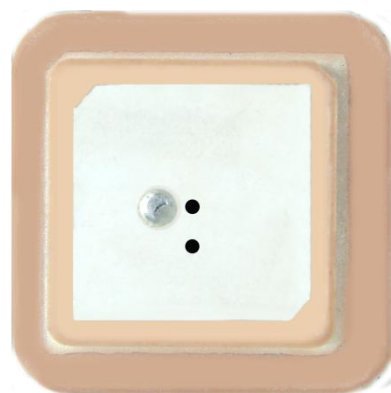
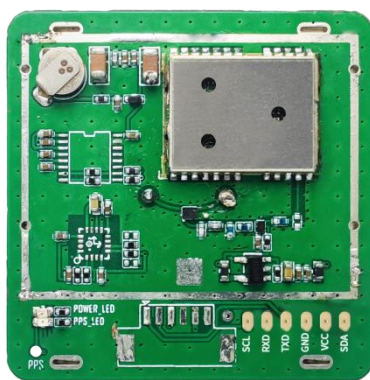




JS-ATP38-M

PRODUCT SPECIFICATION

Data Sheet



Contents

Revision History	2
1 Product Description	3
1.1 Overview	3
1.2 Product Features	3
1.3 Performance	4
1.4 Protocol	5
1.5Antenna	5
1.6Product Applications	5
2 Pin Definitions	5
2.1 Pin Assignment Definitions 5	5
2.2 LED Status Indicators	6
3 Electrical Specifications	6
4 Mechanical Specifications	6
5 Interface Configuration Options	7
5.1 Interface Description	7
5.1.1 Block Diagram	7
5.1.2 Application Circuit	8
6 ROHS	8
7 NMEA	8
7.1 NMEA Protocol	8
7.2 Standard Information	10
7.2.1 GGA	11
7.2.2 GLL	11
7.2.3 GSA	12
7.2.4 GSV	12
7.2.5 RMC	13
7.2.6 VTG	13
7.2.7 ZDA	14

Revision History

Revision	Date	Content of Revision	Comments
V1.0	2023-02-21	Initial Version	Chen Kang
V1.1	2023-02-27	Revision of Known Content	Chen Kang

This document applies to the following products:

ProductType	Product Model	Product Status
Integrated GNSS Antenna Module	JS-ATP38-M	Mass Production
Integrated GNSS Antenna Module	JS-ATP38R-M	Mass Production

1 Product Description

1.1 Overview

JS-ATP38-M adopts a multimode solution, low power consumption, and low cost. It is a multimode dual-frequency (GPS, BDS, GLONASS, Galileo, QZSS, and SBAS, L1+L5) positioning module developed to meet the requirements of a wide range of applications and end products. Based on a high-performance SOC positioning engine, this receiver offers excellent sensitivity and acquisition time, with interference suppression measures, ensuring reliable positioning even in difficult signal conditions.

1.2 Product Features

- Based on high-performance GNSS SOC series
- 135 channels (L1:75, L5:60)*
- Cold start acquisition sensitivity of -148dBm, tracking sensitivity of -165dBm
- Up to 10Hz navigation update rate
- Supports GPS, BDS, GLONASS, Galileo, QZSS, and SBAS
- Supports AGPS
- Indoor and outdoor multipath detection and compensation
- Rich hardware interface for various configurations
- Integrated TCXO, LNA, SAW, and RTC
- Compact size (38 *11.5 mm±0.3mm), suitable for space-sensitive applications
- Complies with ROHS standards
- Supports standard NMEA 0183 V3.01/V4.10
- Supports 1PPS output
- Number of channels in wearable mode is L1:42, L5:30

1.3 Performance

Parameters	Specifications	
Constellation Frequency Points	■GPS L1CA L5 ■BDS B1I B2a ■Galileo E1B E1C E5a	
	■GLONASS L1OF ■QZSS L1CA L1SAIF L5	
	■SBAS WAAS EGNOS MSAS GAGAN	
Sensitivity	Tracking and Navigation	-165dBm
	Cold Start	-148dBm
First Fix Time ¹	Cold Start	24s
	Hot Start	1s
GNSS Positioning Accuracy ²	Horizontal 3G+B	1.0m (L1+L5); 2.5m (L1)
	Vertical	2.25m
Time Pulse Signal Accuracy	1PPS	10ns
Speed Accuracy ³	0.05m/s	
Operational Limits ⁴	Acceleration	4g
	Altitude Limit	10000m
	Speed Limit	100m/s
Time Pulse Signal Frequency	1Hz	
Baud Rate	4800-921600bps (default 115200 bps) ⁵	
Maximum Navigation Update Rate	10Hz (default is 1Hz)	

¹ All satellites at -130dBm

² Open sky, stationary for 24 hours, -130dBm, >6SVs, CEP 50%

³ 50% @ 30m/s dynamic operation

⁴ Assuming airborne ≤4g platform

⁵ Opening debuglog requires support for higher baud rates above 230400bps

1.4 Protocol

Protocol	Type
NMEA 0183 V3.01/V4.10	Input/Output, ASCII

1.5Antenna

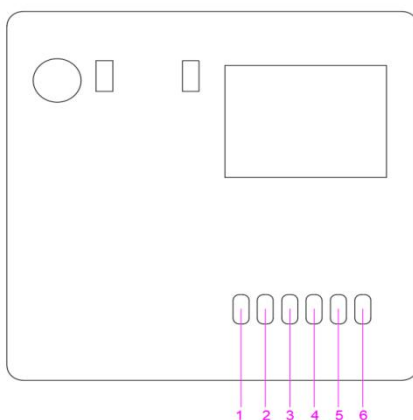
Parameters	Specifications
Passive Antenna Type	38*38*6mm (L5) stacked on 28.0*28.0*4.0mm (L1)

1.6Product Applications

- Automotive Applications
- Smart Logistics Dispatching
- Intelligent robots
- Personal travel and wilderness exploration
- Maritime Navigation, Fleet Management
- Ground vehicle tracking and urban intelligent traffic management
- Wearable devices
- Emergency rescue

2 Pin definition

2.1 Pin assignment definition



PIN	Name	I/O	Description
1	SCL	O	IIC-SCL
2	RXD	I	UART data input
3	TXD	O	UART data output
4	GND	G	GND
5	VCC	P	Main power supply
6	SDA	O	IIC-SDA

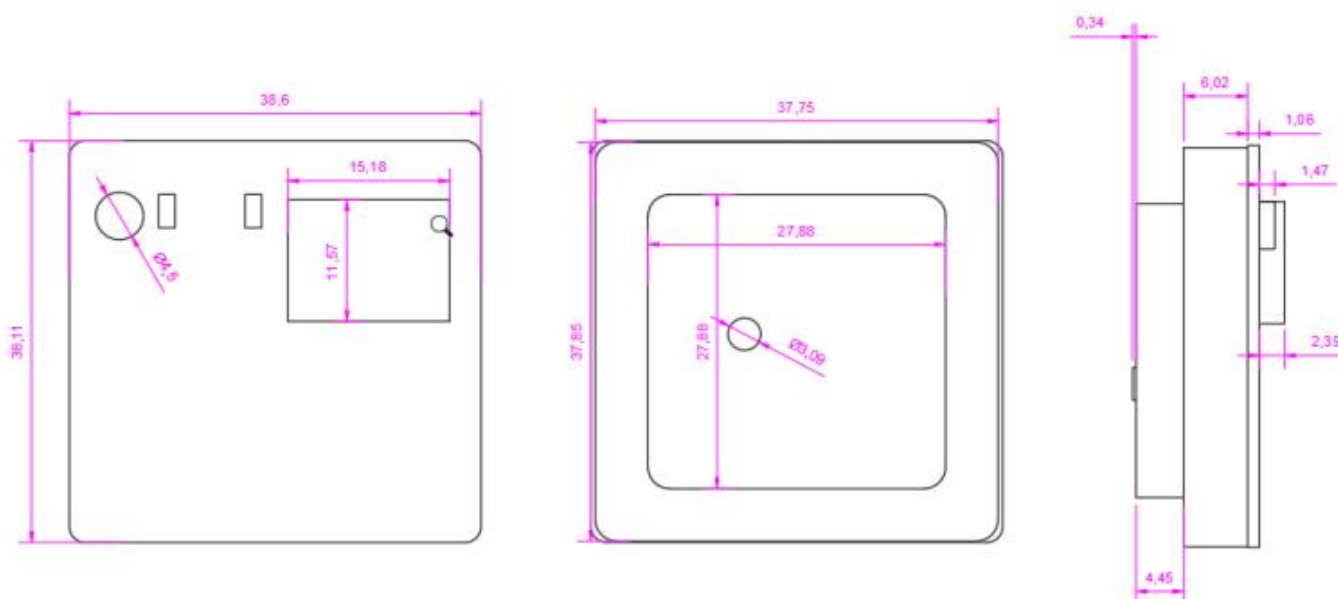
3 Electrical specifications

Parameters	Symbol	Minimum	Typical	Maximum	Unit
Power supply voltage	VCC	3.0	5.0	5.5	V
Average power supply current	Gain	37@5V	41@5V	53@5V	mA
	Tracking	42@5V	47@5V	58@5V	mA
Backup battery			0.07		F
Backup battery current	I_BCKP		11@3.3V		uA
Digital input-output voltage	Div	3.0	3.3	3.3	V
Storage temperature	Tstg	-40		85	°C
Operating temperature ¹	Topr	-40		85	°C
Farad capacitor ²	Tstg	-25		60	°C
Humidity				95	%

¹ This temperature range is the operating temperature range without a Farad capacitor

² When the temperature is below -25°C or above 60°C, this module cannot perform a hot start

4 Mechanical Specifications



Unit: mm Dimensional Tolerance: $\pm 0.3\text{mm}$

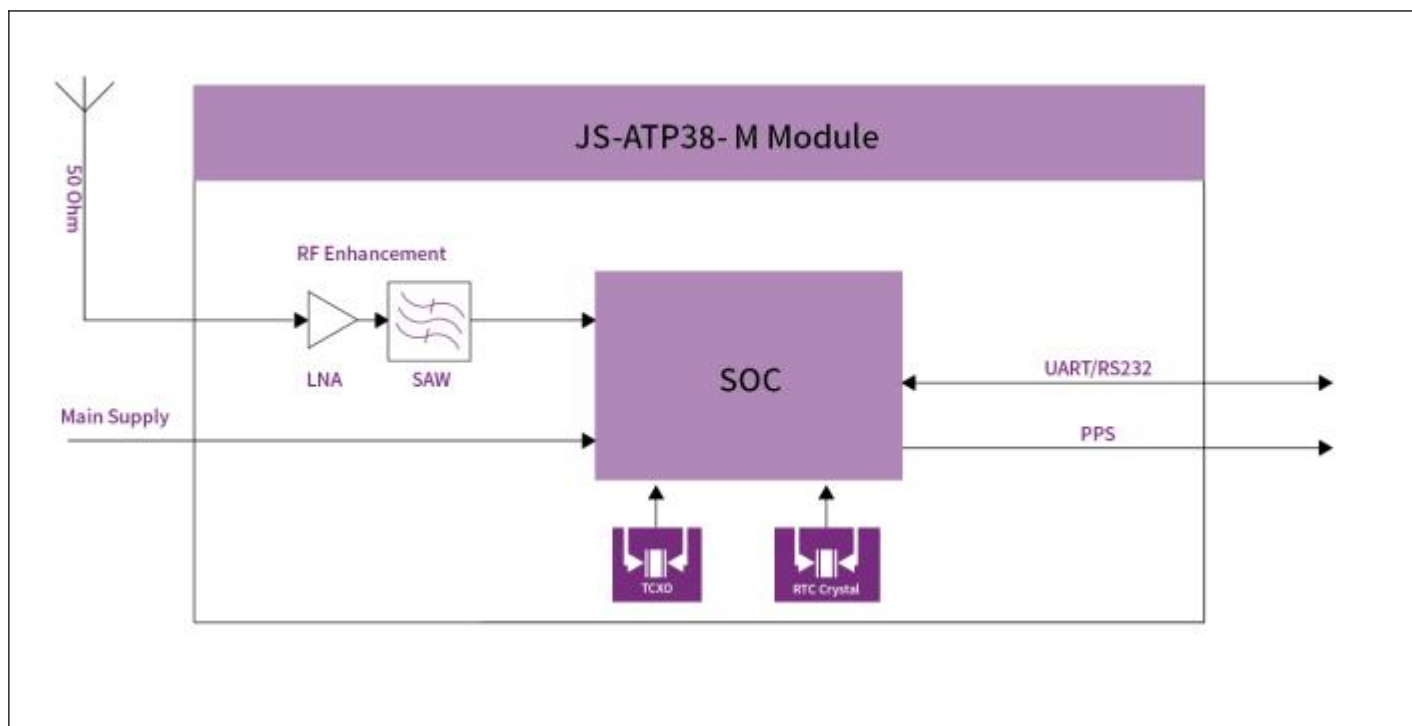
5 Interface Configuration Options

5.1 Interface Description

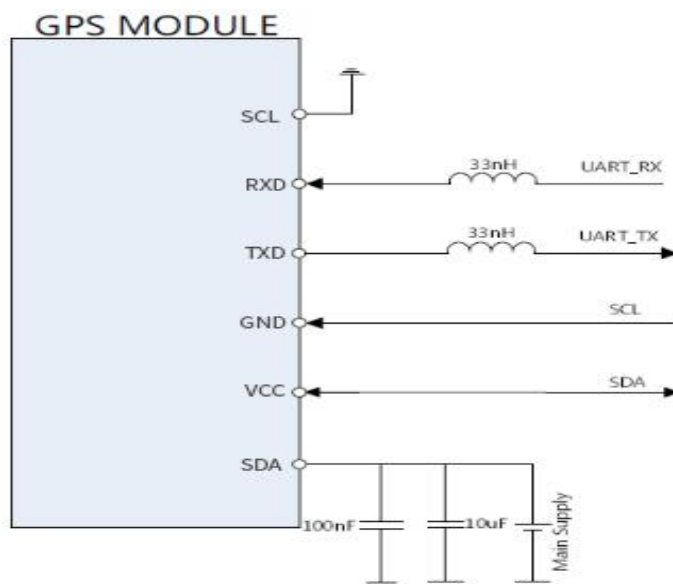
The JS-ATP38-M module can be selected according to the corresponding interface output terminal and additional sensors needed, here the geomagnetic model is the default option, other interfaces mainly have the following choices.

Name	TTL	RS232
JS-ATP38-M	√	NC

5.1.1 Block Diagram



5.1.2 Application Circuit



6 ROHS

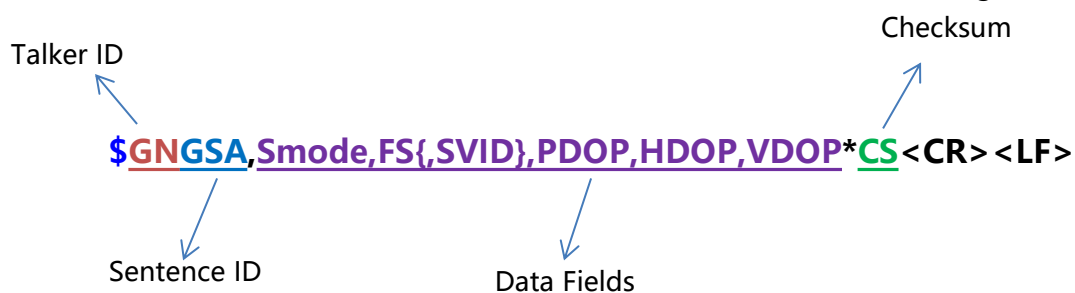
This product complies with the RoHS standard

7 NMEA

This module supports National Marine Electronics Association (NMEA) messages based on NMEA 0183 v3.01/v4.10. The section below shows the structure of NMEA protocol messages and the corresponding general standard message format.

7.1 NMEA Protocol

Under normal circumstances, NMEA messages start with a \$ character, followed by talker ID, sentence ID, data fields, and checksum, and then end with '<CR>' '<LF>', as shown in the figure below.



Detailed Explanation of NMEA Protocol

Parameters	String Length	Description
Preamble Code	1	\$
Talker ID	2	Applicable to various GNSS configurations, such as GP/GL/GA/GB/GN
Sentence ID	3	Field Explanation, such as GGA/GSA/GSV/RMC
Data Field	~	A comma symbol must be inserted before each data field to assist the decoder in processing the Data Field
*	1	The asterisk * marks the end of the Data Field
Checksum	2	Checksum of the data between the preamble code and *
CR, LF	2	These two bytes are used to identify the end of the data packet

Talker ID Description

Talker ID	Description
GP	GPS
GL	GLONASS
GA	Galileo
GB*	BDS
GI*	NavIC
GN	Multi-GNSS

* NMEA v4.10 does not define BDS /NavIC Talker ID. GB / GI are only defined in NMEA v4.11.

Note: This product does not support NavIC

Sentence ID Description

Sentence ID	Description
GGA	Receiver Positioning Data
GLL	Latitude and Longitude, with Time Positioning and Status
GSA	Dilution of Precision (DOP) and Effective Satellites
GSV	Visible Satellite Information
RMC	Recommended Minimum Specific GNSS Data
VTG	Course Over Ground and Ground Speed
ZDA	GNSS Date and Time

Different GNSS System Talker ID Display(For NMEA 0183 v3.01)

Talker ID	GPS only	GLONASS only	Galileo only	Beidou only	NavIC only	Multi-GNSS GPS+GLO+GAL+BDS+NavIC
GGA	GP	GL	GA	GB*	GI*	GN
GLL						
RMC						
VTG						
ZDA						
GSA**						
GSV						GP+GL+GA+GB+GI

Different GNSS System Talker ID Display(For NMEA 0183 v4.10)

Talker ID	GPS only	GLONASS only	Galileo only	Beidou only	NavIC only	Multi-GNSS GPS+GLO+GAL+BDS+NavIC
GGA	GP	GL	GA	GB*	GI*	GN
GLL						
RMC						
VTG						
ZDA						
GSA**						
GSV						GP+GL+GA+GB+GI

* NMEA v4.10 does not define BDS/NavIC Talker ID. GB / GI are only defined in NMEA v4.11.

** The difference between Talker ID of NMEA 0183 v3.01 and v4.10 is GSA.

7.2 Standard Information

The standard NMEA messages are GGA/GLL/GSA/GSV/RMC/VTG/ZDA. The definitions of satellite ID, system ID, and signal ID in NMEA sentences are shown in the table below. Here are the details of these messages based on NMEA 0183 v4.10.

7.2.1 GGA

Fixation of time, position, and related data. The output location will be affected by the selected datum. The default data is WGS84.

\$--GGA,hhmmss.sss,ddmm.mmmm,a,ddmmm.mmmm,a,x,xx,x.xx,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	Current positioning UTC time
2	ddmm.mmmm,a	Latitude (degree-minute format) - N / S
3	ddmmm.mmmm,a	Longitude (degree-minute format) - E / W
4	x	GNSS quality indicator
5	xx	Number of satellites in use, which may differ from the number seen
6	x.xx	Horizontal dilution of precision
7	x.x,M	Altitude above mean sea level (geoid), in meters
8	x.x,M	Geoid separation, in meters
9	x.x	Differential GPS Data Age
10	xxxx	Differential Reference Station ID, 0000-1023

7.2.2 GLL

Positioning Time and Status.

\$--GLL,ddmm.mmmm,a,ddmmm.mmmm,a,hhmmss.sss,A,a*hh<CR><LF>

No.	Format	Description
1	ddmm.mmmm,a	Latitude (degree-minute format) - N / S
2	ddmmm.mmmm,a	Longitude (degree-minute format) - E / W
3	hhmmss.sss	Current positioning UTC time
4	A	Status A = Data valid, V = Data invalid
5	a	Positioning Status Indicator. A=Autonomous mode, V=Estimated mode (Dead Reckoning), N=Invalid, D=Differential mode

Dilution of Precision (DOP) and Effective Satellites.

\$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.xx,x.xx,x.xx,h*hh<CR><LF>

No.	Format	Description
1	a	Mode: M = Manual, forcing 2D or 3D mode; A = Automatic, allowing 2D/3D auto-switch
2	x	Mode: 1 = Not available, 2 = 2D, 3 = 3D
3	xx	Satellite IDs used for positioning, this field displays the IDs of 12 available satellites, only the first 12 are output if there are more than 12, and the area is filled with blanks if there are less than 12 (refer to NMEA sentence's Satellite ID)
4	x.xx	PDOP
5	x.xx	HDOP
6	x.xx	VDOP
7	h	GNSS System ID (1:GPS, 2:GLONASS, 3:Galileo, 4:BDS, 6:NavIC) (Only supports NMEA v4.10 format, refer to NMEA sentences for system, signal ID)

7.2.4 GSV

Observed GNSS satellites number, PRN, elevation angle, azimuth, and signal-to-noise ratio.

\$--GSV,x,x,xx,xx,xx,xxx,xx,.....,xx,xx,xxx,xx,h*hh<CR><LF>

No.	Format	Description
1	x	Total number of sentences
2	x	Current sentence number
3	xx	Total number of visible satellites
4	xx	Satellite number
5	xx	Elevation angle, up to 90°
6	xxx	Azimuth, 000 to 359°
7	xx	Signal-to-noise ratio (C/No) 00- 99 dB-Hz, blank when not tracking
8	h	Signal ID (Only supports NMEA v4.10 format, refer to NMEA sentences for system, signal ID)

7.2.5 RMC

Recommended minimum specific GNSS data, i.e., position, SOG, COG, and time.

\$--RMC,hhmmss.sss,A,ddmm.mmmm,a,ddmmm.mmmm,a,x.xx,x.xx,xxxxxx,x.x,a,a*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	Current positioning UTC time
2	A	Status A = Autonomous mode, V = Invalid, D = Differential mode
3	ddmm.mmmm,a	Latitude (degree-minute format) - N / S
4	ddmmm.mmmm,a	Longitude (degree-minute format) - E / W
5	x.xx	Ground speed, unit: knots
6	x.xx	True ground course, unit: degrees
7	xxxxxx	Date (ddmmyy)
8	x.x,a	Magnetic deviation, unit: degrees. Direction of magnetic deviation: E-East, W-West. Fixed to be empty
9	a	Status bar. A=Autonomous mode, V=Estimated mode (dead reckoning), N=Invalid, D=Differential mode
10	a	Navigation status (only supports NMEA v4.10 format)

7.2.6 VTG

Ground Course (COG) and Ground Speed (SOG) information.

\$--VTG,x.xx,T,x.xx,M,x.xx,N,x.xx,K,a*hh<CR><LF>

No.	Format	Description
1	x.xx	True north course over ground, unit: degrees (000-359°)
2	T	True north indicator, fixed to T
3	x.xx	Magnetic north course over ground, unit: degrees (000-359°)
4	M	Magnetic north indication, fixed as M
5	x.xx	Ground speed, unit: knots (000-999 knots)
6	N	Speed unit in knots, fixed as N = nautical miles/hour
7	x.xx	Ground speed (000-999 kilometers/hour)
8	K	Speed unit, fixed as K = kilometers/hour
9	a	Positioning mode status. A=Autonomous mode, V=Estimated mode (dead reckoning), N=Invalid, D=Differential mode

7.2.7 ZDA

GNSS time and date.

\$ --ZDA,hhmmss.sss,xx,xx,xxxx,xx,xx*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	UTC time, hhmmss (hour minute second) format
2	xx	UTC date, 01 to 31 days
3	xx	UTC date, 01 to 12 months
4	xxxx	UTC date, year
5	xx	Current time, hour
6	xx	Current time, minute

Satellite ID in NMEA sentence

Constellation	PRN numbers	Satellite ID (AIROHA)	Satellite ID (NMEA 0183 v4.10)
GPS	1-32	1-32	1-32
SBAS	120-138	33-51	33-64
GLONASS	1-24	65-88	65-99
Galileo	1-36	1-36	1-36
BDS	1-63	1-63	N/A
QZSS	193-199	193-199	N/A
NavIC	1-14	1-14	N/A

System/Signal ID in NMEA sentence

Constellation	System ID (AIROHA)	Signal ID (AIROHA)	System ID (NMEA 0183 v4.10)	Signal ID (NMEA 0183 v4.10)
GPS L1C/A	1	1	1	1
GPS L5Q	1	8	1	8
GLONASS L1	2	1	2	1
GalileoE1-BC	3	7	3	7
Galileo E5a	3	1	3	1
BDS B1I	4*	1*		
BDS B2a	4*	4*		
NavIC L5	6*	1*		

* BDS is not defined in NMEA v4.10, the system/signal ID here is a custom ID