

Table B-2-101. BDS code 6,5 — Extended squitter aircraft operational status**MB FIELD**

1	MSB	
2		
3	FORMAT TYPE CODE = 31	
4		
5	LSB	
6	MSB	MSB
7	SUBTYPE CODE = 0	SUBTYPE CODE = 1
8	LSB	LSB
9	MSB 	

PURPOSE: To provide the capability class and current operational mode of ATC-related applications and other operational information.

Subtype Coding:

- 0 = Airborne Status Message
- 1 = Surface Status Message
- 2–7 = Reserved

1) Message delivery shall be accomplished using the event-driven protocol.

B.3. CF FIELD CODE DEFINITIONS IN DF = 18 ADS-B AND TIS-B MESSAGES

B.3.1 INTRODUCTION

Notes:

1. This section defines the formats and coding for a traffic information service broadcast (TIS-B) service based on the same 112-bit 1 090 MHz signal transmission that is used for ADS-B on 1 090 MHz.
2. TIS-B complements the operation of ADS-B by providing ground-to-air broadcast of surveillance data on aircraft that are not equipped for 1 090 MHz ADS-B as an aid to transition to a full ADS-B environment. The basis for this ground surveillance data may be ATC Mode S radar, a surface or approach multilateration system or a multi-sensor data processing system. The TIS-B ground-to-air transmissions use the same signal formats as 1 090 MHz ADS-B and can therefore be accepted by a 1 090 MHz ADS-B receiver.
3. TIS-B service is intended to provide a complete surveillance picture to 1 090 MHz ADS-B users during a transition period. After transition, it also provides a means to cope with a user that has lost its 1 090 MHz ADS-B capability, or is broadcasting incorrect information.

B.3.2 TIS-B FORMAT DEFINITION

TIS-B information shall be broadcast using the 112-bit Mode S DF = 18 format as shown below in the following table.

<i>TIS-B Format Definition</i>					
Bit #	1 ---- 5	6 --- 8	9 ----- 32	33 ----- 88	89 ---- 112
DF = 18	DF[5]	CF[3]	AA[24]	ME[56]	PI[24]
Field Names	10010				
	MSB	MSB	MSB	MSB	MSB
	LSB	LSB	LSB	LSB	LSB

B.3.3 CONTROL FIELD ALLOCATION

The content of the DF = 18 transmission shall be defined by the value of the control field, as specified in the following table.

CF Field Code Definitions in DF = 18 ADS-B and TIS-B Messages

<i>CF value</i>	<i>ICAO/Mode A Flag (IMF)</i>	<i>Meaning</i>
2	0	Fine TIS-B message, AA field contains the 24-bit ICAO aircraft address
	1	Fine TIS-B message, AA field contains the 12-bit Mode A code followed by a 12-bit track file number
3	0	Coarse TIS-B airborne position and velocity message, AA field contains the 24-bit ICAO aircraft address

<i>CF value</i>	<i>ICAO/Mode A Flag (IMF)</i>	<i>Meaning</i>
	1	Coarse TIS-B airborne position and velocity message, AA field contains the 12-bit Mode A code followed by a 12-bit track file number.
4	N/A	Reserved for TIS-B management message AA field contains TIS-B/ADS-R management information
5	0	TIS-B messages that relay ADS-B Messages using anonymous 24-bit addresses
	1	Reserved
6	0	ADS-B rebroadcast using the same TYPE Codes and message formats as defined for DF = 17 ADS-B messages AA field contains the 24-bit ICAO aircraft address
	1	ADS-B rebroadcast using the same TYPE Codes and message formats as defined for DF = 17 ADS-B messages AA field contains a 24-bit anonymous aircraft address

B.3.4 TIS-B SURVEILLANCE MESSAGE DEFINITION

B.3.4.1 TIS-B FINE AIRBORNE POSITION MESSAGE

The TIS-B fine airborne position ME field shall be formatted as specified in Table B-3-1.

B.3.4.1.1 ICAO/MODE A FLAG (IMF) FOR THE AIRBORNE POSITION MESSAGE

This one-bit field (bit 8) shall indicate the type of identity associated with the aircraft data reported in the TIS-B message. IMF equal to ZERO (0) shall indicate that the TIS-B data is identified by an ICAO 24-bit address. IMF equal to ONE (1) shall indicate that the TIS-B data is identified by a “Mode A” code. A TIS-B report on a primary radar target shall indicate a “Mode A” code of all ZEROs.

Note.— The AA field is coded differently for 24-bit addresses and Mode A codes as specified in §B.3.3.

B.3.4.1.2 PRESSURE-ALTITUDE

This 12-bit field shall provide the aircraft pressure-altitude. This field shall contain barometric altitude encoded in 25- or 100-foot increments (as indicated by the Q Bit).

Note.— All zeros in this field indicate that there is no altitude data.

B.3.4.1.3 COMPACT POSITION REPORTING (CPR) FORMAT (F)

This field shall be set as specified in A.2.3.2.1.

B.3.4.1.4 *LATITUDE/LONGITUDE*

The Latitude/Longitude fields in the TIS-B fine Airborne Position Message shall be set as specified in §A.2.3.2.3.

B.3.4.2 TIS-B SURFACE POSITION MESSAGE

The TIS-B surface position ME field shall be formatted as specified in Table B-3-2.

B.3.4.2.1 *MOVEMENT*

This field shall be set as specified in §B.2.3.3.1

B.3.4.2.2 *GROUND TRACK (TRUE)***B.3.4.2.2.1** *Ground track status*

This field shall be set as specified in §B.2.3.3.2.1.

B.3.4.2.2.2 *Ground track angle*

This field shall be set as specified in §B.2.3.3.2.2.

B.3.4.2.3 *ICAO/MODE A FLAG (IMF) FOR THE SURFACE POSITION MESSAGE*

This one-bit field (bit 21) shall indicate the type of identity associated with the aircraft data reported in the TIS-B message. Coding is specified in §B.3.4.1.1.

B.3.4.2.4 *COMPACT POSITION REPORTING (CPR) FORMAT (F)*

This field shall be set as specified in §A.2.3.3.3.

B.3.4.2.5 *LATITUDE/LONGITUDE*

The Latitude/Longitude fields in the TIS-B fine Surface Position Message shall be set as specified in §A.2.3.3.5.

B.3.4.3 IDENTIFICATION AND CATEGORY MESSAGE

The TIS-B identification and category ME field shall be formatted as specified in Table B-3-3. This message shall only be used for aircraft identified with an ICAO 24-bit address.

B.3.4.3.1 *AIRCRAFT IDENTIFICATION CODING*

This field shall be set as specified in the definition of BDS 0,8.

B.3.4.4 VELOCITY MESSAGE

The TIS-B Velocity ME field shall be formatted as specified in Tables B-3-4a and B-3-4b.

B.3.4.4.1 SUBTYPE FIELD

Subtypes 1 and 2 shall be used for the velocity message when velocity over ground is reported. Subtypes 3 and 4 shall be used when airspeed and heading are reported.

Subtype 2 (the supersonic version of the velocity coding) shall be used if either the east-west OR north-south velocities exceed 1 022 kt. A switch to subtype 1 (the normal velocity coding) shall be made if both the east-west AND north-south velocities drop below 1 000 kt.

Subtype 4 (the supersonic version of the airspeed coding) shall be used if airspeed exceeds 1 022 knots. A switch to subtype 3 (the normal airspeed coding) shall be made if the airspeed drops below 1 000 knots.

B.3.4.4.2 ICAO/MODE A FLAG (IMF) FOR THE VELOCITY MESSAGE

This one-bit field (bit 9) shall indicate the type of identity associated with the aircraft data reported in the TIS-B message. Coding is specified in §B.3.4.1.1.

B.3.4.5 COARSE AIRBORNE POSITION MESSAGE

The TIS-B coarse airborne position ME field shall be formatted as specified in Table B-3-5.

Note.— This message is used if the surveillance source for TIS-B is not of high enough quality to justify the use of the fine formats. An example of such a source is a scanning beam Mode S interrogator.

B.3.4.5.1 ICAO/MODE A FLAG (IMF) FOR THE COARSE AIRBORNE POSITION MESSAGE

This one-bit field (bit 1) shall indicate the type of identity associated with the aircraft data reported in the TIS-B message in §B.3.4.1.1.

B.3.4.5.2 SERVICE VOLUME ID (SVID)

The 4-bit SVID field shall identify the TIS-B site that delivered the surveillance data.

Note 1.— In the case where TIS-B messages are being received from more than one TIS-B service, the Service ID can be used to select coarse messages from a single service. This will prevent the TIS-B track from wandering due to the different error characteristics associated with the different services.

Note 2.— The SVID is defined by the service provider.

B.3.4.5.3 PRESSURE-ALTITUDE

This 12-bit field shall provide the aircraft pressure-altitude. This field shall contain barometric altitude encoded in 25- or 100-foot increments (as indicated by the Q Bit).

B.3.4.5.4 GROUND TRACK STATUS

This one bit (ME bit 20) field shall define the validity of the ground track value. Coding for this field shall be as follows:
0 = not valid and 1 = valid.

B.3.4.5.5 GROUND TRACK ANGLE

This 5-bit (ME bits 21-25) field shall define the direction (in degrees clockwise from true north) of aircraft motion. The ground track shall be encoded as an unsigned angular weighted binary numeral, with an MSB of 180 degrees and an LSB of 360/32 degrees, with ZERO (0) indicating true north. The data in the field shall be rounded to the nearest multiple of 360/32 degrees.

B.3.4.5.6 GROUND SPEED

This 6-bit (ME bits 26-31) field shall define the aircraft speed over the ground. Coding of this field shall be as specified in the following table:

<i>Coding</i>	<i>Ground speed (GS) in kt</i>
0	No ground speed information
1	$GS \leq 16$
2	$16 \leq GS < 48$
3	$48 < GS < 80$
*****	*****
62	$1936 \leq GS < 1968$
63	$GS \geq 1968$

B.3.4.5.7 LATITUDE/LONGITUDE

The Latitude/Longitude fields in the TIS-B Coarse Airborne Position Message shall be set as specified in §A.2.3.2.3 except that the 12-bit form of CPR coding shall be used.

B.3.4.6 Reserved for TIS-B/ADS-R Management Messages

Note.— TIS-B/ADS-R Management Messages could announce information such as location and the service of the TIS-B ground station. There is no requirement for Management Messages. Format DF = 18 with CF = 4 has been reserved for the future use of such messages.

Table B-3-1. TIS-B fine airborne position message**MB FIELD**

1	MSB
2	
3	FORMAT TYPE CODE
4	(see §B.2.3.1)
5	LSB
6	MSB SURVEILLANCE STATUS
7	LSB
8	IMF (see §B.3.4.1.1)
9	MSB
10	
11	
12	
13	PRESSURE-ALTITUDE
14	
15	This is the altitude code (AC) as specified in §3.1.2.6.5.4
16	of Annex 10, Volume IV, but with the M-bit removed
17	
18	
19	
20	LSB
21	RESERVED
22	CPR FORMAT (F) (see §A.2.3.2.1)
23	MSB
24	
25	
26	
27	
28	
29	
30	CPR ENCODED LATITUDE
31	
32	(CPR airborne format
33	specified in §C.2.6)
34	
35	
36	
37	
38	
39	LSB
40	MSB
41	
42	
43	
44	
45	
46	
47	CPR ENCODED LONGITUDE
48	
49	(CPR airborne format
50	specified in §C.2.6)
51	
52	
53	
54	
55	
56	LSB

PURPOSE: To provide airborne position information for aircraft that are not equipped with 1 090 MHz ADS-B when the TIS-B service is based on high quality surveillance data.

Surveillance Status coding:

0 = no condition information

1 = permanent alert (emergency condition)

2 = temporary alert (change in Mode A identity code other than emergency condition)

3 = SPI condition

Codes 1 and 2 take precedence over code 3.

Table B-3-2. TIS-B fine surface position message**MB FIELD**

1	MSB
2	
3	
4	FORMAT TYPE CODE (see §B.2.3.1)
5	LSB
6	MSB
7	
8	
9	
10	MOVEMENT (see §B.2.3.3.1)
11	
12	LSB
13	STATUS for Heading/Ground Track (1 = valid, 0 = not valid)
14	MSB
15	
16	HEADING/GROUND TRACK (Referenced to true north)
17	
18	
19	
20	LSB = 360/128°
21	IMF (see §B.3.4.2.3)
22	CPR FORMAT (F) (see §A.2.3.3.3)
23	MSB
24	
25	
26	
27	
28	
29	
30	CPR ENCODED LATITUDE
31	
32	CPR Surface Format (specified in §C.2.6)
33	
34	
35	
36	
37	
38	
39	LSB
40	MSB
41	
42	
43	
44	
45	
46	
47	CPR ENCODED LONGITUDE
48	
49	CPR Surface Format (specified in §C.2.6)
50	
51	
52	
53	
54	
55	
56	LSB

PURPOSE: To provide surface position information for aircraft that are not equipped with 1 090 MHz ADS-B.

Table B-3-3. TIS-B identification and category message

1	MSB	FORMAT TYPE CODE (see §B.2.3.1)
2		
3		
4		
5	LSB	EMITTER CATEGORY
6	MSB	
7		
8	LSB	
9	MSB	CHARACTER 1
10		
11		
12		
13		CHARACTER 2
14	LSB	
15	MSB	
16		
17		CHARACTER 3
18		
19		
20	LSB	
21	MSB	CHARACTER 4
22		
23		
24		
25		CHARACTER 5
26	LSB	
27	MSB	
28		
29		CHARACTER 6
30		
31		
32	LSB	
33	MSB	CHARACTER 7
34		
35		
36		
37		CHARACTER 8
38	LSB	
39	MSB	
40		
41		
42		
43		
44	LSB	
45	MSB	
46		
47		
48		
49		
50	LSB	
51	MSB	
52		
53		
54		
55		
56	LSB	

PURPOSE: To provide aircraft identification and category for aircraft that are not equipped with 1 090 MHz ADS-B.

Type coding:

- 1 = Aircraft identification, category set D
- 2 = Aircraft identification, category set C
- 3 = Aircraft identification, category set B
- 4 = Aircraft identification, category set A

ADS-B Emitter Category coding:

Set A:

- 0 = No ADS-B emitter category information
- 1 = Light (<15 500 lb or 7 031 kg)
- 2 = Small (15 500 to <75 000 lb or 7 031 to <34 019 kg)
- 3 = Large (75 000 to 300 000 lb or 34 019 to 136 078 kg)
- 4 = High vortex aircraft
- 5 = Heavy (>300 000 lb or 136 078 kg)
- 6 = High performance (>5 g acceleration) and high speed (>400 kt)
- 7 = Rotorcraft

Set B:

- 0 = No ADS-B emitter category information
- 1 = Glider/sailplane
- 2 = Lighter-than-air
- 3 = Parachutist/skydiver
- 4 = Ultralight/hang-glider/paraglider
- 5 = Reserved
- 6 = Unmanned Aerial Vehicle
- 7 = Space/Trans-atmospheric vehicle

Set C:

- 0 = No ADS-B emitter category information
- 1 = Surface vehicle — emergency vehicle
- 2 = Surface vehicle — service vehicle
- 3 = Fixed ground or tethered obstruction
- 4 = Cluster obstacle
- 5 = Line obstacle
- 6–7 = Reserved

Set D: Reserved

Aircraft identification coding:

As specified in Annex 10, Volume IV, Table 3-9.

Table B-3-4a. TIS-B velocity messages (Subtypes 1 and 2: Velocity over ground)**MB FIELD**

1	MSB	1
2		0
3	FORMAT TYPE CODE = 19	0
4		1
5	LSB	1
6	SUBTYPE 1 0	SUBTYPE 2 0
7	0	1
8	1	0
9	IMF (specified in §B.3.4.4.2)	
10	MSB	
11	NAVIGATION ACCURACY CATEGORY FOR POSITION	
12	(NAC _P) (specified in §B.2.3.10.7)	
13	LSB	
14	DIRECTION BIT for E-W Velocity: 0 = East, 1 = West	
15	EAST — WEST VELOCITY	
16	NORMAL: LSB = 1 kt	SUPERSONIC: LSB = 4 kt
17	All zeros = no velocity information	All zeros = no velocity information
18	<u>Value</u> <u>Velocity</u>	<u>Value</u> <u>Velocity</u>
19	1 0 kt	1 0 kt
20	2 1 kt	2 4 kt
21	3 2 kt	3 8 kt
22		
23	1 022 1 021 kt	1 022 4 084 kt
24	1 023 >1 021.5 kt	1 033 >4 086 kt
25	DIRECTION BIT for N-S Velocity: 0 = North, 1 = South	
26	NORTH — SOUTH VELOCITY	
27	NORMAL: LSB = 1 kt	SUPERSONIC: LSB = 4 kt
28	All zeros = no velocity information	All zeros = no velocity information
29	<u>Value</u> <u>Velocity</u>	<u>Value</u> <u>Velocity</u>
30	1 0 kt	1 0 kt
31	2 1 kt	2 4 kt
32	3 2 kt	3 8 kt
33		
34	1 022 1 021 kt	1 022 4 084 kt
35	1 023 >1 021.5 kt	1 023 >4 086 kt
36	GEO FLAG (GEO = 0)	
37	SIGN BIT FOR VERTICAL RATE: 0 = Up, 1 = Down	
38	VERTICAL RATE	
39	All zeros = no vertical rate information; LSB = 64 ft/min	
40	<u>Value</u> <u>Vertical Rate</u>	
41	1 0 ft/min	
42	2 64 ft/min	
43		
44	510 32 576 ft/min	
45	511 >32 608 ft/min	
46		
47	NIC SUPPLEMENT (see §B.2.3.10.6)	
48	MSB	
49	NAVIGATION ACCURACY CATEGORY FOR VELOCITY	
50	LSB (NAC _V) (see §B.2.3.5.5)	
51	MSB SURVEILLANCE INTEGRITY LEVEL	
52	LSB (SIL) (see §B.2.3.10.9)	
53		
54	RESERVED	
55		
56		

PURPOSE: To provide velocity information for aircraft that are not equipped with 1 090 MHz ADS-B when the TIS-B service is based on high quality surveillance data.

Subtype shall be coded as follows:

Code	Velocity	Type
0	Reserved	
1	Ground Speed	Normal
2		Supersonic
3	Airspeed, Heading	Normal
4		Supersonic
5	Reserved	
6	Reserved	
7	Reserved	

Note 1.— The “vertical rate” and “geometric height difference from barometric altitude” fields for surface aircraft do not need to be processed by TIS-B receivers.

Note 2.— When bit 36 = 0, then bits 37–56 contain the fields shown in the left hand side of this page. When bit 36 = 1, then bits 37–56 contain the fields shown below.

36	GEO FLAG (GEO = 1)	
37	SIGN BIT FOR VERTICAL RATE: 0 = Up, 1 = Down	
38	VERTICAL RATE	
39	All zeros = no vertical rate information; LSB = 64 ft/min	
40	<u>Value</u> <u>Vertical Rate</u>	
41	1 0 ft/min	
42	2 64 ft/min	
43		
44	510 32 576 ft/min	
45	511 >32 608 ft/min	
46		
47	NIC SUPPLEMENT (see §B.2.3.10.6)	
48	RESERVED	
49	DIFFERENCE SIGN BIT: (0 = above baro alt., 1 = below baro. alt.)	
50	GEOMETRIC HEIGHT DIFFERENCE FROM BARO. ALT.	
51	All zeros = no information; LSB = 25 ft	
52	<u>Value</u> <u>Difference</u>	
53	1 0 ft	
54	2 25 ft	
55	126 3 125 ft	
56	127 >3 137.5 ft	