4.2.5 Galileo Decoded Message Blocks

GALNav	Number: 4002 "OnChange" interval: output each time a new navigation data batch is decoded.

The GalNav block contains the following decoded navigation data for one Galileo satellite:

- orbital elements and clock corrections
- health, Signal-In-Space Accuracy (SISA) indexes and Broadcast Group Delays (BGDs) for each carrier or carrier combinations.

The interpretation of the clock correction parameters (t_oc, a_f0, a_f1, a_f2) depends on the value of the Source field:

Source	Message type	Applicable Clock Model
2	I/NAV	(L1,E5b)
16	F/NAV	(L1,E5a)

If the receiver is decoding both the I/NAV and the F/NAV data stream, it will output a GalNav block for the I/NAV stream, containing the (L1, E5b) clock model, and a different GalNav block for the F/NAV stream, containing the (L1, E5a) clock model.

Depending on the message type being decoded, some health, SISA or BGD values may not be available (in that case they are set to their respective Do-Not-Use values). The following health, SISA and BGD values are guaranteed to be available for a given value of the Source field:

Source	Health, SISA and BGD availability
2 (I/NAV)	At least L1-B_{DVS}, L1-B_{HS}, E5b_{DVS},E5b_{HS}, SISA_L1E5b and BGD_L1E5b are available
16 (F/NAV)	At least E5a_{DVS},E5a_{HS}, SISA_L1E5a and BGD_L1E5a are available

The IODNav field identifies the issue of data. All orbital elements, clock parameters and SISA values in the block are guaranteed to refer to the same data batch identified by IODNav. The fields Health_OSSOL, BGD_L1E5a, BGD_L1E5b and CNAVenc are not covered by the issue of data, and the block simply contains the latest received value.

Please refer to the Galileo Signal-In-Space ICD for the interpretation and usage of the parameters contained in this SBF block.

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite (see 4.1.9)

Source	u1			See table above: this field indicates how to interpret the clock correction parameters.
SQRT_A	f8	1 $m^{1/2}$		Square root of the semi-major axis
M_0	f8	1 semi-circle		Mean anomaly at reference time
e	f8			Eccentricity
i_0	f8	1 semi-circle		Inclination angle at reference time
omega	f8	1 semi-circle		Argument of perigee
OMEGA_0	f8	1 semi-circle		Longitude of ascending node of orbit plane at weekly epoch
OMEGADOT	f4	1 semi-circle / s		Rate of right ascension
IDOT	f4	1 semi-circle / s		Rate of inclination angle
DEL_N	f4	1 semi-circle / s		Mean motion difference from computed value
C_uc	f4	1 rad		Amplitude of the cosine harmonic correction term to the argument of latitude
C_us	f4	1 rad		Amplitude of the sine harmonic correction term to the argument of latitude
C_rc	f4	1 m		Amplitude of the cosine harmonic correction term to the orbit radius
C_rs	f4	1 m		Amplitude of the sine harmonic correction term to the orbit radius
C_ic	f4	1 rad		Amplitude of the sine harmonic correction term to the angle of inclination
C_is	f4	1 rad		Amplitude of the cosine harmonic correction term to the angle of inclination
t_oe	u4	1 s		Reference time, ephemeris
t_oc	u4	1 s		Reference time, clock. The Source field indicates which clock model t_oc refers to.
a_f2	f4	1 s / s^2		SV clock aging. The Source field indicates which clock model a_f2 refers to.
a_f1	f4	1 s / s		SV clock drift. The Source field indicates which clock model a_f1 refers to.
a_f0	f8	1 s		SV clock bias. The Source field indicates which clock model a_f0 refers to.
WNt_oe	u2	1 week		WN associated with t_oe, in GPS time frame, modulo 4096
WNt_oc	u2	1 week		WN associated with t_oc, in GPS time frame, modulo 4096
IODnav	u2			Issue of data, navigation (10 bits)
Health_OSSOL	u2			Bit field indicating the last received Health Status (HS) and Data Validity Status (DVS) of the E5a, E5b and L1-B signals: Bit 0: If set, bits 1 to 3 are valid, otherwise they must be ignored. Bit 1: 1-bit L1-B_{DVS} Bits 2-3: 2-bit L1-B_{HS} Bit 4: If set, bits 5 to 7 are valid, otherwise they must be ignored. Bit 5: 1-bit E5b_{DVS} Bits 6-7: 2-bit E5b_{HS} Bit 8: If set, bits 9 to 11 are valid, otherwise they must be ignored. Bit 9: 1-bit E5a_{DVS} Bits 10-11: 2-bit E5a_{HS} Bits 12-15: Reserved
Health_PRS	u1			Reserved

SISA_L1E5a	u1		255	Signal-In-Space Accuracy Index (L1, E5a)
SISA_L1E5b	u1		255	Signal-In-Space Accuracy Index (L1, E5b)
SISA_L1AE6A	u1		255	Reserved
BGD_L1E5a	f4	1 s	$-2 \cdot 10^{10}$	Last received broadcast group delay (L1, E5a)
BGD_L1E5b	f4	1 s	$-2 \cdot 10^{10}$	Last received broadcast group delay (L1, E5b)
BGD_L1AE6A	f4	1 s	$-2 \cdot 10^{10}$	Reserved
CNAVenc	u1		255	2-bit C/NAV encryption status.

GALAlm	Number: 4003 "OnChange" interval: output each time a new almanac set is received for a satellite.

The GalAlm block contains the decoded almanac data for one Galileo satellite.

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite from which these almanac parameters have been received (see 4.1.9)
Source	u1			See corresponding field in the GalNav block. Source can take the value 18 to indicate that the almanac data contained in this block has been merged from INAV and FNAV pages.
e	f4			Eccentricity
t_oa	u4	1 s		almanac reference time of week
delta_i	f4	1 semi-circle		Inclination angle at reference time, relative to nominal
OMEGADOT	f4	1 semi-circle / s		Rate of right ascension
SQRT_A	f4	1 $m^{1/2}$		Square root of the semi-major axis, relative to nominal
OMEGA_0	f4	1 semi-circle		Longitude of ascending node of orbit plane at weekly epoch
omega	f4	1 semi-circle		Argument of perigee
M_0	f4	1 semi-circle		Mean anomaly at reference time
a_f1	f4	1 s / s		SV clock drift
a_f0	f4	1 s		SV clock bias
WN_a	u1	1 week		2-bit almanac reference week
SVID_A	u1			SVID of the Galileo satellite of which the almanac parameters are provided in this block (see 4.1.9 for the SVID numbering convention).
health	u2			Bit field indicating the health status (HS) of the E5a, E5b, L1-B, L1-A and E6-A signals: Bit 0: If set, bits 1 and 2 are valid, otherwise they must be ignored. Bits 1-2: 2-bit L1-B_{HS} Bit 3: If set, bits 4 and 5 are valid, otherwise they must be ignored. Bits 4-5: 2-bit E5b_{HS} Bit 6: If set, bits 7 and 8 are valid, otherwise they must be ignored. Bits 7-8: 2-bit E5a_{HS} Bit 9: Not applicable Bits 10-11: Not applicable Bit 12: Not applicable Bits 13-14: Not applicable Bit 15: Reserved

IODa	u1			4-bit Issue of Data for the almanac.

GALIon	Number: 4030 "OnChange" interval: output each time the ionospheric parameters are received from a Galileo satellite.

The GalIon block contains the decoded ionosphere model parameters of the Galileo system.

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite from which these parameters have been received (see 4.1.9)
Source	u1			Message type from which the data has been decoded: 2: I/NAV 16: F/NAV
a_i0	f4	$1 \cdot 10^{-22}$ W / (m^2 Hz)		Effective ionization level, a_{i0}
a_i1	f4	$1 \cdot 10^{-22}$ W / (m^2 Hz) / deg		Effective ionization level, a_{i1}
a_i2	f4	$1 \cdot 10^{-22}$ W / (m^2 Hz) / deg^2		Effective ionization level, a_{i2}
StormFlags	u1			Bit field containing the five ionospheric storm flags: Bit 0: SF5 Bit 1: SF4 Bit 2: SF3 Bit 3: SF2 Bit 4: SF1 Bits 5-7: Reserved

GALUtc	Number: 4031 "OnChange" interval: output each time the UTC offset parameters are received from a Galileo satellite.

The GalUtc block contains the decoded UTC parameter information.

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite from which these parameters have been received (see 4.1.9)
Source	u1			Message type from which the data has been decoded: 2: I/NAV 16: F/NAV
A_1	f4	1 s / s	$-2 \cdot 10^{10}$	first order term of polynomial
A_0	f8	1 s	$-2 \cdot 10^{10}$	constant term of polynomial
t_ot	u4	1 s		reference time of week for UTC data
WN_ot	u1	1 week		UTC reference week number, to which t_ot is referenced
DEL_t_LS	i1	1 s		Delta time due to leap seconds whenever the effectivity time is not in the past
WN_LSF	u1	1 week		Effectivity time of leap second (week)
DN	u1	1 day		Effectivity time of leap second (day, from 1 to 7)
DEL_t_LSF	i1	1 s		Delta time due to leap seconds whenever the effectivity time is in the past

GALGstGps	Number: 4032 "OnChange" interval: output each time valid GST-GPS offset parameters are received from a Galileo satellite.

This block contains the decoded GPS to Galileo System Time offset parameters. This block is only output if these parameters are valid in the navigation page (i.e. if they are not set to "all ones").

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite from which these parameters have been received (see 4.1.9)
Source	u1			Message type from which the data has been decoded: 2: I/NAV 16: F/NAV
A_1G	f4	$1 \cdot 10^9$ ns / s		Rate of change of the offset
A_0G	f4	$1 \cdot 10^9$ ns		Constant term of the offset
t_oG	u4	1 s		Reference time of week
WN_oG	u1	1 week		6-bit reference week number.

GALSARRLM	Number: 4034 "OnChange" interval: generated each time a SAR RLM message is decoded.

This block contains a decoded Galileo search-and-rescue (SAR) return link message (RLM).

Parameter	Type	Units	Do-Not-Use	Description
Sync1	c1			Block Header, see 4.1.1
Sync2	c1			
CRC	u2			
ID	u2			
Length	u2	1 byte		
TOW	u4	0.001 s	4294967295	SIS time stamp, see 4.1.3
WNc	u2	1 week	65535	
SVID	u1			SVID of the Galileo satellite from which this RLM has been received.
Source	u1			Message type from which the data has been decoded: 2: I/NAV 16: F/NAV
RLMLength	u1			Length of the RLM message in bits. RLMLength can be either 80 for a short message or 160 for a long message.
Reserved	u1[3]			Reserved for future use, to be ignored by decoding software
RLMBits	u4[*N*]			Bits in the RLM message, with the first bit being the MSB of RLMBits[0]. *N* is 3 for a short message (i.e. if RLMLength is 80), and 5 for a long message (i.e. if RLMLength is 160). The 16 unused bits of a short message are set to 0. These bits correspond to the 16 LSBs of RLMBits[2].
Padding	u1[..]			Padding bytes, see 4.1.5