RECOMMENDATION 633-1*

TRANSMISSION CHARACTERISTICS OF A SATELLITE EMERGENCY POSITION-INDICATING RADIO BEACON (SATELLITE EPIRB) SYSTEM OPERATING THROUGH A LOW POLAR-ORBITING SATELLITE SYSTEM IN THE 406 MHz BAND

(Question 90/8)

(1986-1990)

The CCIR,

CONSIDERING

(a) that satellite EPIRBs can be used for distress alerting in the maritime, land and aeronautical environments;

(b) that satellite EPIRBs with common characteristics may be employed in diverse operating environments;

(c) that satellite EPIRBs are one of the prime alerting means in the Global Maritime Distress and Safety System (GMDSS) of the International Maritime Organization (IMO);

(d) that all ships to which Chapter IV of the International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended in 1988, applies will be required by Regulation IV/7.1.6 to carry a satellite EPIRB from 1 August 1993;

(e) that SOLAS Regulation IV/7.1.6 provides for the carriage of a satellite EPIRB operating in the 406 MHz band;

(f) the necessity to gain operational experience with globally received data by 1 August 1993;

(g) the assured availability of four operational COSPAS-SARSAT type satellites in orbit until the year 2003 and the planned availability thereafter;

(h) the current and projected availability of the COSPAS-SARSAT ground system;

(j) the test results presented in Report 919,

UNANIMOUSLY RECOMMENDS

1. that the transmission characteristics for a satellite EPIRB operating through a low polar-orbiting satellite system in the 406 MHz band should be in accordance with Annexes I and II to this Recommendation;

2. that administrations be discouraged from using data formats not covered by this Recommendation.

* The Director, CCIR, is requested to bring this Recommendation to the attention of the International Maritime Organization (IMO), the International Civil Organization (ICAO), the International Maritime Satellite Organization (INMARSAT), and the COSPAS-SARSAT Secretariat.

ANNEX I

TABLE I – *406 MHz satellite EPIRB characteristics*

Parameter	Value
RF signal:	
Carrier frequency (1):	
initial	406.025 ± 0.002 MHz
Frequency stability (1):	
short term	≤ 0.002 parts/million in 100 ms
medium term:	
mean slope (2)	≤ 0.001 parts/million/min
residual frequency variation (2)	≤ 0.003 parts/million
long term	± 0.005 MHz within 5 years including the initial offset
For the interim period until 1 January 1991, the following relaxation in frequency stability is permitted:	
medium term:	
mean slope (2)	≤ 0.002 parts/million/min
residual frequency variation (2)	≤ 0.005 parts/million
Power output	5 W ± 2 dB measured into 50 Ω load with VSWR ≤ 1.25 : 1
Power output rise time	< 5 ms, measured between 10% and 90% power points
In-band spurious emissions	See Fig. 1
Data encoding	Biphase L (see Fig. 2)
Modulation	Phase modulation positive and negative 1.1 ± 0.1 radians peak referenced to an unmodulated carrier (see Fig. 2)
Modulation rise (τ_R) and fall (τ_F) times	150 µs ± 100 µs (Fig. 3)
Modulation symmetry	$\lvert\tau_1 - \tau_2\rvert/(\tau_1 + \tau_2) \leq 0.05$ (see Fig. 4)
Continuous emission failure mode	Continuous transmission should not exceed 45 s
Warm-up time	All technical characteristics should be met within 15 min from turn on when transmitting within operating temperature range
Digital message:	(See Fig. 5)
Repetition period (3)	50 s ± 5%
Transmission time (4)	440 ms ± 1% (or 520 ms ± 1% for optional long message)
CW preamble (5)	160 ms ± 1%
Digital message	280 ms ± 1% (or 360 ms ± 1% for optional long message)
Bit rate	400 bit/s ± 1%
Bit synchronization	All “1s” (15 “1” bits)
Frame synchronization	000101111 in normal operation, or 011010000 during on-air self test
Antenna (6):	
Elevation	5° to 60°
Pattern	Hemispherical
Polarization	Circular (RHCP) or linear
Gain (vertical plane)	Between – 3 dBi and + 4 dBi over 90% of the above region
Gain variation (azimuth plane)	< 3 dB
VSWR (7)	≤ 1.5 : 1
Operating temperature range	
Minimum acceptable (8)	– 20 °C to + 55 °C
Optional (9)	< – 20 °C to > + 55 °C
Long-term temperature gradient	5 °C/h
Thermal shock	30 °C temperature difference with a degraded performance for 15 min
Minimum operating life time (10)	24 h at any temperature throughout the specified operating temperature range

Footnotes relative to Table I:

(1) Specified values apply after 15 min warm-up and for VSWR ≤ 3 : 1.

(2) The mean slope and residual frequency variation shall be measured as follows; Data shall be obtained by making 18 sequential frequency measurements, one every repetition period (50 s ± 5 %) over an approximate 15 min interval. Each measurement shall be a 100 ms frequency average performed during the modulated part of the message. The mean slope is defined as that of the least-squares straight-line fit to the 18 data points. Residual frequency variation is defined as the r.m.s (root mean square) error of the points relative to the least-squares estimate.

(3) The repetition period shall not be so stable that any two transmitters appear to be synchronized closer than a few seconds over a 5-min period. The intent is to randomize the period between transmission bursts such that no two satellite EPIRBs will have all of their bursts coincident. An acceptable alternative for a production run of any type or model of satellite EPIRB would be an equal distribution of fixed repetition periods of 8 or more values approximately equally spaced over the range of 47.5 s to 52.5 s.

(4) Measured at the 90% power points.

(5) Measured between the 90% power point and the beginning of the modulation.

(6) Antenna characteristics should be verified in a configuration as close as possible to its operational condition.

(7) The satellite EPIRB shall not be damaged by any load from open circuit to short circuit.

(8) This temperature range is also the IMO recommended performance standard (IMO Resolution A.611(15)).

(9) This extended specification may be applied at the discretion of each administration.

(10) For installations meeting IMO recommended performance standards (IMO Resolution A.611(15)), a minimum operating life time of 48 h at any temperature throughout the specified operating temperature range is necessary.

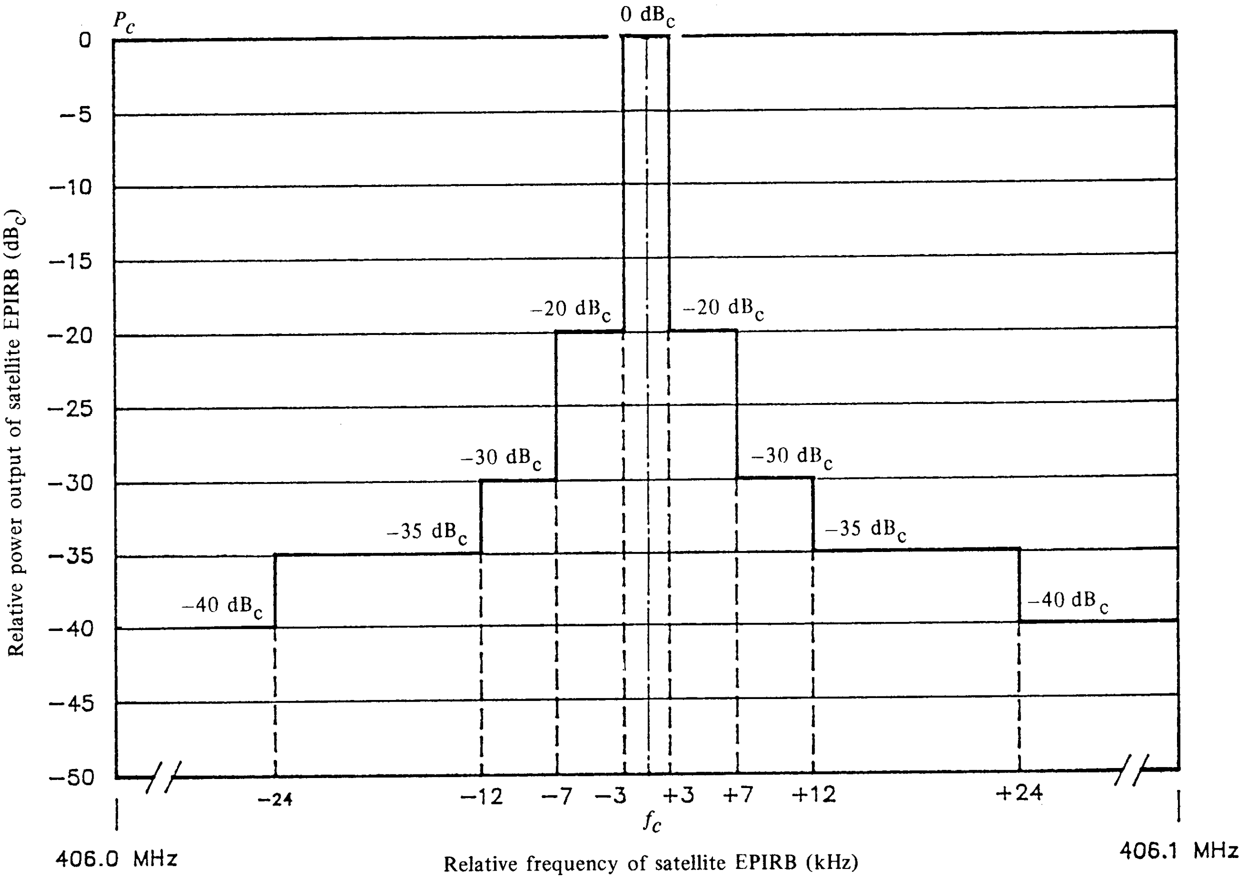

FIGURE 1 – *Spurious emission mask for 406.0 MHz to 406.1 MHz band*

P_c : Satellite EPIRB unmodulated carrier power output

f_c : Satellite EPIRB carrier frequency

dB$_c$: Satellite EPIRB emitted signal power level in dB relative to P_c (measured in a 100 Hz resolution bandwidth)

D01-sc

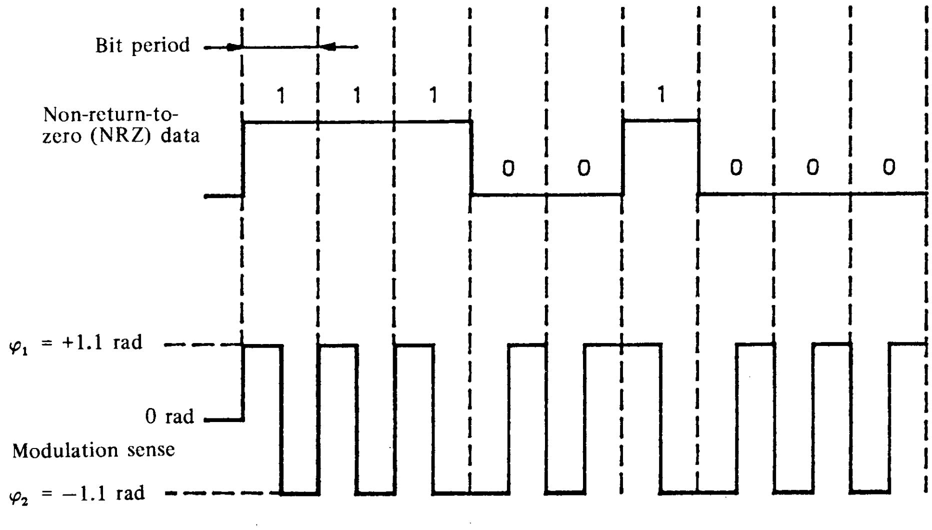

FIGURE 2 – *Data encoding and modulation sense*

D02-sc

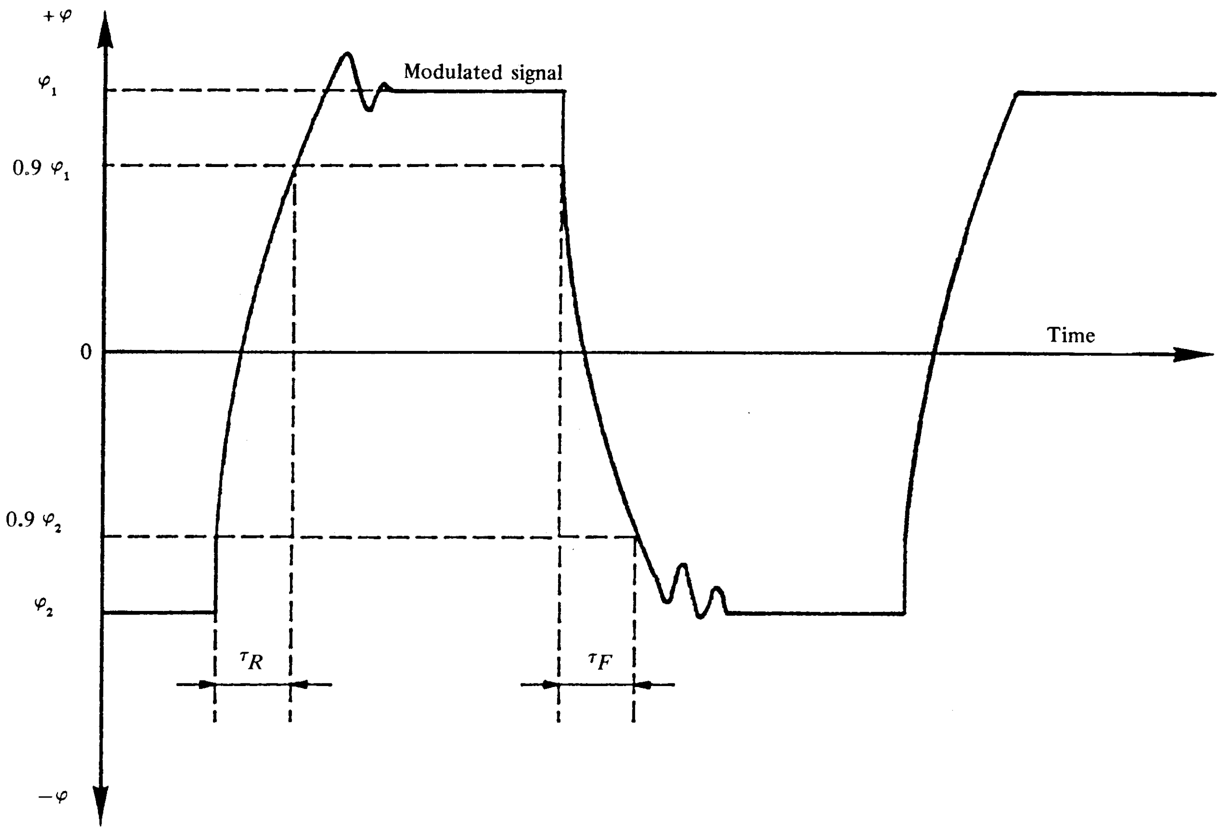

FIGURE 3 – *Definition of modulation rise and fall times* (Figure not to scale)

D03-sc

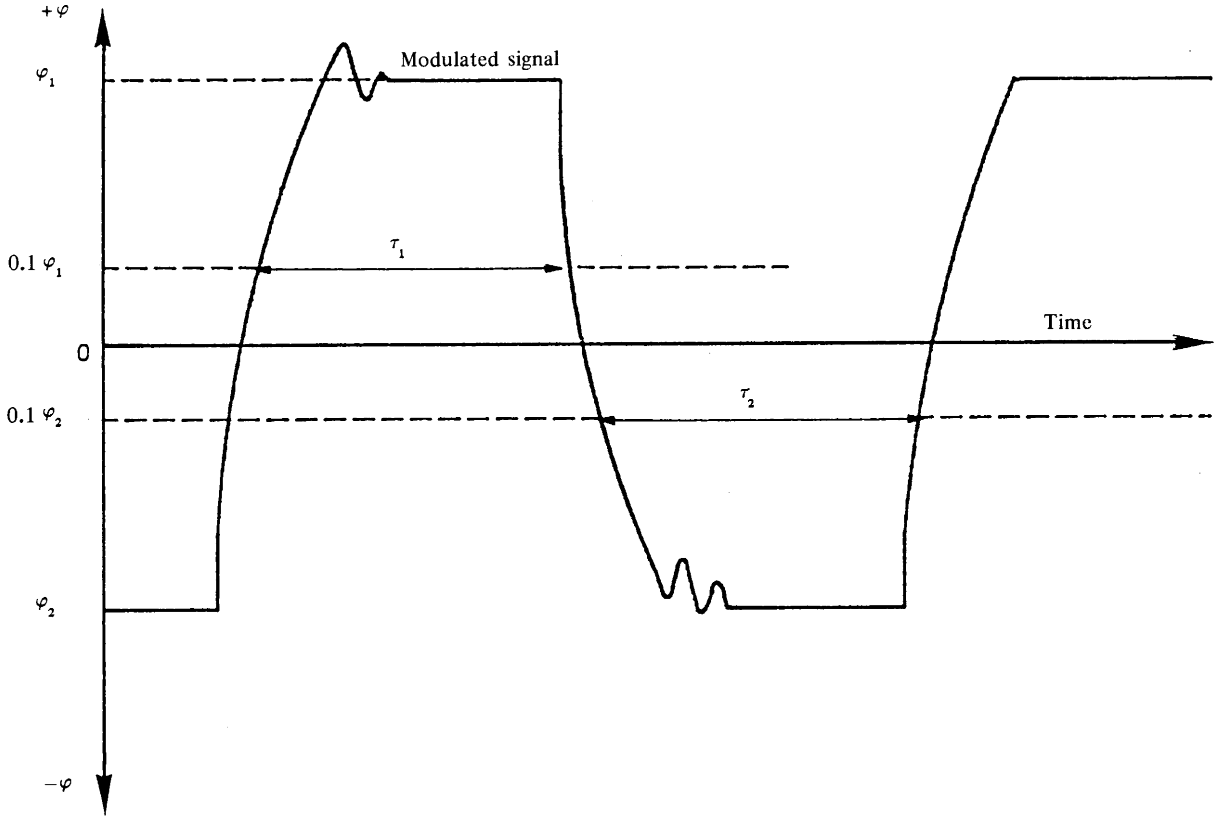

FIGURE 4 – *Definition of modulation symmetry* (Figure not to scale)

D04-sc

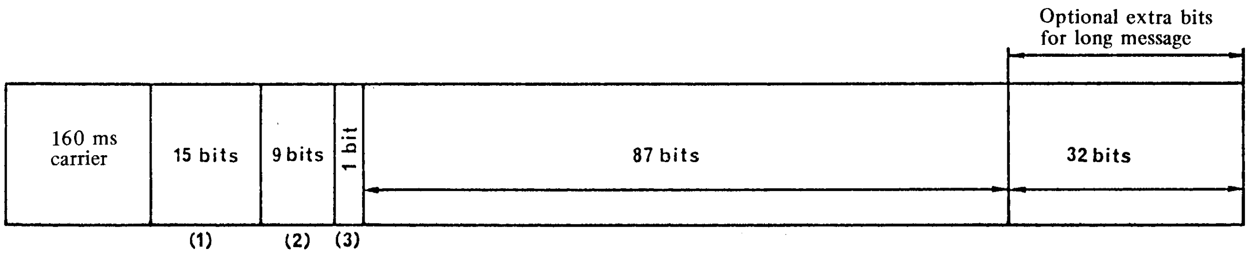

FIGURE 5 – *Transmitted message format*

(1) Bit synchronization: 15 "1" bits

(2) Frame synchronization: 000101111 in normal operation, or
011010000 during on-air self test

(3) "0" bit indicates short-message format
"1" bit indicates long-message format

D05-sc

ANNEX II

SATELLITE EPIRB CODING

1. General

This Annex defines the 406 MHz satellite EPIRB digital message coding (see Fig. 6). The digital message is divided into six major fields. For each field, the most significant bit (MSB) is transmitted first.

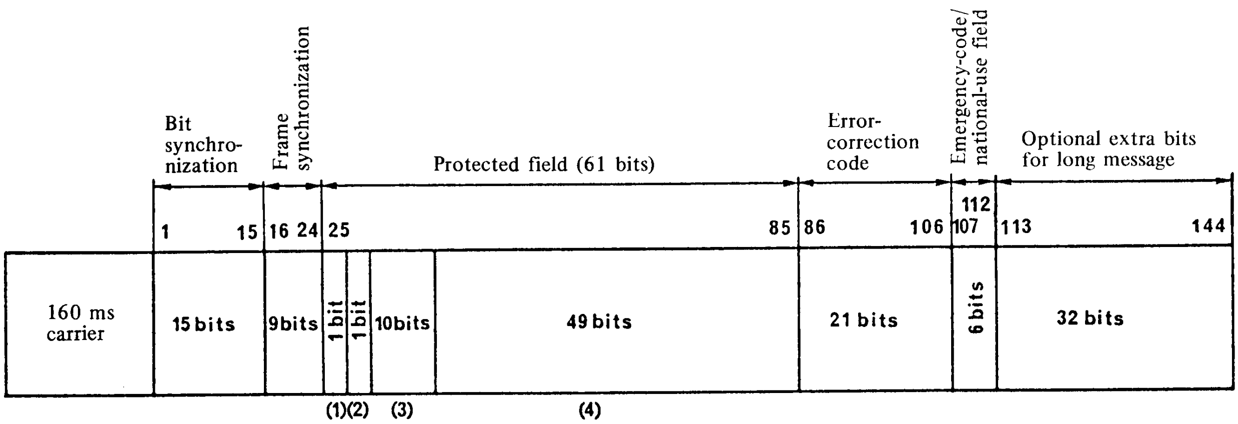

FIGURE 6 – *Message format*

(1) Message-format flag: "0" indicates short message
"1" indicates long message

(2) Protocol flag

(3) MID (Maritime Identification Digit) code (see § 2.2)

(4) Data field

D06-sc

Satellite EPIRBs may be coded either for a short message or for an optional long message format as described below:

– the short message format includes a unique identification number which accommodates either the ship station identity or an identity which meets the special needs of aeronautical or other users. The short message can provide additional information such as type of auxiliary radio-locating device, user type, and location of the satellite EPIRB or other information as desired;

– the optional long-message format provides all information necessary to meet the GMDSS requirements, e.g. maritime users can report course, speed, nature of distress and time of satellite EPIRB activation in accordance with the IMO proposals for content of the distress message;

– the assignment of ship station identities and maritime identification digits (MID) shall be in accordance with the relevant ITU maritime mobile service identities (see Appendix 43 to the Radio Regulations) or relevant national standards;

– administrations should note that any applications of data formats indicated as "spare" or other options not defined in this Annex will not be decoded by operators of the COSPAS/SARSAT system. However, COSPAS/SARSAT Secretariat is willing to consider proposals from administrations for other data formats.

The six major message bit fields are described in Table II and the details of the last four message bit fields are summarized in Table III.

TABLE II – *Major message-bit fields*

Bit-field name	Bit-field location
1. Bit synchronization	Bit 1 to bit 15
2. Frame synchronization	Bit 16 to bit 24
3. Protected field	Bit 25 to bit 85
4. Error-correction code	Bit 86 to bit 106
5. Emergency-code/national-use field	Bit 107 to bit 112
6. Long message (optional)	Bit 113 to bit 144

A bit-synchronization pattern consisting of a series of "1s" shall occupy the first 15 bit positions.

A frame-synchronization pattern consisting of 9 bits shall occupy bit positions 16 to 24. The frame-synchronization pattern in normal operation shall be "000101111". However, if the satellite EPIRB radiates a modulated signal in the self-test mode, the frame-synchronization pattern shall be "011010000" (i.e. the last 8 bits are complemented) and any RF transmission (modulated or unmodulated) must be limited to one burst of 440 ms maximum.

The error-correction code is used with both the short-message format and the long-message format and is based on a (127, 106) triple error-correcting BCH code with the following generator polynomial:

$$g_5(x) = g_3(x) \cdot (7,4,3,2,0)$$
$$g_3(x) = g_1(x) \cdot (7,3,2,1,0)$$
$$g_1(x) = (7,3,0)$$

TABLE III – *Summary of coding options for 406 MHz beacons*

<table>
<tr><td colspan="5">b 25: message-format flag (0 = short message, 1 = long message)</td></tr>
<tr><td colspan="5">b 26: protocol flag (0 = maritime/location protocol, 1 = user protocols)</td></tr>
<tr><td colspan="5">b 27 – b 36: maritime identification digits (MID). Appendix 43 of the ITU Radio Regulations</td></tr>
<tr><td rowspan="4">Maritime/location protocol (b 26 = 0)

b 37 – b 56: trailing 6 digits of ship station identity (binary coded)

b 57 – b 85: location (binary coded)
b 57 – b 63: latitude (degrees)
b 64 – b 69: latitude (min)
b 70: 0 = North, 1 = South
b 71 – b 78: longitude (degrees)
b 79 – b 84: longitude (min)
b 85: 0 = East, 1 = West</td><td colspan="4">User protocol (b 26 = 1)

b 37 – b 39: User protocol type
000 = orbitography
001 = aviation
010 = maritime
011 = serialized
110 = radio call sign
111 = test
100 = spare
101 = spare</td></tr>
<tr><td>Maritime user
(b 37 – b 39 = 010)</td><td>Radio call sign user
(b 37 – b 39 = 110)</td><td>Serialized user
(b 37 – b 39 = 011)</td><td>Aviation user
(b 37 – b 39 = 001)</td></tr>
<tr><td>b 40 – b 75: trailing 6 digits of ship station identity or radio call sign (modified Baudot)
b 76 – b 81: Specific beacon (modified Baudot)
b 82 – b 83: 00 = spare</td><td>b 40 – b 63: first four characters (modified Baudot)
b 64 – b 75: last three characters (binary coded decimal)
b 76 – b 81: Specific beacon (modified Baudot)
b 82 – b 83: 00 = spare</td><td>b 40 – b 43: beacon type
0100: maritime
1000: survival
0000: aviation
1100: personal

b 44 – b 63: serial number
b 64 – b 83: national use, not defined</td><td>b 40 – b 81:
registration marking (modified Baudot)

b 82 – b 83: 00 = spare</td></tr>
<tr><td colspan="4">b 84 – b 85: Auxiliary radio-locating device type(s)
00 = no auxiliary radio-locating device
01 = 121.5 MHz
10 = maritime locating: 9 GHz SART
11 = other auxiliary radio-locating device(s)</td></tr>
<tr><td colspan="5">b 86 – b 106: error-correction code for b 25 – b 85</td></tr>
<tr><td colspan="5">b 107: emergency-code use of b 109 – b 112
0 = national use, undefined
1 = emergency-code flag</td></tr>
<tr><td colspan="5">b 108: 0 = manual activation only type of beacon
1 = automatic and manual activation type of beacon</td></tr>
<tr><td colspan="4">b 109 – b 112: nature of distress as indicated by IMO (Table XVI)</td><td>b 109 – b 112: non-maritime user emergency code
b 109: 1 = fire, 0 = no fire
b 110: 1 = medical help needed,
0 = no medical help needed
b 111: 1 = disabled, 0 = not disabled
b 112: 0 = spare</td></tr>
<tr><td>b 113 – b 144: optional long message for maritime/location protocol
b 113 – b 121: course
b 122 – b 126: speed
b 127 – b 139: activation time
b 127 – b 129: day of week
b 130 – b 134: hour
b 135 – b 139: minute (2-min increments)
b 140 – b 144: optional national use</td><td colspan="4">b 113 – b 144: optional long message for user protocols
b 113 – b 114: 00 = latitude/longitude flag, 01, 10, 11 = spares
b 115 – b 121: latitude (degrees)
b 122 – b 127: latitude (minutes)
b 128: 0 = North, 1 = South
b 129 – b 136: longitude (degrees)
b 137 – b 142: longitude (minutes)
b 143: 0 = East, 1 = West
b 144: even parity applied to b 113 – b 143</td></tr>
</table>

2. Protected field

The protected field consists of 61 bits (i.e. bit 25 to bit 85 inclusive) which are “protected” by application of the error-correction algorithm. The first bit (i.e. bit 25) is a format flag which shows whether the message is short or long using the following coding:

0: short format
1: long format

The identification (ID) field, which begins at bit 26 after the format flag and ends at bit 85, has the general structure as shown in Table IV.

TABLE IV – *Identification field bit structure*

Bits	Usage
26	Protocol flag
27-36	MID code (see § 2.2)
37-85	Data field

2.1 *Protocol flag*

Bit 26 in the ID field is used to identify the type of protocol being used by a satellite EPIRB, i.e. maritime/location protocol (bit 26 = 0) or for one of 8 possible user protocols (bit 26 = 1).

2.2 *Maritime Identification Digits*

Bits 27 to 36 in the ID field designate 3-digit decimal country code number expressed in binary notation. These codes are based on the Maritime Identification Digits (MID), assigned by the ITU from Appendix 43 to the Radio Regulations.

2.3 *Maritime/location protocol*

2.3.1 *Short message*

The short-message structure of the maritime/location protocol is shown in Table V.

TABLE V – *Maritime/location protocol short-message structure*

Bits	Usage
26	Protocol flag (= 0)
27-36	MID code (see § 2.2)
37-56	20 bits ID (trailing 6 digits of ship station identity)
57-85	29 bit location

Use of this protocol requires recalculation of the BCH error-correcting code after each vessel position update.

The MID for the maritime/location protocol is that of the country of vessel registration, and it is coded in bits 27 to 36.

Bits 37 to 56 designate 6-digit decimal number of the ship station identity expressed in binary notation. The formation of this identity is described in Appendix 43 to the Radio Regulations.

Bits 57 to 85 designate the location in binary notation, as shown in Table VI.

TABLE VI – *Maritime/location protocol location field bit structure*

Bits	Usage
57-63	Latitude (degrees)
64-69	Latitude (min)
70	0: North; 1: South
71-78	Longitude (degrees)
79-84	Longitude (min)
85	0: East; 1: West

However, when no location has been entered, bits 57 to 63 and bits 71 to 78 should be set to “1s”, and bits 64 to 70 and bits 79 to 85 should be set to “0s”.

2.3.2 *Long message* (optional)

The long message is not in the “protected” field. At present, only one option exists for this protocol as shown in Table VII. These bits (113 to 144) follow the error-correction and emergency codes (see Fig. 6).

TABLE VII – *Maritime/location protocol long-message structure*

Bits	Item	Usage
113-121	Course	Degrees true; range from 0 to 359
122-126	Speed	Knots; range from 0 to 31
127-129	Time of activation	Day of week (000 = Sunday); range from 0 to 6
130-134		Hours; from 0 to 23
135-139		Minutes (2-min increments); range from 0 to 58
140-144	Optional	National use ([1])

([1]) National option: it is desirable for administrations having alternative uses to so advise the COSPAS/SARSAT Secretariat and the appropriate SAR authorities (see § 1).

The message-format flag, bit 25, should be set to (= 0) for a short-message transmission, but it should be switched automatically to (= 1) when data is entered in bits 113 to 144 for the long-message transmission. This will require two separate BCH codes: one for use with message-format flag (= 0) (short-message format) and one for use with message-format flag (= 1) (long-message format).

2.4 *User protocols*

The user protocol short-message structure is shown in Table VIII.

TABLE VIII – *User protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type
40-83	Data field
84-85	Auxiliary radio-locating device type(s)

Bits 37 to 39 in the user protocol-type field designate one of 8 user protocols and are expressed as one octal character. This determines how the remaining bits in the data field are encoded/decoded. The 8 user protocols are shown in Table IX.

TABLE IX – *User protocol types*

Binary number	Octal character	User protocol type
000	0	Orbitography
001	1	Aviation
010	2	Maritime
011	3	Serialized
100	4	Spare
101	5	Spare
110	6	Radio call sign
111	7	Test

Bits 40 to 83 are used to encode the actual identification of the satellite EPIRB and are defined separately for each user protocol.

Bits 84 to 85 are used to indicate the type of auxiliary radio-locating device(s) of each user protocol (excluding orbitography satellite EPIRBs). The assignment of bits is as follows:

00: no auxiliary radio-locating device
01: 121.5 MHz
10: maritime locating: 9 GHz search and rescue radar transponder (SART)
11: other auxiliary radio-locating device(s) (see Note)

Note – It is desirable that administrations using the “other auxiliary radio-locating device(s)” category (i.e. bits 84 to 85 = 11) advise COSPAS-SARSAT Secretariat and the appropriate SAR authorities as to which auxiliary radio-locating device(s) and its (their) signal characteristics they are using. Of other auxiliary radio-locating device(s) is (are) used in addition to 121.5 MHz, the code for 121.5 MHz (i.e bits 84 to 85 = 01) should be used.

2.4.1 *Orbitography user protocol* (user protocol 000)

The orbitography user protocol is for use by special system calibration transmitters and is intended for use only by operators of the local user terminals.

2.4.2 *Aviation user protocol* (user protocol 001)

The short-message structure of the aviation user protocol is shown in Table X.

TABLE X – *Aviation user protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type (= 001)
40-81	Aircraft registration marking (see Note)
82-83	Spare (= 00)
84-85	Auxiliary radio-locating device type(s)

Bits 27 to 36 designate the country in which the aircraft is registered. However, it may also indicate the country to which an aircraft has been leased if the national authority in the leasing country requires this information within the country code.

Bits 40 to 81 designate the aircraft registration marking (see Note) which is encoded using the modified-Baudot code shown in Table XI. This code enables 7 characters (6 × 7 = 42) to be encoded using 42 bits. This data will be right justified with a modified-Baudot space (100100) being used where no character exists.

Note – This protocol may not be applicable for all commercial aircraft. Further study of protocols for commercial aircraft is necessary.

TABLE XI – *Modified-Baudot code*

Letter (1)	Code MSB LSB	Figure (1)	Code MSB LSB
A	111000	(–) (2)	011000
B	110011		
C	101110		
D	110010		
E	110000	3	010000
F	110110		
G	101011		
H	100101		
I	101100	8	001100
J	111010		
K	111110		
L	101001		
M	100111		
N	100110		
O	100011	9	000011
P	101101	0	001101
Q	111101	1	011101
R	101010	4	001010
S	110100		
T	100001	5	000001
U	111100	7	011100
V	101111		
W	111001	2	011001
X	110111	/	010111
Y	110101	6	010101
Z	110001		
( ) (3)	100100		

MSB: most significant bit.

LSB: least significant bit.

(1) Letters/figures shift is shown by the most significant bit, i.e.:
1 = letters
0 = figures

(2) Hyphen

(3) Space

2.4.3 *Maritime user protocol* (user protocol 010)

The short-message structure of the maritime user protocol is shown in Table XII.

TABLE XII – *Maritime user protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type (= 010)
40-75	Radio call sign or trailing 6 digits of ship station identity
76-81	Specific satellite EPIRB
82-83	Spare (= 00)
84-85	Auxiliary radio-locating device type(s)

Bits 27 to 36 designate the country of vessel registration.

Bits 40 to 75 designate the radio call sign or the trailing 6 digits of the 9-digit ship station identity using the modified-Baudot code shown in Table XI. This code enables 6 characters ($6 \times 6 = 36$) to be encoded using 36 bits. This data will be right justified with a modified-Baudot space (100100) being used where no character exists. If all characters are digits, the entry is interpreted as the trailing 6 digits of the ship station identity.

Bits 76 to 81 are used to identify specific satellite EPIRBs on the same vessel (the first or only float-free satellite EPIRB should be coded with a modified-Baudot zero (001101); additional satellite EPIRBs should be numbered consecutively using modified-Baudot characters 1 to 9 and A to Z).

The maritime user and the radio call-sign user protocols may be used for satellite EPIRBs that require coding with a radio call sign. The maritime user protocol should be used for radio call signs of 6 or fewer characters.

2.4.4 *Serialized user protocol* (user protocol 011)

The serialized user protocol is intended to permit the manufacture of satellite EPIRBs whose ID will be identified by a data base giving specifics about the unit.

The short-message structure of the serialized user protocol is shown in Table XIII.

TABLE XIII – *Serialized user protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type (= 011)
40-43	Satellite EPIRB type
44-63	Serial number
64-83	National use (see footnote to Table VII)
84-85	Auxiliary radio-locating device type(s)

Bits 27 to 36 designate the country of satellite EPIRB registration.

Bits 40 to 43 indicate the satellite EPIRB type as follows:

0000: aviation (i.e. aeronautical satellite EPIRB)
0100: maritime (i.e. float-free satellite EPIRB)
1000: survival (i.e. nonfloat-free satellite EPIRB)
1100: personal satellite EPIRB.

Bits 44 to 63 designate a serial ID code number from 0 to 1 048 575 (i.e. $2^{20} - 1$) expressed in binary notation.

Bits 64 to 83 are for national use and control but will be made public when assigned.

2.4.5 *Radio call-sign user protocol* (user protocol 110)

The radio call-sign user protocol is intended to accomodate a radio call sign of up to seven characters where letters may be used only in the first four characters, thereby complying with the ITU practice on formation of radio call signs. The short-message structure of the radio call-sign user protocol is shown in Table XIV.

TABLE XIV – *Radio call-sign user protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type (= 110)
40-75	Radio call sign
40-63	First 4 characters (modified Baudot)
64-75	Last 3 characters (binary-coded decimal)
76-81	Specific satellite EPIRB
82-83	Spare (= 00)
84-85	Auxiliary radio-locating device type(s)

Bits 27 to 36 designate the country of aircraft or vessel registration.

Bits 40 to 75 contain the radio call sign of up to 7 caracters. Radio call signs of fewer than 7 characters should be left justified in the radio call-sign field (bits 40-75) and padded with “space” (1010) characters in the binary-coded decimal field (bits 64-75).

Bits 76 to 81 are used to identify specific satellite EPIRBs on the same vessel or aircraft (the first or only float-free satellite EPIRB should be coded with a modified-Baudot zero (001101); additional satellite EPIRBs should be numbered consecutively using modified-Baudot characters 1 to 9 and A to Z).

2.4.6 *Test user protocol* (user protocol 111)

The test user protocol is used for demonstrations, national tests, training exercises, etc. Mission control centres (MCCs) will not forward messages coded with this protocol unless requested by the nation conducting the test.

The short-message structure of the test user protocol is shown in Table XV.

TABLE XV – *Test user protocol short-message structure*

Bits	Usage
26	Protocol flag (= 1)
27-36	MID code (see § 2.2)
37-39	User protocol type (= 111)
40-83	National use
84-85	Auxiliary radio-locating device type(s)

Bits 27 to 36 designate the country of satellite EPIRB registration.

Bits 40 to 83 are for national use.

3. Emergency-code/national-use field

The emergency-code/national-use field consists of bits 107 to 112, which can be encoded with optional data described in § 3.1, 3.2 and 3.3. However, when neither the emergency code nor the national use has been implemented nor such data entered, the following default coding should be used for bits 107 to 112:

000000: for satellite EPIRBs that can be activated only manually, i.e. bit 108 = 0 (see below);

010000: for satellite EPIRBs that can be activated both manually and automatically, i.e. bit 108 = 1 (see below).

Bit 107 is a flag bit that should be automatically set to (= 1) if emergency code data has been entered in bits 109 to 112, as defined in § 3.1 or 3.2.

Bit 108 indicates the method of activation that has been built into the satellite EPIRB:

– bit 108 set to (= 0) indicates that the satellite EPIRB is the type that can be activated only manually;

– bit 108 set to (= 1) indicates that the satellite EPIRB is the type that can be activated both manually and automatically.

3.1 *Maritime emergency-code users*

The emergency code is an optional feature that may be incorporated in a satellite EPIRB to permit the user to enter data in the emergency code field (bits 109 to 112) of any maritime protocol (i.e. maritime/location protocol, maritime user protocol, serialized user maritime and survival protocols, and radio call-sign user protocol). If data is entered in bits 109 to 112, then bit 107 should be automatically set to (= 1) and bits 109 to 112 should be set to an appropriate maritime emergency code shown in Table XVI.

TABLE XVI – *Maritime emergency codes in accordance with the modified (*) IMO nature of distress indications*

IMO indication	Binary code	Usage
1	0001	Fire/explosion
2	0010	Flooding
3	0011	Collision
4	0100	Grounding
5	0101	Listing, in danger of capsizing
6	0110	Sinking
7	0111	Disabled and adrift
8	0000	Unspecified distress (1)
9	1000	Abandoning ship
	1001 to 1111	Spare (could be used in future for assistance desired or other information to facilitate the rescue if necessary)

(*) Modification applies only to “1111”, which is used as a “spare” instead of as the “test” code.

(1) If no emergency code data has been entered, bit 107 remains set to (= 0).

3.2 *Non-maritime emergency-code users*

The emergency code is an optional feature that may be incorporated in a satellite EPIRB to permit the user to enter data in the emergency code field (bits 109 to 112) of any non-maritime protocol (i.e. aviation user protocol, serialized user aviation and personal protocols, or other spare protocols). If data is entered into bits 109 to 112, then bit 107 should be automatically set to (= 1) and bits 109 to 112 should be set to an appropriate non-maritime emergency code shown in Table XVII.

TABLE XVII – *Non-maritime emergency codes*

Bits	Usage (1)
109	No fire (= 0) fire (= 1)
110	No medical help (= 0); medical help required (= 1)
111	Not disabled (= 0) disabled (= 1)
112	Spare (= 0)

(1) If no emergency code data has been entered, bit 107 remains set to (= 0).

3.3 *National users*

When bit 107 is set to (= 0), codes (0001) through (1111) for bits 109 to 112 may be used for national use and should be set in accordance with the protocol of an appropriate national authority.

4. Long message (optional)

Long message format for maritime/location protocol us described in § 2.3.2. For all user protocols (bit 26 = 1), the optional long-message format permits additional information to be included in the essage as shown in Table XVIII.

TABLE XVIII – *User protocol long-message code for bits 113-114*

Code	Usage
00	Latitude/longitude flag
01	Spare
10	Spare
11	Spare

For the location message type (i.e. bits 113-114 = 00), bits 115 to 144 inclusive are decoded as shown in Table XIX.

TABLE XIX – *User protocol long-message structure for bits 115-144*

Bits	Usage
115-121	Latitude (degrees)
122-127	Latitude (min)
128	0: North; 1: South
129-136	Longitude (degrees)
137-142	Longitude (min)
143	0: East; 1: West
144	Even parity bit applied to bits 113-143

The message-format flag, bit 25, should be set to (= 0) for a short-message transmission, but it should be switched automatically to (= 1) when data is entered in bits 113 to 144 for the long-message transmission. This will require two separate BCH codes: one for use with message-format flag (= 0) (short-message format) and one for use with message-format flag (= 1) (long-message format).