Asterix category 018 - Mode S Datalink Function Messages

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Preamble

Surveillance data exchange.

Description of standard data items

I018/000 - Message Type

definition: Allows identification of the message type.

Element
bit size: 8
Values:

- **0:** Associate_req
- **1:** Associate_resp
- **2:** Release_req
- **3:** Release_resp
- **4:** Abort_req
- **5:** Keep_alive
- **16:** Aircraft_report
- **17:** Aircraft_command
- **18:** II_code_change
- **32:** Uplink_packet
- **33:** Cancel_uplink_packet
- **34:** Uplink_packet_ack
- **35:** Downlink_packet
- **38:** Data_XON
- **39:** Data_XOFF
- **48:** Uplink_broadcast
- **49:** Cancel_uplink_broadcast
- **50:** Uplink_broadcast_ack
- **52:** Downlink_broadcast
- **64:** GICB_extraction
- **65:** Cancel_GICB_extraction
- **66:** GICB_extraction_ack
- **67:** GICB_response

I018/001 - Result

definition: Indicates the status of a particular message together with additional information.

Group

I018/001/CAUSE - Cause

Element
bit size: 4
Values:

- **0:** Accepted, the request is accepted and is under processing

1: Rejected, the request has not been accepted
2: Cancelled, the request has been cancelled
3: Finished, the request has been accepted and successfully processed
4: Delayed, the request processing is temporarily delayed but the request is still valid
5: In Progress, the request is being successfully processed
6: In Progress, the request is being successfully processed

I018/001/DIAG - Diagnostic

Element
bit size: 4
Values:

0: No diagnostic available
1: Aircraft Exit
2: Incorrect aircraft address
3: Impossibility to process the message
4: Insufficient or change in data link capability
5: Invalid LV field
6: Duplicate request number
7: Unknown request number
8: Timer T3 expiry
9: Expiry of I/R delivery timer
10: Uplink flow disabled by UC

I018/002 - Time of Day

definition: Absolute time stamping expressed as Co-ordinated Universal Time (UTC) time.

Element
bit size: 24
Unsigned quantity
LSB = $1/2^7$ s $\approx 7.8125e-3$ s
unit: "s"

Notes:

1. The time of day value is reset to zero each day at midnight.
2. For time management in radar transmission applications, refer to Part 1, paragraph 5.4.

I018/004 - II Code

definition: Indicates the interrogator's current and previous II Code.

Group

I018/004/PREVIOUSII - Former II Code

Element
bit size: 4
Raw Content

I018/004/CURRENTII - Current II Code

Element
bit size: 4
Raw Content

Note:

- The Previous II code shall be set to the Current II code value when there is no Previous II code available.

I018/005 - Mode S Address

definition: Technical Mode S address used for identification of an aircraft, as defined in ICAO Annex 10.

Element
bit size: 24
Raw Content

I018/006 - Mode S Address List

definition: List of technical Mode S addresses.

Repetitive

Regular, 1 byte(s) REP field size.

Element
bit size: 24
Raw Content

I018/007 - Aircraft Data Link Command

definition: Command for the aircraft data link communications. It allows the GDLP to enable or disable the uplink & downlink data flows for a specified aircraft.

Group

I018/007/UM - Uplink Mask

Element
bit size: 1
Values:

- **0:** UC shall be ignored
- **1:** UC shall be taken into account

I018/007/DM - Downlink Mask

Element
bit size: 1
Values:

- **0:** DC shall be ignored
- **1:** DC shall be taken into account

I018/007/UC - Uplink Command

Element
bit size: 1
Values:

- **0:** the uplink flow shall be enabled
- **1:** the uplink flow shall be stopped

I018/007/DC - Downlink Command

Element
bit size: 1
Values:

- **0:** the downlink flow shall be enabled
- **1:** the downlink flow shall be stopped

Spare bits: 4

Note:

- This command applies to the interrogator's Current status (UCS/DCS) and does not affect the interrogator’s Default Status (see UDS/DDS in Data Item I018/008).

I018/008 - Aircraft Data Link Status

definition: Status for the aircraft data link communications.

Extended

I018/008/UDS - Uplink Default Status

Element
bit size: 1
Values:

0: The interrogator is enabled to uplink frames
1: The interrogator is disabled to uplink frames

I018/008/DDS - Downlink Default Status

Element
bit size: 1
Values:

0: The interrogator is enabled to extract frames
1: The interrogator is disabled to extract frames

I018/008/UCS - Uplink Current Status

Element
bit size: 1
Values:

0: The interrogator is enabled to uplink frames
1: The interrogator is disabled to uplink frames

I018/008/DCS - Downlink Current Status

Element
bit size: 1
Values:

0: The interrogator is enabled to extract frames
1: The interrogator is disabled to extract frames

Spare bits: 2

I018/008/EI - Exit Indication

Element
bit size: 1
Values:

0: The aircraft is in the Datalink coverage map of the interrogator
1: The aircraft is not in the Datalink coverage map of the interrogator

(FX) - extension bit

I018/008/IC - Interrogator Control

Element
bit size: 1
Values:

0: The interrogators current ability to uplink/downlink frames (UCS/DCS) and the content of the Aircraft_report could be changed using D_Data_link_command
1: The interrogators current ability to uplink/downlink frames (UCS/DCS) and the content of the Aircraft_report cannot be changed using D_Data_link_command

Spare bits: 6

(FX) - extension bit

Notes:

1. The current status should never be more restrictive than the default status.

2. IC is usually set 1when the interrogator is a member of a cluster with a decentralised data link responsibility protocol. IC is usually set to 0 when the interrogator is connected to a GDLP. IC settings shall comply with the rules defined in Ref.3.

I018/009 - Aircraft Data Link Report Request

definition: Request for an Aircraft_report message.

Extended

I018/009/SR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_Data_link_status
1: The next Aircraft_report shall include D_Data_link_status

I018/009/AR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_COM
1: The next Aircraft_report shall include D_COM

I018/009/ER

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_ECA
1: The next Aircraft_report shall include D_ECA

I018/009/FR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_CQF
1: The next Aircraft_report shall include D_CQF

I018/009/MR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_CQF_method
1: The next Aircraft_report shall include D_CQF_method

I018/009/PR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_Polar_position
1: The next Aircraft_report shall include D_Polar_position

I018/009/CR

Element
bit size: 1
Values:

0: The next Aircraft_report may not include D_Cartesian_position
1: The next Aircraft_report shall include D_Cartesian_position

(FX) - extension bit

I018/009/ID

Element
bit size: 1
Values:

0: The next Aircraft_report may not include Aircraft_ID
1: The next Aircraft_report shall include Aircraft_ID

I018/009/MA

Element
bit size: 1
Values:

0: The next Aircraft_report may not include Mode_A
1: The next Aircraft_report shall include Mode_A

I018/009/SP

Element
bit size: 1
Values:

0: The next Aircraft_report may not include Speed
1: The next Aircraft_report shall include Speed

I018/009/HG

Element
bit size: 1
Values:

0: The next Aircraft_report may not include Height
1: The next Aircraft_report shall include Height

I018/009/HD

Element
bit size: 1
Values:

0: The next Aircraft_report may not include Heading
1: The next Aircraft_report shall include Heading

Spare bits: 2
(FX) - extension bit

Note:

- This item indicates to the DLF which items to send in the next Aircraft_report messages (for a specified aircraft) through the use of flags. These flags concern D_Data_link_status, D_COM, D_ECA, D_CQF, D_CQF_method, D_Polar_position, D_Cartesian_position, D_Aircraft_ID, D_Mode_A, D_Speed, D_Height, D_Heading.

I018/010 - Transponder Communications Capability

definition: Transponder Communications Capability
Group

Spare bits: 5

I018/010/COM - Communications Capability of the Transponder

Element
bit size: 3
Values:

0: No communications capability (surveillance only)
1: Comm. A and Comm. B capability
2: Comm. A, Comm. B and Uplink ELM
3: Comm. A, Comm. B and Uplink ELM and Downlink ELM
4: Level 5 Transponder capability

I018/011 - Capability Report

definition: Capability report as described in the Mode S subnetwork SARPs

Element
bit size: 56
Raw Content

I018/012 - Aircraft Coverage Quality Factor

definition: Coverage Quality Factor (CQF) of an aircraft (for a given interrogator).
Group

I018/012/FS - Flight Status

Element
bit size: 1
Values:

- **0:** Aircraft is airborne
- **1:** Aircraft is on the ground

I018/012/CQF - Aircraft CQF

Element
bit size: 7
Values:

- **0:** The CQF calculation method is not supported
- **1:** The CQF is minimum
- **126:** The CQF is maximum
- **127:** The CQF is undefined according to the calculation method

I018/013 - Aircraft CQF Calculation Method

definition: Indicates which criteria to take into account when computing the CQF of an aircraft for an interrogator.

Element
bit size: 8
Raw Content

I018/014 - Aircraft Position in Polar Co-ordinates

definition: Measured position of an aircraft in local polar co-ordinates.
Group

I018/014/RHO

Element
bit size: 16
Unsigned quantity
LSB = $1/2^{8}$ NM $\approx 3.90625e-3$ NM
unit: ”NM”
< 256.0

I018/014/THETA

Element
bit size: 16
Unsigned quantity
LSB = $360/2^{1}6$ ° $\approx 5.4931640625e-3$ °
unit: ”°”

Note:

- When expressed in 16 bits, signed or unsigned azimuths have the same value.

I018/015 - Aircraft Position in Cartesian Co-ordinates

definition: Calculated position of an aircraft in Cartesian co-ordinates.

Group

I018/015/X - X-Component

Element
bit size: 16
Signed quantity
LSB = $1/2^7$ NM $\approx 7.8125e-3$ NM
unit: "NM"
>= -256.0
<= 256.0

I018/015/Y - Y-Component

Element
bit size: 16
Signed quantity
LSB = $1/2^7$ NM $\approx 7.8125e-3$ NM
unit: "NM"
>= -256.0
<= 256.0

Note:

- Negative values are expressed in 2's complement form, bit-32 and bit-16 shall be set to 0 for positive values and 1 for negative values.

I018/016 - Packet Number

definition: Number used to correlate an uplink packet request and its associated acknowledgement.

Element
bit size: 32
Unsigned integer

I018/017 - Packet Number List

definition: List of numbers used to correlate an uplink packet request and their associated acknowledgements

Repetitive

Regular, 1 byte(s) REP field size.

Element
bit size: 32
Unsigned integer

I018/018 - Mode S Packet Properties

definition: Properties of an uplink Mode S packet, i.e. its internal priority and its capability to be multiplexed or not, and its type (SVC, MSP or ROUTE).

Group

Spare bits: 1

I018/018/PR - Mode S Packet Internal Priority

Element
bit size: 5
Unsigned integer

I018/018/PT - Packet Type

Element
bit size: 2
Values:

0: SVC packets
1: MSP packets
2: Route packets

Note:

- The PT field is used to identify the ROUTE packets which have a higher priority than SVCs. The PR field is used to describe the priority of SVCs as follows:

  0 = low 1 = high

  For ROUTE and MSP packets the value of PR has no significance. However, for the purpose of standardisation, it is recommended that for ROUTE packets, PR is set to 15 and for MSPs the PR should be set to 31.

I018/019 - Mode S Packet

definition: A Mode S packet as defined in the Mode S subnetwork SARPs.

Explicit

I018/020 - Broadcast Number

definition: Number used to correlate an uplink broadcast request and its associated acknowledgement.

Element
bit size: 32
Unsigned integer

I018/021 - Broadcast Properties

definition: Properties of an uplink broadcast request (power, duration, coverage).

Group

I018/021/PRIORITY - Priority

Element
bit size: 4
Unsigned integer

I018/021/POWER - Power

Element
bit size: 4
Unsigned integer

I018/021/DURATION - Duration

Element
bit size: 8
Unsigned quantity
LSB = 1 s ≈ 1.0 s
unit: ”s”

I018/021/COVERAGE - Coverage

Element
bit size: 32
Raw Content

Notes:

1. A broadcast with a higher priority will temporarily delay a lower priority broadcast if necessary. The delayed broadcast will be resumed as soon as possible for its remaining time.
2. The sectors are numbered from 1 to 32 clockwise, sector 1 being the first sector after the North.

I018/022 - Broadcast Prefix

definition: Contents of the 32 first bits of an uplink broadcast interrogation.

Group

Spare bits: 5

I018/022/PREFIX - Prefix Field

Element
bit size: 27
Raw Content

Note:

- The Mode S uplink broadcast interrogation will be made up of this D_Broadcast_prefix field followed by the D_Broadcast field and then by the Address/Parity field (in this order), as defined in ICAO Annex 10. In the interrogator, the 5 first bits of D_Broadcast_prefix will be replaced by ICAO UF field, as defined in Annex 10.

I018/023 - Uplink or Downlink Broadcast

definition: Broadcast message sent (MA field of the Comm-A frame) or received (MB field of the Comm-B frame), conformant with the ICAO Manual on Mode S Specific Services.

Element
bit size: 56
Raw Content

I018/025 - GICB Number

definition: Number used to correlate subsequent GICB messages (i.e. responses and acknowledgements) with the original GICB request.

Element
bit size: 32
Unsigned integer

I018/027 - BDS Code

definition: BDS code of the GICB to be extracted.

Element
bit size: 8
Raw Content

I018/028 - GICB Extraction Periodicity

definition: Periodicity of the GICB extractions.

Element
bit size: 16
Unsigned quantity
LSB = 1 s ≈ 1.0 s
unit: ”s”

I018/029 - GICB Extracted

definition: GICB extracted message (MB field of the Comm-B frame). i.e., the contents of a BDS register, conformant with the ICAO Manual on Mode S Specific Services.

Element
bit size: 56
BDS register at unknown address

I018/030 - GICB Properties

definition: Properties of the GICB extractions.

Group

I018/030/PRIORITY - GICB Priority

Element
bit size: 5
Unsigned integer

Spare bits: 3

I018/030/PC - Periodicity Constraint

Element
bit size: 1
Values:

- **0:** The periodicity may not be strictly respected
- **1:** The periodicity shall be strictly respected

I018/030/AU - Asynchronous Update

Element
bit size: 1
Values:

- **0:** GICB extractions should be sent only when required by the periodicity
- **1:** If a GICB extraction is done due to external conditions, an update will also be sent, even if it does not match the expected periodicity

I018/030/NE - Non Extraction

Element
bit size: 1
Values:

- **0:** The GICB extraction is attempted according to the periodicity
- **1:** There will no GICB attempts

I018/030/RD - Reply Destination

Element
bit size: 2
Values:

- **0:** The extracted GICB must be sent only on the Data Link line

1: The extracted GICB must be sent only on the Surveillance line
2: The extracted GICB must be sent both on the Data Link and on the Surveillance lines

Spare bits: 3

Note:

- The Non Extraction flag (NE) should be used only if the Asynchronous Update flag (AU) is set to true. It is specially reserved to the ACAS' RA extraction (asynchronous update without periodic extraction request).

I018/031 - Aircraft Identity

definition: Identity of the aircraft extracted by a BDS 20 as described in ICAO Annex 10.

Element
bit size: 48
Raw Content

I018/032 - Aircraft Mode A

definition: Mode-3/A code converted into octal representation.

Group

I018/032/V

Element
bit size: 1
Values:

0: Code validated
1: Code not validated

I018/032/G

Element
bit size: 1
Values:

0: Default
1: Garbled code

I018/032/L

Element
bit size: 1
Values:

0: Mode-3/A code derived from the reply of the transponder
1: Mode-3/A code not extracted during the last scan

Spare bits: 1

I018/032/MOD3A

Element
bit size: 12
Octal string (3-bits per char)

Note:

- Bit 15 has no meaning in the case of a smoothed Mode-3/A code and is set to 0 for a calculated track. For Mode S, it is set to one when an error correction has been attempted.

I018/033 - Aircraft Height

definition: Flight Level converted into binary representation.

Group

I018/033/V

Element
bit size: 1
Values:

0: Code validated
1: Code not validated

I018/033/G

Element
bit size: 1
Values:

0: Default
1: Garbled code

I018/033/FL - Flight Level

Element
bit size: 14
Signed quantity
LSB = $1/2^2$ FL ≈ 0.25 FL
unit: ”FL”

Notes:

1. The value shall be within the range described by ICAO Annex 10
2. For Mode S, bit 15 (G) is set to one when an error correction has been attempted.
3. If Altitude is not extracted on the last scan, it is an implementation issue as to whether Altitude is output from track file, if at all.

I018/034 - Aircraft Speed

definition: Tracker calculated Ground Speed of an aircraft.

Element
bit size: 16
Unsigned quantity
LSB = $1/2^14$ NM/s ≈ $6.103515625e-5$ NM/s
unit: ”NM/s”

I018/035 - Aircraft Heading

definition: Tracker calculated heading of an aircraft. . The heading is the heading with respect to the geographical north at the aircraft position.

Element
bit size: 16
Unsigned quantity
LSB = $360/2^16$ ° ≈ $5.4931640625e-3$ °
unit: ”°”

I018/036 - Data Source Identifier

definition: Identification of the source node for the GDLP/LU data

Group

I018/036/SAC - System Area Code

Element
bit size: 8
Raw Content

I018/036/SIC - System Identification Code

Element
bit size: 8
Raw Content

Note:

- The up-to-date list of SACs is published on the EUROCONTROL Web Site (http://www.eurocontrol.int/asterix).

I018/037 - Data Destination Identifier

definition: Identification of the destination node for the GDLP/LU data.

Group

I018/037/SAC - System Area Code

Element
bit size: 8
Raw Content

I018/037/SIC - System Identification Code

Element
bit size: 8
Raw Content

Note:

- The up-to-date list of SACs is published on the EUROCONTROL Web Site (http://www.eurocontrol.int/asterix).

User Application Profile

- 1: `I018/036` - Data Source Identifier
- 2: `I018/037` - Data Destination Identifier
- 3: `I018/000` - Message Type
- 4: `I018/001` - Result
- 5: `I018/005` - Mode S Address
- 6: `I018/016` - Packet Number
- 7: `I018/017` - Packet Number List
- (FX) - Field extension indicator
- 8: `I018/018` - Mode S Packet Properties
- 9: `I018/019` - Mode S Packet
- 10: `I018/028` - GICB Extraction Periodicity
- 11: `I018/030` - GICB Properties
- 12: `I018/025` - GICB Number
- 13: `I018/027` - BDS Code
- 14: `I018/029` - GICB Extracted
- (FX) - Field extension indicator
- 15: `I018/002` - Time of Day
- 16: `I018/006` - Mode S Address List
- 17: `I018/007` - Aircraft Data Link Command
- 18: `I018/008` - Aircraft Data Link Status
- 19: `I018/009` - Aircraft Data Link Report Request
- 20: `I018/010` - Transponder Communications Capability
- 21: `I018/011` - Capability Report
- (FX) - Field extension indicator
- 22: `I018/014` - Aircraft Position in Polar Co-ordinates
- 23: `I018/015` - Aircraft Position in Cartesian Co-ordinates

- 24: `I018/020` - Broadcast Number
- 25: `I018/021` - Broadcast Properties
- 26: `I018/022` - Broadcast Prefix
- 27: `I018/023` - Uplink or Downlink Broadcast
- 28: `I018/004` - II Code
- (FX) - Field extension indicator
- 29: `I018/031` - Aircraft Identity
- 30: `I018/032` - Aircraft Mode A
- 31: `I018/033` - Aircraft Height
- 32: `I018/034` - Aircraft Speed
- 33: `I018/035` - Aircraft Heading
- 34: `I018/012` - Aircraft Coverage Quality Factor
- 35: `I018/013` - Aircraft CQF Calculation Method
- (FX) - Field extension indicator