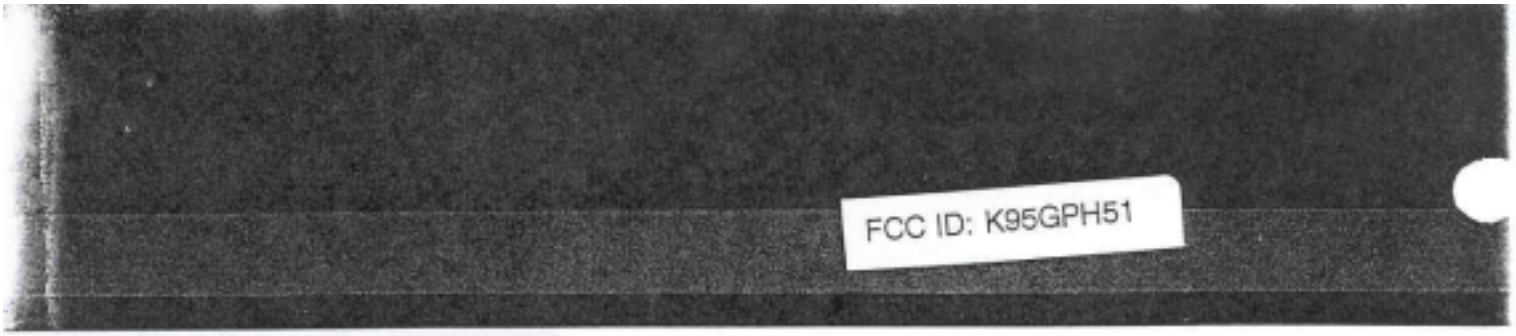
EPH SERIES PORTABLE RADIO

Service Manual

FCC ID: K95GPH21

BENDIX/KING



BENDIX/KING

Mobile Communications Division
2920 Haskell Avenue
Lawrence, Kansas 66046
Telephone: (913) 842-0402
Telex: 669916 KINGRAD UW
FAX: (913) 841-0287

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006-01202-0000

Allied Signal *Aerospace*

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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information concerning the physical, mechanical, and electrical characteristics of the Bendix/King EPH Series handheld VHF radios.

1.2 INTRINSICALLY SAFE MODELS

Radios certified Intrinsically Safe for use in hazardous environments require special care in their repair and maintenance. Therefore, it is strongly recommended that you send all Intrinsically Safe radios in need of repair to the Bendix/King factory to ensure compliance with Intrinsically Safe certification.

> WARNING
>
> MODIFICATION OR IMPROPER REPAIR OF INTRINSICALLY SAFE RADIOS WILL MAKE THEM UNSAFE FOR OPERATION IN HAZARDOUS ENVIRONMENTS AND WILL VOID THEIR INTRINSICALLY SAFE RATING.

1.3 DESCRIPTION

The EPH Series radios are self-contained VHF FM Transceivers covering the frequency range of 148MHz to 174MHz. The units are multi-channel, digitally synthesized radios using a single crystal for frequency control. All models incorporate an EEPROM for the storage of channel frequency, Code Guard™, and Dual Tone Multiple Frequency/Automatic Numeric Identifier (DTMF/ANI) encode information. All models also include low battery and busy channel indicators. Toggle switches control hi/low transmit power, priority scan, and multi-channel scan. Status and channel information is displayed over a liquid crystal display on Keyboard/Display models. Connectors are provided on the side of the unit for external antenna, microphone, speaker, and other optional accessories. A variety of twist-off battery packs are also available.

A partial list of EPH models and unit features appear in the table below:

EPH MODEL	CHANNELS/ SYSTEM	KEYBOARD DISPLAY	SPECIAL FEATURES
214 2A	14 16	Alphanumeric	2 Watt
514 0A	14	none	
514 0M	14	none	Metal Case
514 1A	14	Standard	
514 2A	14	Alphanumeric	
514 2M	14	Alphanumeric	Metal Case
599 1A	System	Standard	
599 2A	System	Alphanumeric	

NOTE: System radios may have special programming features that reduce the number of channels available to the user. Depending on the model, System radios may have as many as 210 channels, or as few as 14 channels.

1.4 TECHNICAL CHARACTERISTICS

FREQUENCY:	148-174MHz
POWER SUPPLY:	One rechargeable nickel-cadmium battery pack with temperature sensor or one Alkaline battery pack
OPERATIONAL FEATURES:	Programmable (Keyboard units only)
Priority Channel Scan	Programmable
Transmit-Time-Out Timer	Programmable
Scan Delay	Programmable
DTMF/ANI Encode	Programmable
Code Guard Squelch	Programmable
Squelch Tail Elimination	Standard
CHANNELS:	
EPH 214/514	14
EPH 599	210 in fifteen 14-channel groups
FREQUENCY SPREAD:	26 MHz with no degradation
OPERATING TEMPERATURE:	-30° to +60°c

PHYSICAL DIMENSIONS

Weight:	20 oz. (24 oz. with large battery) 0.6 kilograms (0.7 Kg with large battery)
Width:	2.55 in. (64.8 millimeters)
Depth:	1.5 in. (38.1 mm.)
Height:	6.6 in. (167.6 mm.) 7.8 in. (198.1 mm.) with large battery)
ANTENNA TYPE:	Threaded Helical wound rubber flex (standard) BNC Helical wound rubber flex (optional)
CHANNEL SPACING:	30 Khz
MAX CURRENT DRAIN:	
Transmit 5 watt:	1.4 amps
Receive:	165 mA
Receive standby:	45 mA (battery save off) 15 mA (battery save on)
FCC Identification number:	ASY90Q LT20001

TRANSMITTER

RF OUTPUT POWER:	5 Watts (HI Power Mode)* 2 Watts (LO Power Mode)* 2 Watts EPH 214

*High and Low power output are computer programmable

MODULATION CHARACTERISTICS:	15KOF2D 16KOF3E 16KOFXE
SPURIOUS AND HARMONICS:	60 dB
MAXIMUM DEVIATION:	5 Khz

FM HUM AND NOISE (EIA):	43 dB
FREQUENCY STABILITY:	±5 PPM
AUDIO DISTORTION:	3% maximum with 3KHz deviation
AUDIO RESPONSE:	+1 to -3dB from 6dB/octave pre-emphasis at 0.3 to 3 Khz
DUTY CYCLE:	5 - 5 - 90%

RECEIVER

SENSITIVITY: 12dB SINAD	0.25µV
NOISE SQUELCH:	0.18µV
SELECTIVITY:	70 dB
IMAGE AND SPURIOUS RESPONSES:	75dB
INTERMODULATION:	70dB
AUDIO RESPONSE:	+1dB to -3dB from 6dB/octave de-emphasis at 0.3 to 3Khz
AUDIO OUTPUT:	500mW with 5% maximum distortion into an 8 ohm load

1.5 ACCESSORIES

A wide variety of optional accessories are available for the EPH hand held transceivers. Contact your BENDIX/KING dealer for complete information.

1.6 LICENSE REQUIREMENTS

This equipment must be licensed by the Federal Communications Commission (FCC) before it may be used. Your BENDIX/KING dealer can assist you in filing the appropriate application for the FCC, and will program each radio with your authorized frequencies and signaling codes.

1.7 SERVICE INFORMATION

If you need service, contact your BENDIX/KING dealer. He or any BENDIX/KING Mobile Communications dealer is equipped to service your radio.

If you find it inconvenient to have service performed by your local dealer, you may contact the fctory at this address:

BENDIX/KING
Mobile Communications Division
2920 Haskell Avenue
Lawrence, Kansas 66046
(913) 842-0402

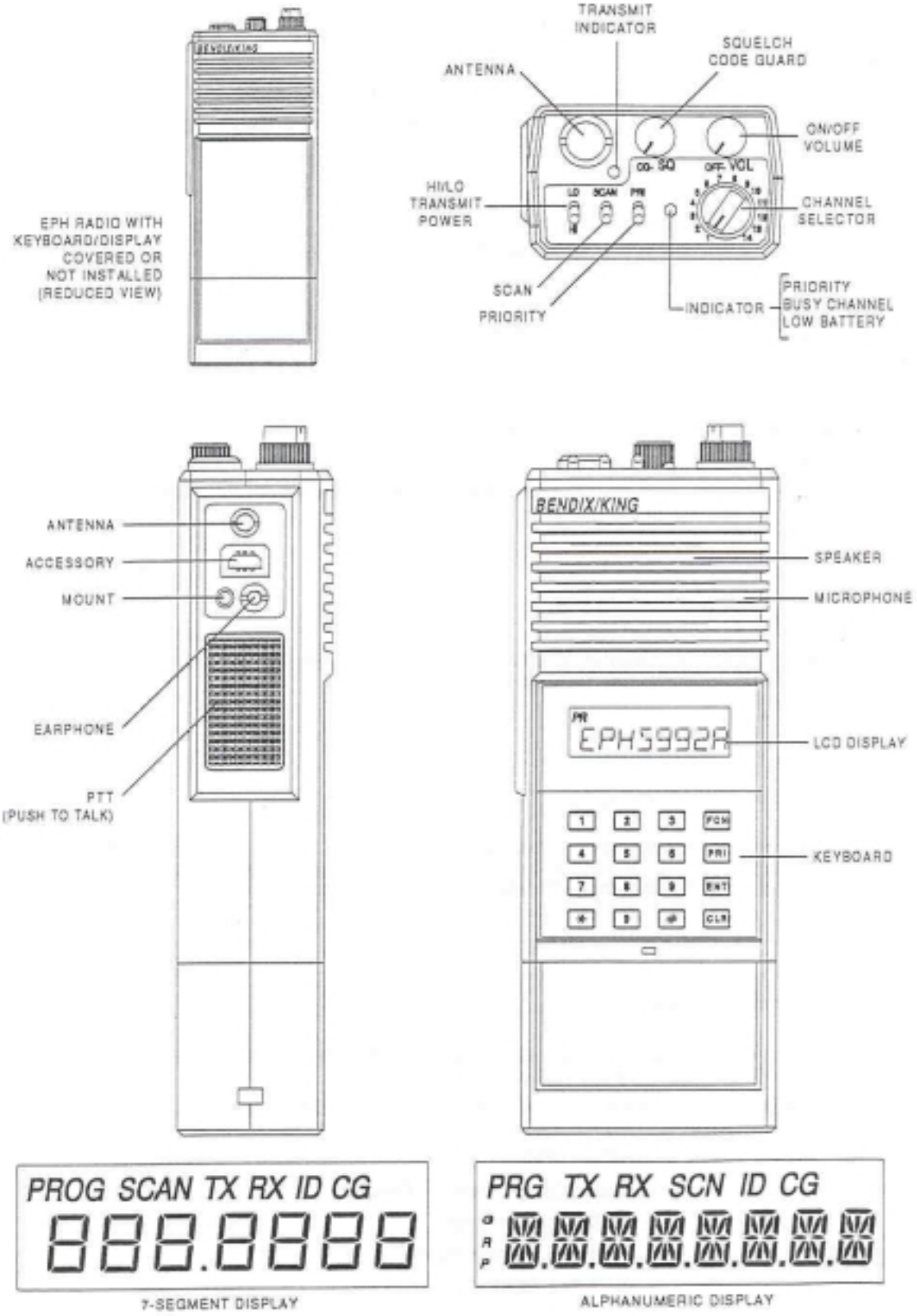


FIGURE 1-1 CONTROLS

SECTION II
INSTALLATION AND PROGRAMMING

2.1 GENERAL INFORMATION

This section contains information concerning the installation and programming of Bendix/King EPH Series handheld VHF radios.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Exercise extreme care when unpacking the equipment. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. The claim should be promptly filed with the transportation company. It would be advisable to retain the container and packaging material after all equipment has been removed in the event that equipment storage or reshipment should become necessary.

2.2.1 BATTERY INSTALLATION

A. Bendix/King battery packs are available in a variety of sizes and types for special applications. Rechargeable battery packs can be charged separately or while attached to a radio.

B. To install the battery, locate the center hub on the radio base and place it in the recess of the battery pack. Position the pack at the 30° offset, seating two metal studs in their recess. Apply upward pressure to the pack while twisting the pack to its original position. The metal tab will click, locking the pack in position.

C. To remove the battery, turn the radio off. Press up the metal tab on the side of the case while twisting the battery pack approximately 30° and remove it from the radio.

D. Periodically check the contacts on battery pack for dirt that may prevent a good electrical contact with the charging base.

WARNING

DO NOT DISPOSE OF A BATTERY PACK IN FIRE. AN EXPLOSION MAY OCCUR.

WARNING

FOR INTRINSICALLY SAFE RADIOS DESIGNED FOR USE IN HAZARDOUS ENVIRONMENTS, REPLACEMENT BATTERIES MUST BE APPROVED BY FACTORY MUTUAL RESEARCH FOR USE WITH BENDIX/KING RADIOS.

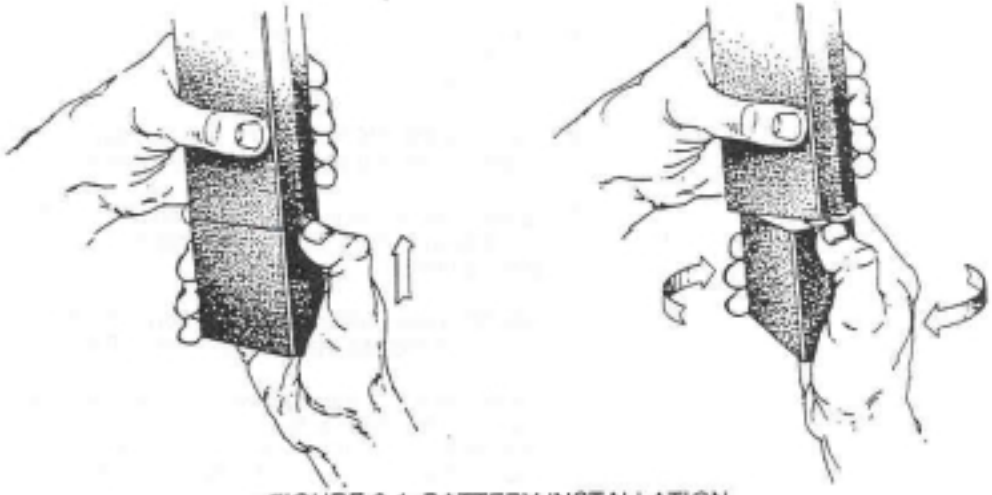


FIGURE 2-1 BATTERY INSTALLATION

2.3 PROGRAMMING

Bendix/King offers two basic types of EPH handheld radios. The first type has a keyboard and liquid crystal display (LCD). The second type has no keyboard or display.

There are three different ways to program these radios:

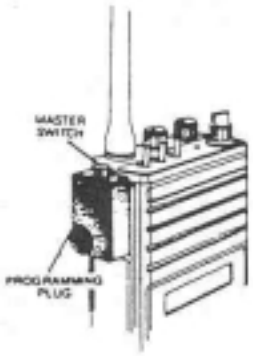
A. A radio with a keyboard and display can be programmed by using its keyboard and a programming plug. This section of the manual describes that procedure.

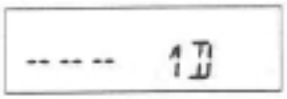
B. A radio with a keyboard and display can transfer its programmed settings (except Alphanumeric display settings) to another radio of the same frequency band, by using a cloning cable. See "Cloning Radio Settings" on page 2-15.

C. Any Bendix/King handheld radio can be programmed from a computer by using a special RS-232 interface cable. That procedure is not described in this manual. Contact Bendix/King for the programming cable, software, and instruction manual.

2.3.1 ENTER PROGRAMMING MODE

Radios are shipped with a door covering the keyboard and display. Before programming, remove the door by removing the battery pack, engaging the door just below the speaker grill, and sliding the door downward. Replace the battery pack.





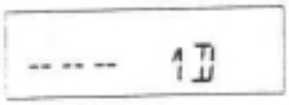
1. Make sure the battery pack is charged.
2. Insert the programming plug into the side connector of the radio. The pushbutton master switch will be on top.

   NOTE: The cloning cable may be used as a substitute for the programming plug by inserting the end with the pushbutton master switch into the side connector of the radio.

3. Select a channel group to be programmed. (Not necessary in 14-channel radios.) See "Group Selection" on page 2-14.
4. Press and hold the master switch.
5. While holding the master switch, press and hold the **[FCN]** key. After approximately three seconds the LCD will display **- - - ID**.
6. Release the **[FCN]** key and the master switch. The radio is now in the password entry mode.
7. Enter the six-digit password code. Without the correct password code, you cannot proceed with programming.

   NOTE: New radios shipped from the factory are assigned the password code **000000**.

   While entering the password code the display will not change, but a beep will sound for each key pressed. If the password code is entered incorrectly, the radio will reset to normal operation. Try again, starting at step 4.

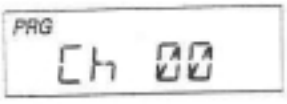


8. To keep the password unchanged, press the **[ENT]** key and continue with normal radio programming.

   To change the password, press the **[FCN]** key and enter a new six-digit password code. The digits are displayed as you enter them.

   NOTE: Do not use a **1** for the first digit of the password code - the radio will malfunction. The password code can contain the digits **0** through **9**, *, and #.

   If you make an error entering the new password code, press the **[CLR]** key and try again.



9. Press the **[ENT]** key to store the new password and proceed to programming mode. The display will change to **PRG Ch 00** (Alphanumeric display) or **PROG Ch 0** (standard 7-Segment display).

2.3.2 GENERAL PERFORMANCE VARIABLES (CHANNEL 0)

Channel 0 is the portion of the program that controls general performance variables for all the channels in a 14-channel radio. For a 210-channel radio, the Channel 0 settings for each group must be programmed separately. Select the group to be programmed before entering Programming Mode. See "Group Selection" on page 2-14.

The same password code is used for all groups in the radio.

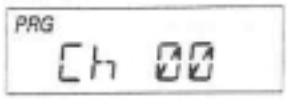
NOTE: Settings listed as Group One functions, Group Two functions, and Group Three functions refer to programming function groups, not channel groups.

Press the **[FCN]** key repeatedly to view the settings in Channel 0, then loop back to the **Ch 00** entry point. Channel 0 settings include:

NOTE: Illustrations in this section show an Alphanumeric Display. The same procedures are also used to program radios with standard 7-Segment displays, except that some procedures apply only to Alphanumeric Displays (see below).

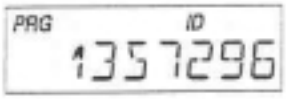
- Automatic Number Identification (ANI)
- Transmitter Timeout Timer
- Scan Delay Time
- Group One functions: 1-12345
  - Battery Saver
  - Priority Scan Operation
  - Priority Key Lockout
  - Scan List Lockout
- Group Two functions: 2-12345
  - Enable User Code Guard
  - Busy Channel Operation
  - ANI Enable
  - DTMF Enable
- Group Three functions: 3-12345 (Alphanumeric Display only)
  - Backlight Enable Conditions (Alphanumeric Display only)
  - Alphanumeric Mode Enable (Alphanumeric Display only)
- Backlight Duration (Alphanumeric Display only)
- Group Label (Alphanumeric Display only)

A. AUTOMATIC NUMBER IDENTIFICATION (ANI)



1. After entering the programming mode the LCD will display **PRG Ch 00** (Alphanumeric) or **PROG CH 0** (7-Segment).

2. Press the **[FCN]** key.



3. The display will indicate the ANI ID number (as many as seven digits may be used). The ID number can be used for either radio management or transmitted as a DTMF tone burst for ANI purposes. The ANI can be enabled or disabled. See "ANI ENABLE" on page 2-8.

4a. If no change is needed for the ID number, press the **[FCN]** key to advance to the next section.

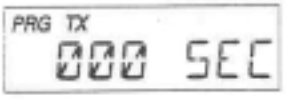
4b. A new number can be entered by pressing the **[CLR]** key, followed by number keys. The digits will appear to right of the display and move to the left.

4c. The existing ID number can be incremented one digit by pressing **[PRI]**.

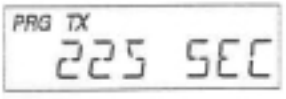
4d. Press the **[ENT]** key to store the new ID number and advance to the next section.

If the new ID number will be used only for cloning, press **[FCN]** instead of **[ENT]** to advance to the next section. The ID number will not be stored locally.

B. TRANSMITTER TIME OUT TIMER



After the ID number is set, the display annunciator will indicate **PRG TX**. This is the duration of the transmitter Time Out Timer. **0 SEC** means the Time Out Timer is disabled.



Press the **[PRI]** key to increase the Time Out Timer duration by 15 seconds, with a maximum of 225 seconds (3 minutes, 45 seconds). Press the **[PRI]** key again to change the duration from 225 seconds to zero.

Press the **[CLR]** key to set the Time Out Timer duration to zero.

Press the **[ENT]** key to store the changed setting and advance to the next section.

Press the **[FCN]** key to advance to the next section if no change is needed, or if a new setting is only to be cloned, not stored locally.

C. SCAN DELAY TIME

After the Time Out Timer is set, the upper display will indicate **PRG SCN**. This is the scan delay time in seconds.

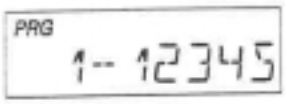
Press the **[PRI]** key to increase the scan delay time by .5 seconds, up to 7.5 seconds. Press the **[PRI]** key again to change the time from 7.5 seconds to 0.

Press the **[CLR]** key to reset the scan delay time to 0.

Press the **[ENT]** key to store the changed setting and advance to the next section.

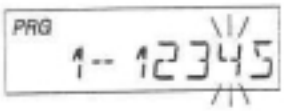
Press the **[FCN]** key to advance to the next section if no change is needed, or if a new setting is only to be cloned, not stored locally.

2.3.3 CHANNEL 0 GROUP ONE FUNCTIONS



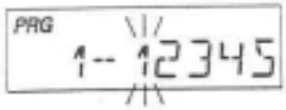
After the scan delay time is set the LCD will display **PRG 1-12345**. This is a group of five individual functions that can be enabled or disabled.

When a function is enabled, the corresponding number in the display will flash. When the function is disabled the number is steady. If you wish to change the function from enable to disable or vice versa, press the number key corresponding to that function.



EXAMPLE: If function 4 (Priority Key Lockout) is disabled, the 4 in the display will not be flashing. If the **[4]** key is pressed, the 4 in the display will flash, signifying that Priority Key Lockout is enabled. A subsequent press of the **[4]** key will disable Priority Key Lockout.

A. BATTERY SAVER INHIBIT



When function 1 is enabled (flashing) the battery saver is turned off . The battery saver should be turned off only to get proper voltage readings during service or in systems requiring extremely fast squelch attack time.

NOTE: Bendix/King current drain and battery life specifications are based on performance with the battery saver on.