Document No. IM-451 Rev NC-4.1h
dated July 5, 2014

INSTALLATION AND OPERATION MANUAL

FOR

MODEL AK-451-( ) Series

406 MHz ELT Emergency Locator Transmitter with GPS/NAV position

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REVISION TABLE

REVISION	DESCRIPTION	CHANGED BY	APPROVED BY	DATE
NC	First Release	T.N.	K. V.	4/4/07
NC-1	Add PLB Programming Para. 1.2.1 d) and Product Pictures added Para. 1.2.4.1, 1.2.4.2, 1.2.4.3, and 1.2.4.4 revised	T.N.	K.V.	9/5/07
NC-2	Para. 2.4.5 deleted Add Volume 2 for AK-451-PLB for clarity	T.N.	K.V.	9/10/07
NC-3	Para 1.2.1 c. and 3.1.c revised Para 3.3.5 added Volume 2, Para 4.1 &4.3.2 revised	T.N.	K.V.	9/11/07
NC-4	Para 1.2.1 b and 2.2.3 revised	T.N.	K.V.	9/26/07
NC-4.1	Para 1.2.2, 2.2, 2.4.6, FAA form 337, 2.5.1, revised TSO-C142 information, RTCA DO-160E form for TSO C-227 deleted	QP	KV	6/16/08

NC-4.1a	Revise: Para 2.5.1 & 3.5 to meet Canadian compliances	QP	KV	10/22/08
NC-4.1b	EASA Review updated	QP	KV	10/31/08
NC-4.1c	EASA, T.C. approved updated	QP	KV	11/26/08
NC-4.1d	Brazil Anatel Approval updated	T.N.	KV	11/27/08
NC-4.1e	Japan Approval Certificates added	T.N.	KV	11/30/08
NC-4.1f	FAA and EASA Antenna approvals added	T.N.	KV	01/27/12
NC-4.1g	Clarify statement for battery pack service	T.N.	KV	01/09/12
NC-4.1h	Delete Optional Multi Axes G Sw Provision (-12)(-16) (-13)(-19)	KV	KV	7/5/14

AK-451 ELT Sets * with no GPS / NAV Position:**

Ameri-King P/N	Description	Antennas Included
AK-451-(AF)(AP)/ Whi/Por (AK-451-2/2D) triple/dual Freq.	ELT Set **for General Aviation,** U.S.A. Registration	Whip Antenna P/N AK 451.017-1B and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP)/ Whi/Por (AK-451-20/20D) triple/dual Freq.	ELT Set **for General Aviation,** Canadian Registration	
AK-451-(AF)(AP) /Whi/Por/WW (AK-451-21/21D-Country) triple/dual Freq	ELT Set **for General Aviation.** Worldwide, Europe/ Australia/ Asia/Africa Registration.	
AK-451-(AF)(AP) /Rod3/Por (AK-451-3)	ELT Set **for Business Jet Aircraft**	Rod3 Antenna P/N AK 451.017-2A-1 and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) /Rod4/Por (AK-451-4)	ELT Set **for Business Jet Aircraft**	Rod4 Antenna P/N AK 451.017-2A and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) /Bla/Por (AK-451-5)	ELT Set **for Transport Aircraft**	Blade Antenna P/N AK 451.017-3A and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AP) (AK-451-10)	ELT Set Auto Portable, with portable soft case ONLY (no other accessories included)	Portable Antenna P/N AK 451.017-4(S) permanently attached to the unit
AK-451-(S) (AK-451-11)	ELT Survival, with portable soft case ONLY (no other accessories included)	
AK-451-(AF)(AP) /Heli/Whi/Por (AK-451-15)	ELT Set **for Helicopter**	Whip Antenna** P/N AK 451.017-1B and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) /Heli/Rod3/Por (AK-451-14)	ELT Set **for Helicopter**	Rod3 Antenna P/N AK 451.017-2A-1 and Portable Antenna P/N AK 451.017-4(S)

AK-451 ELT Sets * with GPS / NAV Position:**

Ameri-King P/N	Description	Antennas Included
AK-451-(AF)(AP) w/ GPS/Whi/Por (AK-451-23/6) Triple Freq, (AK-451-23D/6D) Dual Freq.	ELT Set, with GPS/NAV Position, **for General Aviation**	Whip Antenna P/N AK 451.017-1B and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) w/ GPS/Rod3/Por (AK-451-7)	ELT Set, with GPS/NAV Position, **for Business Jet Aircraft**	Rod3 Antenna P/N AK 451.017-2A-1 and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) w/ GPS/Rod4/Por (AK-451-8)	ELT Set, with GPS/NAV Position, **for Business Jet Aircraft**	Rod4 Antenna P/N AK 451.017-2A and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) w/ GPS/Blade/Por (AK-451-9)	ELT Set, with GPS/NAV Position, **for Transport Aircraft**	Blade Antenna P/N AK 451.017-3A and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP) w/ GPS/Heli/Whip/Por (AK-451-17)	ELT Set, **for Helicopter**, with GPS/NAV Position.	Whip Antenna** P/N AK 451.017-1B and Portable Antenna P/N AK 451.017-4(S)
AK-451-(AF)(AP)w/ GPS / Heli / Rod3 / Por (AK-451-18)	ELT Set, **for Helicopter**, with GPS/NAV Position.	Rod3 Antenna P/N AK 451.017-2A-1 and Portable Antenna P/N AK 451.017-4(S)

*** Whip antenna must have separate approval for installation in a Helicopter (see para. 2.2.2)*

**** Each Ameri-King ELT Set comes with dual Antennas, a FREE Soft Case (P/N SC-451) and a FREE Accessory Set including Remote Switch Unit, Pre-Fabricated 25' Wiring Harness Assembly, Audio Buzzer, T-Splitter, and 6' Coaxial Cable Assembly.*

DOCUMENT NO.: IM-451 REV. NC- 4.1g

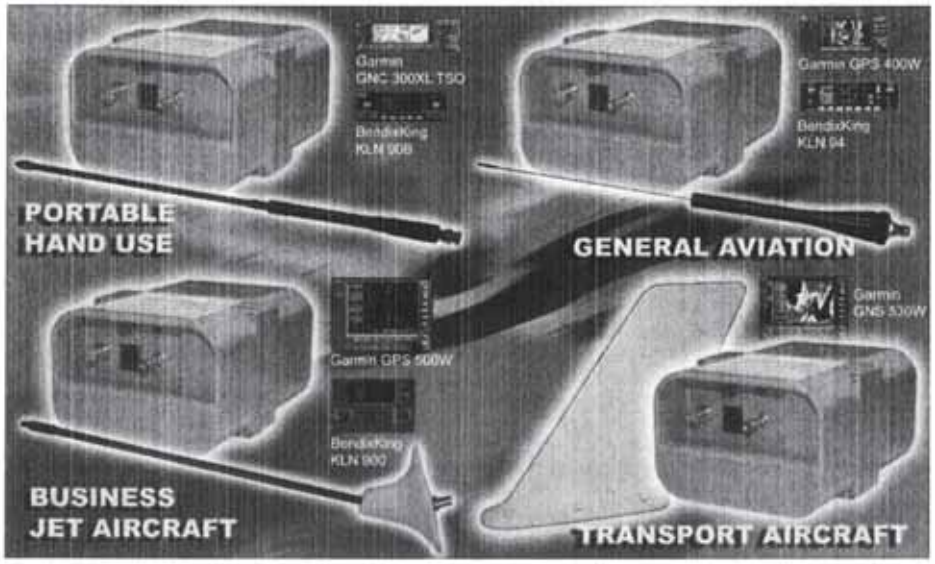
APPLICABILITY

Model/Part No.:	Fixed Whip Antenna AK 451.017-1B 406/121.5 MHz	Or Fixed Rod Antenna AK 451.017-2A 406/121.5/243 MHz	Or Fixed Blade Antenna AK 451.017-3A 406/121.5/243 MHz	Portable Whip Antenna AK 451.017-4(S) 406/121.5/243 MHz
AK- 451-(AF)	S	S	S	-
AK-451(AF)(AP)	S	S	S	M
AK - 451-(AP)	-	-	-	M
AK - 451-(S)	-	-	-	M

M: Mandatory. The respective model must be accompanied by this antenna.
S: Selective. The respective model must be accompanied by at least 1 of these antennas.
- : Not applicable

4500010-1: Battery Package, Lithium, LiMnO2, 90 Hrs Lasting.

TS-451: Computer Test Set and ELT Coding Equipment for AK-451



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3.4 PERIODIC MAINTENANCE (INSTRUCTIONS FOR CONTINUED AIRWORTHINESS):

REFERENCES: FAR Part 91.207, Part 43 Appendix D (i).
FAR Part 91.207 Paragraph (d)
FAR Part 91.407

Refer to Appendix B for Maintenance Check List with Compliance Cross References.

PURPOSE:
To insure continued reliability of your ELT, it must be inspected for damage and wear which could be caused by age, exposed elements, vibrations, etc. Even the best designed equipment, if not properly maintained and cared for, will eventually fail.

IMPORTANT NOTES:
The following inspections must be performed, **a minimum of one time every year:**

3.4.1 Secure Inspection: Inspect the ELT Main Unit and Mounting Tray to insure all fasteners and mechanical assemblies are secure.

3.4.2 Corrosion Inspection for Coaxial Cable: Inspect the Coaxial Cable connecting the ELT Main Unit to the Antenna for cuts or abrasions on its outer jacket. Disconnect the BNC connectors on each end. Examine both the BNC connectors and the mating plug on the Antenna and the ELT Main Unit for any signs of corrosion.

3.4.3 Corrosion Inspection for Remote Wiring Modular Cable: Inspect the Remote Wiring Modular Cable, connecting the ELT Main Unit to the Remote Unit of signs of wear or abrasion on its outer jacket. Remove the Modular Connecting Cable and inspect and jack and plug assembly for corrosion.

3.4.4 Battery Expiration Date Check: Check the expiration date of the ELT Main Unit and the Remote Unit Batteries. Replace if necessary.

3.4.5 Battery Leakage Check: Remove the Battery Case and inspect the Battery Compartment for signs of corrosion or battery leakage. If any battery leakage is present, all batteries must be replaced. **The Battery useful life is 5 years.**

3.4.6 Operational Test: After completing the above inspections, a Functional Test as described in Paragraph 3.3 must be performed to verify proper operation.

3.4.7.1 G-Switch Check: Ensure that the Main Switch on the ELT main unit must be selected at "ARM: position at all times. Activate the ELT using applied force. The direction for mounting and force activation is indicated on the ELT. The AK-451-(AF)(AP) ELT can be activated by using a rapid forward (throwing) motion coupled by a rapid reversing action. Verify that the ELT has been activated by use of the Wattmeter, the Airplane's VHF Radio Communications Receiver when tuned to 121.5 MHz, or other means (see Note 1). The ELT must then be reset by pressing either the RESET push button located on the ELT main unit or the ELT Remote Unit.

Note 1:
This is not a measured check. It only indicates that the G-Switch is working.

3.4.7.2 Antenna Check: A low quality AM Broadcast Radio Receiver or Equivalent Test Equipment should be used to determine if energy is being transmitted from the Antenna. When the Antenna of this Radio (tuning dial on any setting) is held about 6 inches from the activated ELT Antenna, the ELT Aural tone will be heard (see notes 2 and 3). The ELT must be reset by pressing either the RESET push button located on the ELT Main unit or the ELT Remote Unit.

Note 2:
This is not a measured check, but it does provide confidence that the Antenna is radiating with sufficient power to aid search and rescue. The Aircraft's VHF Receiver, tuned to 121.5 MHz, may also be used. This Receiver however is more sensitive and could pick up a weak signal even if the radiating ELT's Antenna is disconnected. Thus, it does not check the integrity of the ELT System or provide the same level of confidence as does an AM Radio.

Note 3:
Because the ELT radiates on the emergency frequency, the Federal Communications Commission allows these tests to be conducted only within the first 5 minutes after any hour.

IMPORTANT NOTE:
IN NORMAL CONFIGURATION, THE MAIN SWITCH, LOCATED ON THE ELT MAIN UNIT, MUST BE SELECTED AT "ARM" POSITION AT ALL TIMES.

3.4.8 Verification of Digital Message

Note:
This test is not mandatory per FAR 91.207(d) however Ameri-King strongly recommends that it be performed as part of periodic maintenance, at least every year.

Verify the 406 MHz digital message using a Computer Test Set or equivalent, capable of receiving and decoding the message. Ameri-King suggests the Ameri-King ELT Computer Test Set P/N TS-451. Contact your local Ameri-King dealer for availability of the Computer Test Set or call Ameri-King. Follow instructions provided with the computer test set.

The AMERI-KING AK-451 has a self-test feature, which is encoded such that it will be ignored by the SAR satellite system. This 15-digit number is used to register the ELT with the appropriate 406 MHz ELT registration authority. In the US, the National Oceanic and Atmospheric Administration (NOAA) maintain the database of registered ELT's.

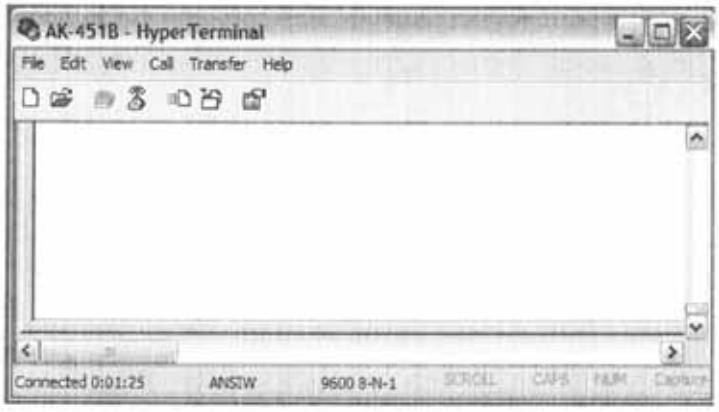
Note:
For the following example, the programming protocol is assumed to be Standard Location Protocol, ELT with C/S type approval number and Serial Number (Long Message.) Other protocols are possible and the exact read-outs of the Computer Test Set will vary. Refer to the applicable operation manual included with the Computer Test Set or contact AMERI-KING for assistance.

To verify the digital message, perform the following steps:

Setup
Use provided cable to connect the ELT (RJ-12 port) to the PC (USB port)

3.4.8.1 ELT ID Reading

Step1: Double-Click AK451 Icon to run the program. The programming window appears as below:



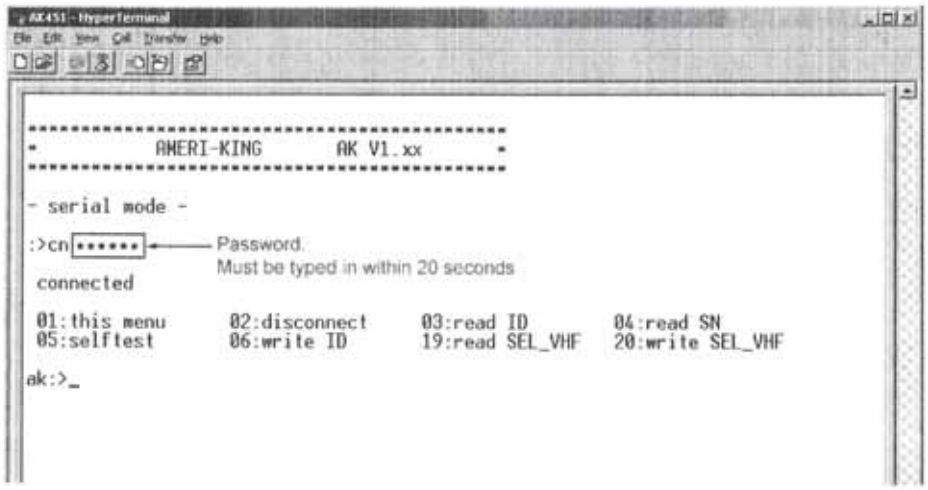
Note: If you don't see the window above, you may try the other USB port.

Step 2: Set the ELT main switch to "**ARM**" position.

Step 3: Verify the LED 'ON' light illuminates for 4 seconds.

Step 4: At the ":>_" prompt, type: "**Password**" command then press "Enter" to go to main menu. Must type this command within next 20 seconds after the command prompt appears.

Note: If there is no programming command input in this time window, the ELT will enter the Self-Test mode, and you cannot program the ELT. In this case, set the ELT switch to "**OFF**" position and start again from step 2.2.



Step 5: To read ELT ID: Use command " **03** "

Step 6: View message, ensure that all applicable information is correct (country code, aircraft ID, etc.).

Step 7: The 15 digit ID hex ID (for example "2E28598228FFBFF") should match what is shown on the ELT product label. This is the 15 digit hex ID (Unique Identification Number or "UIN") that is used to register the ELT.

3.4.9 Verification of Registration

Note:
This verification is not mandatory per FAR 91.207(d) however Ameri-King strongly recommends that it be performed as part of periodic maintenance, at least every year.

Check ELT for signs of registration.
In the US, NOAA supplies a beacon registration label that is applied to the ELT when it is registered. The following address should be used to register and obtain information on how to register 406 MHz ELT's in the United States:

SARSAT BEACON REGISTRATION
E/SP3, RM 3320, FB-4
NOAA/NESDIS
5200 Auth Rd.
Suitland, MD 20746-4304
http://www.sarsat.noaa.gov/

The Ameri-King website also contains information on registering beacons in other countries

http://www.Ameri-King.com

NOTICE: FOR ELTS THAT HAVE A COUNTRY OF REGISTRATION OTHER THAN THE USA, PLEASE CONTACT THE APPROPRIATE CIVIL AVIATION AUTHORITY IN THAT COUNTRY FOR GUIDELINES AND DOCUMENTATION NEEDED TO ASSURE PROPER REGISTRATION

Logbook Entry:
Enter the date the test technician's initials and whether the ELT passed or failed into the aircraft's logbook.

3.4.10 Verification of ELT/GPS interface (if equipped)

Note: This test is not mandatory per FAR 91.207(d); however, Ameri-King strongly recommends that it be performed as part of periodic maintenance, at least every year.

3.4.10.1 ELT to GPS Interface Information

For details on the installation and use of the ELT Computer Test Set TS-451, please contact Ameri-King Corporation to request the brochures and Operation Manual for the ELT Computer Test Set.

When used with ELT's that are programmed for Standard Location 24 bit protocol, the ELT to be program itself to the aircraft's 24 bit address. This feature will allow the ELT to be transferred between aircraft. This makes maintenance of the ELT a simple matter of replacing the ELT. Note: There is no electronic connection between TCAS or Mode S systems and the ELT, only the ID number is common.

The AK-451 receives position data (longitude and latitude) from the aircraft's on-board GPS system. The ELT may be programmed with the aircraft's 24 bit address. When used with ELT's that are programmed for long message 24 bit protocol, which is set up to match the 24 bit address parity of the Mode S surveillance and communications system switch block.

Note: There is no electronic connection between TCAS or Mode S systems and the ELT, only the ID number is common. This feature was implemented in the ELT with fleet operators in mind. ELT's are programmed with either a serialized or 24 bit protocol. The ELT transmits position data as part of the 406.025 MHz distress message.

In the event of a crash, the ELT will transmit the converted position information from the navigation system, such as the GPS flight management computer, loran, etc. Geostationary satellites constantly monitor the 406.025 MHz transmissions. The crash site is instantly known due to the aircraft's navigation system position data

communication with the ELT. Without the position data being transmitted, it is necessary for the polar orbiting satellites to pass overhead, using Doppler Shift technology to determine position. In a worst case scenario this could be a 3 to 4 hour wait for a polar orbiting satellite to pass over. In addition, the accuracy of the position fix is much better i.e. 22 meters (with GPS/Nav Position data) versus 1 to 2 kilometers for the standard 406.028 MHz system (without GPS/NAV Position data).

The ELT accept Aviation RS-232 data bus formats. By reprogramming the ELT with the aircraft's 24 bit identification or serialized (long message format), this facilitates moving the ELT from one aircraft to another when performing routine maintenance, etc.

WARNING: The programming and labeling of the ELT must match the aircraft it is installed in. The product label will have to be re-marked to reflect the new programming and/or country of registry if a 24-Bit address long message protocol ELT is reprogrammed.

Re-registration may not be required if the contact information does not change; however, contact your local civil aviation or beacon registration authority when in doubt.

Both serialized long message and 24-Bit address long message, re-programmed ELT, that is moved to another aircraft, shall need to be re-registered Online or by Mail.

The user must specify 24-bit long message programming when ordering the ELT. Changing the programming protocol of the ELT can only be done at Ameri-King or an authorized Ameri-King Repair Station.

3.4.10.2. ELT/GPS Interface Communication Formats

The only Aviation RS-232 format which is supported is limited to the following conditions:

Baud Rate (fixed):	9600
Parity:	None
Data Bits:	8
Stop Bits:	1

In addition the RS-232 format must have a Start of Text (STX): an **"A"** identifier for latitude; a **"B"** identifier for longitude and END of Text **(ETX)**. The format expects carriage returns but will not operate if there are line feeds.

The following manufacturer's navigation systems are known to interface with the AK-451:

GARMIN INTERNATIONAL INC.:

• All Series: 150/ 250/ 400/420/430/ 500/520/530

HONEYWELL BENDIX-KING INC.:

• KLN 88, KLN89, KLN89B, KLN 90, KLN90B, KLN94, KLN900.

ARNAV SYSTEMS INC.:

• R50, R50i, STAR 5000, FMS 5000, MFD (Multi-Functional Display).

II MORROW:
• FLYBUDDY, 2001 NMS
TRIMBLE NAV INC.:
• NAV 1000, NAV 2000, TNL 2100, and TNL3100. The following Trimble systems all require a RS-422 to RS-232 adapter: NAV 3000, TNL 1000, TNL 2000, TNL 2000A, TNL 3000, 2000 APPROACH, 2000 APPROACH PLUS, 2101 APPROACH, 2101 APPROACH PLUS, 2101 I/O APPROACH, 2101 I/O APPROACH PLUS.

For other equipment models contact that equipment manufacturer to determine if their equipment supports the Aviation RS-232 format specified above.

3.4.10.3 ELT/FMC Interface and Checkout Process

All installation processes and interconnections to navigation systems should adhere to the guidelines set forth in the FAA Advisory Circulars 43.13-2B, 20-130A and 20-138, or later revisions of these documents. It is very important that the Global Positioning System/Flight Management Computer (GPS/FMC) manufacturer's installation instructions be consulted regarding installation details that may be specific to the GPS/FMC. Refer to the installation instructions specific to the GPS/FMC that you are connecting the ELT for specific instructions.
For all testing of the 406 MHz output, only the "test message" that is transmitted at turn off is required to verify the ELT and ELT/GPS Interface function.

Note: It is extremely important that the ELT/GPS Interface installation not be in conflict with the GPS/FMC manufacturer's installation instructions in order to avoid an installation that may degrade the GPS/FMC performance. As a result, the Post Installation checkout in the GPS/FMC Installation Manual may be followed after installing the ELT.

3.4.10.4 24-Bit Address Installation Test (mandatory for Installations reprogramming by Ameri-King's authorized dealer):

Verify the 24 Bit Address by using the ELT Computer Test Set TS-451 or equivalent. The 15 digit hex code shall be extracted by using the Computer Test Set or equivalent. Realize that the AK-451 transmits a 406 MHz test message, which is encoded such that it will be ignored by the SAR satellite system. This 15-digit number is used to register the ELT with the appropriate 406 MHz ELT registration authority. In the US, the National Oceanic and Atmospheric Administration (NOAA) maintains the database of registered ELT's.

Note: Although a typical 15 digit hex code can contain position data, the 15-digit ID used for registration purposes shall contain the "default' value of no position data instead (this is indicated by the last 5 digits of the 15 digit hex code being "FFBFF").

3.4.10.5 GPS Position Test, if equipped
(for using TS-451 Computer Test Set or equivalent) :

Note: Per FCC Regulation, this test should be conducted inside a RF shielded room or an ELT RF shielded box. Dummy 50 ohm Load should be used.

- Connect the AK-451 with ELT Computer Test Set TS-451.
- Turn the switch of the ELT to "ON" position.
- Verify the following setting (See Figure 20.) From the Hyper Terminal window (or the equivalent RS-232 window), Click File -> Properties -> Settings tab. Click OK to go back to Hyper Terminal window.

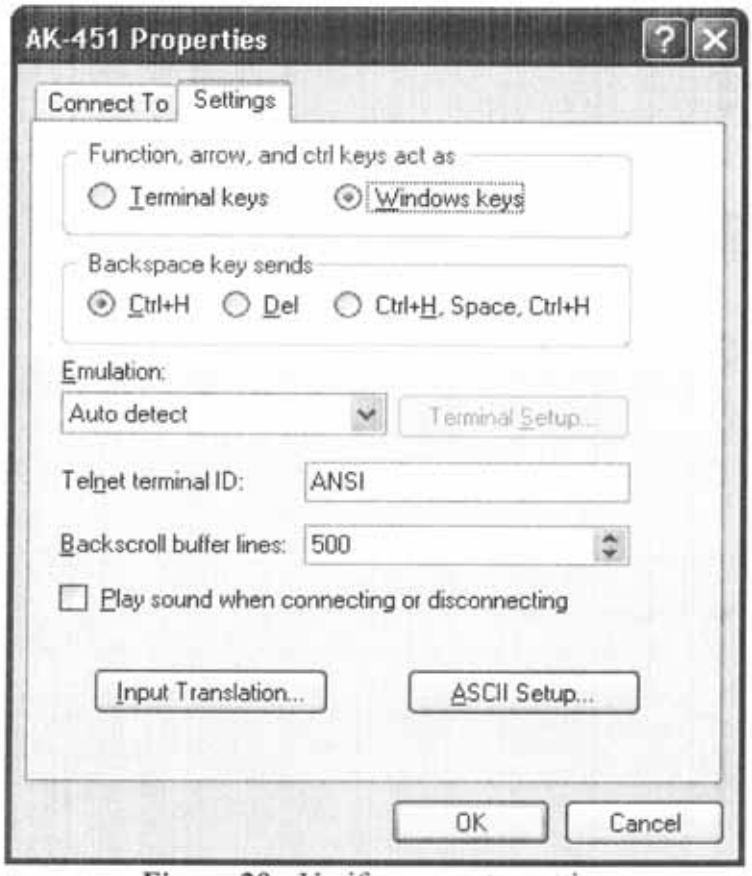


Figure 20: Verify parameter setting.

Waiting for 50s, verify the 36 Hex digits (ignore first 6 digits). The last 30 Hex digits will be used for Cospas-Sarsat Decode program, in order to see the Latitude, Longitude Position.

Note: When used with ELT's that are programmed for Standard Location 24 bit protocol, the ELT to be program itself to the aircraft's 24 bit address. This feature will allow the ELT to be transferred between aircraft. Re-register the ELT with the Search and Rescue authority is required. This makes maintenance of the ELT a simple matter of replacing the ELT. Note: There is no electronic connection between TCAS or Mode S systems and the ELT, only the ID number is common.

3.5 PERIODIC MAINTENANCE (INSTRUCTION FOR CONTINUED AIRWORTHINESS FOR CANADIAN INSTALLATION:

REFERENCES:

Canadian Aviation Regulations CAR Standards: Part V – Airworthiness Manual AWM 571: Appendix B.

Refer to Appendix B for Maintenance Check List with Compliance Cross References.

PURPOSE:

Instructions for continued airworthiness, which shall include as a minimum, details of approved batteries and sources of supply; battery replacement or recharge instructions; battery capacity test procedures, if applicable; transmission or functional test procedures; procedures necessary to accomplish the performance tests specified in Chapter 571 Appendix B ; and for 406 MHz ELTs, instructions to verify the aircraft 24 bit address protocol as applicable;

Appendix B

(a) Corrosion Inspection
(b) Operational Testing
(c) Performance Testing
(d) Battery Replacement and Recharging
(e) Shipping

IMPORTANT NOTES:

The ELT must be "performance tested within the 12 month period preceding installation in an Aircraft and within 12 months intervals thereafter…"

The following Supplemental Installation and Periodic Maintenance requirements must be complied with, when installing the Model AK-451 ELT in Canadian Aircraft:

SUPPLEMENTAL INSTALLATION

Installation and maintenance of the ELT must comply with Transport Canada Airworthiness Manual Chapter AWM 551.104 (f)(4) Transmitter Remote Control

A Placard shall be fabricated and installed near the Remote Unit which states:

FOR AVIATION EMERGENCY USE ONLY
UNAUTHORIZED OPERATION PROHIBITED