A3.3.8 ELT(DT) Location Protocol (see Figure A11)

A3.3.8.1 The ELT(DT) location protocol, identified by the flags F=1, P=0 and the protocol code in series no. 8 of Table A2-B, has the following structure:

a) PDF-1:

bits 37 to 40: 4-bit protocol code defined as 1001;

bits 41 to 42: 2 bits for type of beacon identity set to “00” for Aircraft 24-bit address [*], “01” for Aircraft operators designator and serial number[†], “10” for TAC with serial number[†], and “11” reserved for future use;

bits 43 to 66: 24 bits of beacon identification data:

- (Bits 41 and 42 “00”) a 24-bit aircraft address (only one ELT per aircraft can be identified using this protocol); or
- (Bits 41 and 42 “01”) a 15-bit aircraft operator designator[‡] in bits 43 to 57, and a 9-bit serial number (1 to 511) assigned by the operator in bits 58 to 66; or
- (Bits 41 and 42 “10”) a 10-bit Cospas-Sarsat type approval certificate number of the beacon (1 to 1,023) in bits 43 to 52, and a 14-bit serial number (1 to 16,383) in bits 53 to 66; or
- (Bits 41 and 42 “11”) reserved for future use and shall not be used for beacon coding.

or ELT(DT) Location Test protocol when bits 43 to 66 are encoded with either all ”0”s, or all “1”s;

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[*] This coding 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)" where bits 41 and 42 are set to “00” and the aircraft 24-bit address is provided in PDF-1, and the 3LD designator of the aircraft operator is provided in the rotating PDF-2 field (when bits 113 and 114 are set to “00” and bits 115 to 117 are set to “000” at the intervals described in section 2.2.1 of this document).

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.

[†] **WARNING:** These coding options are NOT compliant with the mandatory data elements defined in ICAO document 10150 (no aircraft identifier is available) and the associated data cannot be stored in the LADR. Manufacturers wishing to comply with ICAO GADSS requirements and use these coding options should first consult the relevant Administration’s aviation authorities for guidance, prior to encoding beacons with these protocols.

[‡] The aircraft operator designator (3 letters) can be encoded in 15 bits using a shortened form of the modified-Baudot code (i.e.: since all letters in the modified-Baudot code are coded in 6 bits, with the most significant bit = "1", this first (most significant) bit can be deleted to form a 5-bit code per letter).

bits 67 to 85: 19 bits of position data to 30 minute resolution;

b) PDF-2:

bits 107 & 108: means of activation

bits 109 to 112: encoded altitude

bits 113 & 114 encoded location freshness or PDF-2 rotating field indicator

bits 115 to 132: 18-bit position offset (Δ latitude, Δ longitude) to 4 second resolution or aircraft operator 3LD.

A3.3.8.2 The 19 bits of position data in PDF-1 are encoded as follows:

a) bits 67 to 75: latitude data (9 bits) with 30 minute resolution, including:
- bit 67: N/S flag (N=0, S=1)
- bits 68 to 75: degrees (0 to 90) in 1/2 degree increments (default value of bits 67 to 75 = 0 11111111); and

b) bits 76 to 85: longitude data (10 bits) with 30 minute resolution, including:
- bit 76: E/W flag (E=0, W=1)
- bits 77 to 85: degrees (0 to 180) in 1/2 degree increments (default value of bits 76 to 85 = 0 111111111).

A3.3.8.3 The 26 bits available in PDF-2 are defined as follows:

a) bits 107 and 108: means of activation
"00": manual activation by the user
"01": automatic activation by the beacon
"10": automatic activation by external means
"11": spare

If the beacon receives more than one triggering command, then the most recent triggering event is indicated in the bits 107-108.

b) bits 109 to 112: encoded altitude
"0000": altitude is less than or equal to 400 m (1312 ft)
"0001": altitude is greater than 400 m (1312 ft) up to and including 800 m (2625 ft)
"0010": altitude is greater than 800 m (2625 ft) up to and including 1200 m (3937 ft)
"0011": altitude is greater than 1200 m (3937 ft) up to and including 1600 m (5249 ft)
"0100": altitude is greater than 1600 m (5249 ft) up to and including 2200 m (7218 ft)

"0101": altitude is greater than 2200 m (7218 ft) up to and including 2800 m (9186 ft)
"0110": altitude is greater than 2800 m (9186 ft) up to and including 3400 m (11155 ft)
"0111": altitude is greater than 3400 m (11155 ft) up to and including 4000 m (13123 ft)
"1000": altitude is greater than 4000 m (13123 ft) up to and including 4800 m (15748 ft)
"1001": altitude is greater than 4800 m (15748 ft) up to and including 5600 m (18373 ft)
"1010": altitude is greater than 5600 m (18373 ft) up to and including 6600 m (21654 ft)
"1011": altitude is greater than 6600 m (21654 ft) up to and including 7600 m (24934 ft)
"1100": altitude is greater than 7600 m (24934 ft) up to and including 8800 m (28871 ft)
"1101": altitude is greater than 8800 m (28871 ft) up to and including 10000 m (32808 ft)
"1110": altitude is greater than 10000 m (32808 ft)
"1111": default value if altitude information is not available

c) bits 113 & 114: encoded location freshness or PDF-2 rotating field indicator:
- "00": PDF-2 rotating field indicator,
- "01": encoded location in message is more than 60 seconds old, or the default encoded position is transmitted,
- "10": encoded location in message is greater than 2 seconds and equal to or less than 60 seconds old,
- "11": encoded location in message is current (i.e., the encoded location freshness is less than or equal to 2 seconds);

d) bits 115 to 123: Δ latitude with 4 second resolution:

- bit 115: Δ sign (0 = minus, 1 = plus)
- bit 116 to 119: minutes (0 to 15) in 1 minute increments*
- bits 120 to 123: seconds (0 to 56) in 4 second increments
  (default value of bits 115 to 123 = 1 0000 1111);

e) bits 124 to 132: Δ longitude with 4 second resolution:

- bit 124: Δ sign (0 = minus, 1 = plus)
- bits 125 to 128: minutes (0 to 15) in 1 minute increments*

* Section A3.3.8 defines the coding scheme for the ELT(DT) Location Protocol. For these new beacons the coarse position in PDF-1 is always selected to be as close as possible to the actual position and will have a maximum offset in PDF-2 of +/- 15 minutes.

- bits 129 to 132: seconds (0 to 56) in 4 second increments
  (default value of bits 124 to 132 = 1 0000 1111)

OR when bits 113 and 114 are set to “00”;

f) bits 115 to 117: PDF-2 rotating field type

- 000: aircraft operator 3LD
- other combinations: spare;

g) bits 118 to 132: when PDF-2 rotating field type is 000, then bits 118 to 132 indicate aircraft operator 3LD*, coded using the Modified Baudot Code in Table A3 (3 letters, each using 5 bits, omitting the most significant bit in Table A3; if there is no 3LD for the aircraft operator, then the 3LD is coded as “ZGA”, i.e., bits 115 to 132 are set to 000 10001 01011 11000).

A3.3.8.4 Users should utilize the ELT(DT) Location Test protocol identified with bits 43-66 described in section A3.3.8.1 when testing an ELT(DT).

A3.3.8.5 Cancellation message

In case of alert cancellation, a specific message shall be sent with the following bit assignment:

bits 37 to 40:	4-bit protocol code as defined as 1001;
bits 41 to 42:	2-bits for type of beacon identity;
bits 43 to 66:	24 bits of beacon identification data, or ELT(DT) Location Test protocol;
bits 67 to 75:	fixed sequence “1 11111010”;
bits 76 to 85:	fixed sequence “1 111111010”;
bits 86 to 106:	BCH-1;
bits 107 to 114:	fixed sequence “00111100”;
bits 115 to 123:	fixed sequence “0 1111 0000”;
bits 124 to 132:	fixed sequence “0 1111 0000”;
bits 133 to 144:	BCH-2.

*3LD is a 3-Letter aircraft operator Designator from the list of "Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services" published by the International Civil Aviation Organization (ICAO) as document 8585.