cat021 expansion specification

Release 2018-03-08, 1.4

ADS-B Target Reports Expansion

2018-03-08

CONTENTS:

category: 021

edition: 1.4

date: 2018-03-08

CHAPTER

ONE

DESCRIPTION OF ASTERIX EXPANSION

Compound item (fspec=8 bits)

BPS - *Barometric Pressure Setting*

`(spare)`

- 4 bits [`....`]

BPS - *Barometric Pressure Setting*

- 12 bits [`............`]
- unsigned quantity
- scaling factor: 0.1
- fractional bits: 0
- unit: “hPa”
- LSB = 0.1 hPa
- value $>= 0$ hPa
- value $<= 409.5$ hPa

remark Notes:

- BPS is the barometric pressure setting of the aircraft minus 800 hPa
- A value of “0” indicates that in the aircraft a value of 800 hPa or less has been selected.
- A value of “409.5” indicates that in the aircraft a value of 1209.5 hPa or more has been selected.

SelH - *Selected Heading*

`(spare)`

- 4 bits [`....`]

HDR - *Horizontal Reference Direction*

- 1 bit [`.`]
- values:

  0: True North
  1: Magnetic North

Stat - *Selected Heading Status*

- 1 bit [`.`]
- values:

0: Data is either unavailable or invalid.
1: Data is available and valid.

SelH - *Selected Heading*

- 10 bits [. . . . .]
- unsigned quantity
- scaling factor: 45
- fractional bits: 6
- unit: “deg”
- LSB = $45/2^6$ deg = $45/64$ deg ≈ 0.703125 deg

remark On many aircraft, the ADS-B Transmitting Subsystem receives Selected Heading from a Mode Control Panel / Flight Control Unit (MCP / FCU). Users of this data are cautioned that the Selected Heading value transmitted by the ADS-B Transmitting Subsystem does not necessarily reflect the true intention of the airplane during certain flight modes (e.g., during LNAV mode).

NAV - *Navigation Mode*

AP - *Autopilot*

- 1 bit [.]
- values:

0: Autopilot not engaged
1: Autopilot engaged

VN - *Vertical Navigation*

- 1 bit [.]
- values:

0: Vertical Navigation not active
1: Vertical Navigation active

AH - *Altitude Hold*

- 1 bit [.]
- values:

0: Altitude Hold not engaged
1: Altitude Hold engaged

AM - *Approach Mode*

- 1 bit [.]
- values:

0: Approach Mode not active
1: Approach Mode active

(spare)

- 4 bits [. . . .]

remark This data-item should only be transmitted if an ADS-B indication has been received that the mode bits have been “actively populated”.by the avionics (1090 ES version 2 (as defined in I021/210) BDS 6,2, subtype 1, bit 47: “Status of MCP / FCU Mode Bits”)

GAO - *GPS Antenna Offset*

- 8 bits [. . . . . .]
- raw value

  remark The value of this field is copied from the respective bits 33-40 of version 2 (as defined in I021/210) of 1090 ES BDS register 6,5 (Aircraft Operational Status)

SGV - *Surface Ground Vector*

Extended item with first part `16 bits` long and optional `8 bits` extends.

STP

- 1 bit [.]
- values:

  0: Aircraft has not stopped
  1: Aircraft has stopped

HTS

- 1 bit [.]
- values:

  0: Heading/Ground Track data is not valid
  1: Heading/Ground Track data is valid

HTT

- 1 bit [.]
- values:

  0: Heading data provided
  1: Ground Track provided

HRD

- 1 bit [.]
- values:

  0: True North
  1: Magnetic North

GSS - *Ground speed*

- 11 bits [. . . . . .]
- unsigned quantity
- scaling factor: 1
- fractional bits: 3
- unit: “kts”
- LSB = $1/2^3$ kts = $1/8$ kts ≈ 0.125 kts

`(FX)`

- extension bit

  0: End of data item
  1: Extension into next extent

HGT - *Heading/Ground Track information*

- 7 bits [. . . . . .]
- unsigned quantity

- scaling factor: 45
- fractional bits: 4
- unit: “deg”
- LSB = $45/2^4$ deg = $45/16$ deg ≈ 2.8125 deg

(FX)

- extension bit

  0: End of data item
  1: Extension into next extent

STA - *Aircraft Status*

Extended item with first part 8 bits long and optional 8 bits extends.

ES

- 1 bit [.]
- values:

  0: Target is not 1090 ES IN capable
  1: Target is 1090 ES IN capable

UAT

- 1 bit [.]
- values:

  0: Target is not UAT IN capable
  1: Target is UAT IN capable

(spare)

- 5 bits [.....]

(FX)

- extension bit

  0: End of data item
  1: Extension into next extent

TNH - *True North Heading*

- 16 bits [................]
- unsigned quantity
- scaling factor: 360
- fractional bits: 16
- unit: “deg”
- LSB = $360/2^{16}$ deg = $360/65536$ deg ≈ 0.0054931640625 deg

  remark Magnetic Heading is defined in I021/152.

MES - *Military Extended Squitter*

Compound item (FX)

SUM - *Mode 5 Summary*

M5

- 1 bit [.]
- values:

0: No Mode 5 interrogation
1: Mode 5 interrogation

ID

- 1 bit [.]
- values:

  0: No authenticated Mode 5 ID reply/report
  1: Authenticated Mode 5 ID reply/report

DA

- 1 bit [.]
- values:

  0: No authenticated Mode 5 Data reply or Report
  1: Authenticated Mode 5 Data reply or Report (i.e any valid Mode 5 reply type other than ID)

M1

- 1 bit [.]
- values:

  0: Mode 1 code not present or not from Mode 5 reply/report
  1: Mode 1 code from Mode 5 reply/report.

M2

- 1 bit [.]
- values:

  0: Mode 2 code not present or not from Mode 5 reply/report
  1: Mode 2 code from Mode 5 reply/report.

M3

- 1 bit [.]
- values:

  0: Mode 3 code not present or not from Mode 5 reply/report
  1: Mode 3 code from Mode 5 reply/report.

MC

- 1 bit [.]
- values:

  0: Flightlevel not present or not from Mode 5 reply/report
  1: Flightlevel from Mode 5 reply/report

PO

- 1 bit [.]
- values:

  0: Position not from Mode 5 report (ADS-B report)
  1: Position from Mode 5 report

remark Notes:

1. The flag M2 refers to the contents of Subfield #6 below, M3, MC refer to the contents of data items I021/070 and I021/145 respectively. The flag M1 refers to the contents of Subfield #3 below (Extended Mode 1 Code in Octal Representation).
2. If a Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I021/200, Target Status, shall be set.
3. If a Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I021/200, Target Status, shall be set.
4. If a Mode 5 report (ID or Data) is received and fullfill the autentication criteria the corresponding authentication bit shall be set.

PNO - *Mode 5 PIN /National Origin*

`(spare)`

- 2 bits [. .]

PIN - *PIN Code*

- 14 bits [. . . . . .]
- raw value

`(spare)`

- 5 bits [. . . . .]

NO - *National Origin Code*

- 11 bits [. . . . . .]
- raw value

EM1 - *Extended Mode 1 Code in Octal Representation*

V

- 1 bit [.]
- values:

  0: Code validated
  1: Code not validated

`(spare)`

- 1 bit [.]

L

- 1 bit [.]
- values:

  0: Mode 1 code as derived from the report of the transponder
  1: Smoothed Mode 1 code as provided by a local tracker

`(spare)`

- 1 bit [.]

EM1 - *Extended Mode 1 Code in Octal Representation*

- 12 bits [. . . . .]
- Octal string (3-bits per digit)

remark Notes:

- Subfield #1 is present, the M1 bit in Subfield #1 indicates whether the Extended Mode 1 Code is from a Mode 5 reply or a Mode 1 reply. If Subfield #1 is not present, the Extended Mode 1 Code is from a Mode 1 reply.
- If Subfield #3 is not present the Mode 1 Code was not reported or all Code Bits were equal to 0.
- The valid bit is set if the Code was only reported once for that target.

XP - *X Pulse Presence*

`(spare)`

- 2 bits [. .]

XP - *X-pulse from Mode 5 PIN reply/report*

- 1 bit [.]
- values:

  0: X-Pulse not present.
  1: X-pulse present.

X5 - *X-pulse from Mode 5 Data reply or Report.*

- 1 bit [.]
- values:

  0: X-pulse set to zero or no authenticated Data reply or Report received.
  1: X-pulse set to one (present).

XC - *X-pulse from Mode C reply*

- 1 bit [.]
- values:

  0: X-pulse set to zero or no Mode C reply
  1: X-pulse set to one (present)

X3 - *X-pulse from Mode 3/A reply*

- 1 bit [.]
- values:

  0: X-pulse set to zero or no Mode 3/A reply”
  1: X-pulse set to one (present)

X2 - *X-pulse from Mode 2 reply*

- 1 bit [.]
- values:

  0: 0 X-pulse set to zero or no Mode 2 reply
  1: X-pulse set to one (present)

X1 - *X-pulse from Mode 1 reply*

- 1 bit [.]

- values:

  0: X-pulse set to zero or no Mode 1 reply
  1: X-pulse set to one (present)

remark Within Mode 5 reports, the X-Pulse can be set for the following cases:

1. In a combined Mode 1 and Mode 2 report: in this case the X5 bit and the X2 bit shall be set;

2. In a combined Mode 3 and Mode C report: in this case the X5 bit and the X3 bit shall be set;

3. In a Mode 5 PIN data report: in this case the X5 bit and the XP bit shall be set. The X1 bit and the XC bit are meaningless as in Mode 1 and Mode C replies/reports the X Pulse is not defined. They are kept for compatibility reasons.

FOM - *Figure of Merit*

`(spare)`

- 3 bits [. . .]

FOM - *Figure of Merit*

- 5 bits [. . . . .]
- raw value

M2 - *Mode 2 Code in Octal Representation*

V

- 1 bit [.]
- values:

  0: Code validated
  1: Code not validated

`(spare)`

- 1 bit [.]

L

- 1 bit [.]
- values:

  0: Mode-2 code as derived from the reply of the transponder
  1: Smoothed Mode-2 code as provided by a local tracker

`(spare)`

- 1 bit [.]

ABCD - *Mode 2 Code in Octal Representation*

- 12 bits [. . . . . .]
- Octal string (3-bits per digit)

remark If Subfield 6 is not present the Mode 2 Code was no reported or all Code Bits were equal to 0.

remark Notes:

- The Reserved Expansion Field is optional. When used to transmit MES, it shall be sent when the targets are represented by Mode 5 Level 2 reports.
- The information contained in this data item is specific to 1090MHz Extended Squitter messages transmitted by military aircraft (Mode 5 Level 2 squitter).

CHAPTER

TWO

INDICES AND TABLES

- genindex
- modindex
- search