

# Asterix category 018 - Mode S Datalink Function Messages

**category:** 018

**edition:** 1.8

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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 1 when 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  
 $\text{LSB} = 1/2^8 \text{ NM} \approx 3.90625e-3 \text{ NM}$   
unit: "NM"  
< 256.0

### **I018/014/THETA**

Element  
bit size: 16  
Unsigned quantity  
 $\text{LSB} = 360/2^{16} \text{ }^\circ \approx 5.4931640625e-3 \text{ }^\circ$   
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  
 $\text{LSB} = 1/2^7 \text{ NM} \approx 7.8125e - 3 \text{ NM}$   
 unit: "NM"  
 $\geq -256.0$   
 $\leq 256.0$

**I018/015/Y - Y-Component**

Element  
 bit size: 16  
 Signed quantity  
 $\text{LSB} = 1/2^7 \text{ NM} \approx 7.8125e - 3 \text{ NM}$   
 unit: "NM"  
 $\geq -256.0$   
 $\leq 256.0$

**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  $\approx$  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  $\approx$  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  $\approx$  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  $\approx$   $6.103515625e-5$  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 =  $360/2^{16}$  °  $\approx$   $5.4931640625e-3$  °

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