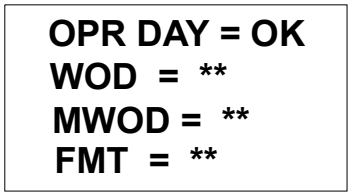


Figure 2-36 MWOD-M Screen

The MWOD-M (Multiple Word Of Day - Manual) screen allows the user to load HAVEQUICK I/II data through the keypad and display. When MWOD-M is selected on the keyfill screen, the first screen that opens (Figure 2-36) is for the selection of individual parameters. "OK" indicates there is already a valid entry for that parameter; "**" indicates that an entry is required.

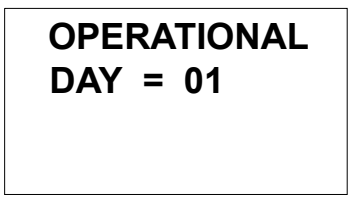


Figure 2-37 OPR DAY Screen

Selecting OPR DAY allows the user to add the Operational Day setting. When the OPR DAY screen (Figure 2-37) opens, press [ENT] to enable the change mode (ones digit will be in reverse video). Use the [▲] or [▼] keys to select the desired value and [ALT] with the [▲] or [▼] keys to move to the tens digit. Allowed values are 01 to 31. (NOTE: The Operational Day will advance at midnight (HAVEQUICK time) to the next value.)

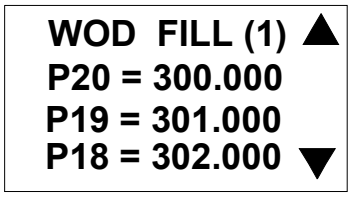


Figure 2-38 WOD FILL Screen

Selecting WOD allows the user to add the HAVEQUICK I Word of Day. The WOD FILL screen (Figure 2-38) opens with P20 outlined. Press [ENT] to enable the change mode and change the values as on previous screens. Allowed values are 225.000 to 399.975. (NOTE: P20 entry must end in 00, 25, or 50.) In order to use a HAVEQUICK I Training Net, the P20 entry must be 300.0XX and a valid HAVEQUICK I training net (see paragraph 2.2.3.3.5 for training net requirements) is selected. Scrolling up from the P20 line reverts to the MWOD-M screen (Figure 2-36); scrolling down from the P18 line opens the second WOD FILL screen (for P17 through P15). Scrolling down from P15 on this screen reverts to the MWOD-M screen.

Selecting MWOD allows the user the add the HAVEQUICK II Multiple Word of Day (Figure 2-39). Use the [▲] or [▼] keys to select MWOD 1-6 and press [ENT] to select one of the MWOD locations. The next screen (Figure 2-40) opens with P20 outlined. Press [ENT] to enable the change mode and change the values as on previous screens. Allowed values are 225.000 to 399.975. (NOTE: P20 entry must end in 00, 25, or 50.) In order to use a HAVEQUICK II Training Net, the P20 entry must be 300.0XX and a valid HAVEQUICK II training net (see paragraph 2.2.3.3.5 for training net requirements) is selected.

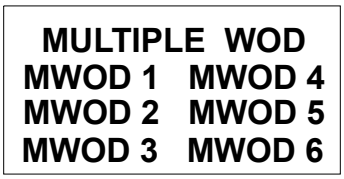


Figure 2-39 MWOD FILL Screen (1)

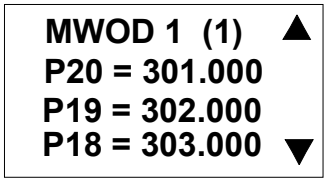


Figure 2-40 MWOD FILL Screen (2)

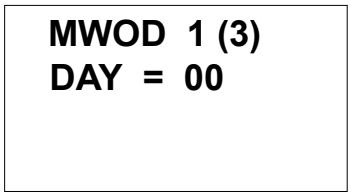


Figure 2-41 WOD FILL Screen (3)

Scrolling up from the P20 line reverts to the MWOD screen (Figure 2-39); scrolling down from the P18 line opens the second MWOD FILL screen (for P17 through P15). Scrolling down from P15 on the second screen opens the MWOD Day of the Month screen (Figure 2-41). Allowed values are 00 to 31. (Entering 00 disables that MWOD.) An MWOD will not be selected unless the MWOD Day of the Month equals the Operational Day. When the radio is in HAVEQUICK II mode, there must be an MWOD with the Day of the Month equal to the Operational Day. The Operational Day automatically advances at midnight (HAVEQUICK time) and there must be an MWOD with Day of the Month equal to the new Operational Day.

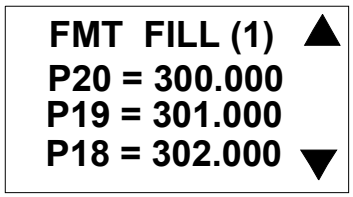


Figure 2-42 FMT FILL Screen

Selecting FMT allows the user to add the HAVEQUICK I/II Frequency Management Training frequencies. The FMT FILL screen (Figure 2-42) opens with P20 outlined. Press [ENT] to enable the change mode and change the values as on previous screens. Allowed values are 225.000 to 399.975 (in 25 kHz increments). Scrolling up

from the P20 line reverts to the MWOD-M screen (Figure 2-36); scrolling down from the bottom line opens the second FMT FILL screen, and continuing to scroll down through subsequent screens opens additional FMT FILL screens (six screens in total for values P20 through P05). Scrolling down from the last FMT FILL screen reverts to the MWOD-M screen.

2.2.3.2.8 Key Selection

The INFOSEC firmware controls the encryption key selection. The user can select either plain (PT) or cipher (CT) operation for individual channels (Figure 2-52), as long as a key is loaded in the TEK location assigned to the selected channel (see Basic Channel Programming Options). If ciphertext is selected and no key is loaded into the assigned TEK location, the radio will alarm. Note that selecting key selects the algorithm (Saville or Padstone) assigned to that key (see COMSEC Key Fill Operation). (See 2.2.2.7.1, MODE Select for additional information.)

2.2.3.2.9 Over-The-Air-Rekey (OTAR)

The MBITR can receive, but not transmit, over-the-air-rekey (OTAR). The following instructions are given for transmitting/receiving OTAR using a DTD (AN/CYZ-10) and SINCGARS to transmit the rekey data. Other equipment (e.g., KYX-15) may also be used; consult the SINCGARS operating manual for instructions. In order for the rekey to be successful, the MBITR must be set to the Ciphertext (CT) mode with the same TEK selected as that being used by the transmitting radio. Prior to attempting OTAR, verify that there is secure voice communication between the MBITR and the transmitting radio on the "old" TEK.

a. Preparation:
   1. Load the DTD with the KEK and the new TEK.
   2. Load the MBITR with the KEK and the old TEK.
   3. Load the SINCGARS with the old TEK and the new TEK.
b. On the DTD:
   1. Turn on and select the "Fill" application. Use the 'Utility" function, if necessary, to select the K15 (KYX-15 emulation) protocol.
   2. Press "N" to select the "Net" function.
   3. Press "A" to select the "SARK-AK" function.
   4. Press "CLR" key.
   5. Select the KEK on the DTD screen and press "ENTER".
   6. Press "E".
   7. DTD will briefly display "1 KEK selected" and then display "Select TEK".
   8. Press "CLR".
   9. Select the new TEK on the DTD screen and press "ENTER".
   10. Press "E".
   11. Press "E" again.
   12. Connect the DTD to the SINCGARS (or other sending radio) and press "SEND".
c. The new TEK is transferred. Verify that communications on the old TEK is not possible. Switch the transmitting radio to the new TEK and confirm voice communications.
d. Once successful communications are established with the new TEK, the operator should perform a Variable Update (VU) on the KEK stored in the DTD. The KEK in the MBITR is updated automatically after successful receipt of an OTAR.

2.2.3.2.10 Electronic Remote Fill (ERF)

The MBITR can receive, but not transmit, SINCGARS Electronic Remote Fill (ERF) data. ERF is used to send additional FH data (hopsets and lockout sets) during net opening or to update FH data during net operations . The Net Control Station (NCS) will initiate ERF. The following instructions are for MBITR users:

a. When notified by the NCS of ERF, leave the radio in the current operating configuration.
b. If a hopset is received, the screen will change to Figure 2-44. Use the [▲] or [▼] to select the SINCGARS channel location (1-6) and press [ENT] to store the data.
c. If a lockout set is received, the screen will change to Figure 2-43. The lockout set storage location (1-8) is pre-determined by the Network Controller. Press [ENT] to store the lockout set data.

Figure 2-44 Hopset ERF

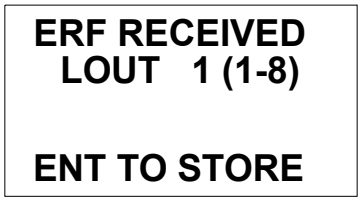


Figure 2-43 Lockout Set ERF

2.2.3.3 Programming

Figure 2-45 Initial Programming Screen

A typical programming screen or menu may contain one or more Sub Menu selections or Field / Item selections. The main menu screen is shown in Figure 2-19. Select PROGRAM and press [ENT] to open the initial programming screen, illustrated in Figure 2-45. The PROGRAM Menu has four available choices: GLOBAL, RADIO CONFIG, EMERGENCY, and GROUP.

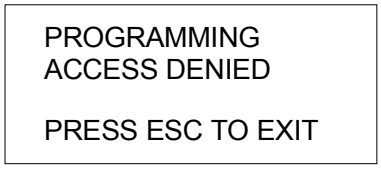


Figure 2-46 Restricted Access Screen

The operator's access to radio programming, and other functions such as Zeroize, can be selectively restricted by the PC Programmer. If a function is disabled for keypad access, the screen in Figure 2-46 will appear when the operator selects that function.

2.2.3.3.1 Global Programming Options

Table 2-3 Global Options

Label	Parameter	Value
TX TIMEOUT	Transmit Timeout (in seconds)	30, 60, 90, 120, INF
BL TIMEOUT	Display Backlight Timeout (in seconds)	10, 20, 30, 40, INF (no timeout)
SET CLOCK	Sets the internal real time clock that is used for frequency hopping operation.	Days (two digit Julian date) and time (in hours and minutes)

Table 2-3 Global Options

Label	Parameter	Value
SIDE/MIC LVL	Enables or disables Side Connector; Selects MIC sensitivity for normal (low) or whisper (high) gain. The MIC LOW setting provides normal gain and includes whisper mode at the two lowest settings. MIC HIGH sets the gain to a level higher than the MIC LOW whisper mode setting across all volume settings.	Enable/Disable LOW/HIGH

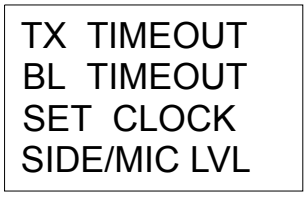


Figure 2-47 Global Programming Screen

The Global Programming Screen (Figure 2-47) opens with SIDE/MIC LVL outlined. The other global parameters are selected by pressing the [▲] or [▼] keys. Pressing [ENT] with any parameter selected accesses a value selection screen with the current selection shown in reverse video. Figure 2-48, Figure 2-49, Figure 2-51, and Figure 2-50 show the different value screens. Pressing the [▲] or [▼] keys will move the highlighting to a new value. To select the new value, press [ENT]. To exit the menu structure, press the [ESC] key.

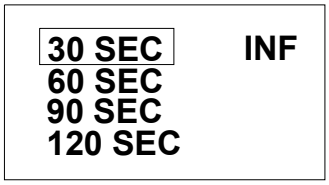


Figure 2-48 Transmit Timeout Screen

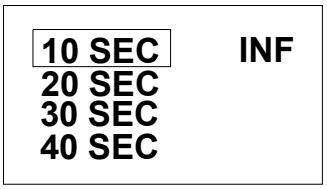


Figure 2-49 Backlight Timeout Screen

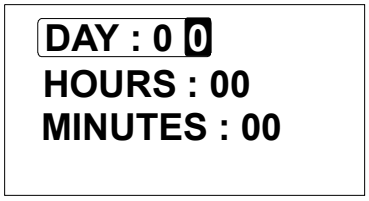


Figure 2-50 Set Clock Screen

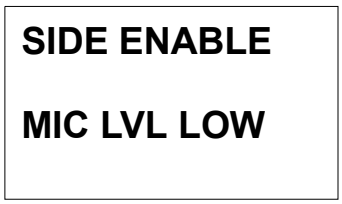


Figure 2-51 Side Connector Enable

2.2.3.3.2 RADIO CONFIG

The RADIO CONFIG screen (Figure 2-52) allows the user to program the general channel values (channel number, encryption mode, channel label, and output (TX RF) power) and select the operating mode (the type of radio operation to be programmed in a channel). The screen opens with the Channel Number outlined. To change the units digit, press [ENT] to show the units digit in reverse video (white on black) and use the [▲] or [▼] keys to scroll up or down. To move to the next digit to the left, press [ALT] and [▲] and then scroll up or down using the [▲] or [▼] keys. To move to the encryption mode setting, press [ENT]. To change the setting, press [ENT] again and use the [▲] or [▼] keys to toggle between PLAIN and SECURE. To move to the Channel Label, press [ENT]. To change the label, press [ENT] again. The rightmost character is now in reverse video. To select a new character, scroll up or down using the [▲] or [▼] keys through the 36 alphanumeric characters. When the desired character is displayed, press [ALT] and [▼] to move the highlighting to the next character. When all the characters of the new label have been selected, press [ENT] to confirm and move the outline to the output power setting. Press [ENT] again to change to reverse video and press the [▲] or [▼] keys to scroll through the available power settings. Press [ENT] to confirm and move to the operating mode [OPER MODE] selection. Press [ENT] to enable the change mode and use the [▲] or [▼] keys to scroll through the different operating modes: Basic (AM or FM), SINCGARS, ANDVT, and HAVEQUICK I/II. *SINCGARS, ANDVT, and HAVEQUICK I/II require optional software.* Select the radio operating mode and press [ENT] to confirm. To scroll through the selections or move to the next screen, press [▼] (see Figure 2-53). To scroll up the screen to previous selection or to return to this screen from the following screen, use the [▲] key. On the following screens, only the programmable parameters available for the selected operating mode are displayed; other parameters are blanked out.

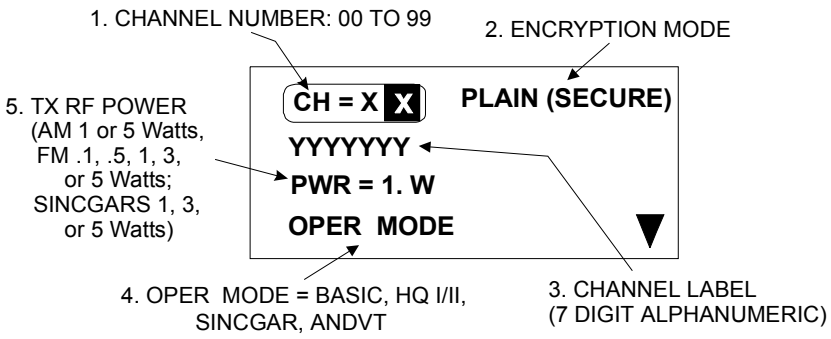


Figure 2-52 RADIO CONFIG Screen

2.2.3.3.3 Basic Channel Programming Options

The Basic Channel Programming screens (two screens) allow the user to set channel-specific parameters from the front keypad and display. The actual programmable parameters displayed will vary depending on the individual channel configuration (operating mode). If a parameter is not available in a certain configuration, that selection will be blanked out on the display. Individual channels can be programmed for:

Table 2-4 Channel Options (Basic)

Parameter	Value
RX / TX	Receive/Transmit Frequency 30-512 MHz
R / T	Receive/Transmit Squelch (CTCSS) tones - see paragraph 1.3.1.2 (active for FM PT only)
Modulation type	AM (Amplitude Modulation)(25 kHz), FM (Frequency Modulation)(25 kHz), or NB (Narrowband FM)(12.5 kHz)
COMSEC key	Select key location TEK 1-5 (Saville or Padstone)
Initial Synchronization	OFF/ 256 msec / 384 msec/ 1.06 second
Traffic Rate	12 or 16 kbps
Fade Bridge (in seconds)	1.0, 2.0, 3.0, 4.0, 0.0
Repeater Delay (in seconds)	.2, .4, .6, .8, 1, NONE
Squelch Level	6, 8, 10,12, 14, 16 dB (above background)

The Basic Channel Programming Screen (Figure 2-53) opens with the RX (receive) frequency outlined. To change the frequency, press [ENT] to highlight the rightmost significant digit of the frequency with reverse video. To change the units digit, scroll up or down using the [▲] or [▼] keys. To change the first digit of the frequency, press [ALT] and [▲] to move the reverse video highlighting and then scroll up or down using the [▲] or [▼] keys. Change the remaining digits of the frequency by pressing [ALT] and [▲] and then scrolling up or down using the [▲] or [▼] keys. Note that the TX frequency changes as the RX frequency is changed. To confirm the new frequency and move the selection outline to the TX (transmit) frequency, press [ENT]. Press [ENT] again to enable the change mode. By pressing the [▲] or [▼] keys to change the displayed values, and [ALT] and [▲] to move the highlighting, program in a new TX frequency. Note that when the TX frequency is changed, the RX frequency does NOT change. Press [ENT] to move to the RX CTCSS selection and [ENT] again to enable the change mode. For programmable parameters that have a limited number of choices (squelch tone, modulation, encryption key location, receive and fade delay, synchronization, and traffic rate), scroll through a list of the available choices by pressing the [▲] or [▼] keys. When the desired choice is displayed on the screen, press [ENT] to move to the next parameter. Alternately, if you do not want to change a selection, press the [▼] to move to the next line (or the next screen) or [▲] to move to the previous line (or previous screen).

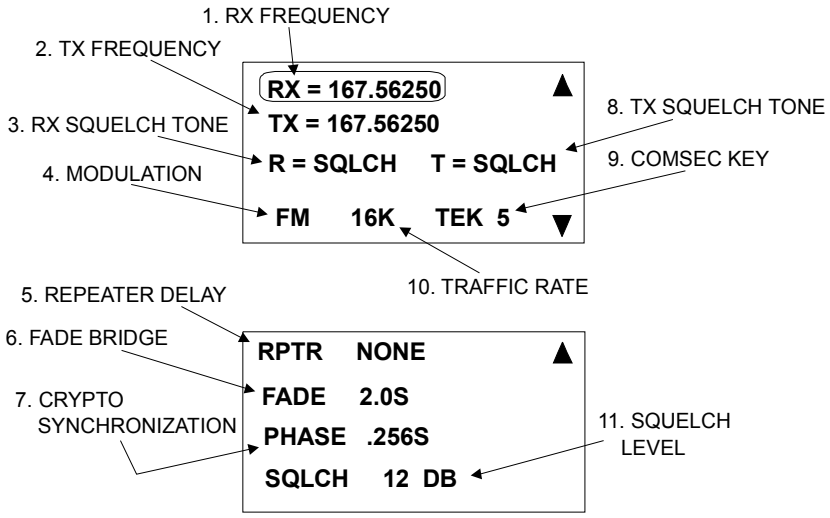


Figure 2-53 Basic Channel Programming Screens

2.2.3.3.4 SINCGARS Channel Programming Options

The SINCGARS Channel Programming screens (two screens) allow the user to set channel-specific parameters from the keypad and display. Individual channels can be programmed for:

Table 2-5 Channel Options (SINCGARS)

Parameter	Value
SINCGARS	SINCGARS Channel: 1-6, MAN, CUE
ECCM	Electronic Counter Counter-Measures Mode: SC (Single Channel) or FH (Frequency Hopping) (if SINCGAR=MAN or CUE, ECCM must be SC)
FX	Single Channel Frequency: 30.000 MHz to 87.975 MHz in 25 kHz steps
OFFSET	Frequency offset (in kHz) (single channel): -10, -5, 0, +5, +10
NET ID	Communications Net Identification Number: 000 to 999
DATA	Data Transmission Rate: 600, 1200, 1200N, 2400, 2400N, 4800, 4800N, 9600N, 16000, PCKT (Packet), or RS232
TEK	COMSEC key location: TEK 1-5
FADE	Fade Bridge (in seconds): 1.0, 2.0, 3.0, 4.0, 0.0

The SINCGARS Channel Programming Screen (Figure 2-54) opens with the SINCGARS channel selection outlined. To change the selected channel, press [ENT] to highlight the channel number and scroll up or down using the [▲] or [▼] keys. To confirm the new channel and move the selection outline to the ECCM mode, press [ENT]. The remaining parameters are changed similarly. Note that modulation Type (FM) cannot be changed.

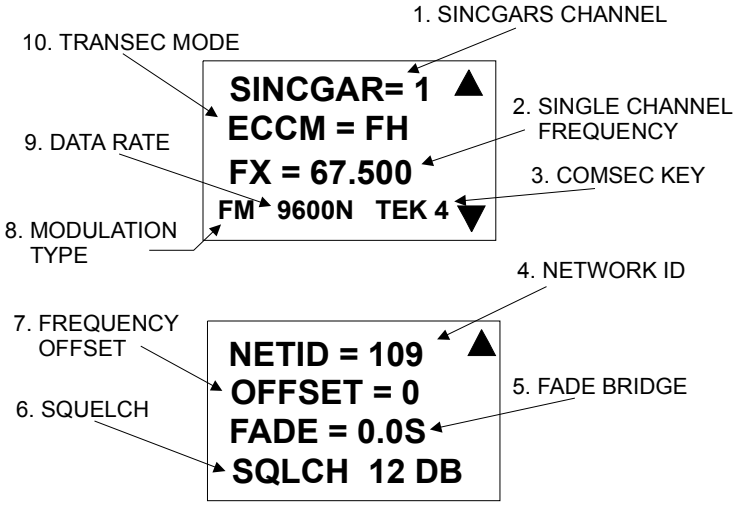


Figure 2-54 SINCGARS Channel Screens

2.2.3.3.5 HAVEQUICK Channel Programming Options

The HAVEQUICK Channel Programming screens (two screens) allow the user to set channel-specific parameters from the front keypad and display. If ECCM = SC, the first line will show FX =; if ECCM = FH, the first line will show NET =. Individual channels can be programmed for:

Table 2-6 Channel Options (HAVEQUICK)

Parameter	Value
FX	HAVEQUICK Single Channel Frequency; 25 kHz tuning steps must end in 00, 25, 50, or 75
NET (Alternate)	HAVEQUICK I and II Nets; must end in 00, 25, or 50
ECCM	Electronic Counter Counter-Measures Mode: SC (Single Channel) or FH (Frequency Hopping)
TEK	COMSEC key location: TEK 1-5
RPTR	Repeater Delay (in seconds): Disabled in HAVEQUICK I/II
FADE	Fade Bridge (in seconds): 1.0, 2.0, 3.0, 4.0, 0.0
PHASE	Initial Crypto Synchronization Preamble Length: OFF/ 256 msec / 384 msec/ 1.06 second
SQLCH	Squelch Level: 6, 8, 10,12, 14, 16 dB (above background)

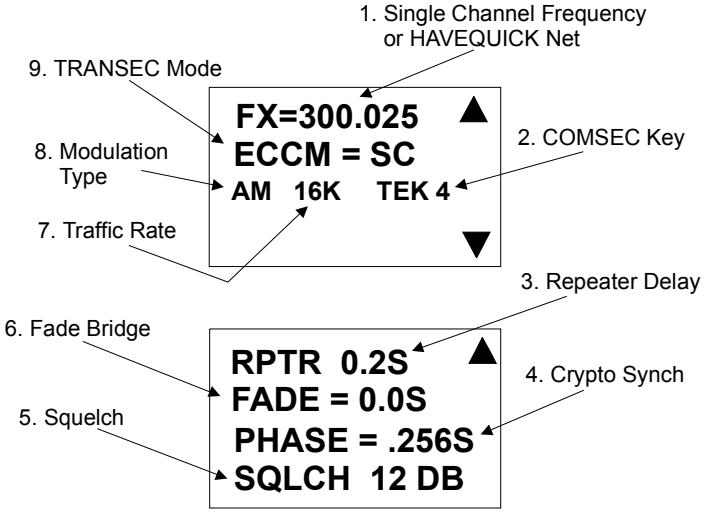


Figure 2-55 HAVEQUICK Channel Screens

The HAVEQUICK Channel Programming Screen (Figure 2-55) opens with the HAVEQUICK Net (NET) or Single Channel Frequency (FX) outlined. To change the selected net or frequency, press [ENT] to highlight the rightmost digit and scroll up or down using the [▲] or [▼] keys. To move to the next digit, hold down the [ALT] key and press the [▲] or [▼] key. When the new frequency or net is keyed in, press [ENT] to confirm the information and move the selection

outline to the ECCM mode. The remaining parameters are changed similarly. Note that Modulation Type (AM) and Traffic rate (16K) cannot be changed.

To use the HAVEQUICK Training Nets, NET must be set to A00.000 – A00.400 for HAVEQUICK I or A00.025 – A01.525 for HAVEQUICK II. P20 of the WOD (for HAVEQUICK I) or MWOD (for HAVEQUICK II) must be set to 300.0xx.

2.2.3.3.6 ANDVT Channel Programming Options

The ANDVT Channel Programming screens (two screens) allow the user to set channel-specific parameters from the keypad and display. Individual channels can be programmed for:

Table 2-7 Channel Options (ANDVT)

Parameter	Value
RX / TX	Receive/Transmit Frequency 30-512 MHz
DELAY	135, 295, 600, 895, 1200 (msec).
Modulation	PSK (Phase Shift Keying) (Fixed)
Data Rate	2.4 kbps (Fixed)
COMSEC Key	TEK 1-5
Repeater Delay (in seconds)	.2, .4, .6, .8, 1, NONE
Fade Bridge (in seconds)	1.0, 2.0, 3.0, 4.0, 0.0
Training Frames	Number of frames = 6, 9, 12, 15, 30, 60.
Squelch Level	6, 8, 10,12, 14, 16 dB (above background)

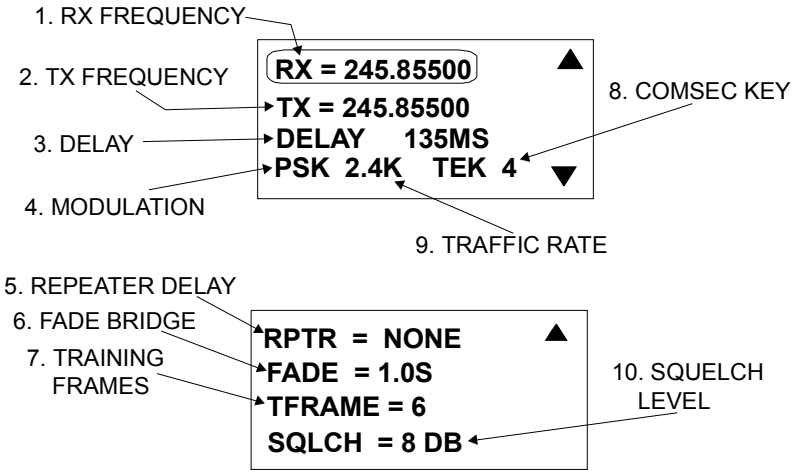


Figure 2-56 ANDVT Channel Screens

The ANDVT Channel Programming Screen (Figure 2-56) opens with the RX (receive) frequency outlined. The RX and TX frequency programming are identical in operation with the Basic

Channel. Other parameters are programmed similarly. Delay is the time between the transmit carrier going active without modulation and the carrier having modulation applied. A training frame is a 32-bit pattern of alternating "0s" and "1s". Training frames are used to improve the chances of initial signal acquisition by providing a repetitive pattern for synchronization and mode identification. Using the maximum setting of 60 frames will extend the turnaround time of communications due to the increased header times.

2.2.3.3.7 Group Programming Options

Table 2-8 Group Options

Parameter	Value
Group Number	One digit: 0-9
Group Label	Three characters: A-Z, 0-9, @, ?, >, <, ;, :, and blank
Channel Number	00-99
Channel Select Switch Position	1-16

The Group Programming Screen (Figure 2-57) displays the current Group Number, Group Label, the current Channel Number, and the corresponding Channel Select switch position. The GROUP programming screen allows the user to add and remove individual channels from a group, assign a selected channel to a selected channel switch position, and change a group label. The screen opens with "GR = " outlined or selected. Pressing the [▲] or [▼] keys will increment or decrement the Group Number. To move to the first character of the group label (GR2 on the sample screen), press [ENT]. Press [ALT] and [▲] to select the second character, and [ALT] and [▲] again to select the third character. To change any of the selected characters, press the [▲] or [▼] until the desired character appears on the screen. To select the tens digit of the channel number (CH=49), press the [ENT] key, then [▼] to move the selection outline, and then [ENT] again. To change this digit, use the [▲] or [▼]. Press [ALT] and [▲] to move to the units digit and use the [▲] or [▼] to change the selected digit. When the user changes the rotary switch position, the channel number and switch position shown on the display will also change. To add or change a channel in the current group, place the rotary switch on the desired location, set the desired channel, and move the selection outline to ENABLED (using the [▲] or [▼] keys to move the selection outline). Press [ENT] and then [▲] or [▼] to toggle between ENABLED (which adds the channel in the current switch position) and DISABLED (which removes the channel and makes the current switch position EMPTY). To exit the Group Programming Screen, press the [ESC] key twice.

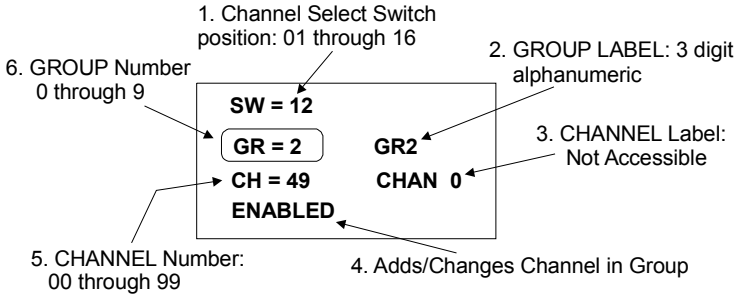


Figure 2-57 Group Programming Screen

2.2.3.3.8 Emergency Programming Options

The Emergency Programming screen (Figure 2-58) is accessed from the main function menu (Figure 2-19). This screen allows the user to select either the user-programmable emergency beacon channel (Figure 2-59) or situation awareness (Figure 2-60) programming. The user-programmable parameters for the emergency beacon channel are: transmit frequency and transmit on/off times. The transmit frequency is limited to the range of 116.00-149.975 MHz or 225.00-399.975 MHz. The transmit on/off times can be set to a maximum of 30 seconds each. For situation awareness, the user can set the Combat Identification (CID) and enable the radio to transmit and receive GPS data through the situation awareness mode of operation. **NOTE:** In addition to enabling TX SA and RX SA, the radio must be in CT mode for Situation Awareness to be active.

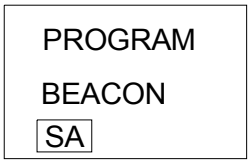


Figure 2-58 Emergency Programming Screen

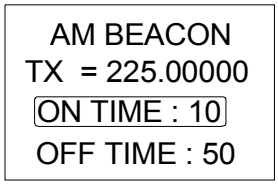


Figure 2-59 Beacon Programming

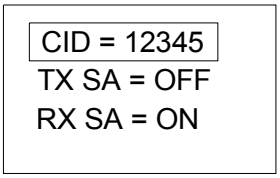


Figure 2-60 SA Programming

2.2.3.4 Radio Maintenance Operation

The available radio maintenance operations allow the user to activate Built-In-Test (BIT) functions, check the internal real-time clock, check the enabled radio options, or display elapsed operating time. The initial Radio Maintenance Screen (Figure 2-61) is reached from the Main Menu Screen (Figure 2-19).

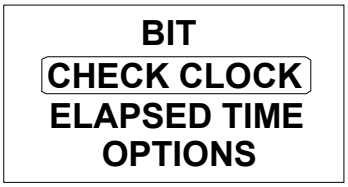


Figure 2-61 Radio Maintenance Screen

2.2.3.4.1 Built-In Test

The Built-In-Test function allows the user to run a self-test of the primary radio boards: Control CCA, Keyfill, Power Amplifier, and Synthesizer. Selecting BIT and pressing [ENT] begins the test. The screen displays "Performing Tests" while BIT is running. At the test conclusion (10-15 seconds), the screen will show the test results (PASS or FAIL) for each board.

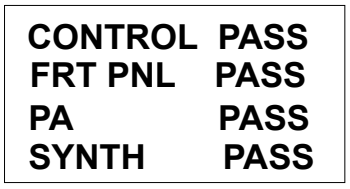


Figure 2-62 Built-In-Test Screen

2.2.3.4.2 Check Clock

The Check Clock Screen allows the user to check the internal real-time clock. The time is displayed in hours:minutes:seconds:tenths of seconds. The Julian day value is from 00 to 99.

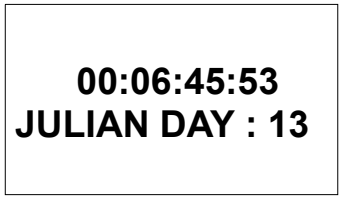


Figure 2-63 Check Clock Screen

2.2.3.4.3 Elapsed Time

The Elapsed Time Screen shows the total time the radio has been in Transmit mode (PTT pressed), Receive mode (actively receiving radio signals with audio output), and Standby mode (powered on but neither transmitting nor receiving). The time is shown in hours:minutes.

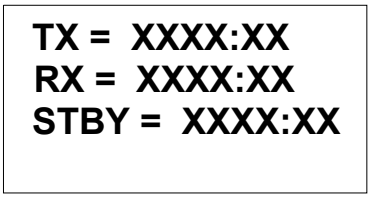


Figure 2-64 Display Elapsed Time Screen

2.2.3.4.4 Options

The Options Screen displays the enabled radio operating software options. The available options are Basic, Retrans, SINCGARS, ANDVT, and HAVEQUICK I/II (HQII). This screen is for information only. The user cannot change the enabled options.

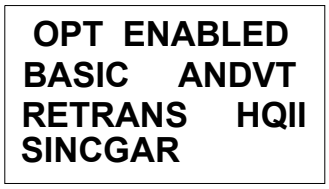


Figure 2-65 Options Enabled Screen

2.2.4 SCAN

The SCAN, or channel monitoring, function allows the radio to monitor traffic on multiple channels. SCAN can monitor clear channels and secure channels with different TEKs and different traffic rates (either 12 or 16 kbps). SCAN does NOT monitor frequency hopping channels. If a frequency hopping channel is included in a SCAN Plan, that channel is skipped during scanning. If SCAN is selected while the radio is set to a frequency hopping channel, SCAN will not initiate. If a Scan Plan contains both Basic and ANDVT channels, the radio will scan either Basic or ANDVT channels, depending on which type is the Home Channel when Scan is initiated.

2.2.4.1 Definitions

2.2.4.1.1 Home Channel

The Current Selected Channel becomes the "HOME" channel from which all other channels are scanned. Normal receive and transmit operations may only be performed from the Home channel.

2.2.4.1.2 Normal SCAN

In Normal SCAN mode, the radio scan function sequentially checks each channel in the current selected Scan Plan for radio signals. If a signal is detected, the radio pauses on that channel until 2 seconds after activity ceases (to allow the user an opportunity to answer). If the user presses the PTT switch during the 2 second "hold" period, the radio will automatically transmit on the received scan channel.

2.2.4.1.3 Priority Monitor

In Priority Monitor mode, the radio alternates between the Scan Plan channels and either one or two Emergency Monitor (Priority) channels in the following sequence (Priority channels are PR1 and PR2): PR1-PR2-CH1-PR1-PR2-CH2-PR1-PR2-CH3-PR1 . . . . ..

2.2.4.2 Scan Operation

Open the initial SCAN operation screen (Figure 2-66) by pressing [ALT] and [GR] from the default display (Figure 2-5). The display has four choices: SCAN (enable), PRI (Priority selection), SPLAN (select a scan plan), and CONFIG (program a scan plan). Press [▲] or [▼] and then [ENT] to select one of the choices. Press [ESC] to return to the Main Menu.

Figure 2-66 SCAN Operation Screen

2.2.4.2.1 Active SCAN Screen (SCAN)

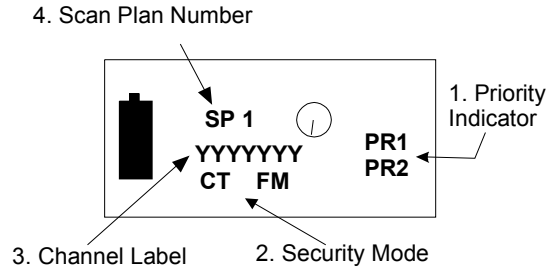


Figure 2-67 Active SCAN Screen

The screen for Active Scan (Figure 2-67) shows the channel and Scan Plan label for the Home Channel (the channel selected by the channel select switch). If the Priority Channel Scan has been activated (see following paragraph), the display will include PR1 and/or PR2. If a signal is detected on one of the channels being scanned, the radio will stop scanning and remain on the received channel as long as a signal is present. The channel label on the display is updated to reflect the active channel. The radio will remain on the received channel for approximately 2 seconds after a signal ends to allow the operator to respond to the received traffic. The Scan function can be stopped (and the display returned to the default screen (Figure 2-5)) by pressing the [ALT] and [GR] or [ESC] keys.

2.2.4.2.2 Priority Channel Assignment Screen (PRI)

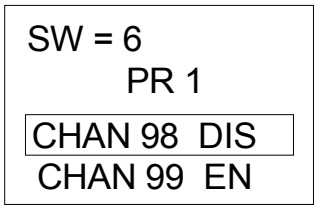


Figure 2-68 Priority Channel Assignment

The Priority Channel Assignment Screen (Figure 2-68) allows the user to select the Priority 1 and Priority 2 channels from the channels already programmed in the selected scan plan. To select, move the outline to either the first or second channel label (PR 1 or PR 2) and turn the channel select knob on top of the radio. The channel label associated with that switch position will appear on the display. When the desired channel is displayed, press [ENT] to switch to reverse video. Use the [▲] or [▼] keys to toggle between EN (enabled) and DIS (disabled). Press [ENT] again to confirm the selection and move the outline to the next selection. When finished, press [ESC] to the Scan Operation screen (Figure 2-66) with the enabled priority selections displayed. The default Priority channels are the last two channels in the radio.

2.2.4.2.3 Select SCAN Plan (SPLAN)

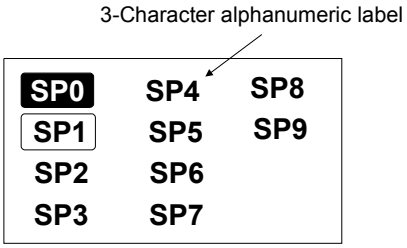


Figure 2-69 Select SCAN Plan

The Select Scan Plan screen (Figure 2-69) opens with the selected Scan Plan highlighted in reverse video. To select a different Scan Plan, use the [▲] or [▼] keys to move the selection outline. Press [ENT] to select the new Scan Plan and return to the Scan Operation screen (Figure 2-66).

2.2.4.2.4 Configure SCAN Screen (CONFIG)

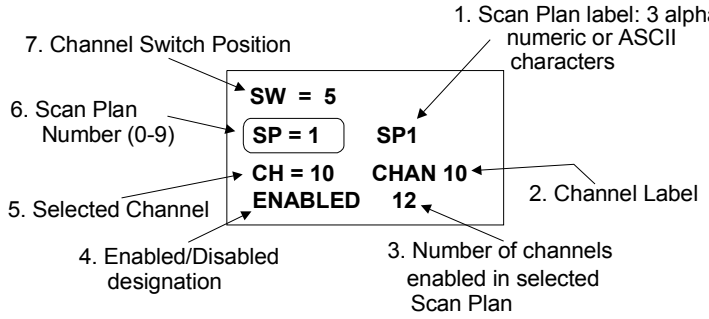


Figure 2-70 Configure SCAN Screen

This screen (Figure 2-70) opens with "SP = " outlined or selected. Press [ENT] to enable the change mode and press [▲] or [▼] to increment or decrement the Scan Plan number. To confirm the change and move to the Scan Plan label, press [ENT] and then [▼]. To change the label, press [ENT] to highlight the first character and press [▲] or [▼] to change. Press [ALT] and [▲] to select the second character, and again to select the third character. Use [▲] or [▼] to change the selected character. To confirm the change and move to the channel number, press [ENT] and [▼]. The channel selection is used to both add and remove channels from a Scan Plan and assign the selected channel to a selected channel switch position. By changing the position of the channel select rotary switch, the "Switch Position" on the screen will change. The selected channel will be "mapped" to the displayed switch position. When the selected channel is outlined, press [ENT] to highlight the tens digit and press [▲] or [▼] to change. Press [ALT] and [▲] to select the units digit. As the channel number is changed in the CH= X display, the label displayed in the CHAN position also changes. Press [ENT] to confirm the channel number and press [▼] to move the selection outline to the Enabled/Disabled position,. Press [ENT] again to enable the change mode and [▲] or [▼] to toggle between ENABLED (included in the selected Scan Plan) and DISABLED (excluded from the selected Scan Plan). Press [ENT] to confirm the change. To exit the Configure SCAN Screen, press [ESC].

2.2.5 Cloning Operation

NOTE

COMSEC/TRANSEC keys cannot be transferred via the cloning mode. HAVEQUICK Operational day, WOD, MWOD, and FMT are transferred.

NOTE

Ensure that both radios are set for INTERNAL AUDIO and SIDE CONNECTOR ENABLED.

The cloning function enables one radio to transfer its programmed data into another radio.

To clone programmed information from one radio to another, connect the SEND end of the cloning cable (3500395-501) to the side connector of the Sending radio (the radio set with the information to be cloned) and the RECEIVE end of the cloning cable to the side connector of the Receiving radio (the radio set to receive the information). Turn on power to both radios (if they are not already both powered on). The cloning cable detects which radio is the Sending radio.

After the initial power-up screen (see paragraph 2.2.2), the following screens will appear:

Sending Radio	Receiving Radio
CLONING PTT TO SEND	CLONING RECEIVE RDY

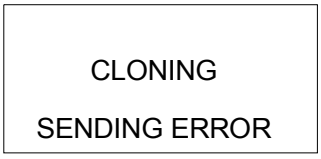
The Sending radio has a timeout period of approximately 20 seconds during which it attempts to establish the connection to the Receiving radio. At the end of the timeout period, if connection is not made, the Sending radio will display an error message.

Press PTT on the Sending radio and the screens should appear as below:

Sending Radio	Receiving Radio
CLONING SENDING DATA	CLONING RECEIVING

When cloning is successfully completed, the receiving radio will reboot and resume normal operation. If the receiving radio is NOT disconnected from the cloning cable or powered off within 15-20 seconds, it will again display the "RECEIVE RDY" message. Press [ESC] to clear the cloning screen from the SEND radio and return to the default display.

If cloning is unsuccessful, or if the connection with the receiving radio is not made within the timeout period, the SEND radio will display the following error message:



2.2.6 Digital Data Operation

NOTE

Ensure the channel is set for encrypted mode (CT) and that the SIDE CONNECTOR is ENABLED.

In order to send or receive digital data, the radio MUST be operating in the encrypted mode AND operating in AM or FM 25 kHz bandwidth (not narrowband (NB)). The radio can also operate in digital data mode when SINCGARS Single Channel or Frequency Hopping or HAVEQUICK Single Channel channels are selected. If the data cable is connected when the radio is set for clear operation, the ERROR message will flash on the screen and an audio alarm will sound.

2.2.6.1 Data Operation using a ViaSat VDC-400 Data Controller

To configure the radio for digital data operation, first select the encrypted operating mode (see Figure 2-15). Then attach the PDC Data Cable (3500466-501) to the radio side connector and to the 25-pin flat serial connector of the ViaSat VDC-400 Personal Data Controller (PCMCIA card). The digital data cable has a switch on the side connector that allows either voice or data operation. When data operation is selected, the display screen appears as shown in Figure 2-71.

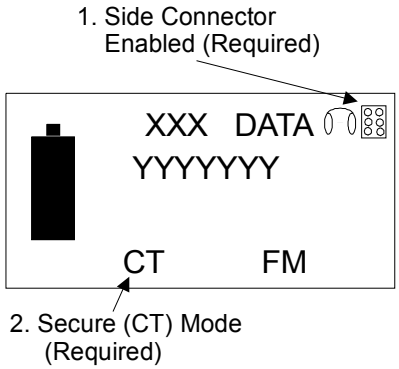


Figure 2-71 Data Operation Screen

When data operation has been selected, all operational control of the radio is transferred to the data terminal device. The radio cannot receive or transmit voice traffic. When voice operation is selected, the radio operates as if the cable was not connected.

For best operation, the ViaSat software on all PC's that are part of the data network should be set as follows:

a. Press F7 key on PC to open configuration window.
b. Compression = ON
c. CSMA = ON
d. Channel mode = Duplex
e. FEC Code = ½
f. Channel Access Speed = Normal
g. Channel Device = KY-57, KY-99, KY-99A
h. Add'l ACK Delay = 1
i. Turnaround Delay = 0.5 sec.
j. Max Packets – 256
k. TX Start Delay = 0.5 sec.
l. TX End Delay = 0.5 sec.

The PDC Data Cable (3500545-501) operates in a similar manner with the ViaSat VDC-200 Compact Data Controller.

2.2.6.2 Data Operation using an RS-232 Data Device

The digital data cable (3500396-501), which connects to a standard 25-pin serial connector, can provide similar capability with selected RS-232 data terminal software. The 3500396-501 cable can also be used in testing radio Bit Error Rate (BER) in data operation. For RS-232 data operation, the terminal software must be able to send and receive the following signals for the radio side connector:

2.2.6.2.1 GNDPWR
This signal provides a common signal ground. This signal is located on pin 1.

2.2.6.2.2 SIDEPTT_RTS
This input signal accepts an RS-232 Request to Send or Push To Talk active high control signal for placing the Receiver/Transmitter in transmit when operating in data mode. A normal contact-closure to ground PTT must be converted to RS-232 for proper operation. A signal with a maximum level of $\pm$25 Vdc and a minimum level of $\pm$3 Vdc is accepted on this pin. This signal is located on pin 8.

2.2.6.2.3 CLK232
This output signal provides an RS-232 clock when operating in the data mode. This signal is used for both transmit and receive synchronous operations. The clock rate is 12 or 16 kbps as determined by the configuration of the selected channel. Transmit data is sampled by the Receiver/Transmitter on the falling edge of the clock and receive data is provided on the rising edge of the clock. The levels provided on this signal are typically $\pm$6 Vdc. This signal is located on pin 10.

2.2.6.2.4 SER232TXD
This input signal accepts RS-232 digital data for encrypting and transmitting when operating in the data mode. This transmit data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. A signal with a maximum level of $\pm$25 Vdc and a minimum level of $\pm$3 Vdc is accepted on this pin. This signal is located on pin 11.

2.2.6.2.5 SER232RXD
This output signal provides RS-232 digital data that was received and decrypted when operating in the data mode. This receive data can be either synchronous at 12 or 16 kbps or asynchronous at

1200, 2400, or 4800 bps. The levels provided on this signal are typically ±6 Vdc. This signal is located on pin 12.

2.2.6.2.6 DDMCN

During normal operations, this input signal selects the data mode. When this signal is grounded, the Receiver/Transmitter goes into the data mode. The Receiver/Transmitter must be programmed in cipher text mode and have a valid key loaded to properly operate in the data mode. This signal is located on pin 14.

2.2.6.2.7 CTS

This output signal provides an RS-232 Clear to Send signal when operating in the data mode. After receiving a RTS, this signal goes active (high) when the Receiver/Transmitter is ready to accept data to be encrypted. The levels provided on this signal are typically ±6 Vdc. This signal is located on pin 17.

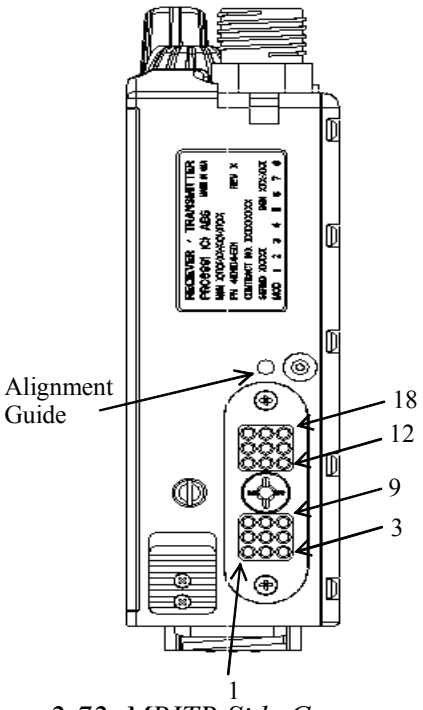


Figure 2-72 MBITR Side Connector Pins

2.2.7 Expedient Retransmission

The MBITR has the capability for "expedient retransmission" when operating in the Basic or ANDVT mode. Note that both radios must be "Basic" or both radios must be "ANDVT". Using two radios (Radio A and Radio B) and an expedient retransmission cable (3500485-501), the retransmission configuration is bi-directional (i.e., can receive and retransmit voice or data, clear or secure traffic on two different frequencies (receive on A and retransmit on B or receive on B and retransmit on A)).

The radio setup for retransmission is flexible. The retransmission channel(s) on each radio can be programmed for either simplex (same receive and transmit frequency) or half-duplex (different receive and transmit frequency) operation. The amount of separation between the receive and transmit frequencies (to prevent accidental keying or a transmit loop) is dependent

on several factors: the actual frequencies selected, the use of filters or a diplexer, and the use of receive CTCSS tones. (NOTE: CTCSS tones are only functional in FM PT mode.) However, it is recommended that the receive and transmit frequencies be separated by AT LEAST 15% of the higher frequency. It is also important that the selected frequencies not be harmonics (multiples) of one another, e.g., if one radio is programmed for 36.75 MHz, the other radio should not be programmed for 73.5 MHz (2X), 110.25 MHz (3X), or 147 MHz (4X). The current retransmission cable is 10 feet in length. Planned receive and transmit frequencies for retransmission should be tested BEFORE being used in the field.

The retransmission kit (part number 1100540-501) includes the retransmission cable (p/n 3500485-501), two antenna cables, and four RF filters. Filter coverage is shown in the following table:

Table 2-9 Retransmission Kit Filters

Thales Part Number	Filter Marking	Filter Description and Coverage
37128	5L110-88/U400-T/T	Lowpass 88 MHz
37129	5L110-174/U750-T/T	Lowpass 174 MHz
37130	5LH30-136/U300-T/T	Highpass 136 MHz
37131	5LH30-380/U850-T/T	Highpass 380 MHz

To best employ the filter capabilities, it is recommended that the frequency programmed on one of the retransmit radios be below a lowpass filter cutoff and the frequency programmed on the other retransmit radio be above a highpass filter cutoff, as in the following example:

Table 2-10 Retransmission Frequencies (Example)

Radio	Frequency	Modulation	Antenna	Filter
A	236.625 MHz	FM	Broadband	Highpass, 136 MHz
B	57.750 MHz	FM	30-88 MHz	Lowpass, 88 MHz

To activate the retransmission mode, with both radios powered up, connect each end of the retransmission cable to one of the radio side connectors. (Check that the side connector is "ENABLED" on both radios.) Retransmission is completely bi-directional, so the cable is identical at each end. Each radio displays "RETRANS" on the default screen (Figure 2-73).

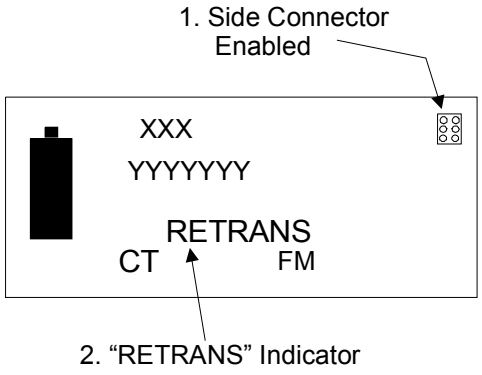


Figure 2-73 RETRANS Enabled

The radios can be set for clear (PT) or secure (CT) mode: connecting the retransmission cable will force the radios into a “RETRANS” CT mode that does not require a COMSEC key to be loaded. This allows the radios to handle both clear and secure messages. The radios can be set to any modulation type that the basic (fixed frequency) radio supports, keeping in mind that a received secure AM or FM signal cannot be retransmitted in NB since NB only supports clear. The over-the-air rate (12k or 16k) must be programmed in the channel and must be the same in both radios. The radio does not auto detect the different rates. The global setting “TX TIMEOUT” should be set to one of the specific values to prevent the radios from locking into a transmit loop.

CHAPTER 3 PRINCIPLES OF OPERATION

Section I. FUNCTIONAL SYSTEM(S) OPERATION

3.1 General

This section describes the theory of operation of the radio set. From both technical and operational standpoints, the radio set is designed to be a component of a communications system. A radio set must function in conjunction with other similar AM and FM radios to perform its purpose: two-way communication. However, it does not depend on other radios for its proper functioning or performance.

3.2 Functional System(s) Operation

Paragraphs 3.2.1 through 3.2.6 provide a limited system description of the radio set. The block diagram (Figure 3-1) shows the interrelationship between the main elements of the radio set.

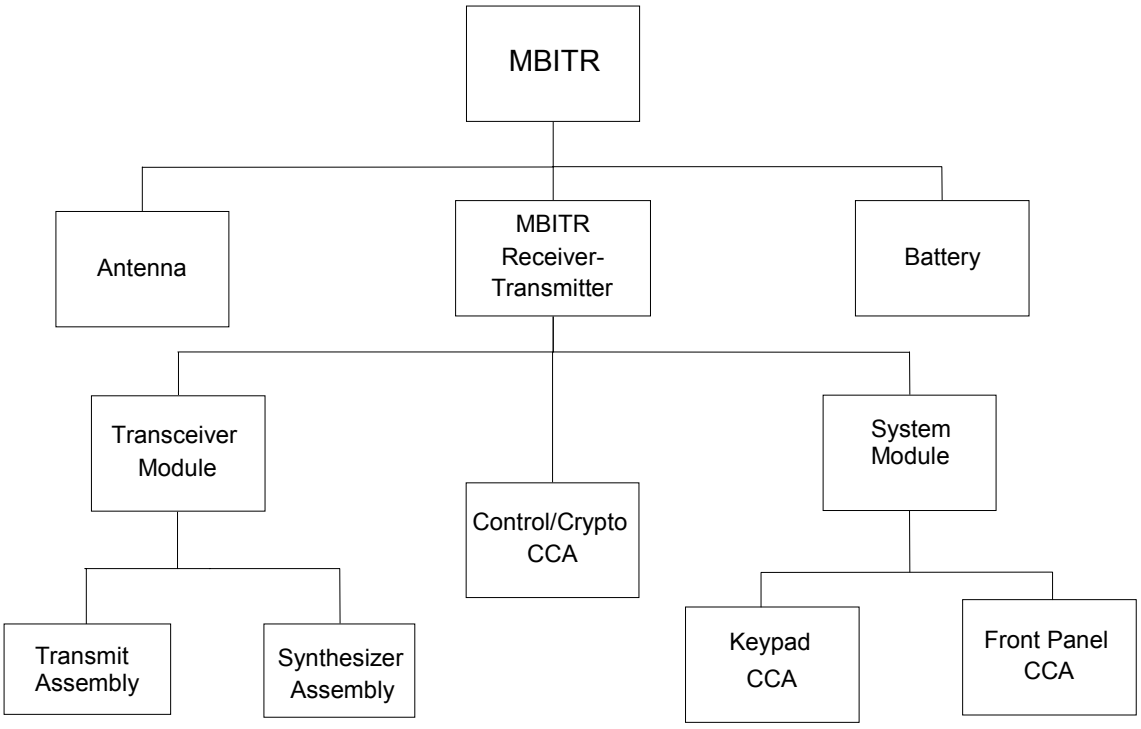


Figure 3-1 Radio Set, Simplified Block Diagram

3.2.1 Transceiver Module

The transceiver module, which mates with the radio set chassis to complete the MBITR assembly, covers the entire 30-512 MHz frequency range. The transceiver module is made up of two circuit card assemblies: the Transmit Assembly and the Synthesizer Assembly. The transceiver provides frequency and changeover control for either transmitting or receiving a signal, as well as the modulator and power amplifier for the MBITR.

3.2.1.1 Transmit Assembly

The Transmit Assembly includes the receiver-transmitter back cover and the Transmit CCA, which contains the radio transmitter output and receiver front-end circuits. These include the transmitter selectable low-pass filters, the low noise RF amplifier, the receive filters, and the output amplifier.

3.2.1.2 Synthesizer Assembly

The Synthesizer Assembly includes RF shields and the Receiver/Synthesizer CCA, which contains the frequency synthesizer circuits, the different oscillators (reference, VCO, and local), the analog-to-digital and digital-to-analog converters, and the receive demodulation circuits. These include the receive signal mixers, the different frequency synthesizers, and the synthesizer tuning loops.

3.2.2 Control/Crypto CCA

The Control/Crypto CCA uses a Field Programmable Gate Array (FPGA) and multiple Digital Signal Processors (DSPs) to control the selection of transmit and receive signal processing in both the clear and encrypted modes. The control/crypto CCA provides operator interface via the PTT switch.

The Control/Crypto CCA contains the on-board NSA approved COMSEC device that is used to provide encryption and decryption of digitized voice signals (VINSON coded or FED-STD-1023). The COMSEC device stores the key data information that is used to provide the crypto capability within the MBITR.

The Control/Crypto CCA uses individual, separated power circuits for clear and encrypted signals. Since key data is lost when power to the MBITR is removed, there are hold-up capacitors (located on the Front Panel CCA) that provide a short period of power backup before clearing the crypto key data after the battery is removed. Key data may be cleared manually by means of the panic zeroize, which clears all keys, or selectively by using the Zeroize menu. The panic zeroize function can be performed with or without the MBITR being turned on.

3.2.3 Radio Systems Module

The radio systems module consists of the keypad CCA, the Front Panel CCA, the LCD module, and the chassis assembly. The systems module, together with the control/crypto CCA and the transceiver module, makes up the MBITR Receiver-Transmitter Unit (RTU).

3.2.3.1 Front Panel CCA

The Front Panel CCA is the primary interface between the radio and the external world. Incoming audio signals can come from any one of three sources: (1) an internal microphone, (2) an external microphone (side connector), and (3) the top audio connector. The user can also provide input to the radio via the keypad, the programmable function switches, and the squelch disable button

3.2.3.2 Chassis Assembly

The MBITR chassis assembly includes the chassis casting, the side connector flexi cable, the battery flexi cable, the mode switch, channel select switch, and power/volume switch flexi cable, the power/volume switch, the audio accessory connector, the antenna connector, and the channel select switch.

3.2.4 Rechargeable Lithium Ion Battery

The rechargeable lithium ion (Li-Ion) battery provides attachable battery power to the MBITR (see Figure 1-1). The Li-Ion is a renewable energy source that can be recharged by the single and multiple battery chargers or the SPAI. It provides 8 hours of operation with a 1:1:8 transmit to receive to standby (on but neither receiving nor transmitting) ratio duty cycle at 21° C.

CAUTION

Lithium batteries are potentially hazardous if misused or tampered with before, during, or after discharge. Observe the precautions listed in the Safety Summary of this manual. Do not attempt to charge batteries outside the temperature range of 0° to +45° C.

3.2.5 Non-Rechargeable Battery Holder

The non-rechargeable battery holder allows the user to power the radio with commercial/ Government inventory disposable lithium manganese dioxide battery cells (commercial identification Duracell DL-123A or DL-2/3A, Government designation BA-5123/U). The battery holder holds up to 12 individual battery cells. It is nearly identical in shape and function to the rechargeable lithium ion battery pack and provides 8 hours of battery life with a 1:1:8 transmit to receive to standby ratio duty cycle at 21° C.

Section II. FUNCTIONAL OPERATION OF ELECTRONIC CIRCUITS

3.3 30-512 MHz Transceiver Module

The 30-512 MHz transceiver module (see Figure 3-2 for block diagram) consists of two circuit card assemblies (CCAs): the receiver/synthesizer CCA and the transmit CCA.

The transceiver module implements a nominal 5 watt FM synthesized transceiver. It is divided into bandpass filter and antenna switching, receiver, transmitter, synthesizer, digital interface, and miscellaneous functions.

The transceiver module has two receiver-transmitter frequency (RF) connections, one for a top panel TNC antenna socket and one for the MBITR side connector. Switching between them is implemented within the module by a pin diode switch.

Immediately after this relay is a receive/transmit switch, which is used to select either the receive side tunable bandpass filters (for receive) or the transmit low pass filter bank.

3.3.1 Receiver/Synthesizer CCA

The following functions are located on the Receiver/Synthesizer Board:

- Reference Oscillator
- Synthesizer/VCOs
- Local Oscillators
- IF Chain
- EEPROM Calibration Data.

3.3.2 Transmit CCA

The following functions are located on the Transmit Board:

- RF Power Amp
- Transmit Harmonic Filters
- Transmit/Receive Switch
- Receive Bandpass Filter
- Low Noise Amp (LNA)
- EEPROM Calibration Data.

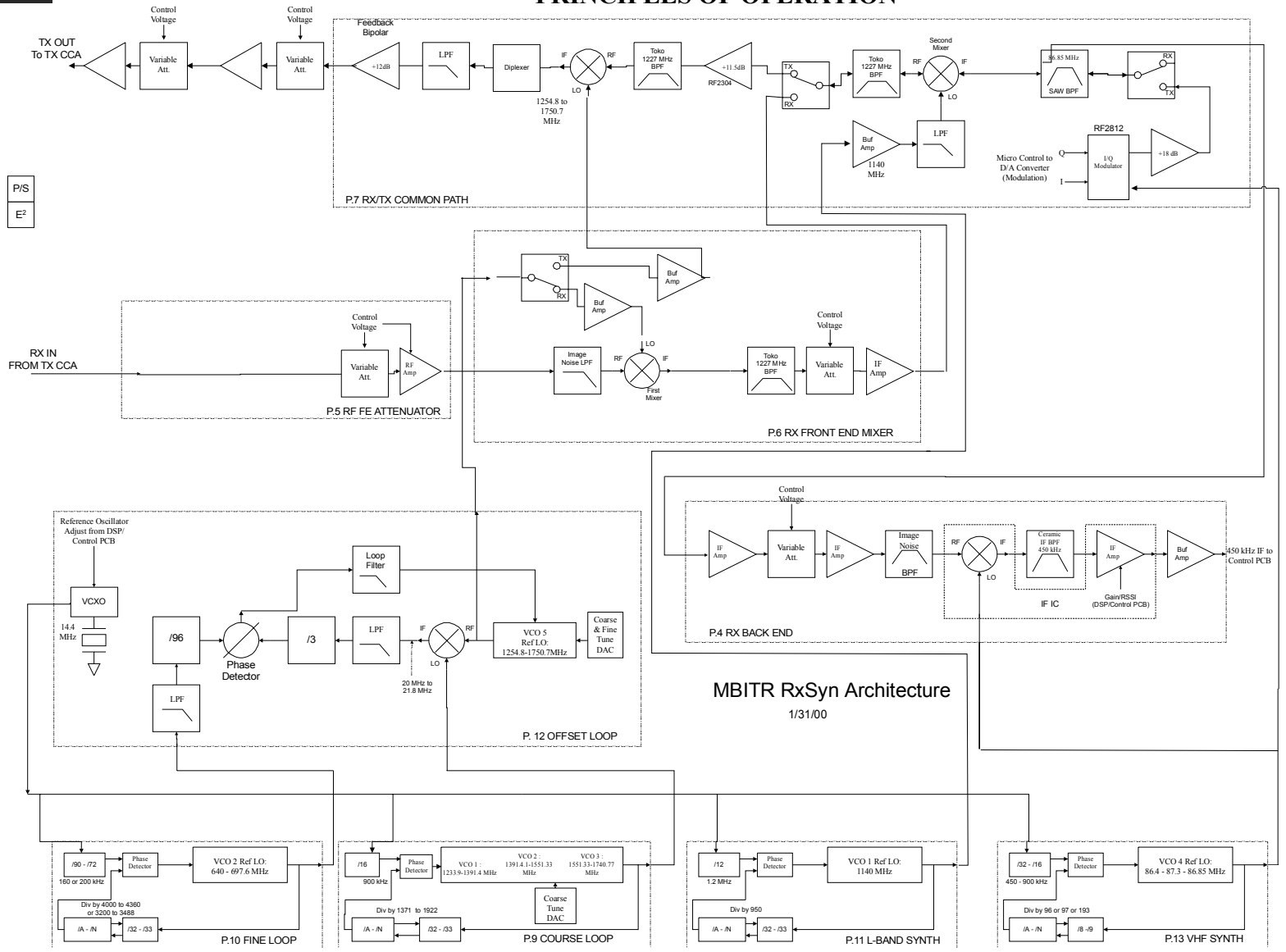


Figure 3-2 Transceiver Module Block Diagram

3.4 Control/Crypto Circuit Card Assembly (CCA)

Refer to Figure 3-3 for the block diagram for the control/crypto CCA. As shown, the control/crypto CCA consists of the following functional elements:

3.4.1 Microcontroller

- Mode Selection
- Key Selection
- Algorithm Selection
- Selective Zeroization
- Providing for TRANSEC key, Hop Set, and Lockout Set transfer and storage
- Global, Channel, and Calibration programming Interface
- Interface to allow re-programming of the operational firmware
- RED and BLACK DSP Status and Control Interface.

3.4.2 Cryptographic Module

- Initialization
- Encryption
- Decryption
- Error Detection
- Cryptovariable Fill, and Key Management
- Cryptographic Algorithm
- Cryptographic Synchronization
- COMSEC Alarm and Alarm Checks.

3.4.3 RED DSP

- Pre-Emphasis
- Transmit Audio Bandpass Filter
- CVSD Encoding
- CVSD Decoding
- De-Emphasis
- Receive Audio Bandpass Filter
- Warning and Alarm Tone Generation
- Data Interface Processing.

3.4.4 BLACK DSP

- Synthesizer Control
- Transceiver Control
- Demodulation
- Bit Synchronization
- Clock Recovery
- Implements the TRANSEC algorithm (KGV-10) and provides the TRANSEC functionality for frequency hopping.
- CTCSS Tone Generation
- CTCSS Tone Detection
- Modulation.

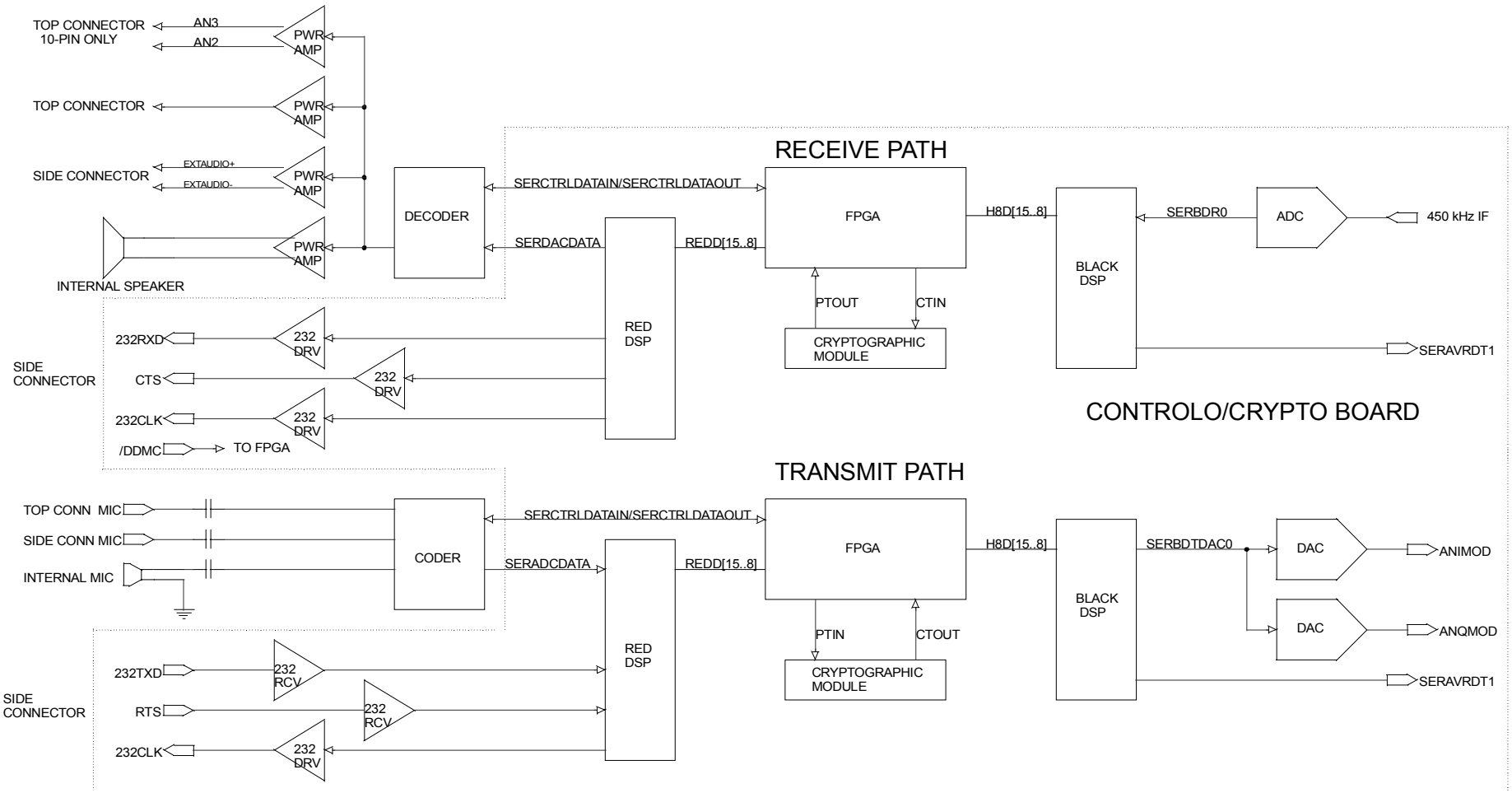


Figure 3-3 Control/Crypto Block Diagram

3.4.5 FPGA

- CODEC Control Interface
- Clock Division
- PTT Switch Interface
- Clear/Secure Bypass Logic
- Bus Arbitrator
- Microcontroller I/O Expansion
- RED DSP interface
- BLACK DSP interface
- Serial to Parallel and Parallel to Serial Conversion.

3.4.6 Power management

- Power Supply Isolation
- Power Supply Protection
- Power Switching
- Power Transient Detectors.

The Control/Crypto CCA provides regulated DC power, control logic, volume control, and the transmit modulation buffer for the MBITR. The Control/Crypto CCA internally interfaces with the transceiver module and front panel CCA within the MBITR. The Control/Crypto CCA interfaces with the keypad and the control switches (ON/OFF/Panic zeroize, volume, PTT, and squelch override) via the Front Panel CCA.

3.5 Front Panel CCA

The front panel CCA, which includes the Graphics Display LCD, is mounted between the RTU front cover and the Control/Crypto CCA. (See Figure 3-4 for the block diagram.) The LCD is an 80 x 32 graphics display.

The following functions are located on the Front Panel Board:

- Liquid Crystal Display
- Bypass Indicator
- Keypad
- Key Fill Microcontroller
- Key Fill Multiplexer
- Cryptographic Module Power Supply
- Audio Processing
- Microphone Pre-Amplifier
- Microphone A/D Converter
- Receive Audio D/A Converter
- Receive Audio Power Amplifier
- Capacitive Power Back-up for Key Retention
- Volume Switch Decoder
- Channel Switch Decoder
- Keypad Interface
- LCD Interface.

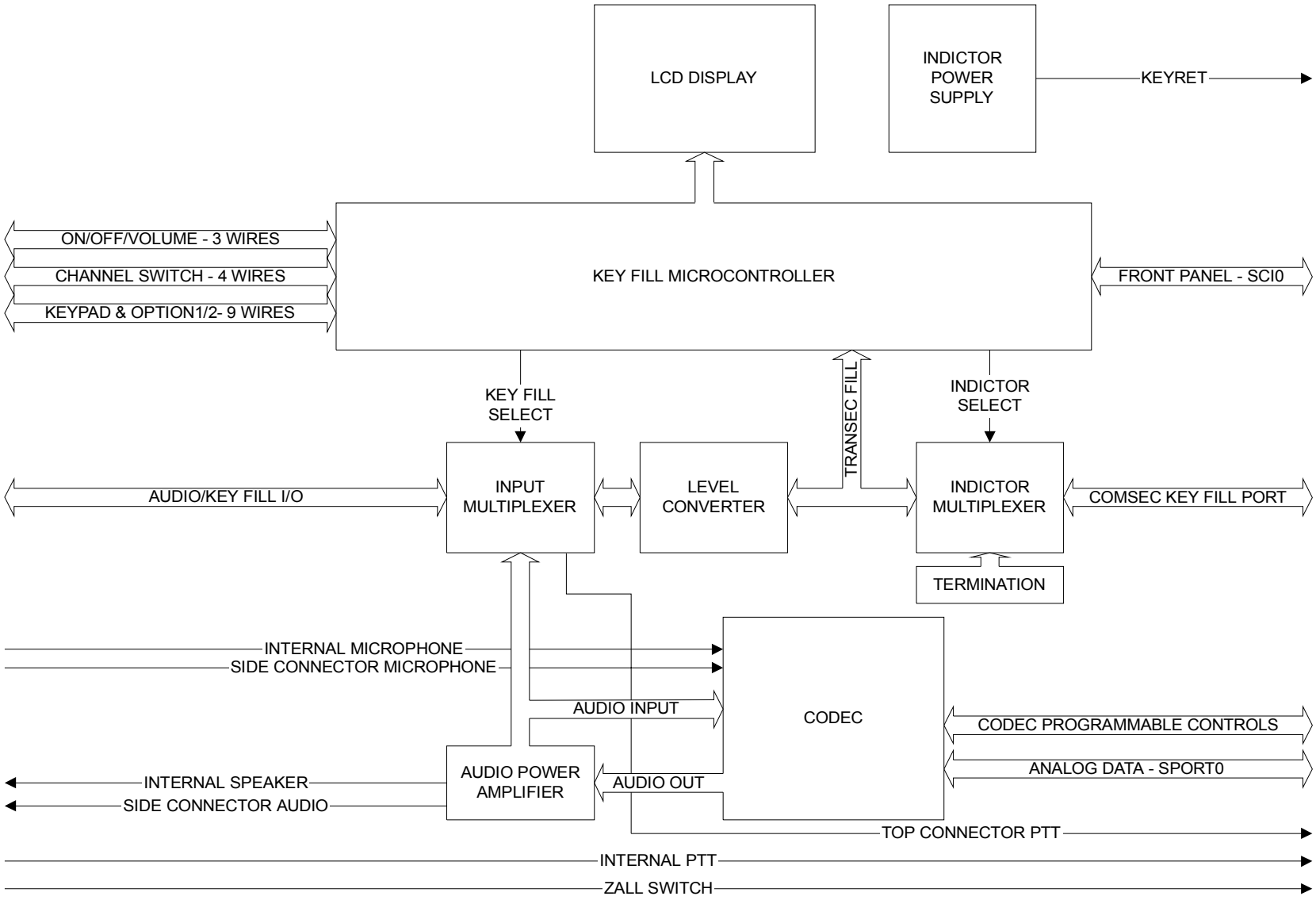


Figure 3-4 Front Panel Block Diagram

The input from the internal microphone or the side connector goes directly to a CODEC on the Front Panel, which consists of microphone preamplifiers for the three audio inputs (internal, audio connector, and side connector microphone), an Analog to Digital Converter, and a Digital to Analog Converter. The input from the top audio connector is multiplexed to the audio I/O path and the key fill path before going to the CODEC. The default connection is the audio I/O path. The Input Multiplexer is controlled by the Key Fill Microcontroller. The A/D converter digitizes the audio and passes the output to the RED DSP on the Control/Crypto CCA.

3.6 Chassis Assembly

The following functions are located on the chassis:

- RF Connector
- Side Connector
- Audio Connector (with Multiplexed Key Fill I/O)
- ON/OFF/Volume/Zeroize Switch (with mechanical interlock)
- Channel Select Switch
- Built-in Speaker Microphone
- Internal PTT Switch
- Squelch ON/OFF Switch
- Battery Release Catch

Section III. FUNCTIONAL OPERATION OF MECHANICAL ASSEMBLIES

Not Applicable.

CHAPTER 4 MAINTENANCE

4.1 General.

This chapter provides operator maintenance instructions for the MBITR radio. This includes operational checkout, inspection and preventive maintenance, troubleshooting, and removal/replacement procedures.

4.2 Operational Checkout.

The radio has a Power-On-Self-Test (POST) function that checks basic radio functions every time the radio is powered up. The user-initiated Built-In Test (BIT) is the first step in the radio operational checkout procedures. The BIT results screen (see Figure 2-62) displays the results of the self-test of the four major circuit cards: Control/Crypto, Front Panel, Power Amplifier, and Receiver-Synthesizer.

The potential radio faults associated with a failure of each section of the BIT test are described in the following table.

Table 4-1 Built-In Test Results

TEST	RESULT	POTENTIAL FAULT
Control :	FAIL - Control/Crypto board failed	1. Red DSP, 2. Black DSP, 3. Microcontroller 4. FPGA, or 5. ADC
Front Panel:	FAIL - Front Panel board failed	1. Keyfill microcontroller
Power Amp:	FAIL - Power Amp/Transmit board failed	1. Transmit AVR
Synth:	FAIL - Receiver/Synthesizer board failed	1. Receive AVR

4.3 Radio Maintenance

The radio does not require any scheduled periodic maintenance. However, the radio should be occasionally inspected for external damage, such as bent connectors, and wear items, such as loose attaching hardware (screws and setscrews). The radio should be cleaned periodically, particularly after exposure to salt water, sand, or mud. The user should rinse exposed contacts, such as the side connector, battery connector, and audio connector with fresh water and then dry with low pressure air, if available. Small pieces of dirt and debris may infiltrate the grill of the internal speaker and should be flushed out with fresh water. The user should also check the pressure relief valve on the Urban MBITR (Figure 1-1) to ensure it is not blocked by dirt or other material.

4.4 Battery Maintenance

4.4.1 Self-discharge

Lithium-ion batteries will self-discharge over time. Excessive discharging can effect (reduce) the maximum potential capacity of the batteries or in extreme cases prevent the battery from accepting any charge at all. In order to prevent the effect of excessive self-discharge, lithium-ion batteries that are not in regular use (e.g., in storage) should be periodically charged to full capacity. The recommended interval for periodic charging is twelve (12) weeks.

If the battery has been charged in one of the 1600426 series chargers while attached to a "powered-on" radio, the radio may exhibit a problem communicating with the rechargeable lithium-ion battery. The "fuel gauge" display for a fully charged battery may show only a partially full or empty battery. If this occurs, it can usually be corrected by fully discharging the battery (e.g., by operating the radio until the radio shuts down) and then placing the discharged battery in the charger to complete a charge cycle (LED turns green).

4.4.2 Protective O-ring

The positive contacts on the top of the battery are protected by an O-ring that forms a watertight seal when attached to the radio or when the plastic cap is attached. If this O-ring is missing or damaged, water (or other fluids) can reach the contacts, causing battery discharge and corrosion to both the battery and radio contacts. If not prevented, this can result in permanent damage to the radio and battery, including flooding of the radio interior when immersed.

When attaching or removing the battery from the radio, check the condition of the O-ring. If it is missing or damaged, replace it using an O-ring from the Ready Spares Kit (p/n 1100590-501). See paragraph 4.8 for more information.

4.5 Troubleshooting

There are only a limited number of equipment failures that can be corrected by the operator. The following table describes the most common.

Table 4-2 Operator Troubleshooting Guide

Symptom	Probable Cause	Corrective Action
Radio does not operate	• Battery not properly connected • Battery dead	• Remove and re-install battery • Replace battery
Cannot communicate with other radio users in clear mode	• Radios set to different frequencies • Radios are set with different CTCSS tones • Radios set to different modulation types (AM/FM)	• Set all radios to the same frequency (can be accomplished by cloning from master radio or loading from PC Programmer). • Set receive and transmit CTCSS tones the same in all radios
Cannot communicate with other radio users in secure (COMSEC) mode	• Radios set to different COMSEC keys • Radios are set with different data rates (12 or 16 kbps) • Radios set to different COMSEC algorithms • Crypto sync period is too short	• Reload COMSEC keys • Check data rate on selected channel • Reload COMSEC keys • Check crypto sync period on selected channel

Symptom	Probable Cause	Corrective Action
Cannot communicate with other radio users in frequency hopping (FH) SINCGARS mode	• Radios using different hopsets • Radios' real time clocks have different times	• Reload hopsets • Check internal clock times
Cannot communicate with other radio users in frequency hopping (FH) HAVEQUICK mode	• Radios on different nets • Radios using different WOD (Word of Day) • Radios have different TOD (Time of Day)	• Check nets in use • Reload WOD • Check internal clock times; reload TOD.
Background noise or other traffic on radio	• Other users are on the same frequency	• Set receive and transmit CTCSS tones in all radios
Limited talk range	• Obstacles (buildings, heavy foliage) are obstructing the signal • Battery power is low • Wrong antenna • Improper frequency selection	• Move away from the obstructions; increase the height of the radio, if possible. • Check battery "fuel gauge"; replace battery if low. • Check antenna. • VHF signals penetrate natural foliage and vegetation better than the higher UHF frequencies. VHF frequencies are more susceptible to man made objects like steel or steel reinforced concrete buildings.
Radio display has flashing "ERROR" message	• Operational error in the radio • DATA Mode selected while radio is set for "PT".	• Check for low battery power - press and release PTT, then check "fuel gauge". • Set radio for "CT" operation before connecting DATA cable.
Radio display has flashing "ERROR" message in HAVEQUICK mode	• Incorrect HAVEQUICK configuration, such as: • HAVEQUICK I net selected with no WOD loaded • MWOD loaded but operational day and MWOD days do not match	• Check that correct HAVEQUICK I/II data is loaded. Use KEY FILL screens to check. Reload using KEY FILL screens and/or KYK-13/KOI-18.
Radio has flashing "ALARM" message	• Crypto alarm in the radio	• Press PTT to clear alarm; check that key is loaded into selected crypto position.
Radio has flashing "UNLCK" message	• Radio synthesizer out of lock	• Wait one or two seconds or change to different channel; • Turn the radio off for five seconds and then turn it back on.

Symptom	Probable Cause	Corrective Action
Radio has flashing "TRSEC" message when SINCGARS channel selected	• TRANSEC (SINCGARS) operation selected without frequency hopsets loaded	• Load frequency hopsets
Radio has flashing "NOTOD" message when HAVEQUICK channel selected	• HAVEQUICK channel selected without Time of Day (TOD) loaded	• Load TOD from PLGR or receive over-the-air TOD • Select EMERGENCY INITIALIZATION. (See paragraph 2.2.3.2.5)
Radio has flashing "NOWOD" message when HAVEQUICK channel selected	• HAVEQUICK channel selected with no WOD, MWOD, or day-of-month loaded.	• Load WOD, MWOD, and/or DOM. (See paragraphs 2.2.3.2.6 and 2.2.3.2.7)
Radio display "locks up"; cannot turn off radio using the ON/OFF switch.	• Microprocessor error in the radio	• Turn ON/OFF switch to OFF; remove the battery for a count of five: re-attach battery and turn radio on.
Radio does not recognize that cloning cable (or other cables, such as Retrans) is connected	• Side connector disabled	• Enable side connector (Global programming, paragraph 2.2.3.3.1)
Radio does not respond to PTT for keyfill and/or cloning	• Radio set for external audio	• Set radio for internal audio operation (Mode select, paragraph 2.2.2.7.1)
Interference between radios during retransmission	• Transmitting radio received on receiving radio (co-site interference)	• Increase distance between radios • Increase frequency separation between receive and transmit radios . • Use frequency-specific filters or diplexers.
Radio "drops" (loses) COMSEC key when changing batteries	• Radio not shut off before removing battery ("hot swapping" battery).	• Shut off radio before removing battery.

4.6 Removal/Replacement Procedures - Operator.

(See Figure 5-2.) The first step for any remove/replace procedure is to power down the equipment. Prior to removing or installing any MBITR assembly, remove all accessories (antenna, microphone, etc.). Removal/replacement procedures that are authorized to be performed by the operator are given in the following paragraphs.

CAUTION

Before performing removal/replacement procedures, make sure the radio is powered down and the battery is removed from the radio. Failure to do so could result in equipment damage.

4.6.1 Audio Accessory Removal/Replacement (Urban version).

Remove/replace the audio accessory as follows:

a. Disconnect the audio accessory (e.g., handset), from the audio accessory connector on the top of the receiver-transmitter by grasping the connector plug, pressing down, and twisting the plug one-quarter turn counterclockwise.

b. Replace the audio accessory with a known good one.

4.6.2 Audio Accessory Removal/Replacement (Maritime version).

Remove/replace the audio accessory as follows:

a. Disconnect the audio accessory (e.g., handset), from the audio accessory connector on the top of the receiver-transmitter by unscrewing the knurled ring on the connector plug counter-clockwise until it is loose and pulling the cable connector straight up from the radio.

b. Replace the audio accessory with a known good one. Before pressing the accessory cable end onto the radio connector, ensure the keyways are aligned.

4.6.3 Antenna Removal/Replacement.

Remove/replace antenna as follows:

a. Disconnect the antenna from the antenna connector at the top of the receiver-transmitter by first grasping the antenna at the base and turning counterclockwise until unthreaded. Then remove the antenna from the connector.

b. Replace the antenna with a known good antenna. Turn antenna clockwise to thread it into position. The antenna should be hand-tightened only.

4.6.4 Battery Removal/Replacement.

Remove/replace battery as follows:

CAUTION

Turn off power before removing the battery by setting the volume switch to the OFF position. Failure to do so may affect (zeroize) the COMSEC keys loaded in the radio, corrupt the programmed configuration, and may damage the radio circuitry.

a. Disconnect the battery from the receiver-transmitter by sliding the battery latch up, towards the top of the receiver-transmitter, grasping the battery on the bottom of the receiver-transmitter, and turning the battery approximately one quarter turn counterclockwise to unlock it from its position.

b. Replace the removed battery with a known good battery. Connect the battery to the receiver-transmitter by placing the battery at a 60^{o} angle to the bottom of the receiver-transmitter, and turning the battery clockwise to lock it in position. Make sure the battery latch at the base of the receiver-transmitter locks into place.

NOTE

If the battery has been charged while attached to a "powered-on" radio, the radio may exhibit a problem communicating with the rechargeable lithium-ion battery. The "fuel gauge" display for a fully charged battery may show only a partially full or empty battery. If this occurs, it can usually be corrected by fully discharging the battery (e.g., by operating the radio until the radio shuts down) and then placing the discharged battery in the charger to complete a charge cycle (LED turns green).

4.7 Watertight Integrity

The receiver-transmitter is not authorized for disassembly. However, in the event of a combat situation where it becomes necessary for partial disassembly of the RTU, the watertight seals will be compromised. In these cases, the RTU must be returned to the depot for proper re-assembly and verification that watertight integrity has been restored.

4.8 Ready Spares Kit

In addition to the corrective actions listed in Table 4-2, there is a Ready Spares kit available (P/N 1100590-1) that supports the unit-level repair of simple equipment damage. The spares kit includes:

- Volume Knob Assembly (5 each),
- Channel Knobs (5 each),
- Set Screws (5 each),
- Battery O-rings (15 each),
- Antenna Protective Caps (Stainless Steel) (5 each),
- Radio Dust Caps (5 each),
- Antenna Gasket Seal (5 each), and
- Battery Plastic Caps (15 each).

Each repair kit contains a hex driver for the set screws, Loc-tite for the set screws, adhesive for the O-rings, and instructions on how to replace each item.

CHAPTER 5 ILLUSTRATED PARTS BREAKDOWN

Section I. INTRODUCTION

5.1 General.

The Illustrated Parts Breakdown (IPB) lists, illustrates, and describes the parts used in the MBITR Maritime (AN/PRC-148(V)1(C)) and Urban (AN/PRC-148(V)2(C)) versions, manufactured by Thales Communications, Inc., Clarksburg, Maryland. Table 5-1 lists available items of equipment that are not supplied as part of the basic AN/PRC-148 system.

5.2 Maintenance Parts List.

The Maintenance Parts List (MPL), (Section II), consists of the complete systems divided into main groups. The main groups are broken down into assemblies, subassemblies, and details. The next higher assembly (NHA) is indicated for each separately illustrated item. Each assembly and subassembly listed is followed immediately by its component parts. In general, the assemblies and parts installed at the time the end item was manufactured are listed and identified in the manual. When an assembly/part is installed during modification, and the original does not have continued application, only the preferred item is listed. Interchangeable and substitute assemblies and parts are not listed in this manual.

a. Figure and Index Number Column. This column lists the figure and index number of each part illustrated in the related figure. The index numbers are in numerical sequence and identify each part number shown in the related figure. Assemblies which have detail parts indexed are not indexed unless the assembly is illustrated completely assembled on the same illustration, or it is identified as an assembly by bracketing or circling of components. When a group of parts (bolt, washer, and nut) is used at a specific location for attachment purposes, one index number assigned is sufficient. The index number appears on the same line as the first part composing the group.

b. Part Number Column. This column lists the contractor's part number (drawing number), including dash numbers, assigned to each part. Vendor part numbers are listed when parts are identical to the contractor used part. Those parts which have Government Standards numbers assigned have the Government Standards number listed. Parts altered or selected for special fit, tolerance, etc., from vendor, commercial, or Government Standards part number of the altered or selected part follow the part description in the Description column.

c. CAGE Column. This column contains a five-digit code number following the part number denoting the procuring vendor. The source of vendor code numbers is the CAGE for Manufacturer Cataloging Handbook H4-1, H4-2, and H4-3. When a CAGE for the appropriate manufacturer or Government agency is not published in the H4 handbook, the word "none" will appear in this column.

d. Description Column. This column contains the description of all items appearing on the MPL. The indentation headed "1" through "7" consists of the contractor's drawing title. The description contains modifiers necessary to identify the particular item. Descriptions that are

indented and marked with a " • " are part of the first unindented part above it. Additional information following the item description may include the following: a list of alternate part numbers to give stock ordering information; exceptions to the Usable On Code for the item; and references to preceding and subsequent figures concerning assemblies and subassemblies. This data is considered an integral part of the item description assuring the correctness of repair maintenance procedures.

e. Units Per Assembly. This column contains the number of units required per assembly and/or subassembly. If more than one assembly is required, the total number of assemblies is listed. When an assembly or subassembly is listed more than once, the total number of units per assembly or subassembly appears the first time and REF for subsequent listings.

f. Source, Maintenance, & Recoverability (SM&R) Code Column. This column shows the manufacturer-recommended SM&R Code. These codes are assigned in accordance with the guidance of Joint Regulation AR 700-82/OPNAVINST 4410.2/AFR 66-45/MCO 4400.120.

5.3 Numerical Index.

The Numerical Index (Chapter 5, Section III) is compiled in accordance with the numerical part number filing system described in paragraph a.

a. Part Number Column. This column contains all the part numbers that appear in the Maintenance Parts List and part numbers that have been assigned to detail parts assembled into the end article. The order of procedure establishing the precedence in which the part numbers are listed is explained below. The order of precedence in the first position of each part number is Letters A through Z, Numerals 0 through 9.

NOTE

Alphabetical O's are considered as numerical zeroes in all positions in each part number.

The order of precedence in the second and succeeding positions in each part number is as follows:

(1) Space (blank column).
(2) Diagonal (/).
(3) Period (.).
(4) Dash (-).
(5) Letters A through Z.
(6) Numerals 0 through 9.

The following is a sample of part numbers arranged in alphabetical-numerical sequence used in the Numerical Index.

AN931-4-13	B2	16.W2
A2460	S/1	16W060
A317	1140	32P010.1

A32	121873	32P0101
B12	128	39A45

b. Figure and Index Number Column. For each part number, the figure or figure and index number refers to the MPL where the parts relationship is shown. When an assembly or part has not been assigned an index number, the figure and index number of the preceding part in the MPL is used with the letter "F" before the figure, such as F7-7. The letter "F" denotes "follows".

5.4 Electrostatic Discharge (ESD) Sensitive Devices.

a. This manual describes parts and assemblies sensitive to damage by ESD.
b. The MPL contained within this manual with ESD sensitive parts are identified by the following symbol (ESD).
c. These symbols are placed in the extreme right of the description column for the item identified as ESD sensitive.

5.5 CAGE Code Summary.

CAGE Code	Manufacturer
23386	Thales Communications, Inc.

Table 5-1 MBITR Accessory Equipment
(not included with the basic radio system)

Description	Part Number	Application
Single Unit Battery Charger	1600581-1	Charges one lithium-ion battery at a time; uses AC input power only. (Replaces 1600426-1.)
Six Unit Battery Charger (AC/DC)	1600580-1	Charges six lithium-ion batteries simultaneously; uses either AC or DC input power. (Replaces 1600426-2.)
Six Unit Battery Charger (AC only)	1600580-2	Charges six lithium-ion batteries simultaneously; uses AC input power only. (Replaces 1600426-3.)
Tactical Charger	MA6751	Charges two Lithium-ion batteries. 12-32 VDC power only.
Vehicle Adapter	MA6943	Provides interface to vehicle power and vehicle-mounted antenna
Special Power Adapter Interface (SPAI) Assembly	4101310-501	Charge battery and power radio from SOPS (Special Operations Power Supply): solar panels, hand-cranked generator
SPAI Power Cable	3500460-501	Connects SPAI to various DC input sources
SPAI Alternate Cable Kit	1100533-501	Connects SPAI to (1) auto 12 VDC outlet, (2) BA-5590 adapter, (3) alligator clips.
Cloning Cable	3500395-501	Used to transfer programmed information from one radio to another. COMSEC information cannot be read out from a radio.
Digital Data Cable	3500396-501	Used to connect the radio to a digital data device (such as a PC). Also used for radio Bit Error Rate testing.
GPS Cable	3500465-501	Used to connect a PLGR (AN/PSN-11) to the radio side connector.
PDC Data Cable (VDC-400)	3500466-501	Used to connect a ViaSat Personal Data Controller (VDC-400) to the radio side connector.
PDC Data Cable (VDC-200)	3500545-501	Used to connect a ViaSat Compact Data Controller (VDC-200) to the radio side connector.
SINCGARS Data Adapter Cable	3500562-501	Used to connect radio side controller to SINCGARS-compatible data devices.
Retransmit Cable	3500485-501	Used to connect two radios (side connector to side connector) for expedient retransmission.
Expedient Retransmission Kit	1100540-501	Includes retransmit cable, selected bandpass filters, and antenna cables.
PC Programmer	MA6941F	Includes software, cable, and user manual. Used to load or edit radio programmable parameters from a PC
PC Programmer Cable	3500393-501	Supplied as part of the PC Programmer. Connects radio to PC serial port.
Antenna, 136-174 MHz	SS-1600293-1	Provides improved performance (gain) in upper VHF band

Description	Part Number	Application
Antenna, 403-470 MHz	SS-1600294-1	Provides improved performance (gain) in UHF band
Speaker Microphone	1600469-4	Handheld speaker microphone with volume control; 6-pin audio connector
Maritime Headset	1600503-5	20 meter immersible headset with 10-pin audio connector
Urban Headset	1600567-1 (Alt. 1600504-1)	2 meter immersible headset with 6-pin audio connector
Commercial Lightweight Headset	1600551-2	Alternative urban headset; 6-pin audio connector
Combined ear-mic/headset	1600585-1	Over-the-ear speaker/microphone and PTT
Covert Headset w/ Wireless Earpiece	1600584-1 w/ 1600584-2	Covert headset with wireless earpiece, speaker microphone, and PTT for covert hands-free operation

Figure 5-1 Multiband Inter/Intra Team Radio System (AN/PRC-148(V)(C))

Table 5-2 Multiband Inter/Intra Team Radio System, 20 meter (AN/PRC-148 (V)1(C))

Figure & Index No.	Part Number	CAGE	Description 1 2 3 4 5 6 7	Units per Assy	SMR Code
5-1-1	4101104-501	23386	Unit Assy Multiband Inter/Intra Team Radio (MBITR), 20 meter	1	PAODD
5-1-2 & 5-1-9	1600515-X	23386	Battery, Li-Ion Rechargeable	2	PAOZZ
5-1-3	3100662-501	23386	Antenna, 30-512 MHz	1	PAOZZ
5-1-4	3100661-501	23386	Antenna, 30-90 MHz	1	PAOZZ
5-1-5	1600495-1	23386	Carrying Case, MBITR	1	PAOZZ
5-1-6	1600494-1	23386	Holster, MBITR	1	PAOZZ
5-1-7	4101240-501	23386	Battery Holder	2	PAOZZ
5-1-8	3600190-1	23386	Audio/Keyfill Adapter (Maritime version only)	1	PAODD
Not illus.	3400577-1	23386	Operator Card	1	PAOZZ
Not illus.	84329	23386	Operator Manual	1	PAOZZ
Not illus.	84335	23386	CD-ROM Training and Operator Manual	1	PAOZZ

NOTE: The above parts list applies to the AN/PRC-148(V)1(C) system (Thales part number PRC6991ABS-SYS). Thales also has a similar system (part number PRC6991ABS-BAS) that includes one (1) rechargeable battery (p/n 1600515-X) and does not include any battery holders (p/n 4101240-501). Additional rechargeable batteries and battery holders may be purchased on an individual basis.

The 1600515-X part number indicates the availability of batteries of different capacities.

Table 5-3 Multiband Inter/Intra Team Radio System, 2 meter (AN/PRC-148 (V)2(C))

Figure & Index No.	Part Number	CAGE	Description 1 2 3 4 5 6 7	Units per Assy	SMR Code
5-1-1	4101195-501	23386	Unit Assy Multiband Inter/Intra Team Radio (MBITR), 2 meter	1	PAODD
5-1-2 & 5-1-9	1600515-X	23386	Battery, Li-Ion Rechargeable	2	PAOZZ
5-1-3	3100662-501	23386	Antenna, 30-512 MHz	1	PAOZZ
5-1-4	3100661-501	23386	Antenna, 30-90 MHz	1	PAOZZ
5-1-5	1600495-1	23386	Carrying Case, MBITR	1	PAOZZ
5-1-6	1600494-1	23386	Holster, MBITR	1	PAOZZ
5-1-7	4101240-501	23386	Battery Holder	2	PAOZZ
Not illus.	3400577-1	23386	Operator Card	1	PAOZZ
Not illus.	84329	23386	Operator Manual	1	PAOZZ
Not illus.	84335	23386	CD-ROM Training and Operator Manual	1	PAOZZ

NOTE: The above parts list applies to the AN/PRC-148(V)2(C) system (Thales part number PRC6991BBS-SYS). Thales also has a similar system (part number PRC6991BBS-BAS) that includes one (1) rechargeable battery (p/n 1600515-1) and does not include any battery holders (p/n 4101240-501). Additional rechargeable batteries and battery holders may be purchased on an individual basis.

The 1600515-X part number indicates the availability of batteries of different capacities.

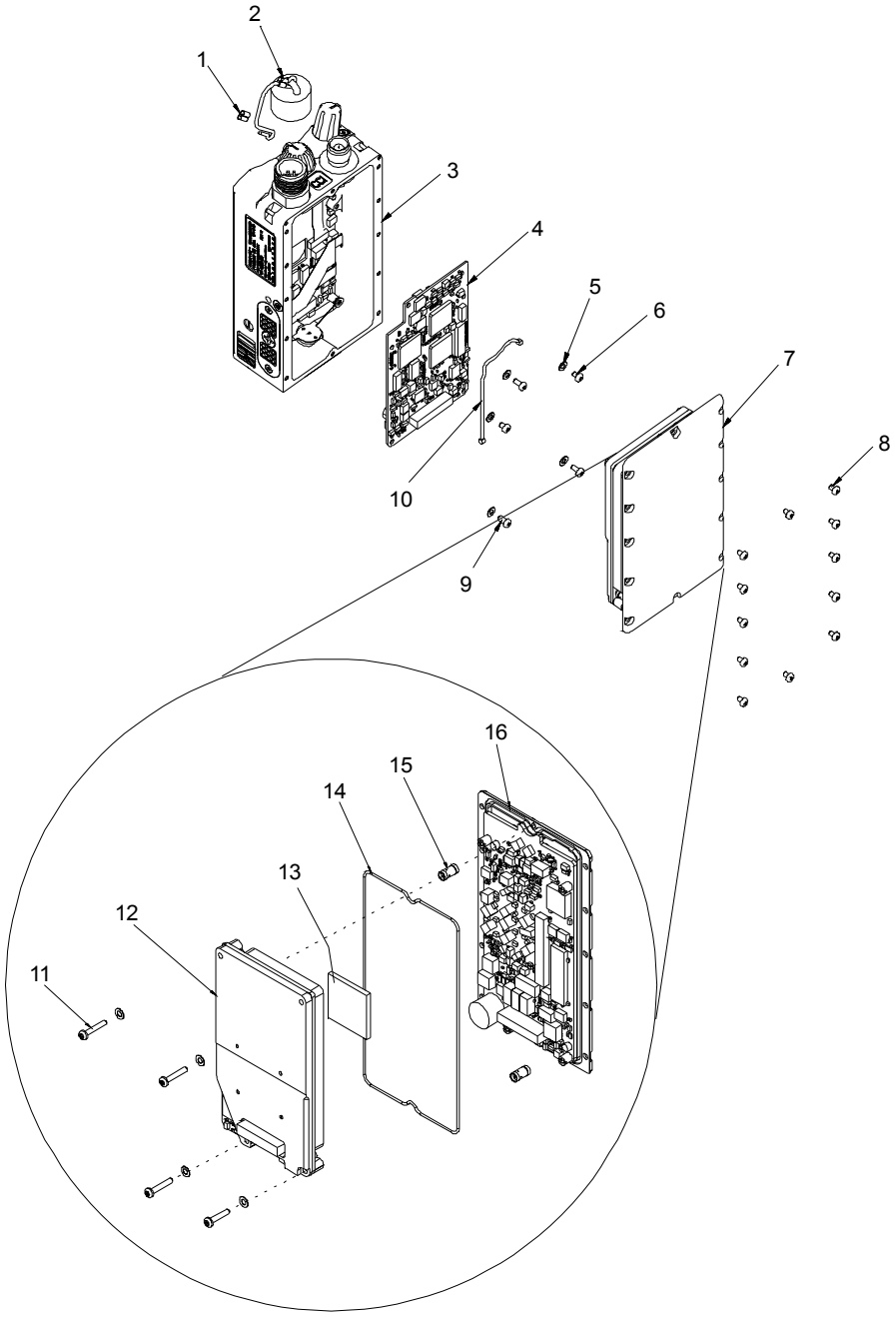


Figure 5-2 MBITR Receiver-Transmitter Unit (RTU)

NOTE

Figure 5-2 shows the component parts of both the Maritime and Urban versions of the MBITR. The actual part numbers of these two versions are listed in Tables 5-4 and 5-5, respectively.

Table 5-4 MBITR Unit, 20 Meter (4101104-501)

Figure & Index No.	Part Number	CAGE	Description 1 2 3 4 5 6 7	Units per Assy	SMR Code
5-2-1	70211	23386	Splice - Open Barrel	1	PAOZZ
5-2-2	3600188-1	23386	Cap, Dust, Connector	1	PAOZZ
5-2-3	4101141-501	23386	Module Assy, Systems, 20 M	1	PADDD
Not illus.	4101162-501	23386	• Front Panel CCA, 20M (ESD)	1	PADZZ
Not illus.	4101150-501	23386	• Keypad CCA (ESD)	1	PADDZ
Not illus.	1600482-1	23386	• Module, LCD	1	PADDZ
5-2-4	4101146-501	23386	Control/Crypto CCA (ESD)	1	PADDD
5-2-5	SS-2400543-2	23386	Washer, Crinkle, Special	5	PADZZ
5-2-6	77600	23386	Screw, Pan Head, .086-56x.125 SS	2	PADZZ
5-2-7	4101143-501	23386	Module, Transceiver, 30-512 MHz	1	PADDD
5-2-11	77897	23386	• Screw, Flat Head, .086-56x.50	4	PADZZ
5-2-12	4101354-501	23386	• Rcvr/Synth Assy (ESD)	1	PADZZ
5-2-13	2400916-5	23386	• Rubber Silicon Strip	1	PADZZ
5-2-14	3400614-1	23386	• Cover Gasket	1	PADZZ
5-2-15	61540	23386	• Connector, Male-Female Adapter	2	PADZZ
5-2-16	4101300-501	23386	• Transmit Assy (ESD)	1	PADZZ
5-2-8	79191-256-125	23386	Screw, Pan Head, .086-56x.125 Black	12	PADZZ
5-2-9	77601	23386	Screw, Pan Head, .086-56x.188 SS	3	PADZZ
5-2-10	7742	23386	Cable Assy, R/A	1	PADZZ

Table 5-5 MBITR Unit, 2 Meter (4101195-501)

Figure & Index No.	Part Number	CAGE	Description 1 2 3 4 5 6 7	Units per Assy	SMR Code
5-2-1	70211	23386	Splice - Open Barrel	1	PAOZZ
5-2-2	3600188-1	23386	Cap, Dust, Connector	1	PAOZZ
5-2-3	4101194-501	23386	Module Assy, Systems, 2 M	1	PADDD
Not illus.	4101162-502	23386	• Front Panel CCA, 2M (ESD)	1	PADZZ
Not illus.	4101150-501	23386	• Keypad CCA (ESD)	1	PADDZ
Not illus.	1600482-1	23386	• Module, LCD	1	PADDZ
5-2-4	4101146-501	23386	Control/Crypto CCA (ESD)	1	PADDD
5-2-5	SS-2400543-2	23386	Washer, Crinkle, Special	5	PADZZ
5-2-6	77600	23386	Screw, Pan Head, .086-56x.125 SS	2	PADZZ
5-2-7	4101143-501	23386	Module, Transceiver, 30-512 MHz	1	PADDD
5-2-11	77897	23386	• Screw, Flat Head, .086-56x.50	4	PADZZ
5-2-12	4101354-501	23386	• Rcvr/Synth Assy (ESD)	1	PADZZ
5-2-13	2400916-5	23386	• Rubber Silicon Strip	1	PADZZ
5-2-14	3400614-1	23386	• Cover Gasket	1	PADZZ
5-2-15	61540	23386	• Connector, Male-Female Adapter	2	PADZZ
5-2-16	4101300-501	23386	• Transmit Assy (ESD)	1	PADZZ
5-2-8	79191-256-125	23386	Screw, Pan Head, .086-56x.125 Black	12	PADZZ
5-2-9	77601	23386	Screw, Pan Head, .086-56x.188 SS	3	PADZZ
5-2-10	7742	23386	Cable Assy, R/A	1	PADZZ

CHAPTER 6 MBITR VEHICLE ADAPTER

6.1 General

The MBITR Vehicle Adapter (MA6943) allows the MBITR to be readily mounted in a variety of vehicles. The Vehicle Adapter:

- Has a 12-32 VDC power supply for operation with most vehicle electrical systems,
- Has RF output of 5 or 20 watts in FM mode, 20 watts only in AM
- Provides connections for:
  - Removable Control Head
  - Headset
  - Multifunction (equivalent to radio side connector)
  - Intercom or external speaker
  - Data
  - Antenna
  - Power
- Charges the radio's battery while the radio is inserted in the vehicle adapter, and
- Allows rapid insertion and removal of the radio.

6.2 Physical Characteristics

6.2.1 Equipment Description

The MBITR Vehicle Adapter consists of the following components:

- Vehicle Adapter Chassis Unit
- DC Input Power Cable Assembly
- Removable Control Head (RCH), and
- RCH Cable Assembly

6.2.1.1 VA Chassis Unit

The VA chassis contains a sleeve for the insertion of the MBITR with a locking cam to fasten the radio into position once it is fully inserted. The radio must be inserted with the side connector facing inward (toward the removable control head). The chassis front panel has a U-283/U six pin audio connector (labeled AUDIO) and a U-283/U six pin connector for attachment of data device accessories (labeled DATA). The chassis has rear connectors for an external speaker or intercom, power input, multifunction connector, and RF connector. The VA chassis includes a 20 watt RF power amplifier and a cosite filter.

6.2.1.1.1 Multifunction Connector

The multifunction connector has the following capabilities:

1. Data mode – with a digital data cable (p/n 4600105-1 (25-pin serial connector) or 4600106-1 (for VDC-400 Personal Data Controller)), an external data device or terminal can be connected to this port,
2. Retransmission – with two VA's connected by a 3500565-501 retransmission cable or a radio and a VA connected by a 3500618-501 retransmission cable for retransmission capability,

3. GPS SA – with a 3500612-501 GPS cable, a PLGR can be connected to the VA for situational awareness transmission,
4. Flash Reprogramming – with a 3500613-501 programming cable, the VA can be flash programmed with software updates from a PC.

6.2.1.2 DC Input Power Cable Assembly

The DC input power cable is a 12 foot long shielded cable that connects the VA to vehicle power.

6.2.1.3 Removable Control Head

The detachable Removable Control Head (RCH) for the VA is the primary user interface. It includes all the keypad functions of the radio, an 80 x 32 Liquid Crystal Display, volume control and channel select toggle switches, and PTT and squelch keys. The Control Head can be left attached to the VA or can be used remotely via the 10 foot cable that connects it to the VA front panel.

6.2.1.4 RCH Cable Assembly

The RCH Cable Assembly is a 10 foot long cable with 15-pin micro-D connectors at each end. It is used to connect the RCH to the VA unit.

6.2.2 Weight

The weight of the vehicle adapter chassis (less the installation kit) is less than 11 pounds.

6.2.3 Dimensions

The maximum external dimensions of the vehicle adapter are: Length: 12.5 in., Width: 7 in., Height: 4.05 in.

6.2.4 Temperature

The operating and storage temperatures for the VA are:

Parameter	Value
Operating Temperature	-31° C to + 60° C
Storage Temperature	-33° C to + 71° C
Charging Temperature	0° C to + 45° C

6.3 Electrical Characteristics

The VA requires an input supply voltage of 12-32 VDC. The MBITR is powered at all times from the VA.

The VA includes a battery charging system that can recharge the MBITR rechargeable lithium-ion battery (Thales p/n 1600515-X) within four hours. **NOTE**: The VA will only recharge the Li-ion battery at temperatures between 0° and 45° C.

6.4 Installation

6.4.1 Mechanical Installation

The VA requires a minimum installation space of: Length – 15 in., Width – 8.5 in., Height – 5 in. The VA power cable limits the mounting location to a point within 8 to 10 feet of the vehicle power distribution panel.

6.4.2 Mounting Location

The VA can be mounted in several configurations: Horizontally with the long side parallel to the ground, vertically with the front panel facing up, and horizontally with the short side parallel to the ground. When mounting horizontally with the short side parallel to the ground, be sure to install the unit with the RCH at the top. There is an alignment pin in the radio sleeve that can damage the radio if the VA is mounted with the RCH at the bottom.

Figure 6-1 VA Horizontal Mounting Configurations

6.4.3 Electrical Connections

The VA power cable runs from the unit through the vehicle firewall to the vehicle battery. The power connection should be made through a switched connection on the vehicle power distribution panel rather than directly to the vehicle battery to prevent draining the vehicle battery.

6.5 Operation

6.5.1 General

1. The VA supports the use of an external audio device through the U-283/U connector and can support digital data operation through the use of the multi-pin connector on the back panel or front panel data connector.
2. When operating co-located VA's, use the following setup guidelines:
    a. Radio frequency separation of 15% or more,
    b. Space antennas six feet apart if using a wide-band antenna,
    c. Space antennas at least 12 feet apart for the 30-90 MHz range if using a 30-90 MHZ band specific antenna.
3. To insert the radio, press in on the center pin of the radio latch (see Figure 6-19) and pull out on the entire latch. Insert the radio with the side connector facing the RCH. Press in

on the latch to lock the radio in place. To ensure a good interface between the VA and the inserted radio, inspect the radio side connector before inserting and clean the connector of any water, dust, or other contaminants before inserting.

4. When using an external speaker with side tone enabled in the VA, ensure a good separation between the speaker and microphone during transmit to prevent feedback.

6.5.2 Removable Control Head and Keypad

Actual radio operation is controlled through the Removable Control Head (RCH). The display and keypad on the RCH perform the same radio operation functions described in Chapter 2, OPERATING INSTRUCTIONS, with the following exceptions:

- Volume Knob – replaced by a rocker key marked (+) and (-), alternate function is external speaker off or on;
- Channel Knob – replaced by a rocker key marked with (▲) and (▼); programming function is UP and DOWN arrow, alternate function is LEFT and RIGHT arrow;
- Squelch Control Key – used to enable and disable the squelch function of the MBITR;
- PTT Key - used in place of radio sidemounted PTT.

The Removable Control Head is shown in Figure 6-2; the RCH keypad is illustrated in Figure 6-3. To release the RCH from the VA unit, press in on the RCH latch on the VA (see Figure 6-19).

Figure 6-2 Removable Control Head (RCH)

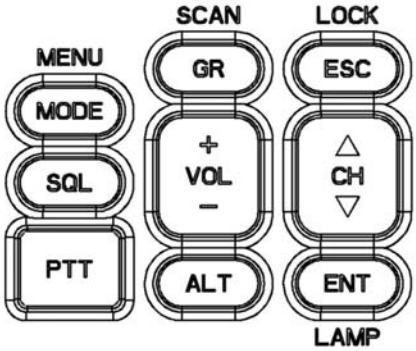


Figure 6-3 Remote Control Keypad

6.5.3 Vehicle Adapter Defaults

The Vehicle Adapter is defaulted to the following configuration on startup:

1. 20 Watts AM or FM;
2. Side tone enabled;
3. External speaker turned OFF;
4. Volume set to lowest setting;
5. RCH keypad unlocked.

6.5.4 New RCH Menu Screens

The VA software includes a number of new operating screens that enhance the user interface of the RCH. When the VA is initially powered up, the introductory screen (Figure 6-4) is displayed.

Figure 6-4 Introductory Screen

During the power-up sequence, the VA checks that an MBITR is installed in the unit. If a radio is not detected, the No Radio screen (Figure 6-5) is displayed.

Figure 6-5 No Radio Screen

The RCH keypad can be locked to prevent accidental key presses by pressing the [ALT] and [ESC] keys at the same time (and can then be unlocked by repeating these same key presses). If the keypad is locked, the RCH display will appear as Figure 6-6.

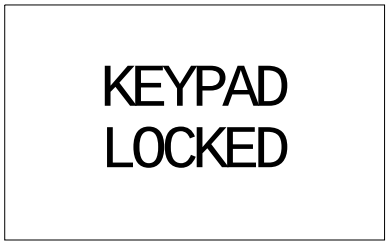


Figure 6-6 Keypad Locked

When the keypad is unlocked, the screen will momentarily display Figure 6-7 before reverting to the default display.

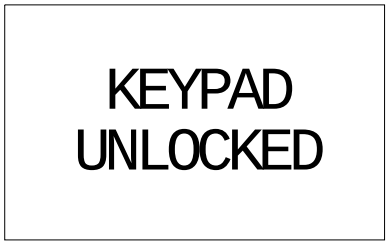


Figure 6-7 Keypad Unlocked

The RCH display can show several information screens during operation to convey information about the state of VA operation or to convey error messages. Figure 6-8 and Figure 6-9 indicate if the external speaker is switched OFF or ON.

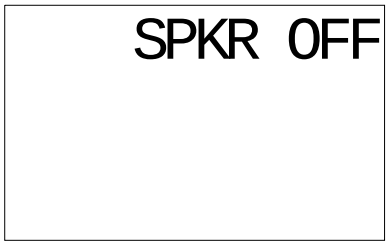


Figure 6-8 Speaker OFF

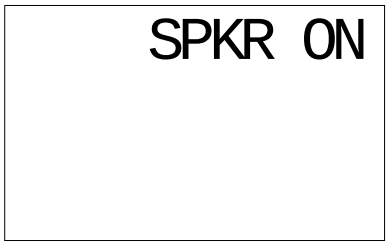


Figure 6-9 Speaker ON

Figure 6-10 indicates if the VA Whisper Mode is switched ON (additional gain for the two lowest volume settings).

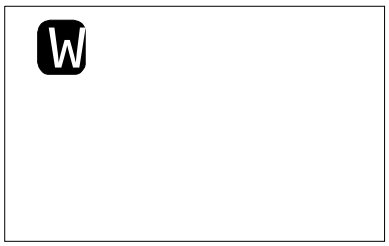


Figure 6-10 Whisper Mode ON

Figure 6-11 indicates if the output power is at the low setting.

Figure 6-11 Low Power Setting

In addition to messages about the overall state of the VA, there are specific message screens concerning the Power Amplifier and cosite filter. Figure 6-12 indicates that there is excessive current flow to the Power Amplifier and Transmit is shut off.

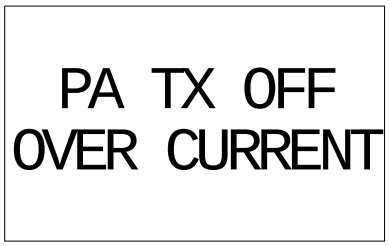


Figure 6-12 Power Amplifier Over Current

Figure 6-13 indicates that the measured temperature of the Power Amplifier is over the specified limit and Transmit is shut off.

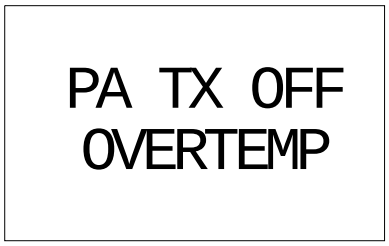


Figure 6-13 Power Amplifier Over Temperature

Figure 6-14 indicates that there is excessive current flow to the Cosite Filter and Transmit is shut off.

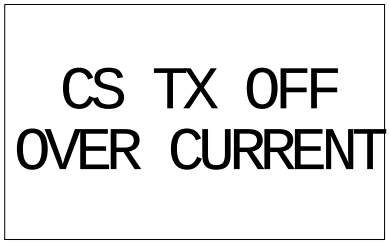


Figure 6-14 Cosite Filter Over Current

Figure 6-15 indicates that the measured temperature of the Cosite filter CCA is over the specified limit and Transmit is shut off.

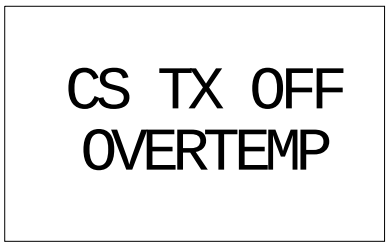


Figure 6-15 Cosite Filter Over Temperature

6.5.5 Data Operation

6.5.5.1 General

The Vehicle Adapter supports digital data operation either through the Multifunction Connector on the rear of the unit or the DATA six-pin connector on the front of the unit. Both the front and rear connectors can be used with either a ViaSat VDC-400 Personal Data Controller or with any data terminal that uses a standard 25-pin RS-232 connector.

Table 6-1 Data Cable Application

Cable Part Number	Application	Connection
3500616-501	VDC-400 Data Controller	Front DATA Connector
3500617-501	RS-232 Serial Interface	Front DATA Connector
4600105-1	RS-232 Serial Interface	Rear Multifunction Connector
4600106-1	VDC-400 Data Controller	Rear Multifunction Connector

In order to send or receive digital data, the radio must be operating in the encrypted mode, either Basic (in AM or FM 25 kHz bandwidth), SINCGARS (Single Channel or Frequency Hopping), HAVEQUICK Single Channel, or ANDVT. Best results are obtained with either an FM (Basic or SINCGARS) or ANDVT channel. If any of the data cables are connected when the radio is set for clear operation, the ERROR message will flash on the screen and an audio alarm will sound. When data operation is selected, the display screen appears as shown in Figure 6-16.

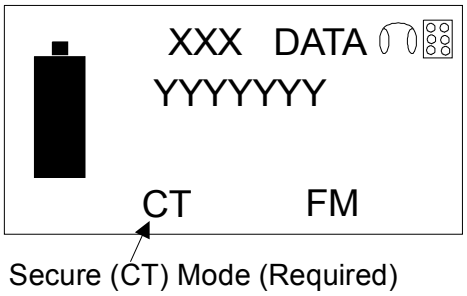


Figure 6-16 Data Operation Screen

6.5.5.2 VDC-400 Personal Data Controller

To route digital data through the MFC, attach the MFC PDC Data Cable (4600106-1) to the MFC and to the 25-pin flat serial connector of the ViaSat VDC-400 Personal Data Controller (PCMCIA card). The MFC digital data cable has an in-line switch that allows either voice or data operation. When data operation has been selected, all operational control of the radio is transferred to the VDC-400 and the ViaSat software. The radio cannot receive or transmit voice traffic. When voice operation is selected, the radio operates as if the cable was not connected.

To route digital data through the front DATA connector, attach the Front Panel PDC Data Cable (3500616-501) to the front panel six-pin connector labeled DATA. This cable does not have a Voice/Data switch. Whenever the cable is connected, the VA automatically switches to DATA mode. To switch to voice operation, disconnect the cable from the DATA connector.

For best operation, the ViaSat software on all PC's that are part of the data network should be set as follows:

2. Press F7 key on PC to open configuration window.

3. Compression = ON
4. CSMA = ON
5. Channel mode = Duplex
6. FEC Code = ½
7. Channel Access Speed = Normal
8. Channel Device = KY-57, KY-99, KY-99A
9. Add'l ACK Delay = 1
10. Turnaround Delay = 0.5 sec.
11. Max Packets – 256
12. TX Start Delay = 0.5 sec.
13. TX End Delay = 0.5 sec.

When setting up a data network, first connect the data cable to the radio with the Voice/Data switch set to the "V" position (for the MFC) or do not connect the cable (for the front DATA connector). Establish voice communication with all other radios that will be part of the network before changing the switch to the "D" position. Before sending critical data across the network, send a short test message to verify proper data operation.

6.5.5.3 RS-232 Data Device

6.5.5.3.1 Multi-Function Connector

To route digital data through the MFC, attach the MFC RS-232 Data Cable (4600105-1) to the MFC and to the 25-pin serial connector of the data terminal device. The MFC digital data cable has an in-line switch that allows either voice or data operation. When data operation has been selected, all operational control of the radio is transferred to the data terminal and its controlling software. The radio cannot receive or transmit voice traffic. When voice operation is selected, the radio operates as if the cable was not connected.

The 37-pin MFC requires the following input and output signals for successful RS-232 data operation (an illustration of the 37-pin connector is included showing the pin locations). Successful digital data operation requires a communications software package that can provide these inputs to the radio and accept the specified outputs.

Table 6-2 Multifunction Connector Pin-Out

Pin No.	Name	Direction	Signal Type	Description
1	GND	GND	GND	Power return/Signal reference
3	SIDEPTT_RTS	IN	EIA-RS-232	Accepts RS232 Request to Send or Push to Talk active high control signal for placing the VA in transmit.
4	SER232TXD	IN	EIA-RS-232	External Data Device
5	SER232RXD	OUT	EIA-RS-232	External Data Device
6	DDMCN	IN	Open Collector	Vin < 0.7V => Digital Data Mode
7	CTS-232	OUT	EIA-RS-232	Clear to Send
9	CLK232	OUT	EIA-RS-232	Provides output clock when operating in data mode.

SIDEPTT_RTT-232 - This input signal accepts an RS-232 Request to Send or Push To Talk active high control signal for placing the VA in transmit when operating in data mode. A normal contact-closure to ground PTT must be converted to RS-232 for proper operation. A signal with a maximum level of +25 Vdc and a minimum level of +3 Vdc is accepted on this pin. This signal is located on pin 3.

SER232TXD-232 - This input signal accepts RS-232 digital data for encrypting and transmitting when operating in the data mode. This transmit data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. A signal with a maximum level of +25 Vdc and a minimum level of +3 Vdc is accepted on this pin. This signal is located on pin 4.

SER232RXD-232 - This output signal provides RS-232 digital data that was received and decrypted when operating in the data mode. This receive data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. This signal is also used to transfer information at approximately 130 kbps from a receiving VA to a transmitting VA when operating in a retransmit mode. The levels provided on this signal are typically +6 Vdc. This signal is located on pin 5.

DDMCN - During normal operations, this input signal selects the data mode. When this signal is grounded, the VA goes into the data mode. The radio must be programmed in cipher text mode and have a valid key loaded to properly operate in the data mode. When operating in the retransmit mode, this signal is an input used by the transmitting VA to indicate a plain text or cipher text transmission. This signal is located on Pin 6.

CTS-232 - This output signal provides an RS-232 Clear to Send signal when operating in the data mode. After receiving a RTS, this signal goes active (high) when the Receiver/Transmitter is ready to accept data to be encrypted. This signal also goes active in the audio mode whenever the VA is receiving. In retransmit mode, this signal is used by the receiving VA to activate the SIDEPTT_RTS signal of the transmitting VA. The levels provided on this signal are typically +6 Vdc. This signal is located on pin 7.

CLK232 - This output signal provides an RS-232 clock when operating in the data mode. This signal is used for both transmit and receive synchronous operations. The clock rate is 12 or 16 kbps as determined by the configuration of the selected channel. Transmit data is sampled by the Receiver/Transmitter on the falling edge of the clock and receive data is provided on the rising edge of the clock. The levels provided on this signal are typically +6 Vdc. This signal is located on pin 9.

The 37-pin power connector used on the MBITR VA is MIL-C- 38999 part. The connector is identified as D38999/24WD35PN per MIL-DTL-38999. The connector has an “N” key orientation.

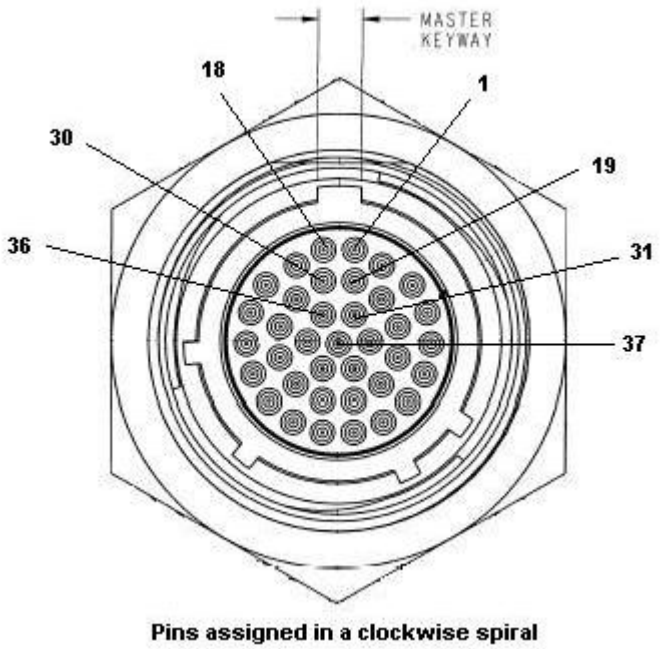


Figure 6-17 Multifunction Connector Pin-Out

6.5.5.3.2 Front DATA Connector

To route digital data through the front DATA connector, attach the Front Panel RS-232 Data Cable (3500617-501) to the front panel six-pin connector labeled DATA. This cable does not have a Voice/Data switch. Whenever the cable is connected, the VA automatically switches to DATA mode. To switch to voice operation, disconnect the cable from the DATA connector.

The six-pin DATA Connector requires the following input and output signals for successful RS-232 data operation (an illustration of the six-pin connector is included showing the pin locations). Successful digital data operation requires a communications software package that can provide these inputs to the radio and accept the specified outputs.

Table 6-3 Front DATA Connector Pin-Out

Pin No.	Name	Direction	Signal Type	Description
A	GND	GND	GND	Common signal reference ground.
B	RXDATA	OUT	EIA-RS-232	Received Data Output
C	PTT	IN	Open Collector	Accepts contact closure to ground to indicate the user pressed PTT. V < 0.7Vdc => PTT active
D	CLK232	OUT	EIA-RS-232	
E	DDMCN	IN	Open Collector	Ground to put VA in data mode. Un-ground to restore voice mode. Low = Data Mode; High = Voice Mode
F	TXDATA	IN	EIA-RS-232	Accepts transmit data from digital device

GND - This signal provides a common signal ground during normal operations. This signal is located on pin A.

RXDATA - This output signal provides RS-232 digital data that was received and decrypted when operating in the data mode. This receive data can be either synchronous at 12 or 16 kbps

or asynchronous at 1200, 2400, or 4800 bps. The levels provided on this signal are typically +6 Vdc. This signal is located on pin B.
PTT - This signal accepts a contact closure to ground push-to-talk during normal operations. This signal is active when the voltage is < 0.7Vdc. The signal is inactive in its default state. When this signal becomes active, the VA will command the MBITR radio to transition from receive mode to transmit mode. When released (or allowed to go inactive), the VA commands the MBITR radio to transition from Transmit mode to Receive mode. This signal is located on pin C
CLK232 - This output signal provides an RS-232 clock when operating in the data mode. This signal is used for both transmit and receive synchronous operations. The clock rate is 12 or 16 kbps as determined by the configuration of the selected channel. Transmit data is sampled by the Receiver/Transmitter on the falling edge of the clock and receive data is provided on the rising edge of the clock. The levels provided on this signal are typically +6 Vdc. This signal is located on pin D.
DDMC - During normal operations, this input signal selects the data mode. When this signal is grounded, the VA goes into the data mode. The radio must be programmed in cipher text mode and have a valid key loaded to properly operate in the data mode. This signal is located on pin E.
TXDATA - This input signal accepts RS-232 digital data for encrypting and transmitting when operating in the data mode. This transmit data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. A signal with a maximum level of +25 Vdc and a minimum level of +3 Vdc is accepted on this pin. This signal is located on pin F.

The data connector used on the MBITR VA is 6-pin receptacle per MIL-C-55116. The pin configuration is labeled on each connector.

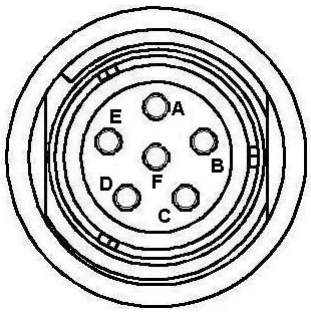


Figure 6-18 Data Connector Pin-out

6.5.6 Retransmission

6.5.6.1 Vehicle Adapter to Vehicle Adapter Connection

Two MA6943 units can be cabled together to provide retransmission capability. Using a 3500565-501 retransmission cable, connect the Multifunction Connectors (see Figure 6-20) of two MA6943 units together. Ensure that each of the installed MBITRs is set to a simplex channel (same receive and transmit frequency) and that the frequency set on one MBITR is at least 15% higher or lower in frequency than the other MBITR. Retransmission is bi-directional; in other words, either VA can receive an incoming signal. Whichever VA receives a signal first will then set the other VA into transmit mode until that transmission is complete.

6.5.6.2 Vehicle Adapter to MBITR (handheld) Connection

Retransmission can also be accomplished using one Vehicle Adapter and one MBITR handheld. Using a 3500618-501 retransmission cable, connect the VA Multifunction Connector to the MBITR side connector (make sure the MBITR side connector is enabled). The radio programming requirements in paragraph 6.5.6.1 also apply to this configuration.

6.6 Maintenance

The user can remove and replace the MBITR receiver-transmitter unit, the RCH and RCH cable, the power cable, and the vehicle adapter unit.

6.7 Illustrations

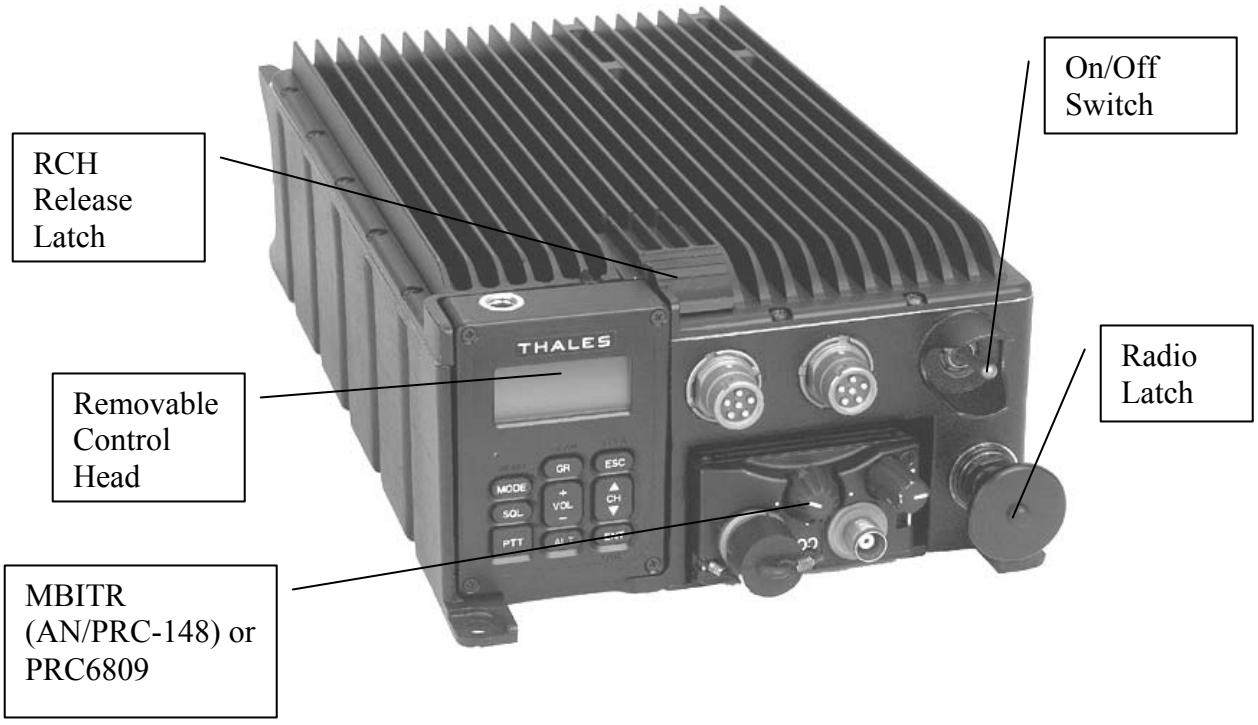


Figure 6-19 MBITR Vehicle Adapter (MA6943) Front View

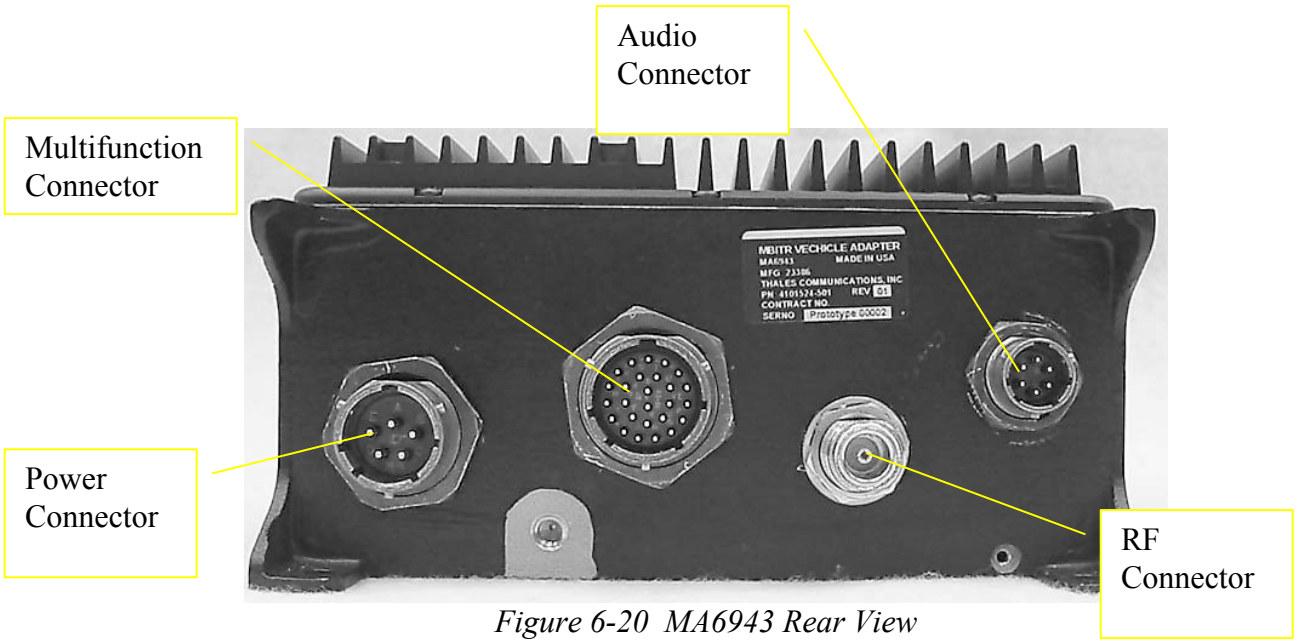


Figure 6-20 MA6943 Rear View

6.8 Parts List

Table 6-4 Parts List, MA6943

Item Number	Description	Part Number
1	Vehicle Adapter Chassis	4101524-501
2	Remote Control Head (RCH)	4101531-501
3	RCH Cable	3600215-1
4	DC Input Cable	3500566-501

CHAPTER 7 SPECIAL POWER ADAPTER INTERFACE (SPAI)

7.1 General

The MBITR Special Power Adapter Interface (SPAI) is used with the power sources found in the Special Operations Power Supply (SOPS) assembly, the SOPS OP 177(V)1/U. The SOPS assembly provides power for field recharging of nickel-cadmium and lead acid batteries used to power military communications/electronic equipment assigned to Army SOF units. It includes three power sources: a hand cranked generator (G-67B/G); rigid solar cell panels; and an AC to DC Power Converter. Also provided is a SOPS Power Supply Adapter (PSA) that provides an interface between the SOPS power source and the batteries. The MBITR SPAI, like the SOPS PSA, provides an electrical/mechanical interface between the SOPS power sources and the MBITR rechargeable lithium ion battery pack. The MBITR SPAI is used to augment, not replace, the SOPS PSA. Through the DC Input Cable, the SPAI is also capable of accepting various 12-32 VDC power inputs in order to operate the MBITR and charge the MBITR battery pack. There are two SPAI DC Input Cables: both are equipped with an in-line fuse; p/n 3500460-501 is terminated at one end with flying leads to allow interoperation with multiple DC sources; 1100533-501 kit has interchangeable connectors: a cigarette lighter adapter and alligator clips.

7.2 Physical Characteristics

Volume: less than 13.75 cubic inches. The width and depth are the same as the MBITR RTU.
Weight: less than 16 ounces.
Connectors: Top – Same twist-on connector as the rechargeable battery
Bottom – Same twist-on connector as the bottom of the radio
Side – MS/3112ES5 Cannon plug connector for directly attaching SOPS equipment.

7.3 Electrical Characteristics

The SPAI can operate on a DC power input of 12-32 volts. The SPAI will maintain normal operations (radio transmitting while charging the battery) at power as low as 80 Watts when applied through the High Current Input signal. The SPAI will maintain limited operations (Receiving/Transmitting or charging the battery) at current less than 2.0A when power is applied through the Low Current Input signal. In transmit mode while charging a battery, the SPAI provides a maximum of 40 Watts to the radio and a maximum of 15 Watts to the rechargeable battery when powered through the High Current Input signal. When powered through the Low Current Input signal, the SPAI provides power to either operate the radio in transmit or charge the battery while operating the radio in receive.

7.3.1 Electrical Protection

The SPAI and SPAI DC Input Cable interfaces are protected against any failures on interconnecting cables or terminations and are protected against electrostatic discharge. The

SPAI or SPAI DC Input Cable will not be damaged by any of the following conditions of use when applied for an indefinite period of time:

- Reverse input of the supply voltage
- Short circuit to ground or a short circuit in either the battery or Receiver/Transmitter
- Excessive temperatures, if natural cooling is prevented
- Over-voltage input of the supply voltage

7.4 Operation

See Figure 7-1. **NOTE: The radio should be OFF until all connections to the SPAI and power source are made.** The SPAI is first connected to the radio and/or battery using the top and/or bottom connector of the SPAI. The SPAI can be used to charge the MBITR battery with only the battery connected, power the radio with only the radio connected, or can have both the radio and battery connected and charge the battery while the radio continues to operate. **NOTE**: *If the SPAI is used to charge a battery without having a radio connected, one of the battery caps should be installed on top of the SPAI.* Then the SPAI side connector is connected directly to any one of the components of the SOPS assembly (solar panels, hand-cranked generator, or AC to DC Power Converter). As long as the SOPS component is generating current, the SPAI will charge the battery or power the radio. If there is not sufficient current to both charge the battery and power the radio, the radio receive/transmit capability will take precedence. The SPAI can also be connected to other DC power sources, such as a car battery, using the SPAI DC Input cable.

7.4.1 Indicators

The SPAI has a multihued LED indicator to provide charge status to the user. The SPAI has a label defining the following status indications.

LED	Status	Description
Yellow	Charging	The fuel gauge is not full and the charge current is above 100mA for temperatures between -10°C to +40°C
Yellow Flash	Cold (Trickle) Charge	The fuel gauge is not full and the charge current is below ~200mA and above 10mA (if 10mA can be detected) for temperatures between -10°C to +40°C
Green	Charge Complete	The fuel gauge is full
Red	Out of Temp	The temperature is above +40°C or below -10°C
Red Flash	Overdischarge (Low voltage) Charge	The fuel gauge is not full and the battery voltage is < ~7.5V for temperatures between -10°C to +40°C. Charge current is limited to ~120 mA
Red/Green Flash	Fault	The fuel gauge is not full and the charge current is below 10mA for temperatures between -10°C to +40°C and any other fault condition that can be detected
Off	Off	Indicator if no battery is attached, no external DC is provided, or if any of the above conditions aren't met

7.5 Performance

The SPAI will charge a fully discharged MBITR lithium ion battery within 3.0 hours at a nominal battery temperature (+21°C). The battery is charged to within 90% of capacity in the first two hours. The SPAI is capable of charging over a temperature range -10°C to +40°C. However, the charge time will vary depending on the response of the lithium ion chemistry.

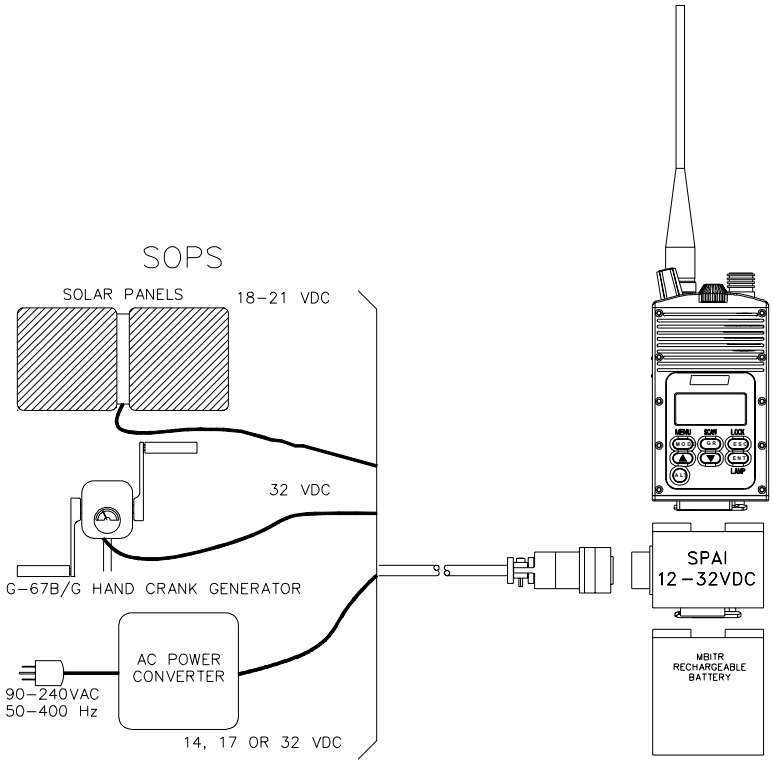


Figure 7-1 SPAI Connections

Figure 7-2 1100533-501 Connector Kit

CHAPTER 8 BATTERY CHARGERS

8.1 General

There are four different versions of MBITR battery chargers: two single-unit, AC power only; two six-unit AC power only; two six unit AC/DC power; and a two-unit tactical charger, DC power only. The MBITR battery chargers are also capable of recharging the batteries used on other Thales radios: the Racal 25, MSHR, and 20 meter MSHR.

8.2 Physical Characteristics

8.2.1 Weight and Dimensions

The Charger weights and dimensions are shown below:

Table 8-1 Battery Charger Weights and Dimensions

Charger Configuration	Part Number	Weight (excluding power cord)	Size (excluding power cord)
Single Unit Charger	1600426-1 (obsolete)	1.5 lb.	5.5” wide x 8” deep x 4.5” tall
Six Unit Charger (AC/DC)	1600426-2 (obsolete)	16 lb.	18.5” wide x 12” deep x 7” tall
Six Unit Charger (AC Only)	1600426-3 (obsolete)	14 lb.	18.5” wide x 12” deep x 7” tall
Single Unit Charger	1600581-1	1 lb.	5.5” wide x 8” deep x 4.5” tall
Six Unit Charger (AC/DC)	1600580-1	16 lb.	18.5” wide x 12” deep x 7” tall
Six Unit Charger (AC Only)	1600580-2	14 lb.	18.5” wide x 12” deep x 7” tall
Two Unit Tactical Charger	MA6751	3 lb.	8.5” wide x 6.2” deep x 8.9” tall

8.2.2 Temperature

The Chargers’ operating and storage temperature ranges are shown below:

Table 8-2 Operating and Storage Temperatures

Operational Temperature Range	0°C (+32°F) to +45°C (+113°F)
Storage (Non-operational) Temperature Range:	-40°C (-40°F) to +85°C (+185°F)

Attempting to charge batteries outside the operating temperature range can result in damage to both the chargers and batteries.

8.3 Electrical Characteristics

8.3.1 Single Unit Chargers.

The single chargers (Figure 8-3) are able to operate from universal power sources, defined as 90 to 265 VAC, 50-400 Hz for the 1600426-1 and 50-60 Hz for the 1600581-1. The chargers require no modification or adjustment in order to operate from any voltage within this range. When using the single chargers, make sure the battery is firmly seated in the charger. The obsolete model (1600426-1) cannot be upgraded to fully charge higher capacity batteries. The 1600581-1 single charger, which can be upgraded, is supplied with an external power supply, P/N 1600555-1.

8.3.2 Six (6) Unit Chargers.

There are two versions of the six-unit charger (Figure 8-1) and two models of each version available. Both versions of the charger are able to operate from universal power sources defined as 90 to 265 VAC, 50-400 Hz for the 1600426-2/3 and 50-60 Hz for the 1600580-1/2. The obsolete models (1600426-2 and 1600426-3) cannot be upgraded to fully charge higher capacity batteries. The new models are able to accept a field software upgrade to be compatible with higher capacity batteries. One version of the charger can also operate from 10.5 to 32 VDC as well. The charger requires no modification or adjustment in order to operate from any voltage within this range. A separate input is used to supply AC and DC input power.

8.3.3 Tactical Charger

The two-unit tactical charger is intended for vehicle mounting and operates on 10-32 VDC, with a maximum current draw of 10 A. The charger is supplied with an integral 2 meter power cord that is terminated with flying leads and has an in-line 15A fuse. The tactical charger can accept a software upgrade to be compatible with future higher capacity batteries.

8.4 Performance

Battery charge time can be affected by various conditions, such as the charger input current. When inserting a battery, make sure it is firmly seated in the charger. If a battery is attached to a radio while in the charger, the radio should be OFF. The battery chargers communicate with the circuitry in the battery to monitor charge current, temperature, and voltage to prevent improper charging. Indicator LED's on the chargers provide status. In the obsolete chargers (see Table 8-1), leaving the radio powered ON during charging will result in data transfer conflicts between the radios, battery, and charger. The charge information in the battery will be corrupted and will result in false readings on the radio display after being removed from the charger. This conflict does not occur in the newer chargers.

Table 8-3 Charger Performance

Charger Configuration	Capacity	Charge Time
Single Station AC (1600426-1 or 1600581-1)	One battery pack	Three hours
Six Station AC (1600426-3 or 1600580-2)	Six battery packs simultaneously	Three hours (for all six batteries)
Six Station AC/DC (1600426-2 or 1600580-1)	Six battery packs simultaneously	Three hours (for all six batteries)
Tactical Charger (MA6751)	Two battery packs simultaneously	Three hours (for two batteries)

8.5 Operating Indications

All versions of the chargers use LEDs to indicate the current charging status and/or charging problems. The meaning of the LED's is as follows:

Table 8-4 Charge Status Indicators (Desktop Chargers)

Indicator	Charge State	Status
Red	Charger OFF	High Temp Exceeded
Flashing Red	Low Rate Charge	Over-discharged Battery[1]
Flashing Yellow	Low Rate Charge	Under-temperature Battery[2]
Yellow	Full Rate Charge	Normal Charge
Green	Charger OFF[1] Trickle Charge[2]	Charge Completed Successfully
Flashing Red/Green	Charger OFF	Charge Error

[1] Applicable to Li+ Batteries Only.
[2] Applicable to NiMH and NiCd Batteries Only.

Table 8-5 Charge Status Indicators (Tactical Charger)

Indicator	Charge State	Status
Red	Charging Disabled	High Temp Exceeded (Battery)
Flashing Red	Low Rate Charge	Over-discharged Battery
Flashing Yellow	Charging Disabled below 0°C	Under-temperature Battery
Yellow	Full Rate Charge	Normal Charge
Green	Charging Disabled	Charge Completed Successfully
Flashing Yellow/Green	Charging Disabled	Battery Detected/Attempting Communications
Flashing Red/Green	Charging Disabled	Charge Error
Flashing Yellow/Red	Charging Disabled	Charger Error

If a battery is inserted in the charger while attached to a radio and the radio is ON, the radio fuel gauge may indicate that the battery is fully charged before the charger indicates full charge.

CAUTION

Do not insert a new battery in the charger until the LED is turned off.

The battery can be charged while attached to a radio. However, in the obsolete desktop chargers, the radio MUST be powered OFF. (See paragraph 4.4 for additional information.)

8.6 Illustrations

Figure 8-3 MBITR Single Charger

Figure 8-2 MBITR Tactical Charger

Figure 8-1 MBITR Multi-Charger

CHAPTER 9 DEFINITIONS

9.1 Definitions

9.1.1 Active Channel

The Selected Channel is receiving a signal that is of sufficient strength to overcome the programmed squelch level.

9.1.2 Channel

(100 per radio) a memory location with defined: receive, transmit, squelch, modulation, and power settings.

9.1.3 CTCSS Tone

Standard EIA Continuous Tone Controlled Squelch System (CTCSS) squelch tones. Subaudible tones superimposed on the radio carrier frequency. When the radio is set to a channel that is programmed for receive CTCSS, the radio will not open squelch unless the required tone is present in the received signal.

9.1.4 Delay

The radio ANDVT mode has a transmit "Delay". When keyed to transmit, the radio transmits without modulation for a variable period of time for synchronization with receiving radios. This "Delay" can be from 135 msecs. to 1200 msecs.

9.1.5 Electronic Remote Fill

Electronic remote fill (ERF) is a means by which the SINCGARS net control station transmits hopsets and/or lockout sets to net member radios.

9.1.6 Fade Bridge

Fade bridging allows the encryption clock recovery to "freewheel" during momentary signal loss so that encryption synchronization is not interrupted. The secure radio can be programmed to provide fade bridging from 0 to 4 seconds in one second increments.

9.1.7 Hopset

Set of frequencies that the radio hops on (changes frequency) during FH operation. The radio changes frequency more than 100 times per second.

9.1.8 Initial Synchronization

Initial synchronization controls the length of time that the radio sends out an encryption synchronization pattern.

9.1.9 Lockout Set

Set of frequencies that are not used for transmission or reception during frequency hopping.

9.1.10 Multiple Word of Day (MWOD)

A HAVEQUICK II Multiple Word of Day consists of a set of up to six WODs with a day of the month associated with each set.

9.1.11 Offset

Used to change a SC operating frequency by adding or subtracting 5 or 10 kHz. Can be used to reduce effects of interference.

9.1.12 Open Channel

The squelch level is overridden and the radio is in a constant receive state.

9.1.13 Priority Scan

The priority channel(s) are sampled preferentially during scanning.

9.1.14 Repeater Delay

When operating with a signal repeater, the radio can be programmed to disable reception for a brief delay after the PTT is released at the end of a transmission. This prevents reception of the signal being re-transmitted by the repeater.

9.1.15 Scan Revert Channel

When the PTT is pressed during or following receipt of a message on a scan channel, this is the transmit channel that will be used.

9.1.16 Selected Channel

The Channel/Frequency currently loaded into the radio for Receiving/Transmitting operations.

9.1.17 Time of Day (TOD)

The HAVEQUICK TOD provides the synchronization necessary for communicating in the anti-jamming mode by allowing frequency hopping at the same instant in time.

9.1.18 Training Frames

The radio ANDVT mode uses Training Frames for radio synchronization and mode identification. A Training Frame is a 32-bit pattern of “0s” and “1s”. When transmitting in ANDVT mode, the radio initially transmits a minimum of 6 Training Frames and a maximum of 60.

9.1.19 Transmit (TX) Timeout

The radio can be programmed to automatically end transmission after a pre-determined length of time in transmit mode. The radio gives a warning tone and visual indication immediately before ending transmission. The visual indication ("TIME" on the front display) continues until the radio exits transmit mode or the radio is unkeyed, whichever comes first.

9.1.20 Word of Day (WOD)

The HAVEQUICK I WOD configures the frequency hopping pattern and hop rate. The WOD consists of six segments entered in P20 through P15 and may vary in length from one to all six.

9.1.21 Working Group

The MBITR’s current selected group

INDEX

CHAPTER 10 QUICK REFERENCE HOW TO DO IT

This section is intended to provide step-by-step instructions on how to perform the most common radio operations. Any suggestions you may have for changes or additions should be sent to Customer.Service@thalescominc.com , Subject line: MBITR Manual Change.

Please refer to these illustrations when reading the instructions in the following paragraphs.

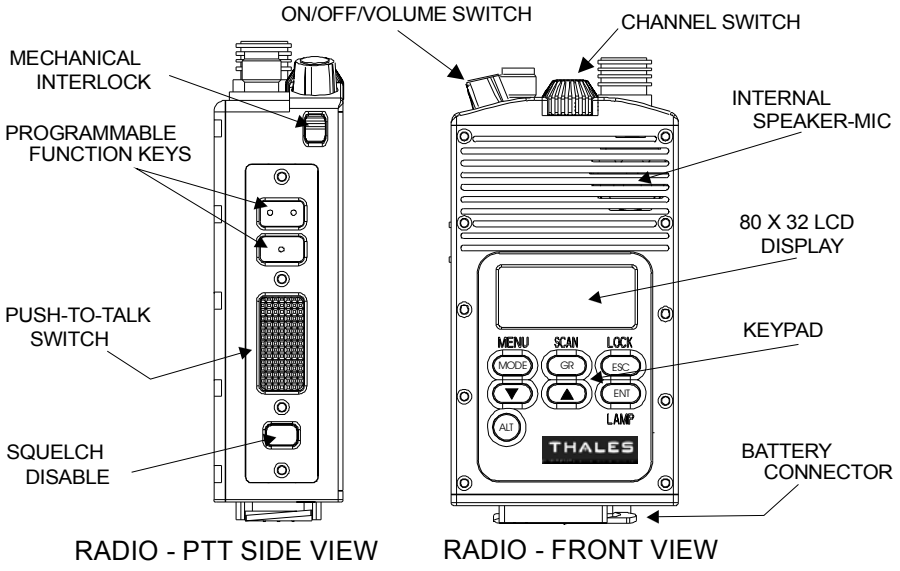


Figure 10-1 MBITR Controls and Switches

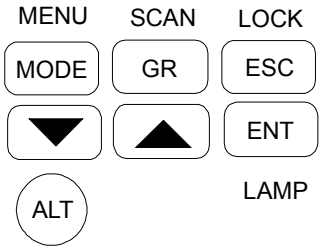


Figure 10-2 MBITR Keypad

10.1 TURN ON THE RADIO

1. Make sure that there is a charged battery attached to the radio
2. Use the correct antenna: long (p/n 3100662-501 for Combat Net (30-88 MHz)) or short (p/n 3100661-501) for above 88 MHz.
3. Turn the ON/OFF/Volume switch clockwise two or three clicks (mid-range volume).
4. The radio display will flash "TESTING" on the display while the power-on self-test is running and will then show "THALES MBITR" and the software version running on the radio. The current version is "REV. V, Ver. 2.33".
5. If your radio does not have the current software version, contact Thales Customer Service, 1-800-914-0303, for information on field software upgrades.

6. After the display has shown the software version, it will then change to the default screen. The radio is now ready for operation.

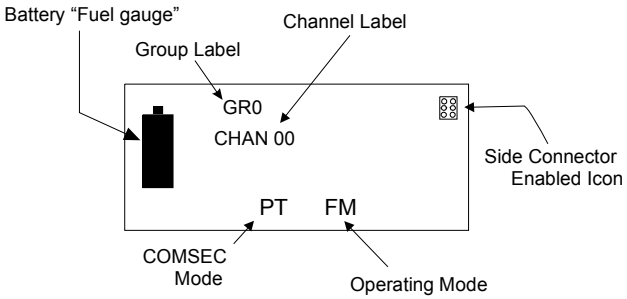


Figure 10-3 Default Screen

10.2 TRANSMIT A VOICE MESSAGE

7. To transmit a voice message, start from the default screen.
8. Make sure that the desired channel is selected. (See paragraph 10.7 to change channels) If the radio is set for external audio, make sure an audio accessory is attached or switch to internal audio. (See paragraph 10.4)
9. Press and hold the Push-To-Talk (PTT) switch on the side of the radio (if using internal audio) or the PTT on the audio accessory (if using external audio).
10. The Transmit Screen should appear on the display.

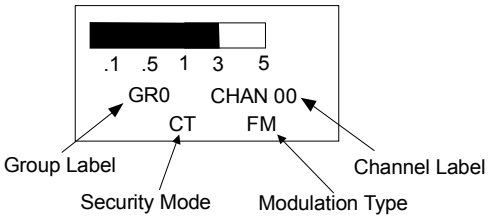


Figure 10-4 Transmit Screen

11. Hold the radio so that the internal microphone is about 6 to 8 inches from your mouth (if using internal audio) or speak into the microphone of the audio accessory (if using external audio).
12. If operating in Secure (CT) mode, wait about ½ second before speaking.
13. When done speaking, release the PTT.

10.3 CHANGE POWER OUTPUT

1. The transmit power setting is programmed as one of the channel parameters, but can be changed "on the fly".
2. To change the power setting, begin transmitting (see paragraph 10.2).
3. While pressing the PTT so that the Transmit screen is on the display, press the UP arrow on the keypad to increase the power setting or the DOWN arrow to decrease the power setting.
4. To activate the new power setting, momentarily release the PTT switch and then press it again to begin transmitting at the new setting.
5. This changes the power setting for the current channel. If you switch to a different channel, the programmed power setting will apply.

10.4 SWITCH BETWEEN INTERNAL AND EXTERNAL AUDIO

1. The radio can be set for either internal audio (uses only the internal speaker-microphone) or external audio (audio goes through the top audio connector and requires the use of a separate audio accessory).
2. External audio can be set for either normal or sidetone. When set for sidetone, radio transmissions are sent to the audio accessory earpiece as well as being transmitted as a radio signal. Sidetone should not be selected when using the speaker-microphone accessory (p/n 1600469-4). When external audio is selected, an external audio icon will appear on the radio display.

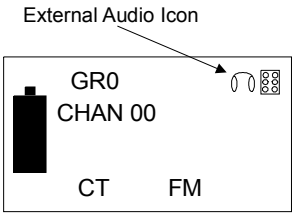


Figure 10-5 External Audio Icon

3. To switch the audio path, first press the MODE key when the radio is on the default screen.
4. The MODE menu will appear on the display with an outline around the first line (audio path selection).

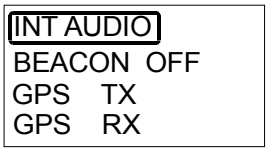


Figure 10-6 MODE Screen

5. To change the selection, press the ENT key. The outline will change to reverse video (white on black).

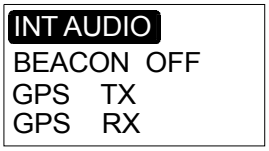


Figure 10-7 Audio Path Select

6. Press either the UP or DOWN arrow key to scroll through the audio path selections (INT AUDIO, EXT AUDIO, SIDE TONE). When the desired setting appears on the screen, press ENT again to confirm the selection.
7. When the outline appears on the screen again (no reverse video), press ESC to return to the default screen.

10.5 ACTIVATE EMERGENCY BEACON

1. The MBITR can transmit an AM Emergency Beacon tone on either the standard military or civilian Search and Rescue frequencies (121.5 or 243.0 MHz) or on a user-programmed frequency (in the range 116.0 to 149.975 MHz or 225.0 to 399.975 MHz).
2. To begin an Emergency Beacon transmission, press the MODE key.
3. Use the DOWN arrow key to move the selection outline to the BEACON OFF line.

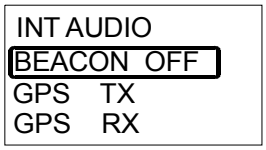


Figure 10-8 BEACON Select

4. Press the ENT key to change the outline to reverse video.
5. Press the UP or DOWN arrow key to change the line to BEACON ON.

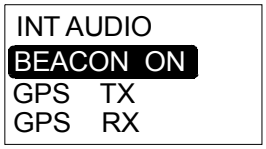


Figure 10-9 BEACON ON Screen

6. Press the ENT key again to open the BEACON frequency selection screen.
7. Use the UP or DOWN arrow to scroll through the three available frequencies: 121.5, 243.0, and the user-programmed frequency. The factory default frequency is 225.0 MHz. DO NOT USE EITHER 121.5 OR 243.0 MHZ UNLESS YOU ARE IN A REAL EMERGENCY SITUATION. BOTH OF THESE FREQUENCIES ARE CONSTANTLY MONITORED BY SEARCH AND RESCUE ORGANIZATIONS WORLDWIDE. The ON/OFF line indicates the time (in seconds) that the radio will transmit the beacon tone and will go into standby (in the illustration, 10 seconds transmit and 30 seconds standby).

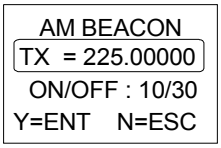


Figure 10-10 BEACON Frequency

8. Press ENT again when the desired frequency is on the screen. The radio will IMMEDIATELY begin transmitting a beacon tone (the TRANSMIT screen will appear).
9. When the BEACON is ON, but the radio is in standby, a BEACON icon will appear on the default screen.

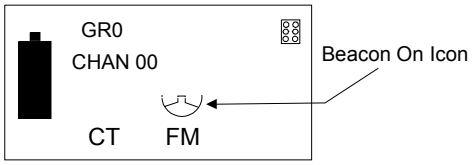


Figure 10-11 BEACON Icon

10. To turn the BEACON OFF, press the ESC key at any time.
11. You can override the BEACON transmission by pressing the PTT to talk. When you release the PTT, the BEACON function will resume.
12. NOTE: The radio is not intended to replace dedicated emergency beacon equipment, such as the AN/PRC-112. The emergency beacon transmission does not contain position information and the radio does not respond to DME interrogation.

10.6 TRANSMIT/RECEIVE SITUATION AWARENESS AND POSITION

The radio can be used to transmit Situation Awareness (SA) and position information when attached to a PLGR (AN/PSN-11) and can receive and store SA and position information even without a PLGR.

1. To TRANSMIT SA and position information, the radio must first be set for COMSEC (CT) operation. Either turn to a CT channel or change the current channel programming to CT (see paragraph 10.15).
2. The radio must have TX SA activated. Press and hold the ALT key while pressing the MODE key to open the Main Menu. The selection outline will be around PROGRAM. Press ENT to open the Programming Menu.

Figure 10-12 Select PROGRAM

3. Use the DOWN arrow key to move the selection outline to EMERGENCY. Press ENT to open the BEACON/SA menu.

Figure 10-13 Select EMERGENCY

4. The selection outline is around SA. Press ENT to open the SA programming menu.

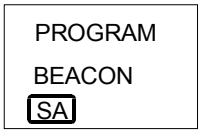


Figure 10-14 Select SA

5. The selection outline is around the first line, the Combat Identification Number (CID). This should be a unique ID number assigned to each radio. The factory default value is 12345, but the operating unit should determine the number assigned to each radio. To change this number, press ENT. The right digit is now shown in reverse video (white on black). Use the UP or DOWN arrow key to scroll through the numbers (0-9).

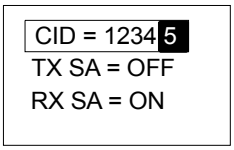


Figure 10-15 Change CID

6. When the desired number is on the screen, press the ALT and UP arrow keys to move the reverse video to the leftmost digit. Again change this number using the UP or DOWN arrow key. Press the ALT and UP arrow keys to move the reverse video one digit to the right. Continue to change the individual digits until the desired CID number is on the screen. Press ENT to confirm this number and move the selection outline to the second line, TX SA = OFF.

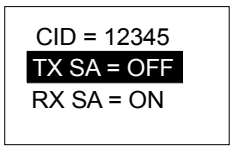


Figure 10-16 Select TX SA

7. Press ENT to enable the change mode (reverse video) and use the UP or DOWN arrow to switch between ON (radio is able to transmit SA information) and OFF (radio cannot transmit SA information). Press ENT to confirm the desired setting and move the selection outline to the last line, RX SA = ON.

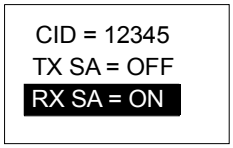


Figure 10-17 Select RX SA

8. Press ENT to enable the change mode and use the UP or DOWN arrow keys to switch between ON (radio is able to receive SA information) and OFF (radio cannot receive SA information). Press ENT to confirm the desired setting. Note that the TX SA and RX SA can be set independently. Press ESC four times to return to the default screen. SA should appear on the screen as shown in Figure 10-18.

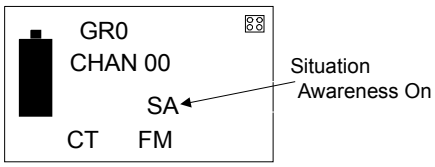


Figure 10-18 SA Enabled

9. When a new message is received that includes SA information, the display will change to RX SA as shown in Figure 10-19. When a PLGR is attached to a radio that has TX SA enabled, the display will change to TX SA when a good position fix is obtained from the PLGR.

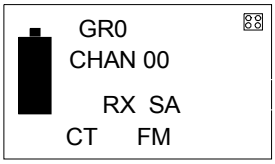


Figure 10-19 New SA Message Received

10. When the radio display shows TX SA, the radio will automatically transmit its CID and the Military Grid Reference System (MGRS) information read from the attached PLGR at the beginning of every transmission. This transmission does not interfere with normal voice operation.
11. To view the information that is being transmitted (TX SA on the display) or received (RX SA on the display), press the MODE key. Use the DOWN arrow key to move the

selection outline to GPS TX (for transmitted information) or GPS RX (for received information).

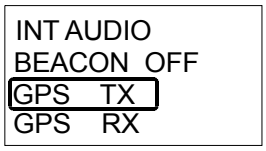


Figure 10-20 Select TX Information

12. Press ENT to open the SA information screen. The GPS TX screen shows the current data read from the PLGR. If the PLGR is disconnected, the TX SA data is deleted. The GPS RX function can store RX SA data from up to 10 different CIDs. The initial GPS RX display shows the oldest RX SA data. There are two screens associated with each RX SA CID. To view the second screen, press ENT. To view data received from other CIDs, press the UP or DOWN arrow keys. If a second transmission is received from a CID that already has RX SA data stored, the new data will overwrite the old data. If RX SA data is received from more than ten CIDs, the oldest data will be deleted.

10.7 CHANGE CHANNELS

The Channel Switch is a 16-position rotary switch that can be used to select any one of up to 16 channels that have been assigned to a Group.

1. To change channels, simply rotate the switch either clockwise or counterclockwise.
2. Check the display to confirm the selection.
3. If you turn the switch rapidly, the display may not refresh immediately (display the correct channel information).
4. If the desired channel is not available in the current Group, you may have to change Groups (see paragraph 10.8).

10.8 CHANGE GROUPS

The radio uses Groups to manage how channels can be selected using the Channel Switch. There are 10 Groups of channels in the radio; each Group can be assigned up to 16 channels corresponding to the 16 positions on the Channel Switch. An individual channel (such as a Command Channel) can be assigned to more than one Group or can be assigned to more than one position within a Group.

1. To change Groups, press the GR key.
2. The Group Select screen will appear on the display. The current active Group is in reverse video (white on black). Note that GR0 through GR9 are the factory default Group labels. The PC Programmer can be used to assign any 3-character alphanumeric as a Group label.
3. Use the UP or DOWN arrow key to move the selection outline to the desired new Group.
4. When the outline is around the desired Group label, press the ENT key to select that Group and return to the default screen.

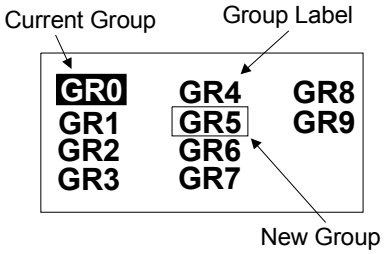


Figure 10-21 GROUP Select Screen

5. The default screen will show the new Group label and the label of the Channel that is assigned to the current Channel Switch position in the new Group.

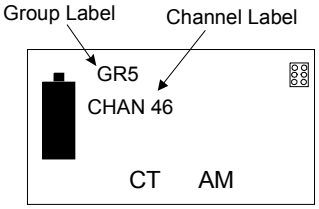


Figure 10-22 New Group and Channel

10.9 CHANGE SQUELCH LEVEL

The squelch control is used to silence the inherent background noise in the radio receiver so that only signals that appear above this background will be heard. Squelch in the MBITR is set for each channel individually as part of channel programming.

1. The squelch control default setting is 8 dB. If conditions require a change in squelch setting (greater than expected background noise or requirement to receive weak signals), you can change the squelch setting for the current channel.
2. To change the squelch, press and hold the Squelch Disable button on the side of the radio for about 3-5 seconds or until the Squelch Adjust Screen appears. Then release the Squelch Disable button.

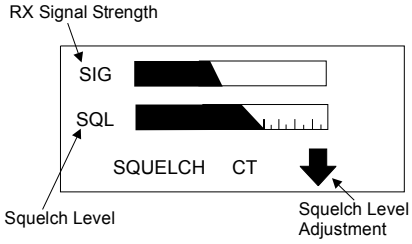


Figure 10-23 Squelch Adjust Screen

3. The screen shows the current squelch level and, for FM signals, the received signal strength (or level of background noise).
4. If the signal meter (top line) is registering background noise (static), use the UP or DOWN arrow key to adjust the squelch level (bottom line) so that it is just slightly greater than the background noise.
5. If the signal meter (top line) is registering a weak signal that you want to hear use the UP or DOWN arrow key to adjust the squelch level (bottom line) so that it is just slightly less than the incoming signal.

10.10 ENABLE/DISABLE THE SIDE CONNECTOR

The radio multi-pin side connector is the primary way to connect the radio to other electronic devices, such as computers, data controllers, vehicle adapters, and other radios. One of the pins on the connector has a voltage applied to it so it can recognize other devices when they are attached. Because the presence of this voltage makes the radio susceptible to moisture, the side connector should only be turned ON (enabled) when it is being used with another device. When the side connector is ENABLED, there is a side connector icon in the upper right corner of the default display.

1. To enable or disable the side connector, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.
2. The screen will open with the selection outline around PROGRAM. Press ENT to continue to the PROGRAMMING screen.

Figure 10-24 MAIN MENU Screen

3. Use the UP arrow to move the selection outline to GLOBAL and press ENT.

Figure 10-25 PROGRAMMING Screen

4. The GLOBAL screen will open with the selection outline around SIDE/MIC LVL. Press ENT to continue.

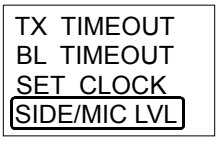


Figure 10-26 GLOBAL Screen

5. The final screen will open with the selection outline around SIDE ENABLE (or SIDE DISABLE). To change this setting, press ENT to change the appearance to reverse video (white on black). Use the UP or DOWN arrow to toggle between the two settings.

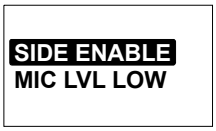


Figure 10-27 SIDE Option Screen

6. When the desired setting is on the screen (SIDE ENABLE or SIDE DISABLE), press ENT again. The screen will appear normal (no reverse video). Press ESC four times to return to the default screen. If the side connector is ENABLED, there will be an icon in the upper right; if the side connector is disabled, there will not be an icon.

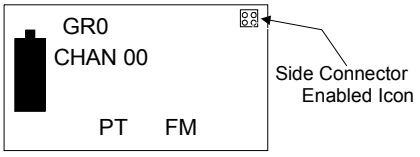


Figure 10-28 Side Connector Enabled

10.11 CLONE A RADIO

You can copy (clone) programming information from one radio to another using a cloning cable (p/n 3500395-501). Cloning copies all the information that is included in a PC Programmer configuration. Cloning DOES NOT copy COMSEC keys, SINCGARS loadsets, HAVEQUICK Time of Day, or real time clock time.

1. To clone from one radio to another, first identify which radio will be SENDING information and which will be RECEIVING.
2. Turn on both radios and make sure that the SIDE CONNECTOR is enabled on both radios (see paragraph 10.10).
3. One end of the cloning cable is labeled SEND and the other end is labeled RECEIVE. Be sure to connect the correct end of the cable to the SENDING and RECEIVING radios.
4. AS SOON AS THE CABLE IS CONNECTED TO THE RADIO, the display on the SENDING radio will appear as shown in Figure 10-29 and the display on the RECEIVING radio will appear as shown in Figure 10-30.

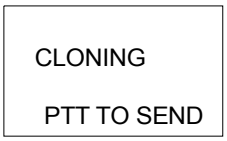


Figure 10-29 Cloning SEND

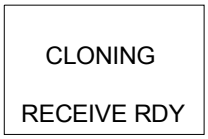


Figure 10-30 Cloning RECEIVE

5. Make sure that the SEND radio has the SEND display and the RECEIVE radio has the RECEIVE display. Press and release the PTT on the SEND radio. When cloning begins, the displays will change to Figure 10-31 on the SEND radio and Figure 10-32 on the RECEIVE radio.

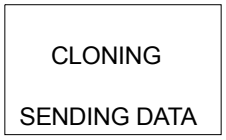


Figure 10-31 Cloning SENDING

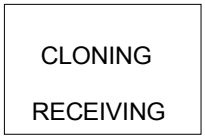


Figure 10-32 Cloning RECEIVING

6. When cloning is complete (about 20 seconds), the RECEIVE radio will automatically re-boot so that the new programming information can be loaded. While the RECEIVE radio is re-booting, disconnect the RECEIVE end of the cloning cable.
7. The SEND radio will go back to the SEND screen (Figure 10-29) so that you can clone other radios. If there are no other radios to clone, disconnect the cloning cable from the SEND radio and press ESC once or twice to return to the default screen.
8. If you are not going to connect the radios to other devices (such as a data controller or PLGR), disable the side connectors.

10.12 LOAD COMSEC KEYS

The radio must have at least one Traffic Encryption Key (TEK) loaded for encrypted (Secure or CT) operation. The radio can hold up to five TEKs and one Key Encryption Key (KEK), which is used for Over-The-Air-Rekey (OTAR). **IMPORTANT: Do not attach the fill device until AFTER the radio is set up for keyfill.**

10.12.1 RADIO PREPARATION

1. All keyfill is done through the top (six-pin) audio connector. In order to load keys in the Maritime (20 meter) version, first attach the audio/keyfill adapter (p/n 3600190-1) to the ten-pin audio connector.
2. To begin keyfill, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-33 Select KEYFILL

3. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

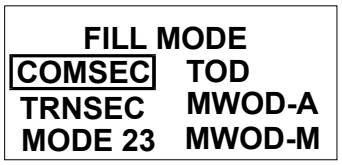


Figure 10-34 KEYFILL Screen

4. The KEYFILL screen opens with the selection outline around COMSEC. Press ENT to continue to the COMSEC FILL screen.

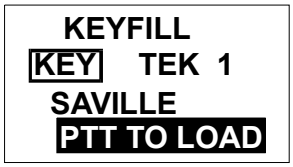


Figure 10-35 COMSEC FILL Screen

5. The COMSEC FILL screen opens with the selection outline around KEY. This shows the first key location that will be filled and can be TEK 1 through 5 or KEK. The recommended sequence is to fill TEK 1 first, continue through as many TEKs as needed (up to 5), and only load the KEK if OTAR is planned, and a valid KEK is available. NOTE: If the crypto alarm (steady 1 khz tone) sounds when this screen opens, press the PTT once or twice to stop the alarm, and proceed with loading keys.
6. To change the KEY location shown, press ENT and use the UP or DOWN arrow keys to scroll through the available values (TEK 1-5 and KEK). DO NOT ATTEMPT TO LOAD ANYTHING INTO THE KEK LOCATION EXCEPT A VALID KEK.
7. When the COMSEC FILL screen (Figure 10-35) is on the radio display with the desired first key location, you can attach the fill device.

10.12.2 LOADING COMSEC FROM KYK-13

1. Check that a key is loaded in the KYK-13. Turn the select switch to position 1 and turn the mode switch to OFF/CHECK. Press and release the initiate button and look for a flash on the check light. If there is no flash, the KYK-13 does not have a key loaded in that position. Turn the select switch to each of the remaining positions (2-6) and check for keyfill.
2. With the select switch set to a position that has a key loaded, use the fill cable to attach the KYK-13 to the radio audio connector. **Make sure the radio is displaying the COMSEC FILL screen (Figure 10-35).**
3. Set the KYK-13 mode switch to ON. Press the PTT on the radio. The check light on the KYK-13 flashes, and if successful the key number on the radio display increases by 1 (e.g., TEK 1 to TEK 2).
4. If more keys are to be loaded, set the KYK-13 select switch to the next key position and press the radio PTT. Again, the KYK-13 check light will flash and the key number on the radio display increases by 1. Continue until all desired TEKs are loaded (up to 5).
5. If there is a valid KEK in the KYK-13, and OTAR capability is needed in the radio, turn the KYK-13 select switch to the position that contains the KEK and set the radio display to KEK. Press the radio PTT to load the KEK.
6. When all keys are loaded, set the KYK-13 mode switch to OFF, Disconnect the KYK-13 from the MBITR audio connector.

10.12.3 LOADING COMSEC FROM AN/CYZ-10 (ANCD)

1. Turn on the ANCD and select ‘Appl” on the display. Press ENTR.
2. The ANCD display will read “Radio/SOI/RDS”.
3. Press LOCK LTR to remove “Letter” from the display. Select RADIO and press ENTR. The ANCD display will read “SEND/RECEIVE/DATABASE/SETUP /COMSEC/TIME”.
4. Select COMSEC and press ENTR. The display will read “VG/LD/RV/AK/MK/VU”.
5. Select LD and press ENTR. The display will read “Select TEK/KEK”.
6. Select TEK and press ENTR. The display will show the TEKs loaded in the ANCD.
7. Select the desired key, then press ENTER.
8. Enter QUIT. The ANCD display will read “Connect ANCD TO RT”.
9. Connect ANCD to the radio audio connector. Make sure the radio is displaying the COMSEC FILL screen (Figure 10-35).
10. The ANCD display will read “Press LOAD on RT”. Press the radio PTT.
11. The ANCD reports: "1 Keys Transferred." The radio display will increase the TEK number by one.

10.13 PREPARE RADIO FOR SINCGARS OPERATION

NOTE: SINCGARS is an optional software capability, so your radio may not be capable of SINCGARS operation.

Successful SINCGARS operation requires several related functions: one or more of the MBITR channels must be programmed for SINCGARS operation, a SINCGARS loadset must be loaded into the radio, and the MBITR clock must be synchronized with SINCGARS net time. The following paragraphs illustrate how to perform each of these functions.

10.13.1 PROGRAM A SINCGARS CHANNEL

1. To program an MBITR channel for SINCGARS operation, first press the MODE key while also pressing the ALT key. This opens the MAIN menu with the selection outline around PROGRAM.

Figure 10-36 MAIN Menu

2. Press ENT to open the PROGRAMMING menu. The selection outline is around RADIO CONFIG.

Figure 10-37 PROGRAMMING Menu

3. Press ENT to open the first screen of the Channel Programming menu.
4. The selection outline is around the channel number (the internal number (00-99) used by the radio to identify a channel). The number shown is the current active channel (based on the channel switch setting (paragraph 10.7)). You can select other channels in the current group by changing the channel select switch. (To select channels in other groups, return to the default screen and change groups (paragraph 10.8)).

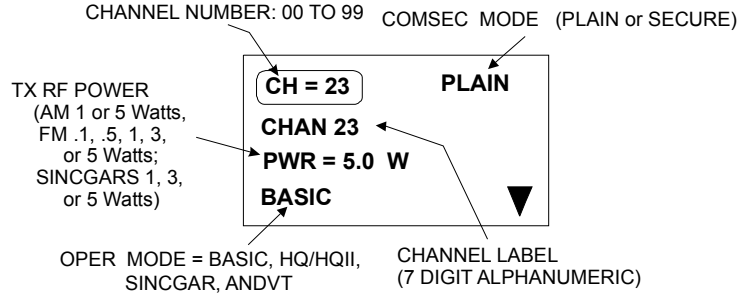


Figure 10-38 Channel Programming Screen 1

5. Press the DOWN arrow key to move the outline to the COMSEC setting. Press the DOWN arrow again to move to the next selection without making a change or press ENT to enable the change mode (reverse video). Use the UP or DOWN arrow to switch between PLAIN and SECURE. Press ENT again to confirm the desired setting and move the outline to the channel label.
6. The channel label is the seven character alphanumeric user-assigned label. The label is usually created using the PC Programmer, but can be changed using the radio keypad and display. See paragraph 10.15 for instruction on changing the label.
7. The next line is the transmit power setting. The default value is 5 watts. To change this setting, press ENT and use the UP and DOWN arrow keys to scroll through the available values. The channel operating mode (Basic, SINCGARS, HAVEQUICK, or ANDVT) and modulation type (AM, FM, or NB) will determine what values are available. (See Figure 10-38.) Press ENT after setting this value to confirm and move to the last line on the screen.

8. The last line is the operating mode. The default setting is BASIC. To change to SINCGARS, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the available choices to SINCGAR. Press ENT to confirm this choice. The screen should appear as shown in Figure 10-39.

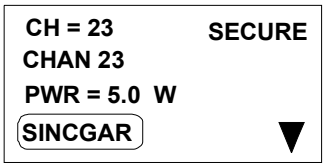


Figure 10-39 SINCGARS Programming Screen 1

9. Press the DOWN arrow key to move to the second channel programming screen.
10. This screen opens with the selection outline around the SINCGARS channel number. The available choices are CUE, MAN, and 1-6, corresponding to the settings on the front panel of the standard SINCGARS manpack radio (AN/PRC-119). The default setting is MAN. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm and move the outline to the next line.

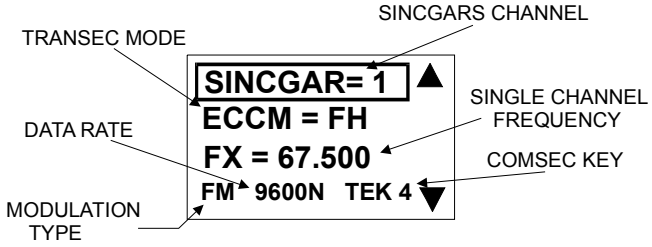


Figure 10-40 SINCGARS Programming Screen 2

11. The next line is the ECCM (Electronic Counter-Counter Measures) mode, either SC (for Single Channel) or FH (Frequency Hopping). This determines whether the radio will operate on a single frequency or will hop through multiple frequencies when set on this channel. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm and move the outline to the next line.
12. The next line is the frequency the radio will use if ECCM is set to SC. The available frequency range is 30.000 MHz to 87.975 MHz. To change frequencies, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit. Use the UP and DOWN arrow keys to scroll through the numbers. Note that only 3-8 are available for this position. Press the ALT and UP arrow keys again to move to the next digit. Again use the UP and DOWN arrow keys to scroll through the numbers (now 0-9 are available). When the new frequency is entered, press ENT to confirm and move the selection outline to the next value, Data Rate.

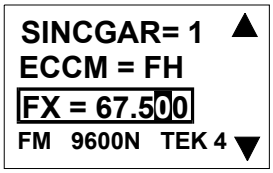


Figure 10-41 SINCGARS SC Frequency

13. Data Rate is the transfer rate for data operation in SINCGARS mode. The available rates are: 600, 1200, 2400, 4800, and 16000 bps (SINCGARS SDM), 1200N, 2400N, 4800N, and 9600N bps (SINCGARS EDM), and RS232. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm and move the outline to the next value, COMSEC Key.
14. COMSEC Key refers to the Traffic Encryption Key (TEK) location assigned to the MBITR channel. Available key locations are TEK 1-5. When assigning a TEK to a channel that is intended for SECURE operation, make sure that a valid COMSEC key is loaded in that location (see paragraph 10.12). To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm. When all selections are set on this screen, and the selection outline is around the last value, press the DOWN arrow key to move to the last SINCGARS channel programming screen.

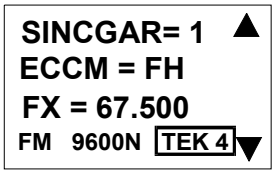


Figure 10-42 SINCGARS TEK Selection

15. The third and final programming screen opens with the selection outline around the Net ID number. The Net ID number is usually loaded in the radio as part of the SINCGARS Loadset (paragraph 10.13.2) but can be changed through the keypad if necessary. To change the Net ID, press ENT to enable the change mode. The rightmost digit will be in reverse video (white on black). Use the UP and DOWN arrow keys to scroll through the numbers. Press the ALT and UP arrow keys to move to the leftmost digit. Again use the UP and DOWN arrow keys to scroll through the numbers. When the new Net ID is entered, press ENT to confirm and move the selection outline to the next value, Offset.

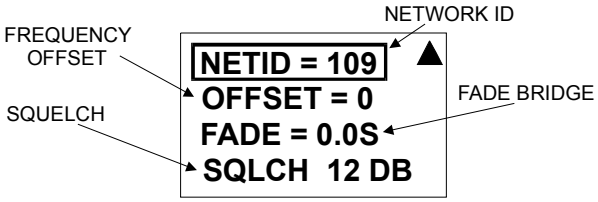


Figure 10-43 SINCGARS Programming Screen 3

16. Offset is an optional value that can increase or decrease the Single Channel frequency by 5 or 10 kHz or make no change. The default setting is 0 (no offset). If you want to change the default, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values (0, +5, +10, -10, -5). When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, Fade.
17. Fade is a parameter that affects SECURE operation. In order for a radio operating in SECURE mode to decrypt an incoming signal, the encryption chip of the receiving radio must be synchronized (operating at the same clock rate) with the transmitting radio. This synchronization takes place at the beginning of a transmission and normally takes only a fraction of a second. If the signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the FADE value (0-4 seconds) forces the encryption

chip to 'freewheel', or maintain synchronization, for the set period of time. When the signal is again received, the radio does not have to re-synchronize. If you are operating in SECURE mode with weak signals, you may want to set a FADE value. To do this, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, Squelch.

18. Squelch is used to set the pre-programmed squelch level for the selected channel (see paragraph 10.9). Available values are 6 to 16 dB at 2 db intervals. Lower values allow weaker signals to be heard; higher values block more background noise. To change squelch level, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm. Press ESC 5 times to return to the default screen. If a SINCGARS Loadset is loaded in the radio, the screen should appear similar to Figure 10-44. If a SINCGARS Loadset is not in the radio, the screen will appear similar to Figure 10-45 with a flashing "TRSEC" in the upper right.

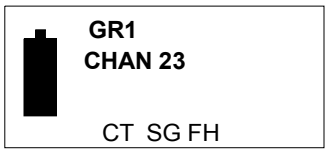


Figure 10-44 SINCGARS Default Screen

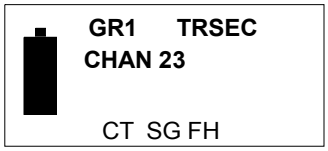


Figure 10-45 SINCGARS Missing Loadset

10.13.2 LOAD SINCGARS LOADSET

A SINCGARS Loadset includes hopsets (up to six), transmission security keys (TSKs), TEKs, and may include lockout sets, FH sync time, and KEK. The recommended loading method is the Integrated COMSEC (ICOM), or Mode 2/3, load using an AN/CYZ-10. **IMPORTANT: Do not attach the fill device until AFTER the radio is set up for loading.**

10.13.2.1 RADIO PREPARATION

1. All loading is done through the top (six-pin) audio connector. In order to load SINCGARS data in the Maritime (20 meter) version, first attach the audio/keyfill adapter (p/n 3600190-1) to the ten-pin audio connector.
2. To begin loading, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-46 Select KEYFILL

3. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

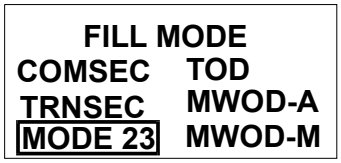


Figure 10-47 KEYFILL Screen

4. The KEYFILL screen opens with the selection outline around COMSEC. Use the DOWN arrow key to move the selection outline to MODE 23 and press ENT to continue to the SINCGARS LOAD screen.

Figure 10-48 SINCGARS LOAD Screen

5. The radio is now ready to connect the ANCD (AN/CYZ-10) and proceed to load the SINCGARS frequency hopping data.

10.13.2.2 LOADING SINCGARS DATA FROM AN/CYZ-10

1. Turn on the ANCD and select 'Appl" on the display. Press ENTR.
2. The ANCD display will read "Radio/SOI/RDS".
3. Press LOCK LTR to remove "Letter" from the display. Select RADIO and press ENTR. The display will read "SEND/RECEIVE/DATABASE/SETUP /COMSEC/TIME"..
4. Select: SEND and press ENTER. The display will read "SEND TO: RADIO/ ANCD/ STU/ PC".
5. Select: RADIO and press ENTER. The display will read "Select: iCom/ Nonicom/ Abn/ RCU/ Haveq".
6. Select: ICOM and press ENTER. The display will read "Connect to RT AUD/FILL Connector".
7. Connect to MBITR audio connector using the fill cable and press the DOWN arrow key **on the ANCD**.
8. The ANCD display will read "Set FCTN switch to LD on RT". Press the DOWN arrow key **on the ANCD**.
9. Display will read "Do you want to include TIME? Y/N". ENTER "Y" for yes. Note: If the same ANCD is used to load all radios in a net, the FH sync time should be the same in all radios. If different ANCDs are used, you will need to set the sync time manually (see paragraph 10.13.3).
10. Press the PTT on the radio. The ANCD will begin transferring all the SINCGARS FH data. When the transfer is complete, the ANCD display will read "Successful Transfer". Disconnect the fill cable from the radio and press the ESC key three times to return to the default menu.

10.13.3 SET SINCGARS NET TIME

Successful frequency hopping operation requires time synchronization of all radios in the net to plus or minus 4 seconds of the Net Control time. The radio has a base clock and separate net clocks for each SINCGARS channel (1-6). The MAN and CUE settings use the base clock time. When time is first loaded into the radio, all clocks are set to the same time. The sync time for a net is automatically updated every time a message is received on that net. If the same base time

is not initially loaded into all radios, it may be necessary to set the base clock manually when first setting up the radio for SINCGARS operation. Before setting the base time, first determine the time to be used. If operating with a Net Control, request the net base time; otherwise, select a radio to be the standard. On the standard radio, turn to a SINCGARS FH channel and press ENT to open the alternate display (Figure 10-49). The alternate display shows the current active SINCGARS channel, the Net ID, the Net time, and the TEK. Use the Net time shown on this display as the reference time for the other radios that will be using the net.

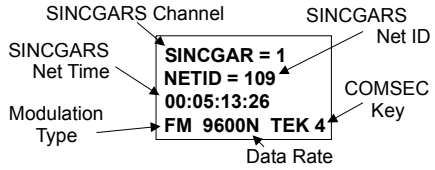


Figure 10-49 SINCGARS Alternate Display

1. To set the base clock, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.
2. The screen will open with the selection outline around PROGRAM. Press ENT to open the PROGRAMMING menu. The selection outline is around RADIO CONFIG.
3. Press the UP arrow key to move the selection outline to GLOBAL. Press ENT to open the GLOBAL programming menu. The selection outline is around SIDE/MIC LVL.
4. Press the UP arrow key to move the selection outline to SET CLOCK and press ENT.

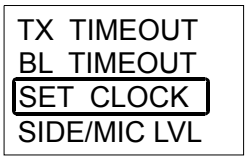


Figure 10-50 Set Clock

5. The SET CLOCK menu opens with the selection outline around DAY. This is a two-digit Julian date. To change DAY, press ENT. The right digit will be shown in reverse video (white on black). Use the UP or DOWN arrow keys to scroll through the values (0-9). Press the ALT and UP or DOWN arrow keys to move the highlighting to the left digit. Use the UP or DOWN arrow keys to scroll through the values (0-9). When the correct day is set, press ENT.

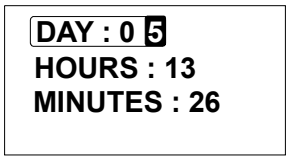


Figure 10-51 Set DAY

6. Press the DOWN arrow key to move the outline to HOURS. HOURS uses a 24-hour clock. To change HOURS, press ENT. The right digit will be shown in reverse video (white on black). Use the UP or DOWN arrow keys to scroll through the values (0-4). Press the ALT and UP or DOWN arrow keys to move the highlighting to the left digit. Use the UP or DOWN arrow keys to scroll through the values (0-2). When the correct hour is set, press ENT.

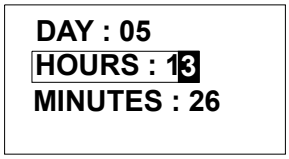


Figure 10-52 Set HOURS

7. Press the DOWN arrow key to move the outline to MINUTES. To change MINUTES, press ENT. The right digit will be shown in reverse video (white on black). Use the UP or DOWN arrow keys to scroll through the values (0-9). Press the ALT and UP or DOWN arrow keys to move the highlighting to the left digit. Use the UP or DOWN arrow keys to scroll through the values (0-5). Set the minute to the next higher unit from that shown on the reference time (see Figure 10-49). When the reference time is within a second or two of the minute on the radio display, press ENT. This starts the base clock at 00 seconds.

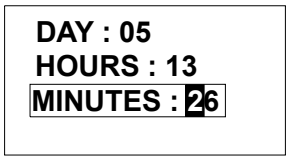


Figure 10-53 Set MINUTES

10.13.4 SINCGARS LATE NET ENTRY

1. If your radio clock time is more than 4 seconds but less than 59 seconds from the net FH sync time, you can use the passive late net entry procedure to synchronize your clock and join the net.
2. Make sure your radio is set to the net SINCGARS channel (check the SINCGARS alternate display, Figure 10-49, to verify SINCGARS channel and net ID). Return to the default display by pressing ENT or ESC.
3. Press and release the GR key while pressing the ALT key at the same time. The display will now show LNE in the lower left.

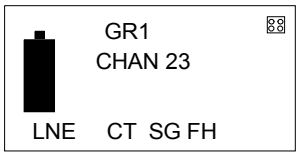


Figure 10-54 SINCGARS Late Net Entry

4. Monitor the channel for approximately three minutes.
5. When the radio receives traffic from the net, it will synchronize the base clock to net time. When the clock is synchronized, the LNE will disappear and you will begin to hear net traffic.
6. CAUTION: Do not press the PTT until you hear net traffic. This will cancel the LNE operation.

10.14 PREPARE RADIO FOR HAVEQUICK OPERATION

NOTE: HAVEQUICK is an optional software capability, so your radio may not be capable of HAVEQUICK operation.

Successful HAVEQUICK operation requires several related functions: one or more of the MBITR channels must be programmed for HAVEQUICK operation, the MBITR HAVEQUICK clock must be loaded with HAVEQUICK Time of Day (usually Zulu time), and a HAVEQUICK

Word of Day or Multiple Word of Day must be loaded into the radio. The following paragraphs illustrate how to perform each of these functions.

10.14.1 PROGRAM A HAVEQUICK CHANNEL

1. To program an MBITR channel for HAVEQUICK operation, first press the MODE key while also pressing the ALT key. This opens the MAIN menu with the selection outline around PROGRAM.

Figure 10-55 MAIN Menu

2. Press ENT to open the PROGRAMMING menu. The selection outline is around RADIO CONFIG.

Figure 10-56 PROGRAMMING Menu

3. Press ENT to open the first screen of the Channel Programming menu.
4. The selection outline is around the channel number (the internal number (00-99) used by the radio to identify a channel). The number shown is the current active channel (based on the channel switch setting (paragraph 10.7)). You can select other channels in the current group by changing the channel select switch. (To select channels in other groups, return to the default screen and change groups (paragraph 10.8)).

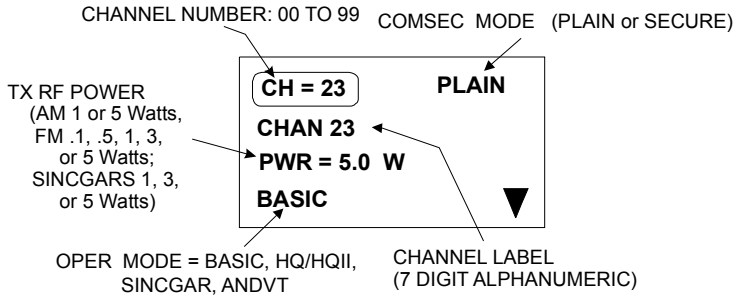


Figure 10-57 Channel Programming Screen 1

5. Press the DOWN arrow key to move the outline to the COMSEC setting. Press the DOWN arrow again to move to the next selection without making a change or press ENT to enable the change mode (reverse video). Use the UP or DOWN arrow to switch between PLAIN and SECURE. Press ENT again to confirm the desired setting and move the outline to the channel label.
6. The channel label is the seven character alphanumeric user-assigned label. The label is usually created using the PC Programmer, but can be changed using the radio keypad and display. See paragraph 10.15 for instruction on changing the label.
7. The next line is the transmit power setting. The default value is 5 watts. To change this setting, press ENT and use the UP and DOWN arrow keys to scroll through the available values. The channel operating mode (Basic, SINCGARS, HAVEQUICK, or ANDVT) and modulation type (AM, FM, or NB) will determine what values are available. (See

Figure 10-38.) Press ENT after setting this value to confirm and move to the last line on the screen.

8. The last line is the operating mode. The default setting is BASIC. To change to HAVEQUICK, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the available choices to HAVEQUICK. Press ENT to confirm this choice. The screen should appear as shown in Figure 10-39.

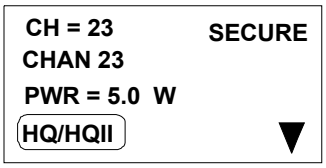


Figure 10-58 HAVEQUICK Programming Screen 1

9. Press the DOWN arrow key to move to the second channel programming screen.

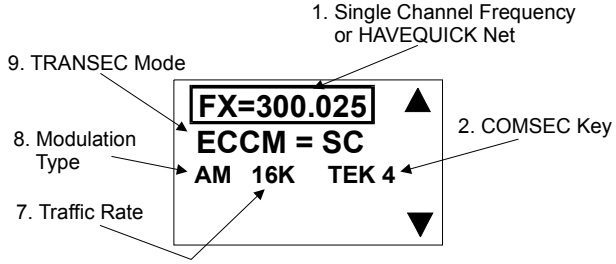


Figure 10-59 HAVEQUICK Programming Screen 2

10. This screen opens with the selection outline around the HAVEQUICK single channel frequency. The available frequency range is 225.000 to 399.975 MHz in 25kHz steps. To change, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black) (see Figure 10-60). Use the UP or DOWN arrow keys to scroll through the available values (00, 25, 50, and 75). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit and use the UP or DOWN arrow keys to scroll through the available values. Continue to set the frequency digits in this way until the desired setting is on the screen. Press ENT again to confirm and move the outline to the next line. NOTE: If the last digits of the frequency are 75, HAVEQUICK operation is only available in Single Channel mode. Pressing ENT will move the outline to TEK.

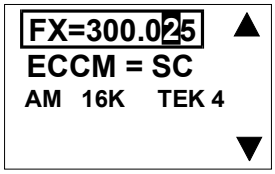


Figure 10-60 HAVEQUICK Frequency Change

11. The next line is the ECCM (Electronic Counter-Counter Measures) mode, either SC (for Single Channel) or FH (Frequency Hopping). This determines whether the radio will operate on a single frequency or will hop through multiple frequencies when set on this channel. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When ECCM =SC, the first line shows the channel's single channel frequency; when ECCM=FH, the first line automatically changes from FX to NET and shows the HAVEQUICK net the radio will use for

frequency hopping. The following table lists the different types of nets available and the associated net numbers. Note that only net numbers ending in 00, 25, and 50 are valid.

Table 10-1 HAVEQUICK Net Identification

MODE	NET		
	TYPE	**RANGE**	**# of Nets**
HAVEQUICK I	Sectorized A	A00.500 – A31.900	320
HAVEQUICK I	A	A32.000 – A99.100	672
HAVEQUICK I	B	A99.200 – A99.900	8
HAVEQUICK I	Training	A00.000 – A00.400	5
HAVEQUICK II	NATO	A00.025 – A99.925	1000
HAVEQUICK II	NATO FMT (Training)	A00.025 – A01.525	16
HAVEQUICK II	Non-NATO	A00.050 – A99.950	1000

When the desired setting is on the screen, press ENT again to confirm and move the outline to the next item, COMSEC Key. NOTE: AM and 16K are the modulation type and encrypted data rate, respectively. They are shown for information only.

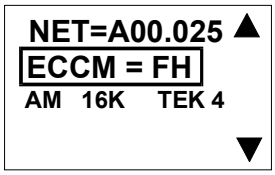


Figure 10-61 HAVEQUICK ECCM Setting

12. COMSEC Key refers to the Traffic Encryption Key (TEK) location assigned to the MBITR channel. Available key locations are TEK 1-5. When assigning a TEK to a channel that is intended for SECURE operation, make sure that a valid COMSEC key is loaded in that location (see paragraph 10.12). To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm. When all selections are set on this screen, and the selection outline is around the last value, press the DOWN arrow key to move to the last HAVEQUICK channel programming screen.

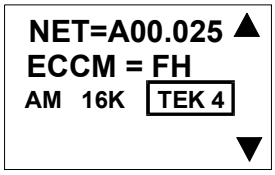


Figure 10-62 HAVEQUICK TEK Selection

13. The third and final programming screen opens with the selection outline around the Repeater Delay. Repeater Delay is used when operating through a repeater system and typically requires that a different receive and transmit frequency be programmed in the current channel. Repeater Delay is fixed at NONE for HAVEQUICK channels. Press the DOWN arrow key to move to the next line, FADE.

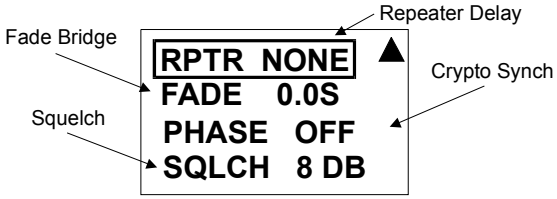


Figure 10-63 HAVEQUICK Programming Screen 3

14. Fade is a parameter that affects SECURE operation. In order for a radio operating in SECURE mode to decrypt an incoming signal, the encryption chip of the receiving radio must be synchronized (operating at the same clock rate) with the transmitting radio. This synchronization takes place at the beginning of a transmission and normally takes only a fraction of a second. If the signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the FADE value (0-4 seconds) forces the encryption chip to 'freewheel', or maintain synchronization, for the set period of time. When the signal is again received, the radio does not have to re-synchronize. If you are operating in SECURE mode with weak signals, you may want to set a FADE value. To do this, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, PHASE or encryption synchronization.

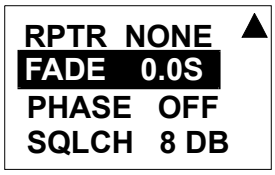


Figure 10-64 HAVEQUICK Fade

15. PHASE is used to set the length of the initial encryption synchronization pattern transmitted by the radio. The radio uses this information during SECURE operation to synchronize the encryption/decryption between the transmitting and receiving radios. The default value is 256 milliseconds. Other values are 384 milliseconds, 1.06 seconds, and OFF. The default value is sufficient time under most operating conditions. To change PHASE, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, squelch.
16. Squelch is used to set the pre-programmed squelch level for the selected channel (see paragraph 10.9). Available values are 6 to 16 dB at 2 db intervals. Lower values allow weaker signals to be heard; higher values block more background noise. To change squelch level, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm. Press ESC 5 times to return to the default screen. If a HAVEQUICK Word of Day and Time of Day are correctly loaded in the radio, the screen should appear similar to Figure 10-65. If a correct Word of Day is not found in the radio, the screen will appear similar to Figure 10-66 with a flashing "NOWOD" in the upper right. If there is a correct Word of Day but no HAVEQUICK Time of Day in the radio, the screen will appear similar to Figure 10-67 with a flashing "NOTOD" in the upper right.

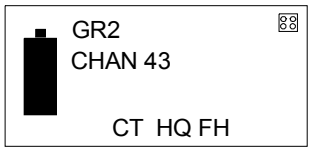


Figure 10-65 HAVEQUICK Default Screen

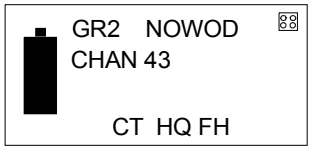


Figure 10-66 HAVEQUICK No Word of Day

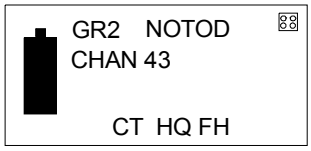


Figure 10-67 HAVEQUICK No Time of Day

10.14.2 LOAD HAVEQUICK WORD OF DAY/MULTIPLE WORD OF DAY

HAVEQUICK Word of Day (WOD) or Multiple Word of Day (MWOD) is used to identify the hop rate and hopping pattern used by the radio. The hopping rate and pattern are determined by a code generator through a key contained within the WOD. A WOD consists of 36 digits broken into 6 segments of 6 digits each. (These segments are also known as presets.) A WOD or MWOD is loaded into the radio either through the Keyfill menu or through the PC Programmer. Loading through the Keyfill menu is described below; PC Programmer loading is described in the PC Programmer manual, p/n 84331.

1. To begin loading, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-68 Select KEYFILL

2. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

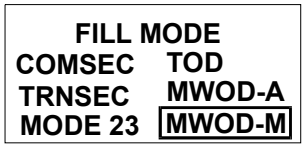


Figure 10-69 KEYFILL Screen

3. The KEYFILL screen opens with the selection outline around COMSEC. Use the UP or DOWN arrow key to move the selection outline to MWOD-M and press ENT to continue to the MWOD LOAD screen.

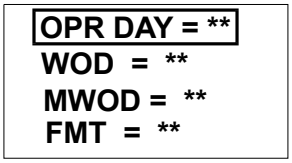


Figure 10-70 MWOD LOAD Screen

4. The MWOD LOAD screen opens with the selection outline around OPR DAY (Operational Day). Operational Day is used in HAVEQUICK II mode to determine which MWOD to use. Press ENT to open the Operational Day screen. The screen opens with the outline around DAY = 00. To change, press ENT to enable the change mode. The ones digit will be in reverse video (white on black) (see Figure 10-71). Use the UP or DOWN arrow keys to scroll through the numbers. Press the ALT and UP arrow keys to move the highlighting to the tens digit and use the UP or DOWN arrow keys to scroll through the available values. Valid Operational Day values are 01 to 31. Press ENT again to confirm and ESC to return to the MWOD LOAD screen.

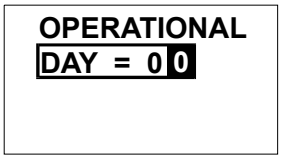


Figure 10-71 HAVEQUICK Operational Day

5. Use the DOWN arrow key to move the selection outline to WOD and press ENT to open the WOD Fill screen. WOD is the single Word of Day used for HAVEQUICK I mode. The screen opens with the selection outline around the first six digit segment, or preset, of the WOD (P20). To change, press ENT to enable the change mode. The rightmost digit will be in reverse video (white on black) (see Figure 10-72). Use the UP or DOWN arrow keys to scroll through the available numbers. Press the ALT and UP arrow keys to move the highlighting to the leftmost digit and use the UP or DOWN arrow keys to scroll through the available values. Continue to use the ALT and UP arrow keys to move across the line and the UP or DOWN arrow keys to scroll through the available values until the complete preset is set. Press ENT again to confirm; the selection outline will automatically move to the next preset (P19). Set P19 and P18 similarly. When P18 is confirmed, the display will automatically change to the next WOD screen that contains the remaining three presets (P17 through P15). After P15 is confirmed, press the DOWN arrow key once or the ESC key twice to return to the MWOD LOAD screen. NOTE: WOD/MWOD values are limited to the range 225.000 through 399.975 and must end in 00, 25, 50, or 75.

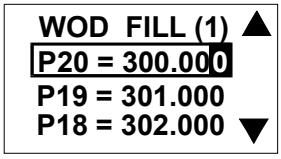


Figure 10-72 HAVEQUICK WOD Fill Screen

6. On the MWOD LOAD screen, use the DOWN arrow key to move the selection outline to MWOD and press ENT to open the MWOD Select screen. The MWOD Select screen is used to access the Multiple Word of Day entry screen. The screen opens with the selection outline around MWOD1. The MBITR can be programmed with up to six MWODs. MWODs are used for HAVEQUICK II mode of operation. To program an

MWOD, either press ENT or use the arrow keys to move the selection outline to one of the other MWODs and press ENT. This opens the MWOD Fill screen.

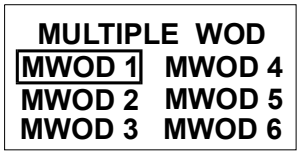


Figure 10-73 HAVEQUICK MWOD Select Screen

7. The MWOD Fill screen (Figure 10-74) is similar in appearance to the WOD Fill screen and is used the same way with one exception. Each MWOD Fill includes a Day of the Month on a third screen. After completing preset P15, press ENT to move to the Day of the Month screen (Figure 10-75). When a HAVEQUICK II net is selected for frequency hopping operation, the radio will compare the Operational Day to each MWOD Day of the Month. If there is a Day of the Month that matches the Operational Day, the radio will use that MWOD. If there is no match, the radio will display a flashing "NOWOD" error message. Valid Days of the Month are 01 to 31; if the Day of the Month is set to 00, that MWOD will not be used. The Day of the Month screen opens with the outline around DAY = 00. To change, press ENT to enable the change mode. The ones digit will be in reverse video (white on black). Use the UP or DOWN arrow keys to scroll through the numbers. Press the ALT and UP arrow keys to move the highlighting to the tens digit and use the UP or DOWN arrow keys to scroll through the available values. Press ENT again to confirm and DOWN arrow to return to the MWOD Select screen

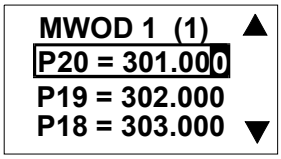


Figure 10-74 HAVEQUICK MWOD Fill Screen

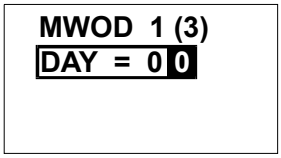


Figure 10-75 HAVEQUICK Day of the Month Screen

8. From the MWOD Select screen, either select another MWOD or press ESC to return to the MWOD LOAD screen.
9. On the MWOD LOAD screen, use the DOWN arrow key to move the selection outline to FMT and press ENT to open the FMT Fill screen. FMT stand for Frequency Managed Training, which are non-operational training frequencies (see paragraph 10.14.4 for more information). The FMT Fill screen opens with the selection outline around the first training frequency (P20). To change, press ENT to enable the change mode. The rightmost digit will be in reverse video (white on black) (see Figure 10-76). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit and use the UP or DOWN arrow keys to scroll through the available values. *NOTE: FMT frequencies are limited to the range 225.000 through 399.975 and must end in 00, 25, 50, or 75*. Continue to use the ALT and UP arrow keys to move across the line and the UP or DOWN arrow keys to scroll through the available values until the complete frequency is set. Press ENT again to confirm; the selection outline will automatically move to the

next frequency (P19). Set P19 and P18 similarly. When P18 is confirmed, the display will automatically change to the next FMT Fill screen that contains the next three frequencies (P17 through P15). When P15 is confirmed, the display will automatically change to the next FMT Fill screen that contains the next three frequencies (P14 through P12). Continue to advance through the training frequencies and screens to the last frequency (P5). When P5 is confirmed, press the DOWN arrow key once to return to the MWOD LOAD screen.

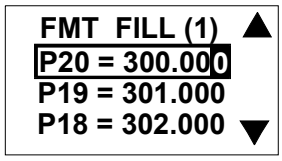


Figure 10-76 HAVEQUICK FMT Fill Screen

10.14.3 LOAD HAVEQUICK TIME OF DAY

HAVEQUICK operation requires time synchronization among all radios operating on the net. Normally, HAVEQUICK nets use Zulu time as the standard, although it is possible to use other time standards. The primary method for loading time into an MBITR is via a PLGR (AN/PSN-11). The radio can also accept a time load over the air from another radio or in exceptional circumstances can perform an emergency time initialization.

10.14.3.1 LOADING TIME FROM A PLGR

In order to load time from a PLGR (which synchronizes the radio HAVEQUICK time with the NAVSTAR GPS time), a GPS cable (Thales p/n 3500465-501) and a PLGR (AN/PSN-11) are required.

1. The first step is to set up the PLGR by using the MENU/SETUP controls to set the PLGR for CONT (continuous) or FIX modes and enabling the HAVEQUICK data port by setting the HAVEQUICK function to ON. (Refer to the PLGR manual TO 31R4-2PSN11-1 for additional information.)
2. The PLGR time input must have a Time Figure of Merit (TFOM) (measure of accuracy) of 7 or better (lower) before the radio will accept it. Allow the PLGR to update location and time information until it shows a TFOM of 7 or less.
3. Turn on the MBITR and set the channel switch to a HAVEQUICK channel (either HQ SC or HQ FH). (If the radio is not set to a HAVEQUICK channel, the TOD menu is not accessible.)
4. Make sure the radio side connector is enabled. (See paragraph 10.10)
5. To begin loading, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-77 Select KEYFILL

6. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

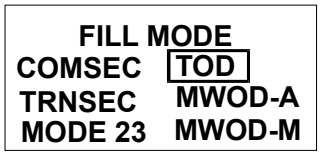


Figure 10-78 Select TOD

7. The KEYFILL screen opens with the selection outline around COMSEC. Use the UP or DOWN arrow key to move the selection outline to TOD and press ENT to continue to the TOD Fill screen.

Figure 10-79 TOD Fill Screen

8. The screen opens with the selection around PLGR TOD. Press ENT to continue to the PLGR Fill screen.

Figure 10-80 PLGR Fill Screen

9. Connect the end of the GPS cable labeled "RADIO" to the radio side connector and the end labeled "GPS RECEIVER" to the PLGR J2 connector.
10. Press and release the radio PTT switch. If the Time of Day loads successfully, the bottom line of the display will change to "TOD LOADED".
11. If the Time of Day does not load, the bottom line of the display will change to "TOD FAILED". If this occurs, make sure the PLGR TFOM is 7 or less, that the radio side connector is enabled, and that the PLGR HAVEQUICK port is set to ON. Then try loading Time of Day again.

10.14.3.2 SENDING AND RECEIVING TIME OVER THE AIR

HAVEQUICK Time of Day can also be transmitted over the air from one radio to another. Although TOD transmission can work in either Single Channel (SC) or Frequency Hopping (FH) mode, it is recommended that both the sending and receiving radios be set to the same HAVEQUICK SC channel. The default display on the sending and all receiving radios should appear as in Figure 10-81.

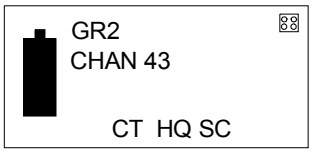


Figure 10-81 HAVEQUICK SC Default

1. To prepare the radio to send or receive TOD, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-82 Select KEYFILL

2. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

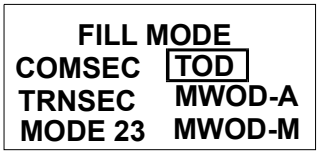


Figure 10-83 Select TOD

3. The KEYFILL screen opens with the selection outline around COMSEC. Use the UP or DOWN arrow key to move the selection outline to TOD and press ENT to continue to the TOD Fill screen.
4. The screen opens with the selection around PLGR TOD. Use the UP or DOWN arrow key to move the selection outline to RX TOD (if the radio is to receive a TOD transmission from another radio) or TX TOD (if the radio has a TOD fill and is to transmit to other radios). Press ENT. The radio display will revert to the default display with either TODRX or TODTX flashing in the upper right.
5. To transmit TOD, press and hold the PTT switch for at least 10 seconds. It is not necessary to talk into the radio.
6. To receive TOD, wait for the transmission from the sending radio while observing the radio display. The display will show RX in the lower left when the transmission is received and will sound a short tone when TOD is received. Switch to a HAVEQUICK FH channel and confirm that the display appears as shown in Figure 10-65. NOTE: The radio will exit TODRX mode if the PTT is pressed before a TOD transmission is received or after about 45 seconds if no transmission is received.

10.14.3.3 TIME EMERGENCY INITIALIZATION

The radio is also capable of TOD emergency initialization. This should only be done if access to a PLGR or over the air TOD transmission is not available, as the time will not be synchronized with any external net. The HAVEQUICK TOD clock will start at 00 hours, 00 minutes, 00 seconds, and 000 operational day (unless a value 01 to 31 has been entered as described in paragraph 10.14.2). Once one radio has had the TOD clock started through emergency initialization, use the TODTX function (paragraph 10.14.3.2) to send that time to other radios that will be members of the HAVEQUICK net.

1. Turn the radio to a HAVEQUICK FH channel. There will be a flashing NOTOD error message flashing in the upper right of the display.
2. To prepare the radio for TOD emergency initialization, press the MODE key while also pressing the ALT key to open the MAIN MENU screen.

Figure 10-84 Select KEYFILL

3. The screen will open with the selection outline around PROGRAM. Use the UP arrow key to move the selection outline to KEYFILL and press ENT to continue to the KEYFILL screen.

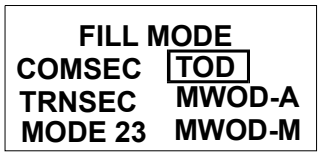


Figure 10-85 Select TOD

4. The KEYFILL screen opens with the selection outline around COMSEC. Use the UP or DOWN arrow key to move the selection outline to TOD and press ENT to continue to the TOD Fill screen.

Figure 10-86 TOD Emergency Initialize

5. The screen opens with the selection around PLGR TOD. Use the UP or DOWN arrow key to move the selection outline to EMER INIT. Press ENT.
6. The screen will revert to the default display for a HAVEQUICK FH channel with no error message.
7. Use the TODTX function to transmit the TOD to any other radio that will be part of this HAVEQUICK net.

10.14.4 USE HAVEQUICK TRAINING FREQUENCIES

As shown in Table 10-1, HAVEQUICK has both operational and training nets. The operational nets are pre-determined sets of frequencies, while the training nets can use sets of frequencies determined by the local command (within the 225.000 to 399.975 MHz HAVEQUICK range).

1. In order to use a training net, the frequencies must be programmed into the FMT storage locations (see paragraph 10.14.2).
2. The HAVEQUICK channel must be programmed for either a HAVEQUICK I Training Net (Net numbers A00.000 – A00.400, where the last two digits are 00) or a HAVEQUICK II Training Net (Net numbers A00.025 – A01.525, where the last two digits are 25). (See Table 10-1.)
3. If a HAVEQUICK I Training Net is selected, the P20 preset of the WOD must be set to 300.0xx (xx = 00, 25, 50, or 75).
4. If a HAVEQUICK II Training Net is selected, the P20 preset of the active MWOD (Day of the Month corresponding to the Operational Day) must be set to 300.0xx.

10.15 PROGRAM A BASIC CHANNEL

The Basic radio mode can be programmed for AM, FM, or NB (Narrowband (12.5 kHz) FM) channels over the frequency range of 30.000 MHz to 512.000 MHz.

1. To program an MBITR channel for Basic operation, first press the MODE key while also pressing the ALT key. This opens the MAIN menu with the selection outline around PROGRAM.

Figure 10-87 MAIN Menu

2. Press ENT to open the PROGRAMMING menu. The selection outline is around RADIO CONFIG.

Figure 10-88 PROGRAMMING Menu

3. Press ENT to open the first screen of the Channel Programming menu.
4. The selection outline is around the channel number (the internal number (00-99) used by the radio to identify a channel). The number shown is the current active channel (based on the channel switch setting (paragraph 10.7)). You can select other channels in the current group by changing the channel select switch. (To select channels in other groups, return to the default screen and change groups (paragraph 10.8)).

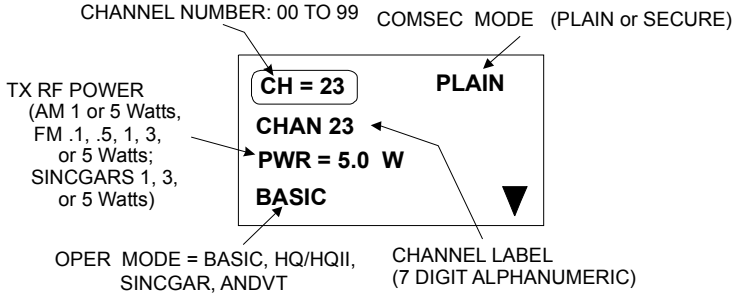


Figure 10-89 Channel Programming Screen 1

5. Press the DOWN arrow key to move the outline to the COMSEC setting. Press the DOWN arrow again to move to the next selection without making a change or press ENT to enable the change mode (reverse video). Use the UP or DOWN arrow to switch between PLAIN and SECURE. Press ENT again to confirm the desired setting and move the outline to the channel label.
6. The channel label is the seven character alphanumeric user-assigned label. The label is usually created using the PC Programmer, but can be changed using the radio keypad and display. See paragraph 10.15 for instruction on changing the label.
7. The next line is the transmit power setting. The default value is 5 watts. To change this setting, press ENT and use the UP and DOWN arrow keys to scroll through the available values. The channel operating mode (Basic, SINCGARS, HAVEQUICK, or ANDVT) and modulation type (AM, FM, or NB) will determine what values are available. (See Figure 10-89.) Press ENT after setting this value to confirm and move to the last line on the screen.
8. The last line is the operating mode. The default setting is BASIC. The screen should appear as shown in Figure 10-90.

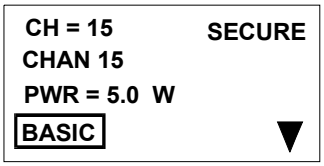


Figure 10-90 Basic Programming Screen 1

9. Press the DOWN arrow key to move to the second Basic programming screen.

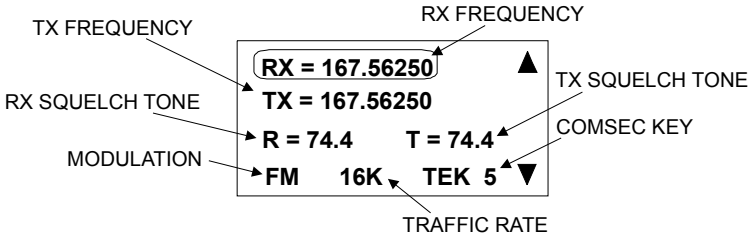


Figure 10-91 Basic Programming Screen 2

10. The second Basic screen opens with the selection outline around the receive frequency (RX). To change the receive frequency, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit. Use the UP and DOWN arrow keys to scroll through the numbers. Note that only 0-5 is available for this position. Press the ALT and UP arrow keys again to move to the next digit. Again use the UP and DOWN arrow keys to scroll through the numbers (now 0-9 are available). When the new frequency is entered, press ENT to confirm and move the selection outline to the next value, transmit frequency (TX). Note that when the receive frequency is changed, the transmit frequency also changes to the same value.
11. To change the transmit frequency, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit. Use the UP and DOWN arrow keys to scroll through the numbers. Note that only 0-5 is available for this position. Press the ALT and UP arrow keys again to move to the next digit. Again use the UP and DOWN arrow keys to scroll through the numbers (now 0-9 are available). When the new frequency is entered, press ENT to confirm and move the selection outline to the next value, receive squelch tone (R). Note that when the transmit frequency is changed, the receive frequency **does not** change.

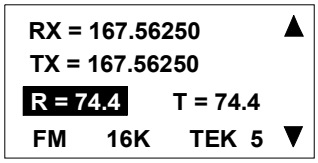


Figure 10-92 Basic RX CTCSS Tone

12. The receive squelch tone is a Continuous Tone Coded Squelch System (CTCSS). In this system, a specific low-frequency sub-audible audio tone is sent along with the voice communication on the radio channel. If the receiving radio recognizes the tone being sent, it will open the squelch and allow the transmitting radio to be heard on the other side. Conversely, no other stations but ones transmitting the correct tone will be heard on the receiver side. CTCSS tones are only available on FM and NB clear channels. The standard CTCSS tones are coded in the radio. To set the receive CTCSS tone, press ENT when the selection outline is around the R= XX value. The value will change to reverse

video (white on black). Use the UP or DOWN arrow key to scroll through the available values. When the desired value is on the screen, press ENT to confirm the selection and move the selection outline to the next value, transmit squelch tone (T). Note that when the receive CTCSS tone is changed, the transmit CTCSS tone changes to the same value.

13. To set the transmit CTCSS tone, press ENT when the selection outline is around the T= XX value. The value will change to reverse video (white on black). Use the UP or DOWN arrow key to scroll through the available values. When the desired value is on the screen, press ENT to confirm the selection and move the selection outline to the next value, modulation. Note that when the transmit CTCSS tone is changed, the receive CTCSS tone **does not** change.

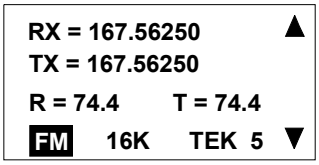


Figure 10-93 Basic Modulation Setting

14. The available modulation types are AM, FM, and NB. To change the type, press ENT when the selection outline is around the value. The value will change to reverse video (white on black). Use the UP or DOWN arrow key to scroll through the available values. When the desired value is on the screen, press ENT to confirm the selection and move the selection outline to the next value, traffic rate.
15. Traffic rate is the transmission rate of the encrypted digital signal, either 12 or 16 kilobits per second (kbps). The default value is 16 kbps, the value for VINSON-compatible (KY-57) encrypted signals. 12 kbps is used for FED-STD-1023 encryption. To change the value, press ENT when the selection outline is around the value. The value will change to reverse video (white on black). Use the UP or DOWN arrow key to toggle between the two values. When the desired value is on the screen, press ENT to confirm the selection and move the selection outline to the next value, COMSEC Key.

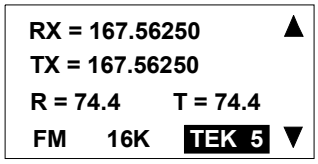


Figure 10-94 Basic COMSEC Key

16. COMSEC Key refers to the Traffic Encryption Key (TEK) location assigned to the MBITR channel. Available key locations are TEK 1-5. When assigning a TEK to a channel that is intended for SECURE operation, make sure that a valid COMSEC key is loaded in that location (see paragraph 10.12). To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm. When all selections are set on this screen, and the selection outline is around the last value, press the DOWN arrow key to move to the last Basic channel programming screen.

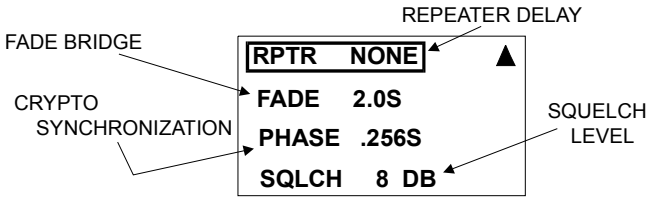


Figure 10-95 Basic Programming Screen 3

17. The third Basic programming screen opens with the selection outline around repeater delay (RPTR). Repeater delay is used when operating through a repeater system and typically requires that a different receive and transmit frequency be programmed in the current channel. Repeater delay disables the receive circuits of the radio for a fraction of a second after the PTT switch is released. This prevents the radio from receiving any of its own transmission from the repeater. Available values are NONE and 0.2, 0.4, 0.6, 0.8, and 1.0 second. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm and move the selection outline to the next value, fade.

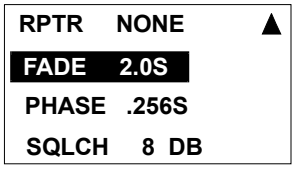


Figure 10-96 Basic Fade Screen

18. Fade is a parameter that affects SECURE operation. In order for a radio operating in SECURE mode to decrypt an incoming signal, the encryption chip of the receiving radio must be synchronized (operating at the same clock rate) with the transmitting radio. This synchronization takes place at the beginning of a transmission and normally takes only a fraction of a second. If the signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the FADE value (0-4 seconds) forces the encryption chip to 'freewheel', or maintain synchronization, for the set period of time. When the signal is again received, the radio does not have to re-synchronize. If you are operating in SECURE mode with weak signals, you may want to set a FADE value. To do this, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, Phase.

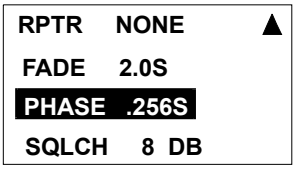


Figure 10-97 Basic Phase Screen

19. PHASE is used to set the length of the initial encryption synchronization pattern transmitted by the radio. The radio uses this information during SECURE operation to synchronize the encryption/decryption between the transmitting and receiving radios. The default value is 256 milliseconds. Other values are 384 milliseconds, 1.06 seconds, and OFF. The default value is sufficient time under most operating conditions. To change PHASE, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, squelch.

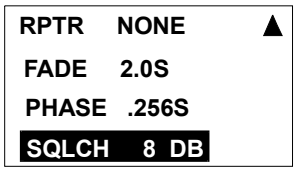


Figure 10-98 Basic Squelch Screen

20. Squelch is used to set the pre-programmed squelch level for the selected channel (see paragraph 10.9). Available values are 6 to 16 dB at 2 db intervals. Lower values allow weaker signals to be heard; higher values block more background noise. To change squelch level, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm. Press ESC 5 times to return to the default screen.

10.16 PROGRAM AN ANDVT CHANNEL

NOTE: ANDVT is an optional software capability, so your radio may not be capable of ANDVT operation.

1. To program an MBITR channel for ANDVT operation, first press the MODE key while also pressing the ALT key. This opens the MAIN menu with the selection outline around PROGRAM.

Figure 10-99 MAIN Menu

2. Press ENT to open the PROGRAMMING menu. The selection outline is around RADIO CONFIG.

Figure 10-100 PROGRAMMING Menu

3. Press ENT to open the first screen of the Channel Programming menu.
4. The selection outline is around the channel number (the internal number (00-99) used by the radio to identify a channel). The number shown is the current active channel (based on the channel switch setting (paragraph 10.7)). You can select other channels in the current group by changing the channel select switch. (To select channels in other groups, return to the default screen and change groups (paragraph 10.8)).

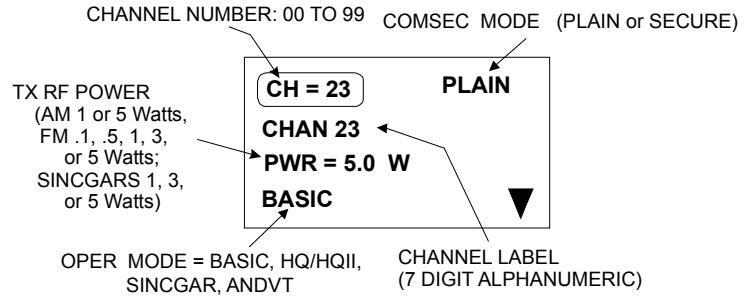


Figure 10-101 Channel Programming Screen 1

5. Press the DOWN arrow key to move the outline to the COMSEC setting. Press the DOWN arrow again to move to the next selection without making a change or press ENT to enable the change mode (reverse video). Use the UP or DOWN arrow to switch between PLAIN and SECURE. Press ENT again to confirm the desired setting and move the outline to the channel label.
6. The channel label is the seven character alphanumeric user-assigned label. The label is usually created using the PC Programmer, but can be changed using the radio keypad and display. See paragraph 10.15 for instruction on changing the label.
7. The next line is the transmit power setting. The default value is 5 watts. To change this setting, press ENT and use the UP and DOWN arrow keys to scroll through the available values. The channel operating mode (Basic, SINCGARS, HAVEQUICK, or ANDVT) and modulation type (AM, FM, or NB) will determine what values are available. (See Figure 10-101.) Press ENT after setting this value to confirm and move to the last line on the screen.
8. The last line is the operating mode. The default setting is BASIC. To change to ANDVT, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the available choices to ANDVT. Press ENT to confirm. Note that when ANDVT is selected, the COMSEC setting is automatically set to SECURE. An ANDVT channel must be assigned a TEK location that has a valid COMSEC key loaded. The screen should appear as shown in Figure 10-102.

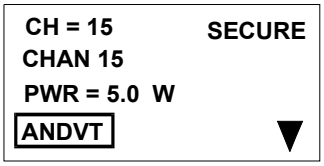


Figure 10-102 ANDVT Programming Screen 1

9. Press the DOWN arrow key to move to the second channel programming screen.

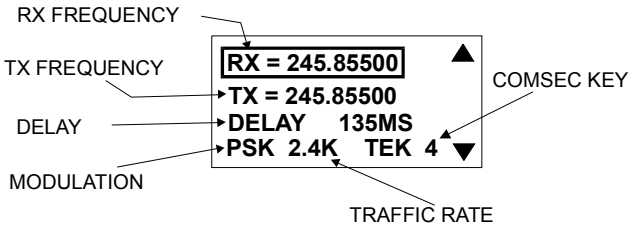


Figure 10-103 ANDVT Programming Screen 2

10. The second ANDVT screen opens with the selection outline around the receive frequency (RX). To change the receive frequency, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black). Press the ALT and

UP arrow keys to move the highlighting to the leftmost digit. Use the UP and DOWN arrow keys to scroll through the numbers. Note that only 0-5 is available for this position. Press the ALT and UP arrow keys again to move to the next digit. Again use the UP and DOWN arrow keys to scroll through the numbers (now 0-9 are available). When the new frequency is entered, press ENT to confirm and move the selection outline to the next value, transmit frequency (TX). Note that when the receive frequency is changed, the transmit frequency also changes to the same value.

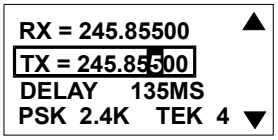


Figure 10-104 ANDVT Transmit Frequency

11. To change the transmit frequency, press ENT to enable the change mode. The rightmost significant digit will be in reverse video (white on black). Press the ALT and UP arrow keys to move the highlighting to the leftmost digit. Use the UP and DOWN arrow keys to scroll through the numbers. Note that only 0-5 is available for this position. Press the ALT and UP arrow keys again to move to the next digit. Again use the UP and DOWN arrow keys to scroll through the numbers (now 0-9 are available). When the new frequency is entered, press ENT to confirm and move the selection outline to the next value, DELAY. Note that when the transmit frequency is changed, the receive frequency **does not** change.

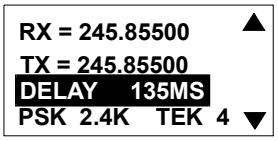


Figure 10-105 ANDVT Delay Setting

12. DELAY is the time between the transmit carrier going active without modulation (carries no information) and the carrier having modulation applied (signal contains information). This part of the signal is used by the receiver during carrier acquisition. The default value is 135 milliseconds; other values are 295, 600, 895, and 1200 msecs. To change the DELAY setting, press ENT to enable the change mode (line changes to reverse video) and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm. The selection outline will move to the next user-selectable value, COMSEC Key.
13. Modulation type is fixed at PSK (Phase Shift Keying). PSK modulation is a relatively efficient method of containing the radio signal energy in a 5 kHz bandwidth signal.
14. Data rate is fixed at 2.4 kbps.

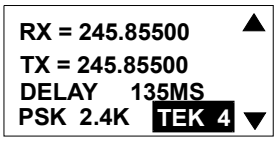


Figure 10-106 ANDVT COMSEC Setting

15. COMSEC Key refers to the Traffic Encryption Key (TEK) location assigned to the MBITR channel. Available key locations are TEK 1-5. When assigning a TEK to a channel that is intended for SECURE operation, make sure that a valid COMSEC key is loaded in that location (see paragraph 10.12). To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the

desired setting is on the screen, press ENT again to confirm. When all selections are set on this screen, and the selection outline is around the last value, press the DOWN arrow key to move to the last ANDVT channel programming screen.

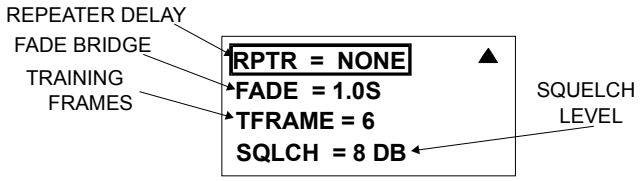


Figure 10-107 ANDVT Programming Screen 3

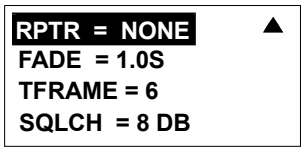


Figure 10-108 ANDVT Repeater Delay Setting

16. The third ANDVT programming screen opens with the selection outline around repeater delay (RPTR). Repeater delay is used when operating through a repeater system and typically requires that a different receive and transmit frequency be programmed in the current channel. Repeater delay disables the receive circuits of the radio for a fraction of a second after the PTT switch is released. This prevents the radio from receiving any of its own transmission from the repeater. Available values are NONE and 0.2, 0.4, 0.6, 0.8, and 1.0 second. To change, press ENT to enable the change mode and use the UP or DOWN arrow keys to scroll through the choices. When the desired setting is on the screen, press ENT again to confirm and move the selection outline to the next value, fade.

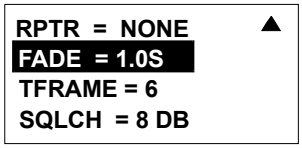


Figure 10-109 ANDVT Fade Setting

17. Fade is a parameter that affects SECURE operation. In order for a radio operating in SECURE mode to decrypt an incoming signal, the encryption chip of the receiving radio must be synchronized (operating at the same clock rate) with the transmitting radio. This synchronization takes place at the beginning of a transmission and normally takes only a fraction of a second. If the signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the FADE value (0-4 seconds) forces the encryption chip to 'freewheel', or maintain synchronization, for the set period of time. When the signal is again received, the radio does not have to re-synchronize. If you are operating in SECURE mode with weak signals, you may want to set a FADE value. To do this, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, TFRAME.

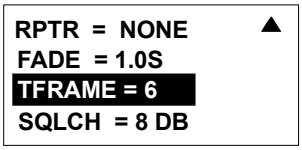


Figure 10-110 ANDVT Training Frame Setting

18. TFRAME, or Training Frame, is a repetitive pattern of 0's and 1's used by the receiving radio for bit synchronization. Each frame is a 32-bit pattern. The default value is 6 frames; other values are 6, 12, 15, 30, and 60. The greater the number of frames selected, the longer the time period from the beginning of transmission until actual information is transmitted. To change the TFRAME value, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm and move the selection outline to the next value, squelch.

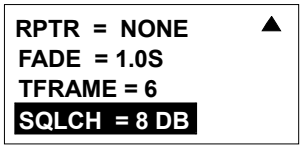


Figure 10-111 ANDVT Squelch Setting

19. Squelch is used to set the pre-programmed squelch level for the selected channel (see paragraph 10.9). Available values are 6 to 16 dB at 2 db intervals. Lower values allow weaker signals to be heard; higher values block more background noise. To change squelch level, press ENT to enable the change mode and press the UP or DOWN arrow keys to scroll through the available values. When the desired selection is on the screen, press ENT again to confirm. Press ESC 5 times to return to the default screen.

10.17 RETRANSMIT VOICE AND DATA MESSAGE TRAFFIC

NOTE: Retransmission is an optional software capability, so your radio may not be capable of retransmission operation.

10.17.1 GENERAL

The radio has an optional capability for expedient retransmission: two radios can be connected by a retransmission cable so that a signal received on one radio (on frequency A) will be automatically retransmitted by the other radio (on frequency B). Operating two radios at the same time in close proximity can result in co-site interference – the receiving retransmission radio may receive the signal from the transmitting retransmission radio, causing interference or a transmit loop (the radios become locked in a receive-transmit cycle). Thales supplies a retransmission kit that includes filters to eliminate the possibility of co-site interference. The kit contents are shown in the following table.

Table 10-2 Retransmission Kit

Thales Part Number	Quantity	Marking	Part Description
3500485-501	1	3500485-501	Retransmission Cable, 10 ft.
3500480-857	2	3500480-857	Antenna Cable
37128	1	5L110-88/U400-T/T	Lowpass Filter, 88 MHz
37129	1	5L110-174/U750-T/T	Lowpass Filter, 174 MHz
37130	1	5LH30-136/U300-T/T	Highpass Filter, 136 MHz
37131	1	5LH30-380/U850-T/T	Highpass Filter, 380 MHz

The lowpass filters allow RF signals at frequencies below the rated value to be received or transmitted; the highpass filters allow RF signals at frequencies above the rated value to be received or transmitted.

10.17.2 FREQUENCY PLANNING

1. Thales recommends that the retransmit channels on both radios be programmed in simplex mode: the same receive and transmit frequency on a single channel.
2. The frequencies used in the two different radios should have a minimum separation of 15% of the higher frequency, i.e., if the higher frequency is 215.5 MHz, then the lower frequency should be no higher than 183.175 MHz.
3. When selecting retransmit frequencies, avoid selecting harmonics (exact multiples) of one frequency for the other frequency, e.g., if the lower frequency selected is 65.75 MHz, do not use 131.5 MHz (x2), 197.25 MHz (x3), or 263 MHz (x4) for the other retransmit frequency.
4. If the frequencies used in the retransmission radios are FM plaintext, Thales recommends the use of CTCSS tones. (See paragraph 10.15 for more information on CTCSS tones.)
5. Use the filters in the retransmission kit to minimize the chance of interference between the receiving and transmitting radios. Recommended filter and frequency combinations are as follows:

Table 10-3 Retransmission Filter Selection

Radio "A" Frequency	Radio "A" Filter	Radio "B" Frequency	Radio "B" Filter
Less than 75 MHz	Lowpass Filter, 88 MHz	Greater than 145 MHz	Highpass Filter, 136 MHz
Less than 165 MHz	Lowpass Filter, 174 MHz	Greater than 400 MHz	Highpass Filter, 380 MHz
Less than 75 MHz	Lowpass Filter, 88 MHz	Greater than 400 MHz	Highpass Filter, 380 MHz

Note that the recommended frequency/filter combinations are interchangeable between radios "A" and "B".

It is possible to use the 136 MHz Highpass Filter and 174 MHz Lowpass Filter in combination. However, it is necessary to avoid using frequencies between 130 and 180 MHz for either receive or transmit with this combination.

10.17.3 EQUIPMENT SETUP

1. Program the retransmit radios with the selected frequencies OR switch to the designated pre-programmed retransmit channels.
2. Press ENT on each retransmit radio to check the alternate display for frequencies (and CTCSS tones if using FM). Press ENT again to return to the default display.
3. Select the appropriate filter for each radio based on the retransmit frequency. (See Table 10-3.)
4. Connect one end of the filter to the TNC connector of the appropriate antenna (antenna 3100661-501 for frequencies below 90 MHz and antenna 3100662-501 for frequencies above 90 MHz).
5. Connect the other end of the filter to one end of the antenna cable (3500480-857).
6. Connect the other end of the antenna cable to the radio TNC antenna connector.

7. Repeat for the second radio.
8. Connect one end of the retransmission cable (3500485-501) to the side connector of one retransmit radio. (Retransmission is completely bi-directional; both cable ends are the same.)
9. Connect the other end of the retransmission cable to the side connector of the other retransmit radio.
10. The display on both radios should appear as shown in Figure 10-112. Note that the radios used for retransmission DO NOT require that a COMSEC key be loaded or that the radios be in SECURE mode. However, both retransmit radios must be set for the same traffic rate (see paragraph 10.15 for additional information).

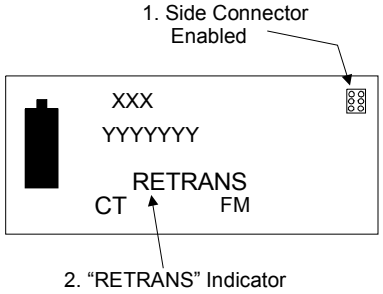


Figure 10-112 RETRANS Screen

11. **TEST THE RETRANSMISSION SETUP BEFORE USING IT IN THE FIELD.**
    a. Use two additional radios set to the two retransmit frequencies ("operator radios").
    b. Turn the retransmit radios OFF.
    c. Attempt communication between the two "operator radios". There should not be a received signal on either radio.
    d. Turn the retransmit radios ON.
    e. Attempt communication between the two "operator radios". There should be two-way communication.
    f. Check the retransmit radios to verify that when one "operator radio" is transmitting, both retransmit radios are operating: one receiving, one transmitting. When the "operator radios" are not transmitting, the retransmit radios should be in standby mode.

10.18 TRANSMIT/RECEIVE A DATA MESSAGE WITH VIASAT VDC-400 CARD

The radio is capable of sending and receiving digital data through the use of a ViaSat VDC-400 Personal Data Controller Card (PCMCIA card), a PC with ViaSat eMail software, and a PDC data cable (Thales p/n 3500466-501). The radio must be in Secure (CT) mode and can be set on a Basic channel (either AM or FM), SINCGARS, HAVEQUICK Single Channel, or ANDVT. Best results are obtained with either an FM (Basic or SINCGARS) or ANDVT channel. All radios that will be part of the data network must be on the same frequency (channel) with the same COMSEC key (TEK) selected.

14. Make sure the radio is set for Secure operation and has the side connector enabled.
15. Attach the flat 25-pin connector to the ViaSat PCMCIA card (Check that the word UP on the connector is facing up.)

16. Attach the other end of the data cable to the radio side connector. The data cable connector has a switch on the bottom labeled "V" and "D". When set to the "V" position, the connector is disabled and allows the radio to operate in normal voice mode. When set to the "D" position, the connector is enabled and switches the radio to data mode. When in data mode, radio control is transferred to the PC (radio PTT is disabled).
17. For best operation, the ViaSat software on all PC's that are part of the data network should be set as follows:
    a. Press F7 key on PC to open configuration window.
    b. Compression = ON
    c. CSMA = ON
    d. Channel mode = Duplex
    e. FEC Code = ½
    f. Channel Access Speed = Normal
    g. Channel Device = KY-57, KY-99, KY-99A
    h. Add'l ACK Delay = 1
    i. Turnaround Delay = 0.5 sec.
    j. Max Packets – 256
    k. TX Start Delay = 0.5 sec.
    l. TX End Delay = 0.5 sec.
18. When setting up a data network, first connect the data cable to the radio with the Voice/Data switch set to the "V" position. Establish voice communication with all other radios that will be part of the network before changing the switch to the "D" position. Before sending critical data across the network, send a short test message to verify proper data operation.

10.19 TRANSMIT/RECEIVE A DATA MESSAGE WITH 3500396-501 RS-232 DATA CABLE

The radio is also capable of transmitting and receiving digital data using the 3500396-501 RS-232 data cable and a PC. Basic operation is similar to data operation with the ViaSat cable. The radio must be in Secure (CT) mode and can be set on a Basic channel (either AM or FM), SINCGARS, HAVEQUICK Single Channel, or ANDVT. Best results are obtained with either an FM (Basic or SINCGARS) or ANDVT channel. All radios that will be part of the data network must be on the same frequency (channel) with the same COMSEC key (TEK) selected.

1. Make sure the radio is set for Secure operation and has the side connector enabled.
2. Attach the 25-pin RS-232 connector to the PC.
3. Attach the other end of the cable to the radio side connector. The data cable connector has a switch on the bottom labeled "V" and "D". When set to the "V" position, the connector is disabled and allows the radio to operate in normal voice mode. When set to the "D" position, the connector is enabled and switches the radio to data mode. When in data mode, radio control is transferred to the PC (radio PTT is disabled).
4. The 18-pin radio side connector requires the following input and output signals for successful RS-232 data operation (Figure 10-113 shows the pin locations). Successful digital data operation requires a communications software package that can provide these inputs to the radio and accept the specified outputs.

a. **GNDPWR.** This signal provides a common signal ground. This signal is located on pin 1.

b. **SIDEPTT_RTS.** This input signal accepts an RS-232 Request to Send or Push To Talk active high control signal for placing the Receiver/Transmitter in transmit when operating in data mode, with an audio accessory, or with a VA. A normal contact-closure to ground PTT must be converted to RS-232 for proper operation. A signal with a maximum level of ±25 Vdc and a minimum level of ±3 Vdc is accepted on this pin. This signal is located on pin 8.

c. **CLK232.** This output signal provides an RS-232 clock when operating in the data mode. This signal is used for both transmit and receive synchronous operations. The clock rate is 12 or 16 kbps as determined by the configuration of the selected channel. Transmit data is sampled by the Receiver/Transmitter on the falling edge of the clock and receive data is provided on the rising edge of the clock. The levels provided on this signal are typically ±6 Vdc. This signal is located on pin 10.

d. **SER232TXD.** This input signal accepts RS-232 digital data for encrypting and transmitting when operating in the data mode. This transmit data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. A signal with a maximum level of ±25 Vdc and a minimum level of ±3 Vdc is accepted on this pin. This signal is located on pin 11.

e. **SER232RXD.** This output signal provides RS-232 digital data that was received and decrypted when operating in the data mode. This receive data can be either synchronous at 12 or 16 kbps or asynchronous at 1200, 2400, or 4800 bps. This signal is also used to transfer information at approximately 130 kbps from a receiving Receiver/Transmitter to a transmitting Receiver/Transmitter when operating in a retransmit mode. The levels provided on this signal are typically ±6 Vdc. This signal is located on pin 12.

f. **DDMCN.** During normal operations, this input signal selects the data mode. When this signal is grounded, the Receiver/Transmitter goes into the data mode. The Receiver/Transmitter must be programmed in cipher text mode and have a valid key loaded to properly operate in the data mode. When operating in the retransmit mode, this signal is an input used by the transmitting Receiver/Transmitter to indicate a plain text or cipher text transmission. This signal is located on pin 14.

g. **CTS.** This output signal provides an RS-232 Clear to Send signal when operating in the data mode. After receiving a RTS, this signal goes active (high) when the Receiver/Transmitter is ready to accept data to be encrypted. This signal also goes active in the audio mode whenever the Receiver/Transmitter is receiving. In retransmit mode, this signal is used by the receiving Receiver/Transmitter to activate the SIDEPTT_RTS signal of the transmitting Receiver/Transmitter. The levels provided on this signal are typically ±6 Vdc. This signal is located on pin 17.

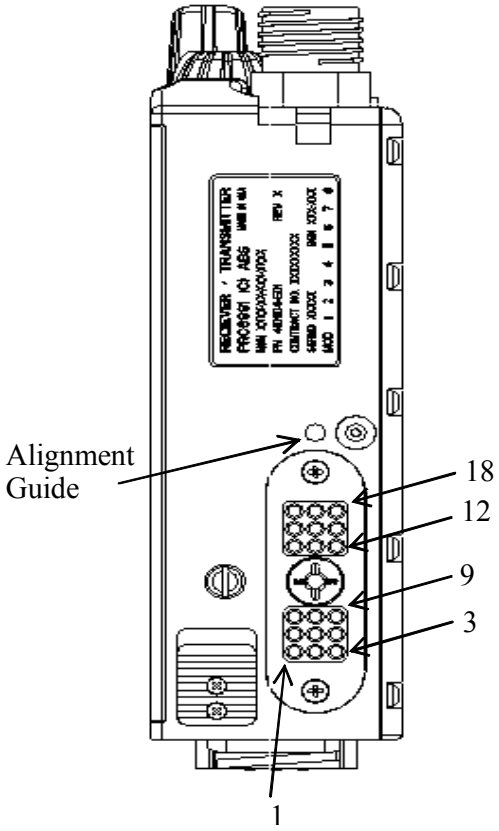


Figure 10-113 Side Connector Pins

10.20 SCAN A SET OF CHANNELS

The radio is capable of scanning a set of up to 16 different channels, including two priority channels. This set of channels is a Scan Plan. The radio can be programmed with ten different Scan Plans (normally done with the PC Programmer).

1. To activate the Scan function, press the GR key while holding down the ALT key. This opens the Scan Select screen with the selection outline around SCAN.

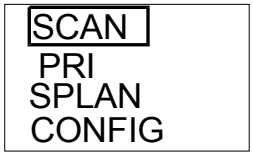


Figure 10-114 Scan Select Screen

2. To begin scanning the current Scan Plan, press ENT.

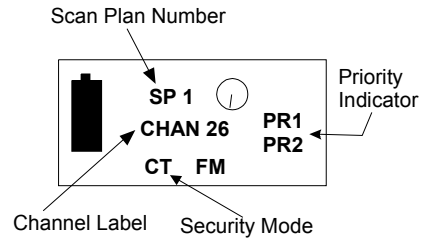


Figure 10-115 Active Scan Screen

3. To change the priority channel settings, use the DOWN arrow key to move the selection outline to PRI and press ENT.
4. This opens the Priority change screen with the selection outline around the Priority One channel. This screen also shows the current Channel Select switch position (SW= 7) and PR1 or PR2 for Priority One or Priority Two selected.

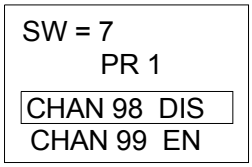


Figure 10-116 Scan Priority Selection Screen

5. To change the Priority One channel, turn the Channel Select switch on top of the radio. This will change the channel label that appears on the screen.
6. To enable or disable the Priority One channel, press ENT with the selection outline around the top channel label. The outline around PR1 and the channel label will change to reverse video (white on black). Use the UP or DOWN arrow keys to toggle between EN (enabled) and DIS (disabled). Press ENT again to confirm the selection.

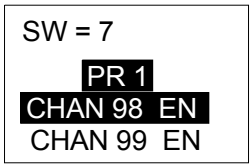


Figure 10-117 Enable Scan Priority

7. Press the DOWN arrow to move the selection outline to the second channel label. Note that PR1 changes to PR2. You can change the Priority Two channel, or enable or disable the Priority Two channel in the same way as the Priority One channel. When both the Priority One and Priority Two channels are set to the desired values, press ESC to return to the Scan Select screen.
8. If you need to change Scan Plans (the set of channels being scanned), use the DOWN arrow key to move the selection outline to SPLAN on the Scan Select screen and press ENT.
9. The Scan Plan Select screen will appear on the display. The current active Scan Plan is in reverse video (white on black). Note that SP0 through SP9 are the factory default Scan Plan labels. The PC Programmer can be used to assign any 3-character alphanumeric as a Scan Plan label.
10. Use the UP or DOWN arrow key to move the selection outline to the desired new Scan Plan.

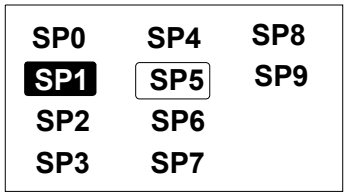


Figure 10-118 Scan Plan Select Screen

11. When the outline is around the desired Scan Plan label, press the ENT key to select that Scan Plan and return to the Scan Select screen. Press ENT with the selection outline around SCAN to activate scan with the new Scan Plan.

12. The Active Scan screen will show the new Scan Plan label and the label of the Channel that is assigned to the current Channel Switch position in the new Scan Plan.

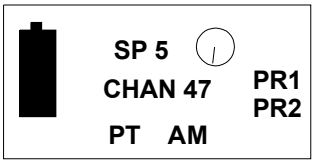


Figure 10-119 New Scan Plan

SOFC4I-00-G10-00253-00
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