406 MHz Beacon Coding
Guidelines for USA
National Use Fields

National Oceanic and Atmospheric Administration
National Environmental Satellite, Data and Information Service
Direct Services Division

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Section 1

1.0   Introduction

Cospas-Sarsat 406 MHz emergency beacons are designed to transmit digitally coded data. The data contains beacon identification, and in some cases, position of the beacon. Various coding schemes, or protocols, exist to allow flexibility in coding the beacons. The protocols are defined in the Cospas-Sarsat document "Specification for Cospas-Sarsat 406 MHz Distress Beacons, C/S T.001." However, national administrations have been given control over the coding of certain portions of the Cospas-Sarsat protocols.

1.1   Purpose

The purpose of this document is to provide coding and bit allocation guidelines for Cospas-Sarsat beacon protocols that allow a "national use" field. These protocols include the Serialized User Protocol, National User Protocol and the National Location Protocol. Due to the sensitive nature of some of the beacon applications this document is intended for use and reference by members of the USA SARSAT program only. This document is maintained by the Direct Services Division of NOAA.

1.2   Scope

This document contains coding guidelines for USA coded 406 MHz beacons. USA coded beacons are those where the decimal value of the country code (bits 27 to 36) is either 366 or 367. This document is meant to be used as a supplement to the reference documents identified in Section 1.3. It is not intended to provide the detail necessary to code 406 MHz beacons. The document is divided into the following sections:

a)   Section 1 is the introduction;

b)   Section 2 contains the coding guidelines for national use fields including;

c)   Annex A describes the allocation of bits for the Serialized User Protocol;

d)   Annex B describes the allocation of bits for the National User Protocol; and

e)   Annex C describes the allocation of bits for the National Location Protocol.

The date on the cover page to this document, along with the dates on the appropriate annexes should be updated anytime an entry is modified or created.

1.3   Reference Documents

The following documents contain additional information on national and international coding requirements:

a)   "Specification for Cospas-Sarsat 406 MHz Distress Beacons, C/S T.001";

b)   "Cospas-Sarsat Guidelines on 406 MHz Beacon Coding, Registration and Type Approval, C/S G.005";

c)   Radio Technical Commission for Maritime Services (RTCM) "Recommended Standards for 406 MHz Satellite EPIRBs"; and

d)   Requirements and Technical Concepts for Aviation (RTCA) TS0-126, 406 MHz Emergency Locator Transmitter (ELT).

- End of Section 1 -

Section 2

2.0   Structure of National Use Fields

2.1   Serialized User Protocol

The Serialized User Protocol allows national administrations to control the allocation of bits 44 to 83. Bits 44 to 63 are intended to provide a unique serial number for a beacon and bits 64 to 83 are allocated for national use. The allocation of these bits in the USA is documented in RTCM's "Recommended Standards for 406 MHz Satellite EPIRBs." Table 1 details the bit usage for USA Serialized User Protocol.

Table 1: Bit Usage for USA Serialized Protocol

Bit Position	Field	Bit Values	Bit Decode
25	Format Flag	1	Short Message
			Long Message
26	Protocol Flag	1	User Protocol
27-36	Country Code	0101 1011 10	366 (USA)
		0101 1011 11	367 (USA)
		0101 1100 00	368 (USA)
37-39	User Protocol Code	011	Serialized User
40-43	Beacon Type	0000	Aviation
		0100	Maritime Float Free
		1000	Maritime Non-Float F
		1100	Personal
44-51	Manufacturer's Block	*Controlled by NOAA*	*See Annex A*
52-63	Manufacturer's Sequence	*Controlled by Manufacturer*	
64-67	Manufacturer's Model	*Controlled by Manufacturer*	
68-75	Manufacturer's Production	*Controlled by Manufacturer*	
76-83	Spare Bits	*Controlled by NOAA*	*See Annex A*

The appropriate Direct Services Division government official, or a designated representative, will allocate bits 44-51 (manufacturer's block number) and bits 76-83 (spare bits). The manufacturer's block number is allocated serially. New manufacturers should be assigned the next available block identifier. The current allocation of manufacturer's blocks is contained in Annex A. Manufacturers should assign a serial number for each production run in bits 52-63. Manufacturers

should also sequentially assign the production run in bits 68-75. Bits 64-67 designate a manufacturer's model number. The manufacturer assigns a model number for each beacon and controls the allocation of these bits. However, the Direct Services Division should be notified when any model numbers are allocated.

The allocation of the spare bits should be coordinated with the USMCC as these are used in the USMCC's exception processing. The allocation of the eight spare bits should yield a two character hexadecimal code (e.g., 1011 1011 = "AA"). The hexadecimal code is used in the USMCC exception processing to specially route alert messages. Any unassigned combination of hexadecimal codes may be used. Annex A contains the current allocation of the spare bits.

2.2   National User Protocol

The National User Protocol is a special coding format that has bits 40 to 85 in the first protected field and bits 107 to 132 in the second protected field controlled by a national administration. The coding of beacons with this protocol is controlled in the USA by the Direct Services Division of NOAA. Table 2 details the bit usage for the National User Protocol.

Table 2: Bit Usage for USA National User Protocol

Bit Position	Field	Bit Values	Bit Decode
25	Format Flag	1	Short Message
			Long Message
26	Protocol Flag	1	User Protocol
27-36	Country Code	0101 1011 10	366 (USA)
		0101 1011 11	367 (USA)
			368 (USA)
37-39	User Protocol Code	100	National User
40-47	Organization Identifier	*Controlled by NOAA*	*See Annex B*
48-85	Organization Use	*Controlled by Organization*	
107-132	Organization Use	*Controlled by Organization*	

Bits 40-47 are allocated by NOAA and bits 48-85 and 107-132 are controlled by the organization that has coordinated the use of this protocol with NOAA.

The appropriate Direct Services Division government official, or a designated representative, will allocate bits 40-47. The allocation will yield a two character hexadecimal identifier similar to the spare bits in the User Protocol (e.g., 1100 0000 = C0). Annex B contains the bit allocation for the National User Protocol national use fields.

The use of this protocol should be limited, as the content of this protocol is only known to the USMCC system. Foreign MCCs may not be able to correctly process encoded data for this protocol. The organization identifier must be coordinated with the USMCC as it is linked to the USMCC's exception processing.

It should be noted that bits 1 to 106 must remain constant if Doppler processing is to be performed on beacons using this protocol. Bits 107 to 132 may change periodically provided the correct BCH code is also computed and such changes do not occur more frequently than 20 minutes.

2.3   National Location Protocol

The National Location Protocol allows an encoded position to be provided in the short message. This protocol also allows a national administration to control the identification of beacons through the use of serial numbers. The allocation of this serial number in the USA is controlled by the Direct Services Division of NOAA. Table 3 defines the bit usage for USA coded National Location Protocol beacons.

The appropriate Direct Services Division government official, or a designated representative, will allocate bits 41-50. The allocation will yield a three character hexadecimal identifier using 8 bits similar to the spare bits in the User Protocol and an additional 2 bits (e.g., 1100 0000 01= C01).

The organization or manufacturer will assign sequence numbers for bits 51-58. This approach allows each organization or manufacturer to produce 2048 EPIRBs, 2048 ELTs and 2048 PLBs for each of the three country codes assigned to the United States. However, spare bits exist for each organization or manufacturer so that their production can be doubled.

The organization/manufacturer identifier must be coordinated with the USMCC as it is linked to the USMCC's exception processing.   Annex C contains the bit allocation for the National Location Protocol national use fields.

Table 3: Bit Usage for USA National Location Protocol

Bit Position	Field	Bit Values	Bit Decode
25	Format Flag	1	Short Message
			Long Message
26	Protocol Flag	0	Location Protocol
27-36	Country Code	0101 1011 10	366 (USA)
		0101 1011 11	367 (USA)
			368 (USA)
37-40	Protocol Code	1000101010111111	ELT
			EPIRB
			PLB
			Test
41-50	Organization/Manufacturer Identifier	*Controlled by NOAA*	*See Annex C*
51-58	Sequence Number	*Controlled by Organization or Manufacturer*	

- End of Section 2 -