3. DIGITAL MESSAGE CONTENT

3.1 Basic Structure

The digital message which is transmitted by the 406 MHz beacon consists of:

a) 202 information bits; and

b) 48 bits for BCH (250,202) error correction.

The 202 information bits are further divided into:

- 154 bits within the main data field (transmitted in every burst),
- 48 bits within a rotating data field (may be 1 of 16 different content types).

Message content structure is shown in Figure 3-1 below. Data transmission starts with bit 1, the left-hand (most significant) bit of the 154 bit main field.

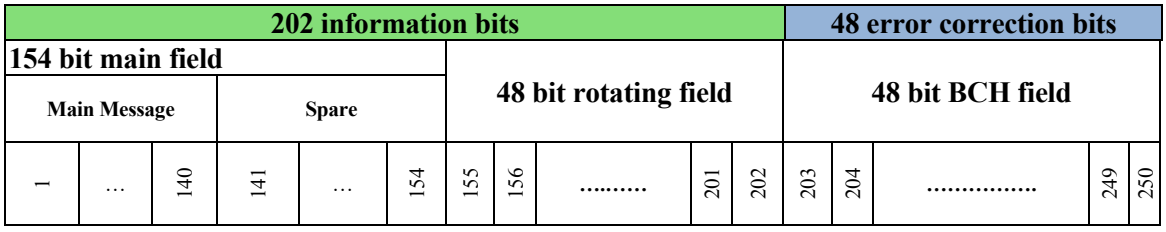

Figure 3-1: Message content bits

3.2 Beacon Message Content – Main Field

The main field provides for the minimum requirements of document C/S G.008 using sub-fields as shown in Table 3.1 below. Note: additional coding guidance is included in Appendix I.

Unless stated otherwise all sub-fields are separately binary encoded, with the Least Significant Bit to the right (i.e., the highest numbered bit in that particular message field).

Table 3.1: Minimum Requirement main field in the beacon message (transmitted in every burst)

C/S G.008 reqmt Para.	Description	Number of bits	Bit numbers in message	Content
3.7.1a	TAC Number	16	1-16 (MSB=1)	16-bit TAC # (0 to 65,535)*†
3.7.1a	Serial Number	14	17-30	14-bit serial number (0 to 16,383)*
3.7.1a	Country code	10	31-40 (MSB= 31)	A three-digit decimal country code number (0 to 999). Country codes are based on the International Telecommunication Union (ITU) Maritime Identification Digit (MID) country code available on the ITU website: (www.itu.int/cgi-bin/htsh/glad/cga_mids.sh).
3.7.1d	Status of homing device	1	41	On beacon activation a '1' indicates that the beacon is equipped with at least one homing signal and a '0' indicates that the beacon is not equipped with any homing signals or that they have been deliberately disabled. Once the homing signal in the beacon has been activated, a '1' indicates that at least one homing device is functional and transmitting. A '0' indicates that no homing device is functional, or it has been deliberately disabled.
	RLS function(s)	1	42	A '0' indicates a beacon without RLS capability or with this capability disabled. A '1' indicates a beacon with RLS capability enabled (e.g., RLS Type-1 automatic acknowledgement, RLS Type-2 manual acknowledgement, or RLS Type 3 two-way communication (message) service).
N/A	Test Protocol	1	43	A '0' indicates normal beacon operation. A '1' indicates a Test Protocol message for non-operational use. Selection of test protocol is not an end-user capability.

* The TAC and serial number combination shall be unique (see section 3.6).
† TAC value range 65,521 - 65,535 is reserved for System beacons (e.g., reference and QMS beacons, calibration beacon, simulators, etc.) – See document C/S T.022.

C/S G.008 reqmt Para.	Description	Number of bits	Bit numbers in message	Content
3.7.1g	Encoded GNSS location		(MSB= 45, 52, 68, 76)	Location* is provided to 3.4 m resolution max in the following order:
		1	44	N/S flag (N=0, S=1);
		7	45-51	Degrees (0 to 90) in 1-degree increments;
		15	52-66	Decimal parts of a degree (0.5 to 0.00003); (Default value of bits = 0 1111111 000001111100000). If the beacon does not have encoded location capability†, then these bits shall be set to the following default value: Bits = 1 1111111 000001111100000.
		1	67	E/W flag (E=0, W=1);
		8	68-75	Degrees (0 to 180) in 1-degree increments;
		15	76-90	Decimal parts of a degree (0.5 to 0.00003); (Default value of bits = 0 11111111 111110000011111). If the beacon does not have encoded location capability†, then these bits shall be set to the following default value: Bits = 1 11111111 111110000011111.
3.7.1h	Vessel ID	3	91-93	A three-digit binary field identifier is first transmitted to identify the following message content: 000 - No aircraft or maritime identity (may be defined for national use‡; default content for bits 94-137 is all 0's); 001 – Maritime MMSI; 010 – Radio call sign; 011 – Aircraft Registration Marking (Tail Number); 100 – Aircraft aviation 24 Bit Address; 101 – Aircraft operator and serial number; 110 – Spare; 111 – Reserved for System Testing (may contain

* All position information is encoded as degrees and decimal parts of a degree, or as fractions of these units to be as close as possible to the actual position. Latitude and longitude data are rounded off (i.e. not truncated) to the available resolution. All rounding shall follow normal rounding conventions, for example with a resolution of 4, 0.000 to 1.999 shall be rounded down to 0 and 2.000 to 3.999 shall be rounded up to 4.

† If a beacon model has an external navigation input capability but is installed in a configuration in which a navigation signal will never be supplied to the interface (i.e., an ELT in a GA aircraft which cannot supply the navigation signal to the beacon), then this (no capability) is the preferred default that should be used under those circumstances. However, if the external navigation connection in the installed configuration is uncertain, then the alternate default (no position available at this time) should be used.

‡ The information contained in this field shall be static even when defined for national use, otherwise the 23-Hex ID will be affected, and such a beacon would need to be considered under of letter of compatibility (LoC).

C/S G.008 reqmt Para.	Description	Number of bits	Bit numbers in message	Content
	Vessel ID (continued)			additional information; default content for bits 94-137 is all 0's)*. This is followed by the vessel or aircraft identity. The following coding schemes are permitted:
		30	94-123	1 - Maritime Mobile Service Identity: A unique ship station identity in the format $M_1I_2D_3X_4X_5X_6X_7X_8X_9$ where MID indicates the flag state of the vessel and XXXXXX is the unique vessel number in accordance with ITU-R M.585 Annex 1 Section 1 encoded as a 9-digit number in binary format or for Craft Associated with a Parent Ship a unique identification in the format 98MIDXXXX where MID represents the administration having jurisdiction over the identity for the craft associated with a parent ship and XXXX represents a unique number assigned by the administration for that craft in accordance with ITU-R M.585 Annex 1 Section 5 encoded as a 9-digit number in binary format. If no MMSI is available, then insert the default decimal number 000111111.
		14	124-137	Followed if applicable by the Maritime Mobile Service Identity for the EPIRB-AIS system in the format $9_1 7_2 4_3 X_4 X_5 Y_6 Y_7 Y_8 Y_9$ in accordance with ITU-R M.585 Annex 2 Section 2 where only the last 4 digits ($Y_6Y_7Y_8Y_9$) are encoded here as a number in binary format. If there is no EPIRB-AIS device, then insert the default binary number 10101010101010 (10922).
		44	94-137	2 - Radio call sign: Is encoded using the modified-Baudot code shown in Table 3.2. This code enables 7 characters to be encoded using 42 bits (6x7=42), 94 to 135 (1 to 42 within the field). Two bits (136 and 137 (43 and 44 within the field)) are spare and shall be coded as 00. The modified-Baudot characters will be left justified with a modified-Baudot space (100100) being used where no character exists. If no Radio call sign is available, then insert a series of 7 spaces (100100).

* This value is invalid when the test protocol flag, bit-43, is set to '0'.

C/S G.008 reqmt Para.	Description	Number of bits	Bit numbers in message	Content
	Vessel ID (continued)	44	94-137	3 - Aircraft Registration Marking*: Is encoded using the modified-Baudot code shown in Table 3.2. This code enables 7 characters to be encoded using 42 bits (6x7=42), 94 to 135 (1 to 42 within the field). Two bits (136 and 137 (43 and 44 within the field)) are spare and shall be coded as 00. The modified-Baudot characters will be right justified with a modified-Baudot space (100100) being used where no character exists. If no Aircraft Registration Mark is available, then insert a series of 7 spaces (100100).
		44	94-137	4 – Aviation 24 Bit Address†: Shall either be encoded as a 24-Bit Binary Number, followed by 20 spare bits all of which are coded as 0 or shall be encoded as a 24-Bit Binary Number, followed by the 3-letter aircraft operator designator‡. The 3 letters are encoded using the modified-Baudot code shown in Table 3.2‡ (3x5 = 15 Bits) followed by 5 spare bits all of which are coded as 0. If there is no 3LD for the aircraft operator, then the 3LD is coded as "ZGA", i.e., bits 118 to 137 are set to 10001 01011 11000 00000.
		44	94-137	5 - Aircraft operator and serial number*: A 3-letter aircraft operator designator†. The 3 letters are encoded using the modified-Baudot code shown in Table 3.2§ (3x5 = 15 Bits).

* **WARNING**: These coding schemes when used in an ELT(DT) (i.e., bits 138-140 are '011'), are NOT compliant with the mandatory data elements defined in ICAO document 10150 (either no 3LD aircraft operator (for 3 - Aircraft Registration Marking) or no aircraft identifier is available (for 5 - Aircraft operator and serial number)) and the associated data cannot be stored in the LADR. Manufacturers wishing to comply with ICAO GADSS requirements and use these coding options should consult the relevant Administration's aviation authorities for guidance prior to coding a beacon with these coding options.

† This coding (when the aircraft 24-bit address and the 3LD designator of the aircraft operator are provided in the "Vessel ID" field) is compliant with the mandatory data elements defined in ICAO document 10150, "Manual on the Functional Specifications for the Location of an Aircraft in Distress Repository (LADR)".
The LADR is a facility, that will be used by Cospas-Sarsat, to support ICAO requirements for autonomous location of an aircraft in distress contained in Annex 6, Part I, section 6.18 to the Convention on International Civil Aviation.

‡ A 3-letter aircraft operator designator (3LD) from the list of "Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services" published by the International Civil Aviation Organization (ICAO) as document 8585.

§ The aircraft operator designator (3 letters) can be encoded in 15 bits using a shortened form of the modified-Baudot code (i.e.: all letters in the modified-Baudot code are coded in 6 bits, with the first bit = "1". This first bit can, therefore, be deleted to form a 5-bit code).

C/S G.008 reqmt Para.	Description	Number of bits	Bit numbers in message	Content
				Followed by a serial number (in the range of 1 up to 4095) as designated by the aircraft operator, encoded in binary, with the least significant bit on the right (12 Bits). The remaining 17 Bits are spare and shall follow the above 27 Bits and be encoded all as 1's.
	Beacon Type*	3	138-140	"000" ELT (excludes ELT(DT)); "001" EPIRB; "010" PLB; "011" ELT(DT); "111" System beacon; and "100", "101", "110" spare.
	Spare bits	14	141-154	These bits are all set to binary 1. For a cancellation message, these bits are all set to 0.
	TOTAL BITS IN EACH BURST	154		To be transmitted in each burst.

Table 3.2: Modified Baudot Code

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

* These bits always indicate the type of beacon (ELT, EPIRB, PLB, ELT(DT)), as certified, or a System beacon, regardless of the vessel ID coded into the beacon.
† MSB: most significant bit,
LSB: least significant bit
‡ Space
§ Hyphen

3.3 Beacon Message Content – Rotating Fields

The objective requirements of document C/S G.008 are provided in rotating fields as detailed below. During every transmission burst the beacon shall transmit 1 of the 16 types of rotating field content. The type of field content selected for transmission shall be in accordance with the rotating field scheduling requirements – see section 3.4. The 16 types of rotating field content are listed below.

0. C/S G.008 Objective Requirements (except national use and spares)
1. ELT(DT) In-flight Emergency (to allow more accurate time parameters)
2. RLS Type 1 Automatic and Type 2 Manual Acknowledgment (for RLS messages)
3. National Use (to allow national administrations to define for their use)
4. RLS Type 3 Two-way Communication (to support TWC messages)
5. Spare (for future use)
6. Spare (for future use)
7. Spare (for future use)
8. Spare (for future use)
9. Spare (for future use)
10. Spare (for future use)
11. Spare (for future use)
12. Spare (for future use)
13. Spare (for future use)
14. Spare (for future use)
15. Cancellation Message

Detailed content of rotating fields #0 through #3, and #15 are shown in the tables below.

Unless stated otherwise all sub-fields of every rotating field are separately binary encoded, with the Least Significant Bit to the right (i.e., the highest numbered bit in that particular message field).

Table 3.3: C/S G.008 Objective Requirements Rotating Field (#0)

C/S G.008 Section	Sub-field Description	Number of bits	Bit numbers in message	Content
	Rotating field Identifier	4	155-158 in message (1-4 in rotating field)	0000 – G.008 Objective Requirements.
4.3.1a	Elapsed Time since activation	6	159-164 in message (5-10 in rotating field)	0 to 63 hours in one-hour steps (actual time since activation shall be truncated, not rounded e.g., between 1 hour and 2 hours after activation shall be encoded as 1 hour). If the beacon is turned off and on again (even quickly) this field shall be reset to zero. If the time is greater than 63 hours, the value shall be set to 63.
4.3.1b	Time from last encoded location	11	165-175 in message (11-21 in rotating field)	0 to 2046 minutes (34 hours and 6 minutes) in one-minute steps (actual time since last location shall be truncated, not rounded e.g., between 34 minutes and 35 minutes after activation shall be encoded as 34 minutes). Every time that a new / updated encoded location is obtained this field shall be reset to zero. Time is calculated from when the location was obtained not when it was transmitted. If the time is greater than 2046 minutes, the value shall be set to 2046. If the beacon has not yet obtained a location from the GNSS receiver or is not equipped with encoded location capability, then this field should be set to 2047 as a default value.
4.3.1c	Altitude of Encoded location	10	176-185 in message (22-31 in rotating field)	Altitudes of ≤-400 metres to 15952 metres in steps of 16 metres (where altitudes ≤-400m are encoded as all zeros, -384 metres is encoded as 0000000001 and sea level would be encoded as 0000011001). Heights shall be rounded to the nearest 16 metre step, not truncated. If the height is greater than 15952 metres, the height shall be considered as 15952 metres and encoded as 1111111110. If altitude is not available (e.g., there is no location data or only a 2D fix is available) then this field shall be encoded as all 1's.
4.3.1d	Dilution of Precision	8	186-193 in message (32-39 in rotating field)	The value of HDOP of the encoded location shall be reported (first 4 bits) followed by the value of VDOP on the following basis: 0000 = DOP <= 1; 0001 = DOP > 1 and <= 2; 0010 = DOP > 2 and <= 3; 0011 = DOP > 3 and <= 4; 0100 = DOP > 4 and <= 5; 0101 = DOP > 5 and <= 6; 0110 = DOP > 6 and <= 7;

C/S G.008 Section	Sub-field Description	Number of bits	Bit numbers in message	Content
				0111 = DOP > 7 and <= 8; 1000 = DOP > 8 and <= 10; 1001 = DOP > 10 and <= 12; 1010 = DOP > 12 and <= 15; 1011 = DOP > 15 and <= 20; 1100 = DOP > 20 and <= 30; 1101 = DOP > 30 and <= 50; 1110 = DOP > 50; 1111 = DOP Not Available.
4.3.1f	Automated/Manual Activation notification	2	194-195 in message (40-41 in rotating field)	Report the activation method of the beacon as follows: 00 Manual Activation by user; 01 Automatic Activation by the beacon; 10 Automatic Activation by external means; and 11 Spare.
4.3.1g	Remaining battery capacity	3	196-198 in message (42-44 in rotating field)	The remaining battery capacity in the beacon compared to its initial capacity shall be reported as follows: 000 <= 5% remaining; 001 > 5% and <= 10% remaining; 010 > 10% and <= 25% remaining; 011 > 25% and <= 50% remaining; 100 > 50% and <= 75% remaining; 101 > 75% and <= 100% remaining; 110 Reserved for future use; and 111 Battery Capacity Not Available or Not Provided.
Not in C/S G.008	GNSS status	2	199-200 in message (45-46 in rotating field)	This field reports the status of the GNSS receiver used to provide the encoded location as follows: 00 No Fix, or not available; 01 2D location only; 10 3D location; and 11 Reserved for future use.
	Spare	2	201-202 in message (47-48 in rotating field)	00.
TOTAL	Bits in Rotating Field	48		

Table 3.4: ELT(DT) In-Flight Emergency Rotating Field (#1)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field Identifier	4	155-158 in message (1-4 in rotating field)	0001 In-Flight Emergency.
4.3.1b	Time of last encoded location	17	159-175 in message (5-21 in rotating field)	Time rounded to nearest second (17 bits): Time 'sssss' where '00001' indicates a time of 00:00:01 UTC and '86399' indicates a time of 23:59:59 UTC). If UTC time is not available or the time is more than 24 hours old, then this field shall be encoded as all ones.
	Altitude of Encoded Location	10	176-185 in message (22-31 in rotating field)	Altitudes of ≤-400 metres to 15952 metres in steps of 16 metres (where altitudes ≤-400m are encoded as all zeros, -384 metres is encoded as 0000000001 and sea level would be encoded as 0000011001). Heights shall be rounded to the nearest 16 metre step, not truncated. If the height is greater than 15952 metres, the height shall be considered as 15952 metres and encoded as 1111111110. If altitude is not available, e.g., there is no location data or only a 2D fix is available, then this field shall be encoded as all ones.
	Triggering event	4	186-189 in message (32-35 in rotating field)	0001 – Manual activation by the crew; 0100 – G-switch/Deformation Activation; 1000 – Automatic Activation from Avionics or Triggering System*. If multiple triggers occur these bits shall always indicate the latest event. All other bit combinations – spare.
	GNSS Status	2	190-191 in message (36-37 in rotating field)	This field reports the status of the GNSS receiver used to provide the encoded location as follows: 00 Not Fix; 01 2D location only; 10 3D location; and 11 Spare.
	Remaining battery capacity	2	192-193 in message (38-39 in rotating field)	The remaining battery capacity in the beacon compared to its initial capacity shall be reported as follows: 00 ≤ 33% remaining; 01 > 33% and ≤ 66% remaining; 10 > 66% remaining; and 11 Battery capacity not available or Not Provided
	Spare	9	194-202 in message (40-48 in rotating field)	All 0's.
	TOTAL	**48**		

* Trigger in compliance with EUROCAE document ED-237.

Table 3.5: RLS Type 1 Automatic and Type 2 Manual Acknowledgment Rotating Field (#2)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field identifier	4	155-158 in message (1-4 in rotating field)	**bit 1-4:** "0010".
	Unassigned	2	159-160 in message (5-6 in rotating field)	**bit 5-6:** All 0's.
	Beacon RLS Capability	6	161-166 in message (7-12 in rotating field)	**bit 7** - Capability to process automatically generated Acknowledgement RLM Type-1: "1": Acknowledgement Type-1 (automatic acknowledgement) accepted by this beacon; and "0": Acknowledgement Type-1 not requested and not accepted by this beacon. **bit 8** - Capability to process manually generated RLM (e.g., Acknowledgment Type-2): "1": Manually generated RLM (such as Acknowledgement Type-2) accepted by this beacon; and "0": Manually generated RLM (such as Acknowledgement Type-2) not requested and not accepted by this beacon. Note: The condition bit 7 = "0" and bit 8 = "0" is an invalid condition; at least one of these two bits must always be a "1". **bit 9-12** – Reserved for future use and to be set to all "0's".
	RLS Provider Identification	3	167-169 in message (13-15 in rotating field)	**bit 13-15:** "001": GALILEO Return Link Service Provider; "010": GLONASS* Return Link Service Provider; and "011": BDS* Return Link Service Provider. Other combinations: Spares (for other possible RLS providers)
	Beacon Feedback (acknowledgement of RLM reception)	22	170-191 in message (16-37 in rotating field)	If RLS Provider Identification = 001 (bit 13-15) **bit 16 – RLM Type I Feedback:** "0": Type 1 not (yet) received; and "1": Type 1 received. **bit 17 – RLM Type 2 Feedback:** "0": Type 2 not (yet) received; and "1": Type 2 received.

* Beacons shall not be coded with these coding options (except for the RLS test coded beacons) until the GLONASS or BDS RLS services are declared by the Cospas-Sarsat Council as operational within the Cospas-Sarsat Programme. Type approval certificates allowing these versions of the RLS coding will not be issued until the RLS provider has been approved for operational use in the System.

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content

				bit 18-37 – RLM:
				if (bit 16 = 1 and bit 17=0):
				Copy of bits 61-80 of the short RLM in the Open Service Signal in Space (section 5.2 of OS SIS ICD* and section 3.2.1 of Galileo SAR SDD†).
				
				if (bit 16 = 0 and bit 17=1):
				Reserved for future use, currently an invalid condition.
				
				if (bit 16 = 0 and bit 17 = 0):
				Then bits 18-37 all = "0".
				
				if (bit 16 = 1 and bit 17 = 1):
				Reserved for future use, currently an invalid condition.
				
				If RLS Provider Identification is not 001:
				Reserved and bits 16-37 shall all be set to "0".

	Unassigned	11	192-202 in message (38-48 in rotating field)	All 0's
	TOTAL	**48**		

Table 3.6: National Use Rotating Field (#3)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field identifier	4	155-158 in message (1-4 in rotating field)	0011.
4.3.1.i	National use	44	159-202 in message (5-48 in rotating field)	As defined by national administrations Default content all 0's.
	TOTAL	**48**		

* European GNSS (Galileo) Open Service Signal In Space Interface Control Document (OS SIS ICD v1.3), December 2016.
† European GNSS (Galileo) SAR/GALILEO Service Definition Document (GALILEO SAR SDD Issue 2.0), January 2020.

Table 3.7: RLS Type 3 TWC (Message) Rotating Field (#4)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field identifier	4	155-158 in message (1-4 in rotating field)	**bit 1-4:** "0100".
	TWC Provider Identification	3	159-161 in the message (5-7 in rotating field)	**bits 5-7:** "001": GALILEO* Return Link Service Provider; "010": GLONASS† Return Link Service Provider; and "011": BDS* Return Link Service Provider. Other combinations: Spares (for other possible RLS providers)
	Version ID	5	162-166 in the message (8-12 in rotating field)	bits 8-12: TWC Message Database versioning‡ Default value 00000 The database version inserted here shall correspond to the Database version number that is being used by the beacon at that time. If the Database is subsequently updated then this field shall also be updated to reflect the version number of the updated Database now being used by the beacon.
	RLM Type 3 TWC Acknowledgement	1	167 in the message (13 in rotating field)	**bit 13:** "0": RLM Type3 TWC Acknowledgement not (yet) received; and "1": RLM Type-3 TWC Acknowledgement received. Note: Once the first RLM Type-3 TWC acknowledgement is received by the beacon, this bit should remain set to "1" for the remaining period of activation.
	Spare	2	168-169 in the message (14-15 in rotating field)	**bits 14-15:** Spare bits. Default content all 0's
	TWC Messages	33	170-202 in the message (16-48 in rotating field)	**bits 16-22:** 7 bits dedicated to question or instruction A Default value 0000000. **bits 23-26:**

* Galileo L1 navigation message is described in European GNSS (Galileo) Open Service Signal In Space Interface Control Document (OS SIS ICD version TBC).

† Beacons shall not be coded with these coding options (except for the RLS test coded beacons) until the GLONASS or BDS RLS services are declared by the Cospas-Sarsat Council as operational within the Cospas-Sarsat Programme. Type approval certificates allowing these versions of the RLS coding will not be issued until the RLS provider has been approved for operational use in the System.

‡ TWC message database versions are available at [document C/S TBD].

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
				4 bits allocated to answer. Default value (0000) is for the acknowledgement to question or instruction A. **bits 27-33:** 7 bits dedicated to question or instruction B Default value 0000000. **bits 34-37:** 4 bits allocated to answer. Default value (0000) is for the acknowledgement to question or instruction B. **bits 38-44:** 7 bits dedicated to question or instruction C Default value 0000000. **bits 45-48:** 4 bits allocated to answer. Default value (0000) is for the acknowledgement to question or instruction C. [The dataset is defined in document C/S TBD]
	TOTAL	**48**		

Table 3.8: Spare Rotating Fields (for future use) (#5 - #14)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field identifier	4	155-158 in message (1-4 in rotating field)	0101 to 1110 inclusive.
4.3.1.h	Spares	44	159-202 in message (5-48 in rotating field)	Default content all 0's.
	TOTAL	**48**		

Table 3.9: Cancellation Message Rotating Field (#15)

C/S G.008 section	Sub-field Description	# Bits	Bit numbers in message	Content
	Rotating field Identifier	4	155-158 in message (1-4 in rotating field)	1111.
	Fixed	42	159-200 in message (5-46 in rotating field)	Set to all 1's.
	Method of deactivation	2	201-202 in message (47-48 in rotating field)	00 Spare; 10 Manual De-Activation by user; 01 Automatic De-Activation by external means; and 11 Spare.
	TOTAL	**48**		

3.4 Beacon Transmission Scheduling of Rotating Fields

Unless dictated otherwise by national or international regulations beacons shall transmit the rotating fields indicated below when making the following transmissions:

Table 3.10: Rotating Field Transmission Conditions

Type of Beacon	Self-Test Transmission	Normal Transmission	Cancellation Message
All Beacons except ELT(DT)s, Beacons with RLS Functionality (Type 1, 2 and/or 3) and National Use Beacons	G.008 Objective Requirements Field #0	G.008 Objective Requirements Field #0	Cancellation Message Field #15
ELT(DT)s (see Note 2)	In-Flight Emergency Field #1	In-Flight Emergency Field #1	Cancellation Message Field #15
Beacons with RLS Type 1 Automatic Acknowledgement Functionality (see Note 3)	RLS Field #2	RLS Field #2 alternating with G.008 Field #0	Cancellation Message Field #15
National Use Beacons (see Note 4)	National Use Field #3	Field #3 and Field #0 on a schedule set by	Cancellation Message Field #15

Type of Beacon	Self-Test Transmission	Normal Transmission	Cancellation Message
		the relevant national authority	
Beacons with RLS Type-3 TWC (message) Functionality (see Note 5)	TWC Field #4	TWC Field #4 alternating with G.008 Field #0	Cancellation Message Field #15
[Beacons with combined RLS Functionality (see Note 6)]	[RLS Field #2 and/or TWC Field #4]	[TWC Fields #2 and/or #4 alternating with G.008 Field #0 TWC Field #4 to have priority in TWC mode]	[Cancellation Message Field #15]

Notes

1. All beacons always transmit the Main 154 Bit Message Field in every burst before transmitting a Rotating Field as defined above.
2. ELT(DT)s cannot include RLS (e.g., Type 1, Type 2, Type 3, etc.) functionality and therefore always transmit Rotating Field #1
3. Beacons with RLS Type 1 automatic acknowledgement functionality always transmit Field #2 in the first and subsequent odd numbered bursts and Field #0 in the second and subsequent even numbered bursts
4. National Use ELT(DT) Beacons shall transmit Field #3 and Field #1 on a schedule set by the relevant national authority. National Use Beacons with RLS Functionality shall transmit the selected fields, Field #4, Field #3, Field #2 and Field #0 on a schedule set by the relevant national authority. During a self-test all types of National Use beacons always transmit Field #3.
5. Beacons with RLS Type 3 TWC (message) functionality will transmit Field #4 in the first and subsequent odd numbered bursts and Field #0 in the second and subsequent even numbered bursts.
6. Beacons with combined RLS functionality which may be specified in the future.

3.5 Beacon Message Content – Error Correcting Field

A sample of the BCH Error-correcting Code Calculation is provided in Appendix B.

3.6 Beacon Coding and Hex ID

The manufacturer shall program a unique combination of TAC Number and Serial Number into every beacon before it leaves their factory. The TAC Number and Serial Number shall not be capable of being deleted from that beacon. Only approved devices shall be allowed to temporarily modify the TAC and Serial Number in the transmitted message (e.g., a programming adapter (see section 3.7)). If a unit is destroyed or recycled at the end of its life, the unique combination of TAC Number and Serial Number used in that beacon shall not be used in another beacon.

Beacon coding methods are defined in section 3.1 of this specification. Specific operational requirements that impact beacon coding, such as the encoding of position data, are defined in section 4 of this specification.

The 23 hexadecimal characters that uniquely identify each 406 MHz beacon are called the beacon 23 Hex ID. This is never transmitted by the beacon as such, rather it is generated locally by the SAR ground segment hardware and generated during beacon manufacture in order to apply identity labels to the beacon by extracting the bits shown below from the beacon data.

The 23 Hex ID is composed as follows:

Table 3.11: Hex ID Contents

23 Hex ID Bit	No Bits	Reference to Bits in Message	Data Content
1	1	n/a	Fixed Binary ‘1’
2 to 11	10	31-40	C/S Country Code
12	1	n/a	Fixed Binary ‘1’
13	1	n/a	Fixed Binary ‘0’
14	1	n/a	Fixed Binary ‘1’
15 to 30	16	1-16	C/S TAC No
31 to 44	14	17-30	Beacon Serial Number
45	1	43	Test Protocol Flag
46 to 48	3	91-93	Aircraft / Vessel ID Type
49 to 92	44	94-137	Aircraft / Vessel ID
Total	**92**		**23 Hex**

Notes

1) Fixing bits 1, 12, 13 and 14 of the 23 Hex ID to ‘1101’ ensures that the 23 Hex ID cannot duplicate a First Generation Beacon 15 Hex ID.

2) The first 60 bits of the 23 Hex ID comprising the C/S Country Code, C/S TAC Number, Beacon Serial Number, Test Protocol Flag, Fixed Bits 1, 12, 13 and 14 and the first part of the Aircraft / Vessel ID together form a unique subset of the 23 Hex ID which form an SGB 15 Hex ID which is required for certain services, such as the Return Link Service. That is a unique SGB 15 Hex ID which may be obtained by simply truncating the 23 Hex ID and ignoring the last 8 Hex characters.

3.7 Programming Adapters

If a manufacturer chooses to offer an optional Programming Adapter with a particular Beacon Model (as defined in C/S T.021 section 1.3) then it shall comply with the requirements in this section.

A Programming Adapter shall only be capable of functioning with one particular Beacon Model; separate Beacon Models shall require the use of a different Programming Adapter. The mechanism used to prevent the use of a Programming Adapter with a model for which it was not designed shall be defined by the beacon manufacturer and may include physically keying of the adaptors, use of model recognition functionality, or other suitable design features.

Each Programming Adapter shall be given its own unique Serial Number by the beacon manufacturer.

The manufacturer shall program a unique combination of TAC Number and Serial Number into every Programming Adapter before it leaves their factory. The TAC Number and Serial Number shall not be capable of being deleted from that Programming Adapter or being overwritten by any means. If a unit is destroyed or recycled at the end of its life, the unique combination of TAC Number and Serial Number used in that Programming Adapter shall not be used in another Programming Adapter.

All data stored in a Programming Adapter shall be in non-volatile memory.

A Programming Adapter shall be capable of having a Country Code and Vessel ID programmed into it, which may be capable of being changed and overwritten.

Every Programming Adapter shall be labelled in accordance with Section 4.5.11.

When a beacon connected to a Programming Adapter is activated, it shall continue to transmit in its message the ID supplied from the Programming Adapter for the duration of the beacon activation, even if the adapter subsequently becomes disconnected/disassociated from the beacon. When next activated (unless the Programming Adapter or another Programming Adapter has been reconnected / connected to the beacon in the meantime), it shall transmit the beacon's own unique TAC Number and Serial Number and the Country Code and Vessel ID. If a Programming Adapter is connected to an activated beacon, then the beacon shall ignore the Programming Adapter and continue to transmit the beacons own identity, until the beacon is deactivated and subsequently reactivated with the Programming Adapter connected, at which time it will then transmit the identity in the Programming Adapter.

- END OF SECTION 3 –