Infotainment Business Unit
STA8089-90 Firmware Configuration

1 Introduction

The STA8089-90 binary image supports the firmware configuration facility. It allows changing some application parameters in order to address most of the specific HW constraints and/or the final product functionality requirements.

The firmware configuration management supports the “Factory Setting”, embedded in the binary code, and the “Customized Setting”, stored in the GNSS backup memory (NVM). The “Factory Setting” can be changed directly on the binary image file using the FWConfig.exe tool before flashing (or upgrading) the device’s flash memory. The “Customized Setting” can be made and saved at run-time using specific NMEA commands (See the “Command Interface” sections for details).

Purpose of this document is to provide details about each supported parameter including procedures for changing and saving the firmware configuration.

The STA8089-90 Binary Image software is released with the ST defined default setting (Factory Setting). It is recommended to check if the default setting of all parameters is in line with the final product requirement. ST default setting may be changed on different releases.

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3.1 Revision History

Rev	Date	Author	Notes
0.1	12/02/2014	Andrea Di Girolamo	First revision.
0.2	14/07/2014	Andrea Di Girolamo	Rename STA8089 to STA8089-90 Fixed wrong tracking threshold range Updated antenna sensing configuration Fixed STBIN message list description Added configuration for the RTC disabling Added PZ90.2 Datum configuration
0.3	8/1/2015	Antonio Furno	Updated parameter 227 and 237
0.4	24/04/2015	Andrea Di Girolamo	Fixed CPU speed setting description Added TCXO frequency configuration
1.0	28/10/2015	Andrea Di Girolamo	Added DTM message configuration Updated NCO range and center frequency settings Added GPIO pin mode configurations Added nmea NMEA messages in the message list configuration Added deep standby enabling/disabling Added excluded satellites reporting configuration
1.1	15/12/2015	Antonio Furno	Updated CDB-ID 138 and 214

1.2	01/04/2016	Jerome Durand, Maristella Frazzetto, Andrea Di Girolamo	Low Power mode update: CDB-ID 220, 221, 224, 257, 258, 259 Update CDB-ID 226 Antenna Sensing parameters (added ADC and GPIO mode) Added CDB-ID 242, CDB-ID 243, CDB-ID 244 for Antenna Sensing GPIO mode configuration Added CDB-ID 252 Antenna sensing ADC input configuration Added $PSTMPVRAW configuration Added CDB-ID 260, WLS runtime ON-OFF configuration Added CBD-ID 249, CBD-ID 250 flash write protection configurations Added CDB-ID 121 description (replacing an obsolete description) Added CDB-ID 132 description Added CDB-ID 261 description Updated CDB-ID 201 message list Updated CDB-ID 243 – Antenna Sensing via GPIO setting 2
1.3	29/06/2016	Jerome Durand	Update of CDB-ID 257, 258, 259 for Periodic mode
1.4	28/11/2016	A.Di Girolamo	Added external RTC oscillator switch Added RTC calibration ON/OFF switch Added external shutdown control via GPIO configuration Added NMEA message list configuration for $PSTMFEDATA

Table 1: Revision history

3.2 Acronyms

Keyword	Definition
BEIDOU	China’s regional navigation satellite system
COMPASS	China’s global navigation satellite system (also known as Beidou-2, BD2)
DGPS	Differential GPS (it is the RTCM SC-104)
DTE	Data Terminal Equipment
GALILEO	Europe’s global navigation satellite system
GLONASS	GLObal NAvigation Satellite System (The Russian GNSS)
GNSS	Global Navigation Satellite System – It can include any combination of different satellite constellations like GPS, GLONASS, SBAS etc.
PPS	Pulse Per Second
RTC	Real Time Clock
SBAS	Satellite Based Augmentation System
STAGPS	Self Trained Assisted GPS.
QZSS	Quasi-Zenith Satellite System

Table 2. Acronyms

4 Configuration Data Block (CDB)

All configuration parameters are grouped in a data block. Each field is addressed by a unique ID. The IDs are made by three digits: the most significant one represent the parameter type and the others are used to identify different parameters of the same type.

The table below includes all parameters which can be changed to apply a different configuration to the STA8089-90 firmware.

The IDs not reported in the table should be considered as reserved and must be left untouched to avoid unexpected system behaviors.

ID	Parameter Name	Size Bytes	Allowed values	Default	Description
100	Debug Port Number	1	0 .. 2	0	Set debug port number
101	NMEA Port Number	1	0 .. 2	2	Set NMEA port number
102	NMEA Port Baudrate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set NMEA Baudrate
103	GPS Debug Mode	1	0x00 = Debug Mode ON 0x01 = Debug Mode OFF 0x10 = Debug OUT ON + NMEA IN 0x11 = Debug OUT OFF + NMEA IN 0xA0 = Debug OUT ON + NMEA OUT 0xA1 = Debug OUT OFF + NMEA OUT 0xB0 = Debug OUT ON + NMEA IN/OUT 0xB1 = Debug OUT OFF + NMEA IN/OUT	0	Debug port IN/OUT configuration. Extended debug mode configuration allows having on the debug port the NMEA messages and/or the NMEA input commands. NOTE: bit7 and bit5 must be enabled to have the NMEA messages over debug port.
104	GNSS Mask Angle	1	0 …. 45	5	Set the GNSS Mask Angle for low Satellite Elevation
105	GNSS Tracking Threshold [dB]	1	9..40	10	Set the satellites tracking threshold

106	Debug Port Baudrate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set Debug Baudrate
120	Cold Start Type	1	0xF = clear Almanach,Ephem,Time &Position 0xE = clear Ephemeris, Time, Position	0xE	Set the cold start type with selective data erase
121	NMEA Decimal Digits for Speed and Course values	1	First nibble: 0x1..0x8 Second nibble: 0x1..0x8	0x11	Allow setting the number of decimal digits for the speed and course data in the NMEA messages.
124	NMEA and Debug Output Redirection	1	0x11 = NMEA and Debug over UART 0x21 = NMEA over USB and Debug over UART 0x12 = NMEA over UART and Debug over USB 0x44 = NMEA and Debug over SD card	0x11	Configure the output method for NMEA and Debug messages (over UART, USB or SD card)
125	Notch Filter Setting	1	0x0..0xF	0x0	Enable or disable the Notch Filter usage
126	HW CONFIG	1	0..1	1	Select the HW configuration: 0: SOC 1: SAL
127	NMEA Decimal Digits	1	First nibble: 0x1..0x8 Second nibble: 0x1..0x8	0x55	Allow setting the number of decimal digits for the position data in the NMEA messages.
128	Differential Source Type	1	0..3	0x3	Allow selecting the differential mode source type.
129	GLONASS Satellite ID Type	1	0..1	0x1	Allow setting the GLONASS satellite ID type used in the GSV and GSA messages. 0x0 – the satellite ID is based on frequency 0x1 – the satellite ID is based on slot number.
130	CPU clock speed	1	0x00, 0x10, 0x20, 0x30, 0x02	0x30	Allow setting the CPU clock source and speed.
131	NMEA Talker ID	1	‘P’, ‘L’, ‘N’	‘P’	Allow setting the second character of the NMEA talker ID.
132	GNSS positioning CN0 Threshold [dB]	1	9..40	15	Set the satellites CN0 threshold for the positioning stage
135	SBAS Default PRN	1	120 … 138	124	Set the SBAS default PRN
138	RTCM Port Number	1	0 .. 2	0	Set the serial port number for the RTCM input.

139	RTCM Port Baud rate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set the baudrate for the RTCM input serial port.
From 140 To 188 Even IDs	RF front-end address register and operation	1	b0..b5 = address (from 0 to 24) b6..b7= operation (00b or 01b or 10b)	0xFF = Don't Touch	Set the address and the operation to be performed on the corresponding RF front end register. The address is reported in the first 6 bits. The operation is reported in the last 2 bits. Any address from 0 to 24 is allowed. Supported operations are: b6..b7 = 00b : overwrite register with provided value b6..b7 = 01b: Perform OR operation between register and provided value b6..b7 = 11b: Perform AND operation between register and provided value. Provided value is the value reported in the next parameter (e.g. 140 reports the address and operation for the value reported on 141) NOTE: using 0xFF for this parameter means don't touch the front-end register. If the front-end registers configuration is not needed, all parameters from 140 to 188 (even IDs) should be set to 0xFF. This is the default value of standard ST image.
From 141 To 189 Odd IDs	RF front-end data register value	1	Any RF front-end supported values (see front-end reference manual)	0xFF	The value to be applied to the front-end register pointed by the previous address and operation parameter (e.g. 141 reports the value to be applied to the address reported on 140)
190	NMEA Msg-List 0 output rate scaling factor.	1	1..255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes
191	NMEA Msg-List 1 output rate scaling factor.	1	1..255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes
192	NMEA Msg-List 2 output rate scaling factor.	1	1..255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes
193	USB Detect feature	1	0..1	0	Enable or disable the USB detect feature

194	USB Detect GPIO pin configuration	1	GPIO pin number (from 0 to 63)	0	Configure GPIO pin used for USB detect feature
195	USB Data Terminal Equipment feature	1	0..1	1	Enable or disable the USB Data Terminal Equipment feature
197	PPS Clock	1	16,32,48,64	32	Allow setting the PPS clock. For accurate timing application, 64 is mandatory.
198	GNSS Mask Angle Positioning	1	0 …. 45	1	Set the GNSS Mask Angle for positioning algorithm. Satellites with elevation below the mask angle are not used in the position solution.
199	Local geodetic datum	1	0..215	255	Set the local geodetic datum to be used in position reporting over the NMEA messages. Not valid number (e.g. 255) means default datum which is WSG84.
200	Application ON/OFF	4	0x2 = GPS_2D_FIX_ENABLE 0x4 = SBAS_ENABLE 0x8 = SBAS_SAT_ON_GSV_MSG_ENABLE 0x10 = STAGPS_ENABLE 0x20 = 2.5_PPM_TCXO_ENABLE 0x40 = NMEA_v301_ENABLE 0x80 = QZSS_DISTRIBUTED_ACQ_MODE_ENABLE 0x200 = CONFIG_TXT_HEADER_EN. 0x400 = ST_HEADERS_ENABLE 0x800 = RTCM_ENABLE 0x1000 = FDE_ENABLE 0x4000 = WALKING_MODE_ENABLE 0x8000 = STOP_DETECTION_ENABLE 0x10000 = GPS_ENABLE 0x20000 = GLONASS_ENABLE 0x40000 = QZSS_ENABLE 0x80000 = NMEA_GNGSV_ENABLE 0x100000 = NMEA_GNGSA_ENABLE 0x200000 = GLONASS_USE_ENABLE 0x400000 = GPS_USE_ENABLE 0x800000 = QZSS_USE_ENABLE 0x1000000 = PPS_ENABLE 0x2000000 = PPS_POLARITY_INVERSION 0x4000000 = POSITION_HOLD_ENABLE 0x8000000 = TIMING_TRAIM_ON_OFF 0x10000000 = WAAS_AUTOSEARCH_ON_OFF 0x20000000 = HIGH_DYNAMICS_ON_OFF 0x40000000 = NMEA_RAW_ON_OFF 0x80000000 = LOW_POWER_ON_OFF	0x19419644	Activates/Deactivates GNSS application features
201	NMEA Port Msg-List 0 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x288435F	Set NMEA Message List 0 (32 bits low)
202	NCO Range max.	4	-132000 to 132000	0x0	Set NCO range max. value in Hz
203	NCO Range min.	4	-132000 to 132000	0x0	Set NCO range min. value in Hz
204	NCO Center	4	-132000 to 132000	0x0	Set NCO center frequency Offset in Hz

205	Position Data Time Delay [ms]	4	0..(fix rate time period)	80 ms	Set the time delay between the measurements (on UTC second) and the position data delivery. NOTE: To reduce the jittering of the NMEA message list 2 data delivery, the messages are sent over the uart port after a fixed delay from the measurement time. This delay can be configured to achieve the best jitter reduction at different CPU speed setting.
206	GPIO Port0 CFG0	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFFFFFF	Config0 for GPIO Port0
207	GPIO Port0 CFG1	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	Config1 for GPIO Port0
208	GPIO Port1 CFG0	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFFFFFF	Config0 for GPIO Port1
209	GPIO Port1 CFG1	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	Config1 for GPIO Port1
210	NMEA Port Msg-List 1 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 1 (32 bits low)
211	NMEA Port Msg-List 2 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 2 (32 bits low)
212	SBAS satellites enable mask	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFFFFFF	Allow enabling/disabling satellites to be searched by the autoserch procedure.
213	PPS operating mode setting 1	4	-	0x0000000	Allow setting different operating modes for the PPS signal generation. (see details in the corresponding section)
214	PPS operating mode setting 2	4	-	0x0000000	Allow setting different operating modes for the PPS signal generation (see details in the corresponding section)
215	Position hold auto survey samples.	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Sets the number of position samples to be captured before entering in the position hold mode. If it is set to 0, the auto survey is disabled.
216	SBAS auto search timeouts for decoding channel.	4	-	120s,120s	Allow setting timeouts for SBAS satellite in the decoding channel (see details in the parameter description paragraph)
217	SBAS auto search timeouts for searching channel	4	-	90s ,300s	Allow setting timeouts for SBAS satellite in the serching channel (see details in the parameter description paragraph)
218	SBAS satellite parameters	4	-	0xFFFFFFFF	Allow setting parameters (PRN, longitude and service) for new SBAS satellites not supported by the was library. Not valid value (e.g. 0xFFFFFFFF) means not used.
219	SBAS satellite parameters	4	-	0xFFFFFFFF	Allow setting parameters (PRN, longitude and service) for new SBAS satellites not supported by the was library. Not valid value (e.g. 0xFFFFFFFF) means not used
220	Adaptive Low Power operating mode setting 1	4	-	15m ,10s, 10s, 180s	Allow setting the operative mode for low power algorithm.
221	Adaptive Low Power operating mode setting 2	4	-	4,60s,9, 31min	Allow setting the operative mode for low power algorithm.
222	LMS operating mode setting 1	4	-	1,0,0,,50m, 50m,	Allow setting parameters for the LMS algorithm
223	LMS operating mode setting 2	4	-	5,3,-223m	Allow setting parameters for the LMS algorithm
224	Adaptive Low Power operating mode setting 3	4		1,1,740ms	Allow setting the operative mode for low power algorithm.
225	ADC channel read configuration parameters	4	-	0x3FE	Allow setting parameters for configuration of ADC channels reading

226	Antenna Sensing configuration parameters	4	-	0x7D096010	Allow setting parameters for configuration of Antenna Sensing feature
227	Application ON/OFF 2	4	0x1 = NMEA_COMMAND_ECO_ENABLE 0x2 = NMEA_TTFF_MESSAGE_ENABLE 0x4 = FEW_SATS_POS_ESTIMATION_ENABLE 0x8 = STBIN_IN_OUT_ENABLE 0x20 = NMEA_IN_OUT_INTERFACE_SELECT 0x40 = GALILEO_ENABLE 0x80 = GALILEO_USAGE_ENABLE 0x100 = COMPASS_ENABLE 0x200 = COMPASS_USAGE_ENABLE 0x800 = RTC_USAGE_DISABLING 0x1000 = FAST_SATELLITE_DROP_ENABLE 0x2000 = RESERVED 0x4000 = EXCLUDED_SATS_REPORTING_ENABLE	0x345	Activates/Deactivates GNSS application features
228	NMEA Port Msg-List 0 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x2000	Set NMEA Message List 0 (32 bits high)
229	NMEA Port Msg-List 1 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 1 (32 bits high)
230	NMEA Port Msg-List 2 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 2 (32 bits high)
231	NMEA on Debug Port Msg-List 0 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 0 (32 bits low)
232	NMEA on Debug Port Msg-List 0 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 0 (32 bits high)
233	NMEA on Debug Port Msg-List 1 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 1 (32 bits low)
234	NMEA on Debug Port Msg-List 1 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 1 (32 bits high)
235	NMEA on Debug Port Msg-List 2 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 2 (32 bits low)
236	NMEA on Debug Port Msg-List 2 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 2 (32 bits high)
237	Default GPS MIN-MAX week number	4	MIN: 0x0000 to 0xFFFF - MAX: 0x0000 to 0xFFFF	MIN = 1821 MAX = 3300	Set default MIN-MAX range for GPS week number. NOTE: Min week number is used for correct GPS week number decoding. Max week number is used for GPS week validity check.
238	Default UTC delta time	4	0x0000.0000 to 0xFFFF.FFFF	16	Default value of GPS time to UTC delta time in seconds (leap second)
240	STBIN Msg-List (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x1FF	Set STBIN Message List (32 bits low)
241	STBIN Msg-List (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set STBIN Message List (32 bits high)
245	TCXO Frequency	4	0x0, 0xA, 0xB	0x0	Select the TCXO frequency among the supported ones. (NOTE: supported frequencies are 26MHz, 48MHz and 55MHz)
253	GPIO Port0 Mode AFSLA	4	0x0000.0000 to 0xFFFF.FFFF	0xFFF7C3F0	AFSLA register configuration for GPIO Port0
254	GPIO Port0 Mode AFSLB	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	AFSLB register configuration for GPIO Port0
255	GPIO Port1 Mode AFSLA	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFFFFFF	AFSLA register configuration for GPIO Port1
256	GPIO Port1 Mode AFSLB	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	AFSLB register configuration for GPIO Port1
257	Low Power Setting	4	0x0, 0x1	0x1	Allow configuration of low power functionalities
260	WLS configuration params	4	-	0x00190A00	WLS algorithm configuration params

261	Dynamic modes configurations	4	0,1,3	0	Allow setting the dynamic mode for the satellite tracking engine.
301	PPS Pulse Duration	8	<= 1.0 seconds	0.5	PPS pulse width. It is the time distance (in seconds) from PPS rising edge and next PPS falling edge.
302	PPS Delay Correction	8	< 1.0 seconds	0.0	PPS time delay correction n seconds. It allows to compensate any delay introduced on PPS signal by RF chain.
303	GNSS Fix Rate	8	> 0.1 seconds	1.0	Set the GNSS fix rate period in seconds. NOTE: high fix rates may require a different setting (e.g. 208MHz) of the CPU speed.
304	Position Hold Latitude [deg]	8	From -90.0 to 90.0	40.91747	Set the position hold latitude.
305	Position Hold Longitude [deg]	8	From -180.0 to 180.0	14.27586	Set the position hold longitude.
306	Position Hold Altitude [m]	8	From -1500 to 100000	88.43307	Set the position hold altitude.
307	GPS RF delay correction	8		718E-9	Time delay compensation for the GPS RF path.
308	GLONASS RF delay correction	8		-420E-9	Time delay compensation for the GLONASS RF path.
309	TRAIM alarm threshold	8		15ns	Time error threshold for the satellites exclusion in the TRAIM algorithm.
310	COMPASS RF delay correction	8		100E-9	Time delay compensation for the COMPASS RF path.
400	2D DOPs Threshold	4	P = 0..99,V = 0..99, H = 0..99,G=0..99	P=15,V=12, H=12,G=18	Set default DOP values for 2D fixes
401	3D DOPs Threshold	4	P = 0..99,V = 0..99, H = 0..99,G=0..99	P=15,V=12, H=12,G=18	Set default DOP values for 3D fixes
402	2D DOPs Startup	4	P = 0..99,V = 0..99, H = 0..99,G=0..99	P=15,V=12, H=12,G=18	Set startup DOP values for 2D fixes
403	3D DOPs Startup	4	P = 0..99,V = 0..99, H = 0..99,G=0..99	P=15,V=12, H=12,G=18	Set startup DOP values for 3D fixes
500	Text Message	72	ASCII Characters	Default Configuration	Define Text message to be sent at startup

4.1 CDB-ID 100 – Debug port setting

Allow setting the debug port number.

A system reboot is needed to have new setting in use.

4.2 CDB-ID 101 – NMEA port setting

Allow setting the NMEA port number.

A system reboot is needed to have new setting in use.

4.3 CDB-ID 102 – NMEA port baudrate setting

Allow setting the baudrate for the NMEA port number. The translation table is reported below.

Parameter Value	Baudrate
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud
0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

A system reboot is needed to have new setting in use.

4.4 CDB-ID 103 – Debug mode setting

Allow setting the debug port operational modes.

Bit	Bitmask	Description
0	0x1	Debug messages ON/OFF 0 = ON 1 = OFF
1	0x2	Not Used
2	0x4	Not Used
3	0x8	Not Used
4	0x10	NMEA Input on debug port enabling/disabling 0 = disabled 1 = enabled
5	0x20	NMEA Output on debug port enabling/disabling 0 = disabled 1 = enabled NOTE: this bit is used only when bit7 is enabled.
6	0x40	NMEA Output enabling/disabling 0 = disabled 1 = enabled NOTE: this bit is used only when bit7 is enabled.
7	0x80	Dual NMEA Output enabling/disabling 0 = disabled 1 = enabled NOTE: this bit is used to enable/disable the dual NMEA port feature. It must be enabled to have NMEA messages over debug port.

Any combination of bits in the bitmask is allowed. When debug is configured to be OFF and both NMEA IN and OUT are disabled, the debug port pins are in high impedance mode.

Example: setting 0x01 the debug port pins are in high impedance mode.

A system reboot is needed to have new setting in use.

4.5 CDB-ID 104 – Mask angle setting

Allow setting the minimum elevation angle at which a satellite can be tracked. Satellite with elevation below the mask angle cannot be tracked.

A system reboot is needed to have new setting in use.

4.6 CDB-ID 105 – GNSS Tracking threshold

Allow setting the minimum CN0 [dB] at which a satellite can be tracked. Satellite with CN0 below the configured threshold cannot be tracked.

A GNSS engine reset (suspend/restart) is needed to have this setting in place.

4.7 CDB-ID 106 – DEBUG port baudrate setting

Allow setting the baudrate for the DEBUG port number. The translation table is reported below.

Parameter Value	Baudrate
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud
0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

A system reboot is needed to have new setting in use.

4.8 CDB-ID 120 – Cold start setting

Allow setting the data to be cleared during the COLD start command execution. This parameter is a bitmask where bit=1 indicates the data to be cleared.

Bit	Bitmask	Description

0	0x1	Clear almanacs
1	0x2	Clear ephemeris
2	0x4	Clear position
3	0x8	Clear time

Any bitmask combination can be used, the default one is 0xE.

This setting is in place as soon as the $PSTMSETPAR is performed.

4.9 CDB-ID 121 – Number of decimal digits for speed and course data in NMEA messages

Allow setting the number of decimal digits for the speed and course data in NMEA messages. It affects both RMC and VTG messages

It is possible to set a different number of decimal digits.

Bit	Values	Description
From B0 to B3	From 1 up to 5	Allow setting the number of decimal digits for speed value in RMC and VTG massages
From B4 to B7	From 1 up to 5	Allow setting the number of decimal digits for course value in RMC and VTG messages.

4.10 CDB-ID 124 – NMEA and Debug Output Redirection

Allow setting the output channel for NMEA and Debug messages. Supported channels are UART, USB and SD card. UART is the default channel. If the SD card is selected for NMEA and Debug output but the SD card is not present in the slot, the system switch automatically to the UART mode. NMEA and Debug output cannot be redirected to USB together.

This parameter is made by two bit masks (4 bits each one):

Bit	Bitmask	Description
From B0 to B3	0x01=enable/disable UART output 0x02=enable/disable USB output 0x04=enable/disable SD output	Bit mask for Debug output configuration (only one bit can be enabled at same time in the bitmask)

From B4 to B7	0x10=enable/disable UART output 0x20=enable/disable USB output 0x40=enable/disable SD output	Bit mask for NMEA output configuration (only one bit can be enabled at same time in the bitmask)

NOTE1: USB output works only with TCXO 48Mhz.

NOTE2: ST provides a specific USB driver that can be found in the standard installation pack inside the folder \drivers\usb.

4.11 CDB-ID 125 – Notch Filter Setting

Allow setting the Notch filter usage on GPS RF path, GLONASS RF path or both GPS and GLONASS RF paths. The notch filter can be enabled and inserted in the RF path (normal mode – see b0, b1 below) or the notch filter can be enabled but inserted only if locked on a jammer (auto-insertion mode – see b2, b3 below).

Bitmask	Description
b0..b3 = 0x00	Notch Filter is disabled on both GPS and GLONASS paths
b0	Enable/disable notch filter on GPS path (normal mode).
b1	Enable/disable notch filter on GLONASS path (normal mode).
b2	Enable/disable notch filter on GPS path in auto-insertion mode.
b3	Enable/disable notch filter on GLONASS path in auto-insertion mode.

4.12 CDB-ID 126 – HW Config

Allow setting the HW configuration (SOC=0 or SAL=1). It is currently used for PPS signal configuration.

4.13 CDB-ID 127 – Number of decimal digits in NMEA position messages

Allow setting the number of decimal digits for the NMEA position messages.

It is possible to set a different number of decimal digits for GGA and for both RMC and GLL messages.

Bit	Values	Description
From B0 to B3	From 1 up to 5	Allow setting the number of decimal digits for the RMC and GLL massages

From B4 to B7	From 1 up to 5	Allow setting the number of decimal digits for the GGA massage.

4.14 CDB-ID 128 – Differential Source Type

Allow selecting the differential mode source type.

Value	Description
0x0 - NONE	No differential source.
0x1 - SBAS	SBAS is the source for differential correction.
0x2 - RTCM	RTCM is the source for differential corrections.
0x3 - AUTO	RTCM (if available) or SBAS (if available) is the source for differential corrections.

4.15 CDB-ID 129 – GLONASS Satellite ID Type

Allow selecting between two different ways to report the GLONASS satellites ID in the GSV and GSA messages.

Value	Description
0x0	GLONASS satellite ID based on the satellite frequency. If lowest frequency is marked with freq_ID = 1 and highest frequency is marked with freq_ID = 14, the satellite IDs are reported, starting from lowest frequency as 64+freq_ID. Satellites from 79 up to 92 are the antipodal of satellites from 65 up to 78 (they are received at the same frequency).
0x1	GLONASS satellite ID based on the satellite slot (reported in almanacs and ephemeris data). The satellite IDs are reported as 64+slot_number. The slot number is in the range from 1 up to 24.

4.16 CDB-ID 130 – CPU clock speed

Allow setting the CPU clock speed.

Bit	Values	Description

From B0 to B3	0 = 192f0 1 = TCXO 2 = RTC 3 = RING Oscillator	Allow setting the CPU clock source
From B4 to B6	0 = 1 1 = 2 2 = 3 3 = 4	Allow setting the CPU clock divisor factor
B7		Reserved

Examples:

- 0x00 sets the CPU speed at 192f0 MHz
- 0x10 sets the CPU speed at 96f0 MHz
- 0x20 sets the CPU speed at 64f0 MHz
- 0x30 sets the CPU speed at 48f0 MHz

4.17 CDB-ID 131 – NMEA Talker ID

Allow setting the second character of the NMEA talker ID for the GGA, RMC, VTG, GLL NMEA sentences. The talked ID for GSV and GSA is managed in a different way (see CDB-ID 200, bits 19 and 20).

4.18 CDB-ID 132 – GNSS Positioning CN0 threshold

Allow setting the minimum CN0 [dB] at which a satellite can be used in the position solution. Satellites with CN0 below the configured threshold are used in the position evaluation.

A GNSS engine reset (suspend/restart) is needed to have this setting in place.

4.19 CDB-ID 135 – SBAS default PRN

Allow setting the default PRN for the SBAS library.

A system reboot is needed to have new setting in use.

4.20 CDB-ID 138 – RTCM port setting

Allow setting the RTCM port number.

NOTE: the RTCM feature is supported on all serial ports. It can be configured also to work on the same serial port already used for NMEA or Debug messages.

A system reboot is needed to have new setting in use.

4.21 CDB-ID 139 – RTCM port baudrate setting

Allow setting the baudrate for the RTCM port number. The translation table is reported below.

Parameter Value	Baudrate
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud
0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

A system reboot is needed to have new setting in use.

4.22 CDB-ID From 140 to 189 – GNSS RF Front-end configuration

Allow setting the GNSS RF front-end register. By default the front-end registers don't need to be configured. If a specific configuration is required (see RF front-end reference manual for details about registers) it can be achieved setting in the proper way the configuration parameters in the range from 140 to 189.

Even IDs (e.g. 140, 142, …, 188) are used to set the address at which the value (reported in the next odd ID parameter) is applied. Together with the address (first 6 bits of parameter) there is the operation to perform (last 2 bits).

Allowed addresses are from 0 to 24 (see front-end specs).

Supported operations are:

- 00b: overwrite the register with provided value.

- 01b: execute “OR” operation between register content and provided value.
- 10b: execute “AND” operation between register content and provided value.

Odd IDs (e.g. 141, 143, …, 189) are the value to be applied (according to the operation) to the address reported on previous even ID. For example the value in the parameter ID 141 is applied to the address in the parameter 140 etc.

Examples

Param 140=0x81 and Param 141=0x55: the front-end register at 0x1 address is updated with the result of bit-to-bit AND operation between the register content and 0x55 value.

Param 140=0x44 and Param 141=0x55: the front-end register at 0x4 address is updated with the result of bit-to-bit OR operation between the register content and 0x55 value.

Param 140=0x08 and Param 141=0x55: the front-end register at 0x8 address is overwritten with 0x55 value.

NOTE: 0xFF value in the address IDs is used to skip the parameter without apply any configuration to the front-end registers. The default setting in the ST binary image is all addresses parameters set to 0xFF.

4.23 CDB-ID 190 – NMEA Message list 0 output rate scaling factor.

Allow setting the message list output rate for the message list 0. It is a scaling factor referred to the selected fix rate. The default value is 1 and means that messages are sent out on every fix. Setting the scaling factor to “N” means that the corresponding message list is sent out every “N” fixes.

NOTE: The message list 0 is the standard message list. Only the message list 0 should be used if the NMEA multiple rate features is not required.

4.24 CDB-ID 191 - NMEA Message list 1 output rate scaling factor.

Allow setting the message list output rate for the message list 1. It is a scaling factor referred to the selected fix rate. The default value is 1 and means that messages are sent out on every fix. Setting the scaling factor to “N” means that the corresponding message list is sent out every “N” fixes.

4.25 CDB-ID 192 - NMEA Message list 2 output rate scaling factor.

Allow setting the message list output rate for the message list 2. It is a scaling factor referred to the selected fix rate. The default value is 1 and means that messages are sent out on every fix. Setting the scaling factor to “N” means that the corresponding message list is sent out every “N” fixes.

NOTE: The message list 2 is reserved for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.

4.26 CDB-ID 193 - USB Detect feature

Enable or disable the USB detect feature. When enabled the USB VCOM is open only if detect pin is high. Look at next CDB to see how to configure detect GPIO pin.

NOTE: as soon as the USB is recognized the PLL is automatically enabled if not done before by configuration.

4.27 CDB-ID 194 - USB Detect GPIO pin configuration

Allow setting of USB detect GPIO pin.

Bit	Values	Description
From B0 to B7	From 0 to 63	GPIO pin number

4.28 CDB-ID 195 - USB Data Terminal Equipment feature

Enable or disable the USB Data Terminal Equipment feature. When enabled, the data (NMEA or Debug depending on CDB-ID 124 configuration) are sent over USB VCOM only when DTE is present. This signal corresponds to RS-232 signal DTR. When this feature is enabled, the host must open the VCOM enabling DTR mode.

4.29 CDB-ID 197 – PPS Clock

Allow setting the PPS clock frequency. For accurate timing application 64MHz is mandatory.

Values	Description
16	Sets PPS clock to 16MHz
32	Sets PPS clock to 32MHz
64	Sets PPS clock to 64MHz

4.30 CDB-ID 198 – GNSS Mask Angle Positioning

Set the GNSS Mask Angle for positioning algorithm. Satellites with elevation below the mask angle are not used in the position solution.

4.31 CDB-ID 199 – Local Geodetic Datum Selection

Set the local geodetic datum to be used when position data is reported over the NMEA messages. See Appendix A for the list of all supported datum. In the last column of tables is reported the number to be used for the CDB-ID configuration according to the selected datum.

4.32 CDB-ID 200 - Application ON/OFF

Allow enabling/disabling different features in the GNSS library.

For each bit:

- 0 means feature disabled;
- 1 means feature enabled.

Bit[1]	Bitmask	Function
1	0x2	Reserved
2	0x4	SBAS (WAAS / EGNOS) augmentation system
3	0x8	Enabling SBAS satellite reporting in the GSV messages
4	0x10	STAGPS enable
5	0x20	2.5ppm TCXO support enable
6	0x40	NMEA v301 support enable
7	0x80	QZSS distributed acquisition mode enable
9	0x200	Send “config text” in the “Header Message” at start up
10	0x400	Send standard ST NMEA Headers
11	0x800	RTCM enable
12	0x1000	FDE Algorithm
14	0x4000	Walking Mode Algorithm
15	0x8000	Stop Detection Algorithm
16	0x10000	GPS constellation enable[2]
17	0x20000	GLONASS constellation enable[3]

[1] The Bit-Value indicates the bit position (starting from 0 as least significant bit), thus multiple choices are possible.

[2] Multi-constellation firmware supports following constellations: GPS, GALILEO, GLONASS, COMPASS and QZSS. All constellations cannot be enabled at the same time, allowed combinations to achieve maximum coverage, are: (GPS+GALILEO+QZSS+GLONASS), (GPS+GALILEO+QZSS+COMPASS) and (GLONASS+COMPASS). Any constellation can be enabled as standalone satellite navigation system.

18	0x40000	QZSS constellation enable[4]
19	0x80000	NMEA GNGSV enable
20	0x100000	NMEA GNGSA enable
21	0x200000	GLONAS usage for positioning enable
22	0x400000	GPS usage for positioning enable
23	0x800000	QZSS usage for positioning enable
24	0x1000000	PPS enabling
25	0x2000000	PPS polarity inversion
26	0x4000000	Position Hold enable
27	0x8000000	TRAIM algorithm enable
28	0x10000000	SBAS auto search algorithm enable
29	0x20000000	High dynamics enable.
30	0x40000000	ST NMEA DSP raw messages enable
31	0x80000000	Low power algorithm enable

4.32.1 Bit 2 – SBAS (WAAS / EGNOS) augmentation system

Enable/disable the SBAS engine. When this bit is enabled, the SBAS engine starts searching for SBAS satellites at system startup.

4.32.2 Bit 3 – Enabling SBAS satellite reporting in the GSV messages

If enabled the SBAS satellite is reported in the GSV messages. The SBAS satellite ID, reported in the GSV messages, is in the range from 33 to 51 according to the NMEA specifications.

4.32.3 Bit 4 – Enabling STAGPS functionality

Enable/disable the STAGPS functionality. During STAGPS processing a high CPU load is required, for best performances it is suggested to increase the CPU frequency when the STAGPS is enabled. The server based assisted GPS (PGPS) is included in the STAGPS software. It is enabled/disabled if the STAGPS functionality is enabled/disabled.

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[3] See note 2.

[4] See note 2.

NOTE: if the STAGPS feature is not required and it is disabled, it is strongly suggested to clear all the STAGPS data from the NVM memory. This can be done via NMEA sending the "$PSTMSTAGPSINVALIDATE,7" command. If the NVM was empty (e.g. the STAGPS has been never enabled or the NVM has been completely erased before) the invalidate command is not required.

4.32.4 Bit 5 – Enabling 2.5ppm TCXO support

Enable/disable support for TCXO with 2.5ppm accuracy.

4.32.5 Bit 6 – Enabling the NMEA v3.01 support

Enable/disable the NMEA v3.01 support. To support the NMEA v3.01 standard some new values have been reported in the –RMC, --VTG and –GLL NMEA messages. This feature is enabled by default. To ensure fully compatibility with previous releases, the old NMEA format can be restored disabling this feature.

4.32.6 Bit 7 – Enabling the QZSS distributed acquisition mode

Enable/disable the distributed acquisition operative mode for the QZSS constellation. When distributed acquisition mode for QZSS is enabled, the acquisition stage usage is widespread along the time in order to mitigate the current consumption spikes required by the acquisition engine.

4.32.7 Bit 9 – Send Configured Text

Enable/disable sending the configured text on the NMEA port at startup.

4.32.8 Bit 10 – Send ST headers

Enable/disable sending the ST standard headers on the NMEA port at startup.

4.32.9 Bit 11 – RTCM enable

Enable/disable the RTCM data processing.

4.32.10 Bit 12 – FDE algorithm

Enable/disable the False Detection and Exclusion algorithm.

4.32.11 Bit 14 – Walking Mode algorithm

Enable/disable the Walking Mode algorithm.

4.32.12 Bit 15 – Stop Detection algorithm

Enable/disable the Stop Detection algorithm.

4.32.13 Bit 16 – GPS constellation

Enable/disable the GPS constellation. When this bit is enabled GPS satellites are enabled to be tracked and used for positioning.

This bit setting affect also the talker ID of GSV and GSA NMEA messages. If only the GPS constellation is enabled the NMEA talker ID for GSV and GSA is “GP”. If GLONASS constellation is also enabled “GP” is used for GPS related GSV messages while “GN” is used for the GSA messages.

Note: When GPS and GLONASS constellation are enabled, the GSV messages are sent in two separate sets: one with “GP” as talker ID and one with “GL”.

4.32.14 Bit 17 – GLONASS constellation

Enable/disable the GLONASS constellation. When this bit is enabled GLONASS satellites are enabled to be tracked. To be used for positioning also the Bit 21 should be enabled.

This bit setting affect also the talker ID of GSV and GSA NMEA messages. If only the GLONASS constellation is enabled the NMEA talker ID for GSV and GSA is “GL”. If GPS constellation is also enabled “GL” is used for GLONASS related GSV messages while “GN” is used for the GSA messages

Note: When GPS and GLONASS constellation are enabled, the GSV messages are sent in two separate sets: one with “GP” as talker ID and one with “GL”.

4.32.15 Bit 18 – QZSS constellation

Enable/disable the QZSS constellation. When this bit is enabled QZSS satellites are enabled to be tracked and used for positioning.

Note: Only “GN” is supported as talker ID for QZSS GSV and GSA messages.

4.32.16 Bit 19 – NMEA GNGSV enable

Enable/disable the “GN” talker ID for GSV messages reporting satellite for all constellations. When this bit is enabled, only the talker ID “GN” is used for GSV messages.

Note: In this case the GSV messages are sent in a single set reporting satellites for all enabled constellations.

4.32.17 Bit 20 – NMEA GNGSA enable

Enable/disable the “GN” talker ID for GSA messages reporting satellite for all constellations. When this bit is enabled, only the talker ID “GN” is used for GSA messages.

Note: In this case the GSA messages are sent in a single set reporting satellites for all enabled constellations.

4.32.18 Bit 21 – GLONASS usage

Enable/disable the usage of GLONASS satellite for the GNSS position fix. If this bit is disabled and GLONASS constellation is enabled, the GLONASS satellites are only tracked.

4.32.19 Bit 22 – GPS usage

Enable/disable the usage of GPS satellite for the GNSS position fix. If this bit is disabled and GPS constellation is enabled, the GPS satellites are only tracked.

4.32.20 Bit 23 – QZSS usage

Enable/disable the usage of QZSS satellites for the GNSS position fix. If this bit is disabled and QZSS constellation is enabled, the QZSS satellites are only tracked.

4.32.21 Bit 24 – PPS enabling

Enable/disable the PPS generation on the PPS pin.

4.32.22 Bit 25 – PPS signal polarity inversion.

Enable/disable the PPS signal polarity inversion. If polarity inversion is disabled (Bit25 = 0) the PPS signal has the rising edge on the PPS event. If polarity inversion is enabled (Bit25 = 1) the PPS signal has a falling edge on the PPS event.

4.32.23 Bit 26 – Position Hold enabling

Enable/disable the Position Hold functionality (timing applications).

4.32.24 Bit 27 – TRAIM algorithm enabling

Enable/disable the TRAIM algorithm (timing applications).

4.32.25 Bit 28 – SBAS auto search algorithm enabling

Enable/disable the SBAS satellites auto search functionality.

4.32.26 Bit 29 – High dynamics enabling

Enable/disable the high dynamics functionality. This feature increases the sample rate of the DSP measurements. It is required when high fix rate (> 5Hz) is selected.

4.32.27 Bit 30 – ST NMEA DSP raw messages enabling

Enable/disable the DSP raw messages over the NMEA port. They are proprietary messages which reports info from DSP stage.

4.32.28 Bit 31 – Low power algorithm enabling

Enable/disable the low power management features.

4.33 CDB-ID 201 – NMEA Message List 0 (LOW)

Allow enabling/disabling each NMEA message in the message list 0. CDB-ID 201 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 228 for second 32 bits (high bits) of 64 bits message list.

For each bit:

- 0 means feature disabled
- 1 means feature enabled

	Bit[5]	Bitmask (32 bits)	Function
Low 32 bits	0	0x1	$GPGNS Message
	1	0x2	$GPGGA Message
	2	0x4	$GPGSA Message
	3	0x8	$GPGST Message
	4	0x10	$GPVTG Message
	5	0x20	$PSTMNOISE Message
	6	0x40	$GPRMC Message
	7	0x80	$PSTMRF Message
	8	0x100	$PSTMTG Message
	9	0x200	$PSTMTS Message
	10	0x400	$PSTMPA Message
	11	0x800	$PSTMSAT Message
	12	0x1000	$PSTMRES Message
	13	0x2000	$PSTMTIM Message
	14	0x4000	$PSTMWAAS Message
	15	0x8000	$PSTMDIFF Message
	16	0x10000	$PSTMCORR Message

[5] The Bit-Value indicates the bit position, thus multiple choices are possible.

	17	0x20000	$PSTMSBAS Message
	18	0x40000	$PSTMTESTRF Message
	19	0x80000	$GPGSV Message
	20	0x100000	$GPGLL Message
	21	0x200000	$PSTMPPSDATA Message
	22	0x400000	Reserved
	23	0x800000	$PSTMCPU Message
	24	0x1000000	$GPZDA Message
	25	0x2000000	$PSTMTRAIMSTATUS Message
	26	0x4000000	$PSTMPOSHOLD Message
	27	0x8000000	$PSTMKFCOV Message
	28	0x10000000	$PSTMAGPS Message
	29	0x20000000	$PSTMLOWPOWERDATA Message
	30	0x40000000	$PSTMNOTCHSTATUS
	31	0x80000000	$PSTMTM Message
High 32 bits	32	0x1	$PSTMPV Message
	33	0x2	$PSTMPVQ Message
	34	0x4	$PSTMUTC Message
	35	0x8	$PSTMADCDATA Message
	36	0x10	$PSTMANTENNASTATUS Message
	37	0x20	Reserved
	38	0x40	Reserved
	39	0x80	$GPDTM Message
	40	0x100	$PSTMEPHEM Message
	41	0x200	$PSTMALMANAC Message
	42	0x400	$PSTMIONOPARAMS Message
	43	0x800	Reserved
	44	0x1000	$PSTMBIASDATA Message
	45	0x2000	$GPGBS Message

	46	0x4000	$PSTMPVRAW Message
	47	0x8000	Reserved
	48	0x10000	$PSTMFEDATA Message
	49	0x20000	Reserved
	50	0x40000	Reserved
	51	0x80000	Reserved
	52	0x100000	Reserved
	53	0x200000	Reserved
	54	0x400000	Reserved for DRAW (see DRAW documentation)
	55	0x800000	Reserved for DRAW (see DRAW documentation)
	56	0x1000000	Reserved for DRAW (see DRAW documentation)
	57	0x2000000	Reserved for DRAW (see DRAW documentation)
	58	0x4000000	Reserved for DRAW (see DRAW documentation)
	59	0x8000000	Reserved for DRAW (see DRAW documentation)
	60	0x10000000	Reserved for DRAW (see DRAW documentation)
	61	0x20000000	Reserved for DRAW (see DRAW documentation)
	62	0x40000000	Reserved for DRAW (see DRAW documentation)
	63	0x80000000	Reserved

NOTE: The message list 0 is the standard message list. Only the message list 0 should be used if the NMEA multiple rate features is not required.

4.34 CDB-ID 202 – NCO range max value

Allow setting the upper limit for the NCO search range.

STA8090 supports different TCXO frequencies: 26MHz, 48MHz and 55MHz. The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

A system reboot is needed to have new setting in use.

NOTE: configured value is used only if the NCO value is not yet stored in the GNSS backup memory.

4.35 CDB-ID 203 – NCO range min value

Allow setting the lower limit for the NCO search range.

STA8090 supports different TCXO frequencies: 26MHz, 48MHz and 55MHz. The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

A system reboot is needed to have new setting in use.

NOTE: configured value is used only if the NCO value is not yet stored in the GNSS backup memory.

4.36 CDB-ID 204 – NCO centre value

Allow setting the NCO centre frequency.

STA8090 supports different TCXO frequencies: 26MHz, 48MHz and 55MHz. The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

A system reboot is needed to have new setting in use.

NOTE: configured value is used only if the NCO value is not yet stored in the GNSS backup memory.

4.37 CDB-ID 205 – Position Data Time Delay

Allow setting the time delay [ms] between the measurements (on the UTC second) and the GNSS position data delivery. This parameter should be never bigger than the time period of the configured fix rate.

If “0” is used, the time delay is set in accordance with the CPU speed:

- 50ms if CPU is running @ 208MHz
- 500ms if CPU is running @ 52MHz

A system reboot is needed to have new setting in use.

4.38 CDB-ID From 206 to 209 – GPIO High/Low Status Setting

Allow setting the High/Low status for each GPIO.

Parameters 206 and 207 refer to the GPIO port 0; parameters 208 and 209 refer to GPIO port 1. Each parameter is a 32-bit mask representing the 32 pins of the GPIO port (bit 0 corresponds to PIN0 and bit31 corresponds to PIN31).

For each pin three configurations are possible: DO_NOT_TOUCH, SET_HIGH and SET_LOW. Each configuration is achieved setting in the proper way the bits corresponding to the same pin in the two configurations bit mask of the same port.

Port CFG0 Bit	Port CFG1 Bit	Description
0	0	SET_LOW: GPIO pin is configured as output and set to LOW state.
1	1	SET_HIGH: GPIO pin is configured as output and set to HIGH state.
0	1	DO_NOT_TOUCH: the pin is left unchanged
1	0	DO_NOT_TOUCH: the pin is left unchanged

Examples:

Param 206=0xFFFFFFFE and Param 207=0x08000000 GPIO Port0 pin 0 is set to LOW and GPIO Port0 pin 27 is set to HIGH. All other GPIO Port0 pins are left unchanged.

Param 208=0x7FFFFFFF and Param 209=0x00000004 GPIO Port1 pin 2 is set to HIGH and GPIO Port1 pin 31 is set to LOW. All other GPIO Port1 pins are left unchanged.

4.39 CDB-ID 210 – NMEA Message List 1 (LOW)

Allow enabling/disabling each NMEA message in the message list 1. CDB-ID 210 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 229 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the message list 0 (see CDB-ID 201 and CDB-ID 228 for details).

If not used the message list must be set to “0” (both CDB-ID 210 and CDB-ID 229 must be set to 0)

4.40 CDB-ID 211 – NMEA Message List 2 (LOW)

Allow enabling/disabling each NMEA message in the message list 2. CDB-ID 211 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 230 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the message list 0 (see CDB-ID 201 and CDB-ID 228 for details).

If not used the message list must be set to “0” (both CDB-ID 211 and CDB-ID 230 must be set to 0)

NOTE: The message list 2 is reserved for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.

4.41 CDB-ID 212 – SBAS satellites enable mask

Allow enabling/disabling the SBAS satellites to be searched by the auto search procedure.

It is a bit mask and the less significant bit (bit 0) refers to the lowest SBAS satellite ID (PRN 120). If the bit is set, the corresponding satellite is searched; if the bit is 0 the satellite is not searched. This parameter is by default configured to search all satellites in the SBAs range.

4.42 CDB-ID 213 – PPS operating mode setting 1

Allow setting different operating modes for the PPS signal generation. Full operating mode setting is achieved using both 213 and 214 parameters. This parameter includes different fields as reported in the following table:

Bits	Values	Description
From B0 to B3	0 = on every second 1 = on even seconds 2 = on odd seconds	PPS generation mode
From B4 to B7	0 = UTC 1 = GPS Time 2 = GLONASS Time 3 = UTC(SU) 4 = GPS Time (From Glonass Time Reference)	Reference time on which the PPS signal is synchronized.
From B8 to B11	1 = NO FIX 2 = 2D FIX 3 = 3D FIX	GNSS fix condition for PPS signal generation. NO FIX: PPS signal is present even in GNSS NO fix conditions. 2D FIX: the PPS is present if the GNSS is at least in 2D fix condition. 3D FIX: the PPS is present only if the GNSS is in 3D fix conditions.
From B16 to B23	0..24	Minimun number of satellites used for timing correction. PPS signal is generated if the number of satellites used for time correction is bigger the minimun number. This parameter should be set to 0 is the threshold is not used.
From B24 to B31	0..90	Satellite elevation mask for time correction. It is the minimum satellite elevation angle to use the satellite for time correction. If this parameter is set to 0 there is no satellites filetring based on the elevation.

4.43 CDB-ID 214 – PPS operating mode setting 2

Allow setting different operating modes for the PPS signal generation. Full operating mode setting is achieved using both 213 and 214 parameters. This parameter includes different fields as reported in the following table:

Bits	Values	Description
From B0 to B7	0 = mixing constellation disabled 1 = GPS sats are enabled for GLONASS time correction. 2 = GLONASS sats are enabled for GPS time correction.	Enable/disable mixing constellations for time correction.

4.44 CDB-ID 215 – Position hold auto survey samples

Sets the number of position samples to be captured before entering in the position hold mode. The auto survey procedure is disabled is the number of samples is set to 0.

4.45 CDB-ID 216 – SBAS autosearch timeouts: decoding channel

Allow setting different values for SBAS autosearch timeouts.

Bits	Values	Description
From B0 to B15	Decoding timeout in seconds	The time the autosearch waits to try to decode the current PRN
From B16 to B17	Differential timeout in seconds	The time the autosearch waits before to change the prn when the current SBAS sat is not more decoded

4.46 CDB-ID 217 – SBAS autosearch timeouts: searching channel

Allow setting different values for SBAS autosearch timeouts

Bits	Values	Description
From B0 to B15	Next satellite timeout in seconds	The time the autosearch waits to try to acquire and tracking new SBAS satellite using the searching channel

From B16 to B17	Next session timeout in seconds	The time the autosearch waits before to start a new searching session using the searching channel

4.47 CDB-ID 218 – SBAS satellite parameter

Allow to add or modify a SBAS satellite parameter into default list

Bits	Values	Description
From B0 to B7	From 120 to 138	SBAS PRN
From B8 to B15	From 0 to 180	Satellite longitude in degree
B16	0: EAST 1: WEST	Longitude sense
From B17:B18	0: WAAS 1: EGNOS 2: MSAS 3:GAGAN	The SBAS service

4.48 CDB-ID 219 – SBAS satellite parameter

Allow to add or modify a SBAS satellite parameter into default list

Bits	Values	Description
From B0 to B7	From 120 to 138	SBAS PRN
From B8 to B15	From 0 to 180	Satellite longitude in degree
B16	0: EAST 1: WEST	Longitude sense
From B17:B18	0: WAAS 1: EGNOS 2: MSAS 3:GAGAN	The SBAS service

4.49 CDB-ID 220 – Adaptive and Cyclic operating mode setting 1

Allow setting different operating modes for the adaptive low power algorithm. This parameter includes different fields as reported in the following table:

Bits	Values	Description

From B0 to B3	0/1 for each feature	Adaptive feature set Enable/Disable: B0: Enable/disable the adaptive multi-constellation algorithm. B1: Enable/disable the Duty Cycle If B0 and B1 are set to 1 both features works together for a better reduction of global power consumption. If B0 is set to 1 and B1 is set to 0, only the adaptive multi-constellation algorithm is operative. If B0 is set to 0 and B1 is set to 1, the duty-cycle is operative in GNSS mode. B2 and B3 are reserved for further usage.
From B4 to B11	0….255	EHPE average threshold [m]
From B12 to B19	0…32	first N satellites (with higher elevation) used for the position calculation (Active channel management) in LOW POWER STATE
From B20 to B31	100…740	Duty cycle signal off [ms]

4.50 CDB-ID 221 – Low Power operating mode setting

Reserved CDB-ID for Low Power management:

Bits	Values	Description
From B0 to B31		Reserved

4.51 CDB-ID 222 – LMS operating mode setting 1

Bits	Values	Description
B0	0/1	2D Fix enable/disable
B1	0/1	HDOP product in range error metric enable/disable
B2	0/1	GLONASS path delay lock enable/disable
From B8 to B15	0..255	Position residual threshold [m]
From B16 to B23	0..255	Position residual threshold after RAIM [m]

4.52 CDB-ID 223 – LMS operating mode setting 2

Bits	Values	Description
From B0 to B7	0..255	Minimum number of satellites in GNSS mode
From B8 to B15	0..255	Minimum number of satellites in single constellation mode

From B16 to B31	-32768..32767	Initial GLONASS path delay [dm]. (It is expressed in 2-complements on 16 bits)

4.53 CDB-ID 224 – Low power operating mode setting

Reserved CDB-ID for Low Power management:

Bits	Values	Description
From B0 to B31		Reserved

4.54 CDB-ID 225 – ADC channels read parameters

This parameter allows configuring different parameters for the ADC channels reading. This parameter includes different fields as reported in the following table where the description of the ADC channel reading configuration parameters is reported:

Bits	Values	Description
B0	0 = OFF 1 = ON	ADC channels data reading OFF (default mode)/ON
From B1 to B8	1..255	Channel Mask
From B9 to B16	0..255	Clk divisor factor to configure ADC sampling rate

4.55 CDB-ID 226 – Antenna Sensing parameters

This parameter allows configuring different parameters for the Antenna Sensing feature. This parameter includes different fields as reported in the following table where the description of the Antenna Sensing configuration parameters is reported:

Bits	Values	Description
From B0 to B1	0..1	0 = Antenna Sensing OFF (default value) 1 = Antenna Sensing RF mode ON 2 = Antenna Sensing ADC mode ON 3 = Antenna Sensing GPIO mode ON
Bit2	0..1	Periodic antenna status NMEA message reporting (if disabled the antenna status is reported on status change event) 0 = disabled 1 = enabled

Bit3	0..1	Antenna switching capability: 0 = disabled 1 = enabled
From B4 to B11	0..255	Clk divisor factor to configure ADC sampling rate
From B12 to B21	< 63	Minimum Threshold value (mV).
From B22 to B31	> 210	Maximum Threshold value (mV)

The thresholds values have to be tuned according to the specific Antenna Sensing application implementation. The default values reported in the table above are dimensioned assuming an antenna powered with 3.3 V and with a partitioned maximum input voltage to ADC of 1.4 V.

4.56 CDB-ID 227 – Application ON/OFF 2

Allow enabling/disabling different features in the GNSS library (this is in addition to CDB-ID 200).

For each bit:

- 0 means feature disabled
- 1 means feature enabled.

Bit[6]	Bitmask	Function
1	0x1	NMEA commands eco enable
2	0x2	NMEA Time To First Fix enable
3	0x4	Few satellites position estimation enable
4	0x8	STBIN in/out enable
5	0x10	Reserved
6	0x20	NMEA in/out interface selection
7	0x40	Galileo constellation enable[7]

[6] The Bit-Value indicates the bit position (starting from 0 as least significant bit), thus multiple choices are possible.

[7] Multi-constellation firmware supports following constellations: GPS, GALILEO, GLONASS, COMPASS and QZSS. All constellations cannot be enabled at the same time, allowed combinations to achieve maximum coverage, are: (GPS+GALILEO+QZSS+GLONASS),

8	0x80	Galileo usage for positioning enable
9	0x100	Compass constellation enable[8]
10	0x200	Compass usage for positioning enable
11	0x400	Reserved
12	0x800	RTC usage disabling
13	0x1000	Fast Satellite Drop feature enable
14	0x2000	RESERVED
15	0x4000	Excluded satellites reporting enable
16	0x8000	RESERVED
17	0x10000	RESERVED
18	0x20000	RESERVED
19	0x40000	RESERVED
20	0x80000	RESERVED
21	0x100000	RESERVED
22	0x200000	External RTC oscillator enable
23	0x400000	RESERVED
24	0x800000	RESERVED
25	0x1000000	RESERVED
26	0x2000000	RESERVED
27	0x4000000	RTC calibration enable

4.56.1 Bit 1 – NMEA commands eco enable

Enable/disable the command eco on the NMEA port.

4.56.2 Bit 2 – NMEA Time To First Fix enable

Enable/disable the Time To First Fix message on the NMEA port. If enabled, the TTFF message is sent only one time as soon as the GNSS position fix is achieved.

(GPS+GALILEO+QZSS+COMPASS). Any constellation can be enabled as standalone satellite navigation system.

[8] See previous note.

4.56.3 Bit 3 – Few satellites position estimation enable

Enable/disable the position estimation algorithm when tracked satellites are less than 3.

4.56.4 Bit 4 – STBIN in/out enable

Enable/disable the STBIN in/out communication protocol.

4.56.5 Bit 6 – NMEA in/out interface selection

Select the communication interface to be used over the NMEA port at startup:

0 = NMEA in/out interface

1 = STBIN in/out interface

4.56.6 Bit 7 – Galileo constellation

Enable/disable the Galileo constellation. When this bit is enabled Galileo satellites are enabled to be tracked and used for positioning.

4.56.7 Bit 8 – Galileo usage

Enable/disable the usage of Galileo satellite for the GNSS position fix. If this bit is disabled and Galileo constellation is enabled, the Galileo satellites are only tracked.

4.56.8 Bit 9 – Compass constellation

Enable/disable the Compass constellation. When this bit is enabled Compass satellites are enabled to be tracked and used for positioning.

4.56.9 Bit 10 – Compass usage

Enable/disable the usage of Compass satellite for the GNSS position fix. If this bit is disabled and Compass constellation is enabled, the Compass satellites are only tracked.

4.56.10 Bit 12 – RTC usage disabling

Enable/disable the usage of RTC from the GNSS engine. It is recommended to have RTC usage disabled (Bit12 set to 1) is the RTC crystal is not mounted.

4.56.11 Bit 13 – Fast Satellite Drop enable

Enable/disable the Fast Satellite Drop feature. When fast satellite drop is enabled, the GNSS software reports NO FIX status immediately after the tunnel entrance; the position update is no more propagated for some seconds inside the tunnel.

4.56.12 Bit 15 – Excluded satellite reporting enable

Enable/disable the excluded satellites reporting in the GGA, GSA, GNS and PSTMTG nmea messages.

If this bit is enabled, satellites excluded by positioning stage due to RAIM or FDE algorithms, are included in the number of used satellites (present in the GGA, GNS and PSTMG

messages) and their satellites IDs are included in the list of used satellite (present in the GSA message). This bit is disabled by default.

4.56.13 Bit 22 – External RTC oscillator enable

Enable/disable the usage on an external oscillator for the RTC peripheral. When enabled the internal oscillator is not used and the RTC clock must be fed from the xtal_in pin.

4.56.14 Bit 27 – RTC calibration enable

Enable/disable the RTC calibration feature. When enabled the RTC counter is calibrated using the accurate GNSS internal time reference.

4.57 CDB-ID 228 – NMEA Message List 0 (HIGH)

Allow enabling/disabling each NMEA message in the message list 0. CDB-ID 228 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 201 for first 32 bits (low bits) of 64 bits message list. See CDB-ID 201 also for supported message list table.

4.58 CDB-ID 229 – NMEA Message List 1 (HIGH)

Allow enabling/disabling each NMEA message in the message list 1. CDB-ID 229 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 210 for first 32 bits (low bits) of 64 bits message list. See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 210 and CDB-ID 229 must be set to 0)

4.59 CDB-ID 230 – NMEA Message List 2 (HIGH)

Allow enabling/disabling each NMEA message in the message list 2. CDB-ID 230 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 211 for first 32 bits (low bits) of 64 bits message list. See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 211 and CDB-ID 230 must be set to 0)

NOTE: The message list 2 is reserved for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.

4.60 CDB-ID 231 – NMEA on Debug Port Message List 0 (LOW)

Allow enabling/disabling each NMEA message in the message list 0 used for sending messages over the debug port. CDB-ID 231 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 232 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 231 and CDB-ID 232 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.61 CDB-ID 232 – NMEA on Debug Port Message List 0 (HIGH)

Allow enabling/disabling each NMEA message in the message list 0 used for sending messages over the debug port. CDB-ID 232 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 231 for first 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 231 and CDB-ID 232 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.62 CDB-ID 233 – NMEA on Debug Port Message List 1 (LOW)

Allow enabling/disabling each NMEA message in the message list 1 used for sending messages over the debug port. CDB-ID 233 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 234 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 233 and CDB-ID 234 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.63 CDB-ID 234 – NMEA on Debug Port Message List 1 (HIGH)

Allow enabling/disabling each NMEA message in the message list 1 used for sending messages over the debug port. CDB-ID 234 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 233 for first 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 233 and CDB-ID 234 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.64 CDB-ID 235 – NMEA on Debug Port Message List 2 (LOW)

Allow enabling/disabling each NMEA message in the message list 2 used for sending messages over the debug port. CDB-ID 235 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 236 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 235 and CDB-ID 236 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

NOTE: The message list 2 is reserved for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.

4.65 CDB-ID 236 – NMEA on Debug Port Message List 2 (HIGH)

Allow enabling/disabling each NMEA message in the message list 2 used for sending messages over the debug port. CDB-ID 236 represents second 32 bits (high bits) of extended 64 bits NMEA message list. See CDB-ID 235 for first 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 235 and CDB-ID 236 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

NOTE: The message list 2 is reserved for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.

4.66 CDB-ID 237 – Default GPS MIN-MAX week number

Allow setting of minimum and maximum GPS week number.

Minimum week number is used for correct GPS week decoding. The GNSS software is able to decode correctly the GPS week number for a number of 1024 weeks (about 20 years) starting from minimum week number. NOTE: The minimum week number should be moved ahead along years to guarantee at least 20 years of correct week decoding in the future.

Maximum week number is used for GPS week validity check. It must be set at least 1024 weeks ahead to the minimum week number. NOTE: as soon as the max week number is reached, the GNSS software is no more able to validate the time and so it is no more able to achieve the GNSS position fix.

Bits	Values	Description
From B0 to B15	0..65535	GPS minimum week number

From B16 to B31	0..65535	GPS maximum week number

4.67 CDB-ID 238 – Default UTC delta time

Allow setting the default value for the GPS time to UTC delta time seconds (leap seconds). This parameter is used by the GNSS software only is the UTC backup data in not available in the backup memory (e.g. first startup after production or in case of backup memory content lost occurrence)

4.68 CDB-ID 240 – STBIN Msg-List (LOW)

Allow enabling/disabling each STBIN message in the binary protocol message list. CDB-ID 240 represents first 32 bits (low bits) of extended 64 bits STBIN message list. See CDB-ID 241 for second 32 bits (high bits) of 64 bits message list.

For each bit:

- 0 means feature disabled
- 1 means feature enabled

	Bit[9]	Bitmask (32 bits)	Function
Low 32 bits	0	0x1	ECEF Position Information
	1	0x2	LLH Position Information
	2	0x4	Fix Status Information
	3	0x8	DOP Information
	4	0x10	ECEF Velocity Information
	5	0x20	NEU Velocity Information
	6	0x40	GNSS Time Information
	7	0x80	UTC Time Information
	8	0x100	SV Information
	9	0x200	DGPS Information
	10	0x400	DGPS Information Per Satellite

[9] The Bit-Value indicates the bit position, thus multiple choices are possible.

	11	0x800	Position Residuals
	12	0x1000	Velocity Residuals
	13	0x2000	Satellite Fix Information
	14	0x4000	Fix Information
	15	0x8000	Positioning Algorithm Information
	16	0x10000	Satellites RF Data
	17	0x20000	Position and Velocity Covariance
	18	0x40000	Position Accuracy Data
	19	0x80000	PPS Data
	20	0x100000	Position Hold Data
	21	0x200000	TRAIM Data
	22	0x400000	Low Power Management Information
	23	0x800000	CPU Information
	24	0x1000000	Notch Filter Status Data
	25	0x2000000	Not Used
	26	0x4000000	Not Used
	27	0x8000000	Not Used
	28	0x10000000	Not Used
	29	0x20000000	Not Used
	30	0x40000000	Not Used
	31	0x80000000	Not Used

4.69 CDB-ID 241 – STBIN Msg-List (HIGH)

Allow enabling/disabling each STBIN message in the binary protocol message list. CDB-ID 241 represents second 32 bits (high bits) of extended 64 bits STBIN message list. See CDB-ID 240 for first 32 bits (low bits) of 64 bits message list.

For each bit:

- 0 means feature disabled
- 1 means feature enabled

	Bit[10]	Bitmask (32 bits)	Function
High 32 bits	32	0x1	Not Used
	33	0x2	Not Used
	34	0x4	Not Used
	35	0x8	Not Used
	36	0x10	Not Used
	37	0x20	Not Used
	38	0x40	Not Used
	39	0x80	Not Used
	40	0x100	STAGPS GPS Prediction Information
	41	0x200	STAGPS LONASS Prediction Information
	42	0x400	Not Used
	43	0x800	Not Used
	44	0x1000	Not Used
	45	0x2000	Not Used
	46	0x4000	Not Used
	47	0x8000	Not Used
	48	0x10000	SBAS Satellite Data
	49	0x20000	SBAS Corrections Data
	50	0x40000	Not Used
	51	0x80000	Not Used
	52	0x100000	Not Used
	53	0x200000	Not Used
	54	0x400000	Not Used

[10] The Bit-Value indicates the bit position, thus multiple choices are possible.

	55	0x800000	RF Test Data
	56	0x1000000	Not Used
	57	0x2000000	Not Used
	58	0x4000000	Not Used
	59	0x8000000	Not Used
	60	0x10000000	Not Used
	61	0x20000000	Not Used
	62	0x40000000	Not Used
	63	0x80000000	Not Used

4.70 CDB-ID 242 – Antenna Sensing via GPIO setting 1

Allow GPIO pin configuration for the antenna detection and control signals.

Bits	Values	Description
From B0 to B7	0..63	GPIO pin number for antenna diagnostic enable signal (output)
From B8 to B15	0..63	GPIO pin number for antenna switch control signal (output)
From B16 to B23	0..63	GPIO pin number for antenna SHORT detection signal (input)
From B24 to B31	0..63	GPIO pin number for antenna OPEN detection signal (input)

4.71 CDB-ID 243 – Antenna Sensing via GPIO setting 2

Allow GPIO mode configuration for the antenna detection and control signals.

Bits	Values	Description
From B0 to B7	0..3	GPIO mode for antenna diagnostic enable signal (output) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C

From B8 to B15	0..3	GPIO mode for antenna switch control signal (output) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C
From B16 to B23	0..3	GPIO mode for antenna SHORT detection signal (input) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C
From B24 to B31	0..3	GPIO mode for antenna OPEN detection signal (input) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C

4.72 CDB-ID 244 – Antenna Sensing via GPIO setting 3

Allow setting the active levels for the antenna detection and control signals.

Bits	Values	Description
From B0 to B7	0..1	Active level for antenna diagnostic enable signal (output)
From B8 to B15	0..1	Active level for antenna switch control signal (output)
From B16 to B23	0..1	Active level for antenna SHORT detection signal (input)
From B24 to B31	0..1	Active level for antenna OPEN detection signal (input)

4.73 CDB-ID 245 – TCXO Frequency

Allow selecting the TCXO frequency in the set of supported frequencies.

Value	TCXO Frequency

0x00	26 MHz
0x0A	48 MHz
0x0B	55 MHz

NOTE1: this parameter allows setting the TCXO frequency only for the GNSS firmware. It doesn't configure the BOOT firmware which is present at the beginning of flash memory and which is used to perform the firmware upgrade procedure. The proper BOOT code must be flashed into the device to ensure the firmware upgrade functionality with the TCXO frequency in use.

NOTE2: 55MHz TCXO is supported to avoid RF interferer injection from GNSS subsystem into FW radio frequency band. This configuration should be used when an RF coupling is possible between GNSS and Radio. To guarantee no interferer injected into the radio subsystem, also the CPU speed (see parameter CDB-ID 130) must be set to 55MHz.

4.74 CDB-ID 249 – Flash Protection Setting 1

Allow enabling/disabling the flash write protection feature.

NOTE: this parameter can only be changed in the factory setting (e.g. changing firmware configuration before flashing with fwconfig.exe tool). The parameter setting by commands is no more supported. If the command interface is used to change the value of this parameter, the new configuration doesn't take effect even after the system reboot.

Bits	Values	Description
B0	0..1	0: Flash protection feature disabled 1: Flash protection feature enabled

4.75 CDB-ID 250 – Flash Protection Setting 2

Allow setting the flash sectors to be write protected.

NOTE: this parameter can only be changed in the factory setting (e.g. changing firmware configuration before flashing with fwconfig.exe tool). The parameter setting by commands is no more supported. If the command interface is used to change the value of this parameter, the new configuration doesn't take effect even after the system reboot.

Bits	Values	Description

B0..B31	0x0..0xFFFFFFFF	The word programmed inside the flash memory control registers to select the set of sectors to be protected. It could be different for different memory vendors (see the application note for details). The memory area which is protected by the flash protection feature is the code area. Sectors used by NVM must not be protected. Default setting for Macronix memory which is loaded with the GNSS binary image is 0x0A

4.76 CDB-ID 252 – Antenna sensing ADC inputs configuration

Allow setting the ADC inputs for the antenna sensing feature.

Bits	Values	Description
B0..B7	Any combination with two bits high	ADC channel input mask. The bit position represents the ADC channel. The selected channel must have the corresponding bit enabled in the mask. Any combination of couples of channels is allowed only for STA8090EXG. For all other packages default value must be used: 0x3.

The configurability of ADC input is allowed only for STA8090EXG. For other packages the default ADC input configuration must be used. Default ADC input values are: AIN0 and AIN1,

CDB-ID From 253 to 256 – GPIO Pin Mode Setting

Allow setting the pin mode required by the GPIO function. These settings are used together with parameters from CDB-ID 206 to 209. The default values should be OK and don't require to be changed when parameters from 206 to 209 are configured. Anyway this type of configuration has been added to give flexibility in case a different silicon cut reports a different pin mode setting for the GPIO functionality.

Parameters 253 and 254 refer to the GPIO port 0; parameters 255 and 256 refer to GPIO port 1. Each parameter is a 32-bit mask representing the 32 pins of the GPIO port (bit 0 corresponds to PIN0 and bit31 corresponds to PIN31).

These parameters have the same meaning of the AFSLA and AFSLB registers, described in the STA8090 datasheet, they allow setting the alternate functions (NONE, A, B and C) for each pin.

4.77 CDB-ID 257 – Periodic operating mode setting 1

Configure the periodic low power mode. This CBD has to be combined with CBD-258.This parameter includes different fields as reported in the following table:

Bits	Values	Description
From B0 to B7	0/1 for each feature	Periodic feature set Enable/Disable: B0-B1: 00: Periodic mode OFF 01: Active Periodic mode 11: Standby Periodic mode B2: Ephemeris refresh required B3: RTC calibration required B4 to B7 are reserved for further usage.
From B8 to B24	0..86400	FixPeriod [s]. 0 means the Fix will be given only on WAKEUP pin activation. Value 0 is only valid in Standby Periodic mode.
From B25 to B31	1..127	FixOnTime - Number of fix to report every fix wakeup.

4.78 CDB-ID 258 – Periodic operating mode setting 2

Configure the periodic low power mode. This CBD has to be combined with CBD-257.This parameter includes different fields as reported in the following table:

Bits	Values	Description
From B0 to B7	0..255	NoFixCnt [s] - Time to declare fix loss in HOT conditions.
From B8 to B19	0..4095	NoFixOff [s] - Off duration time after a fix loss event.
From B20 to B28	0..300	NoFixCnt2 [s] – Time to declare fix loss in non-HOT conditions – startup case, obsolete ephemeris …

4.79 CDB-ID 259 – Low Power Mode HW Setting

Describe the state of each power supplies in the TESEO. The TESEO has a Backup LDO, LDO1, LDO2 and SMPS. Two different states are possible, the High and the Low frequency states, basically related to the TCXO ON or OFF state. The value 0 means OFF, any other values represent a voltage (1.0V 1.1V or 1.2V) or an ON state. The different frequency states are obtained by configuring the periodic mode. High frequency is used when the GNSS Library is active, the low frequency is used when the GNSS Library is inactive. During standby state, only the backup LDO is ON.

Bits	Values	Description

B0-B1	0,1	Enable/disable the stop mode functionality of the backup LDO during High frequency periods. If stop mode functionality is enabled, the power consumption in standby mode is reduced. 0 = stop mode disabled 1= stop mode enabled
B2-B3	0,1	Enable/disable the stop mode functionality of the backup LDO during Low frequency periods. If stop mode functionality is enabled, the power consumption in standby mode is reduced. 0 = stop mode disabled 1= stop mode enabled
B4-B5	0,1,2,3	LDO1 status during High frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V. If the LDO1 is configured in 1.8V, any value different from 0 means ON.
B6-B7	0,1,2,3	LDO1 status during Low frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V. If the LDO1 is configured in 1.8V, any value different from 0 means ON.
B8-B9	0,1,2,3	LDO2 status during High frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V.
B10-B11	0,1,2,3	LDO2 status during Low frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V.
B8-B9	0,1,2,3	SMPS status during High frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V.
B10-B11	0,1,2,3	SMPS status during Low frequency mode 0 = OFF, 1 = 1.0V, 2 = 1.1V, 3 = 1.2V.

4.80 CDB-ID 260 – WLS algorithm configuration

Allow to configure the WLS algorithm implemented in the positioning stage.

Bits	Values	Description
B0	0..1	Enable/Disable the WLS algorithm usage in the positioning stage. 0 = disabled 1= enabled
B1..B7	xxx	Not used

B8..B15	1..100	Parameter1 multiplied by 10. Parameter1 is a coefficient to change the measurements weighting in the position filter. Allowed values are from 0.1 to 10.0 (suggested value is 1.0) 0.1 means high acceptance of satellites measurements in the position filter 10.0 means low acceptance of satellites measurements in the position filter
B16..B23	10..100	Parameter2 multiplied by 10. Parameter2 is a coefficient to change the measurements acceptance threshold. Allowed values are from 1.0 to 10.0 (suggested value is 2.5) 1.0 means strong satellite exclusions by FDE (high false alarm rate) 10.0 means relaxed satellites exclusions by FDE.

4.81 CDB-ID 261 – Dynamic modes configuration

Allow to configure supported dynamic modes for the satellites tracking engine. This configuration replaces the old high/low dynamic setting in the CDB-ID 200 bit mask 0x20000000.

NOTE: The old High/Low setting is still operative for backward compatibility reasons. To use CDB-ID 261 the CDB-ID 200 bit mask 0x20000000 must be set to 0

Bits	Values	Description
B0..B3	0,1,3	Dynamic mode selection. 0 = Low Dynamic 1= High Dynamic 2= Reserved 3 = Auto Dynamic

4.82 CDB-ID 262 – HW Shutdown GPIO Configuration

This parameter allows to select and configure the GPIO to be used for the HW shutdown feature.

Bits	Values	Description

B0	0 = OFF 1 = ON	HW shutdown feature enabling/disabling
From B1 to B2	0,1,2	Edge configuration: 0= rising edge 1=falling edge 2=rising and falling edges
From B3 to B7	-	reserved
From B8 to B13	0..63	GPIO ID
From B8 to B13	0,1,2,3	Pin alternate function configuration: 0=None 1=Alternate A 2=Alternate B 3=Alternate C
From B14 to B31	-	reserved

4.83 CDB-ID 301 – PPS Pulse Duration

Allow setting the pulse duration of the PPS signal. The pulse duration is intended to be the time distance between the PPS rising edge and the next falling edge if polarity inversion is disabled or the time distance between falling and rising edge if polarity inversion is enabled.

4.84 CDB-ID 302 – PPS Delay Correction

Allow setting a time correction to compensate any delay introduced on the Pulse Per Second (PPS) signal by cables and/or RF chain.

4.85 CDB-ID 303 – GNSS fix rate

Allow setting the GNSS library fix rate. It is the time period between two consecutive position fix evaluations.

A system reboot is needed to have new setting in use.

4.86 CDB-ID 304 – Position Hold Latitude

Allow setting the latitude [degrees] for the position hold mode (NOTE: to be used the position hold functionality must be enabled, see CDB-ID 200 for details).

A system reboot is needed to have new setting in use.

4.87 CDB-ID 305 – Position Hold Longitude

Allow setting the longitude [degrees] for the position hold mode (NOTE: to be used the position hold functionality must be enabled, see CDB-ID 200 for details).

A system reboot is needed to have new setting in use.

4.88 CDB-ID 306 – Position Hold Altitude

Allow setting the altitude [m] for the position hold mode (NOTE: to be used the position hold functionality must be enabled, see CDB-ID 200 for details).

NOTE: the altitude to be configured in this parameter mustn't be compensated with the geoid correction. If the altitude value is retrieved by the $GPGGA NMEA message, it must be added to the geoid correction (reported in the same $GPGGA message) before setting it in the CDB-ID 306 parameter.

A system reboot is needed to have new setting in use.

4.89 CDB-ID 307 – GPS RF delay correction

Allow setting the RF time delay for the GPS signal path. The RF compensation for GPS is independent by the PPS clock setting. The value calibrated for the ST reference design is 713E-9 s.

4.90 CDB-ID 308 – GLONASS RF delay correction

Allow setting the RF time delay for the GLONAS signal path. The RF compensation for GLONASS depends on the PPS clock setting (see CDB-ID). Here are the values calibrated for the ST reference design.

PPS Clock Setting	GLONASS RF Correction
32 MHz	-
64 MHz	-

NOTE: If the PPS clock setting is changed in the configuration block, also the GLONASS RF delay correction must be changed accordingly. For accurate timing applications is strongly recommended to set PPS clock to 64MHz.

4.91 CDB-ID 309 – TRAIM alarm threshold

Allow setting the time error threshold for satellites removal in the TRAIM algorithm. Satellites which have a time error bigger than the TRAIM threshold are not used for time correction. The TRAIM threshold is also used to rise the TRAIM alarm if the time correction error is bigger than it.

4.92 CDB-ID 310 – COMPASS RF delay correction

Allow setting the RF time delay for the COMPASS signal path.

4.93 CDB-ID 400 – Default 2D DOP

Allow setting the default value for the 2D DOP. This value is used at run-time, after the GNSS startup phase, as a threshold for the 2D fix validation. DOP below this threshold will be considered valid for position fixing.

A system reboot is needed to have new setting in use.

4.94 CDB-ID 401 – Default 3D DOP

Allow setting the default value for the 3D DOP. This value is used at run-time, after the GNSS startup phase, as a threshold for the 3D fix validation. DOP below this threshold will be considered valid for position fixing.

A system reboot is needed to have new setting in use.

4.95 CDB-ID 402 – Startup 2D DOP

Allow setting the startup value for the 2D DOP. This value is used during the GNSS startup phase as a threshold for the 2D fix validation. DOP below this threshold will be considered valid for position fixing.

A system reboot is needed to have new setting in use.

4.96 CDB-ID 403 – Startup 3D DOP

Allow setting the startup value for the 3D DOP. This value is used during the GNSS startup phase as a threshold for the 3D fix validation. DOP below this threshold will be considered valid for position fixing.

A system reboot is needed to have new setting in use.

4.97 CDB-ID 500 – Text message

Allow setting a text message which is sent (if enabled – see bit9 of CDB-ID 200 parameter) at startup over the NMEA port. The user is free to use this text as product name or as specific configuration marker.

A system reboot is needed to have new setting in use.

5 Changing the Factory Setting

Default setting of configuration data block is hard coded into the binary image file. Using a PC tool (FWConfig.exe), it is possible to change the software configuration without recompile the source code. FWConfig.exe allows reading and writing configuration block inside binary images.

5.1 Writing a new configuration

```
FWConfig.exe –f <input_image_file> -c <new_config.txt> -o
<output_image_file>
```

Arguments:

input_image_file	the software binary image.
new_config.txt	is the configuration file. It is a text file reporting the list of parameters ID together with new values to set. It is necessary to include only ID of parameters to be changed.
output_image_file	is the binary image which includes the new configuration.

Note: the input file is not modified by FWConfig.exe.

Example:

Example of config.txt file

```
122 -> 01
123 -> 17
203 -> 00002b83
403 -> 15,12,12
500 -> THIS IS MY CONFIGURATION
```

Config file above will change only the parameters ID 122, 123, 203, 403 and 500 writing respectively 0x01, 0x17, 0x00002B83,(15,12,12) and a new text message that can be used to mark the configuration (this configuration message can be also displayed in the NMEA header message).

5.2 Reading configuration in the binary image

```
FWConfig.exe –f <input_image_file> -r
```

Arguments:

input_image_file	the software binary image.

Example:

The command execution will display the complete parameter list with current values. Here is an example:

```
100 -> 00
101 -> 02
102 -> 0a
103 -> 00
104 -> 00
105 -> 0a
106 -> 05
107 -> 0a
108 -> 0e
109 -> 0d
110 -> 0c
111 -> 0b
112 -> 0a
113 -> 09
114 -> 09
115 -> 08
116 -> 07
117 -> 03
118 -> 01
119 -> 63
120 -> 0e
121 -> 00
122 -> 0c
123 -> 04
124 -> 11
125 -> 00
126 -> 01
127 -> 35
128 -> 03
129 -> 01
130 -> 02
131 -> 50
132 -> 0f
133 -> 00
134 -> 00
135 -> 7c
136 -> 07
137 -> 14
138 -> 00
139 -> 0a
140 -> ff
141 -> ff
142 -> ff
143 -> ff
144 -> ff
145 -> ff
146 -> ff
147 -> ff
```

```
148 -> ff
149 -> ff
150 -> ff
151 -> ff
152 -> ff
153 -> ff
154 -> ff
155 -> ff
156 -> ff
157 -> ff
158 -> ff
159 -> ff
160 -> ff
161 -> ff
162 -> ff
163 -> ff
164 -> ff
165 -> ff
166 -> ff
167 -> ff
168 -> ff
169 -> ff
170 -> ff
171 -> ff
172 -> ff
173 -> ff
174 -> ff
175 -> ff
176 -> ff
177 -> ff
178 -> ff
179 -> ff
180 -> ff
181 -> ff
182 -> ff
183 -> ff
184 -> ff
185 -> ff
186 -> ff
187 -> ff
188 -> ff
189 -> ff
190 -> 01
191 -> 01
192 -> 01
193 -> ff
194 -> ff
195 -> ff
```

```
200 -> 01639604
201 -> 00884356
202 -> ffff6f78
203 -> ffff2158
204 -> ffff4868
205 -> 00000001
206 -> ffffffff
207 -> 00000000
208 -> ffffffff
209 -> 00000000
210 -> 00000000
211 -> 00000000
212 -> ffffffff
213 -> ffffffff
300 -> 0.000000e+000
301 -> 5.000000e-001
302 -> 0.000000e+000
303 -> 1.000000e+000
304 -> 4.091747e+001
305 -> 1.427586e+001
306 -> 8.843307e+001
400 -> 15,12,12,18
401 -> 15,12,12,18
402 -> 15,12,12,18
403 -> 15,12,12,18
500 -> DEFAULT CONFIGURATION
```

Note: values of parameters ID 1xx and 2xx must be reported in hexadecimal format (without "0x" prefix); values for parameters ID 3xx, 4xx and 500 must be reported as decimal.

Note: ALL THE PARAMETERS NOT DOCUMENTED IN THIS MANUAL MUST BE CONSIDERED AS RESERVED AND MUST NOT BE MODIFIED

6 Run Time Configuration: “Customized Setting”

At run-time the configuration parameters can be read, changed and stored (in NVM) using the system configuration commands: `$PSTMSETPAR`, `$PSTMGETPAR` and `$PSTMSAVEPAR`. There is also a command to restore the factory setting parameters: `$PSTMRESTOREPAR`.

When the system is running, it could be possible to have up to three different configuration blocks:

- *Current configuration*: it is placed in RAM memory and it includes the current configuration of each parameter. This configuration block can be modified with the `$PSTMSETPAR` command. The `$PSTMSAVEPAR` command stores the current configuration data block into the NVM memory. At startup the current configuration block is loaded from NVM (if a stored data block is available) or it is loaded from default one embedded in the code (factory settings).

- *Default configuration*: it is generally placed in the flash/rom memory. It includes the factory setting for each parameter. This configuration is used at system startup if there is no configuration data into the NVM memory.

- *NVM stored configuration*: it is available in the NVM backup memory as soon as the `$PSTMSAVEPAR` command is executed. It includes all parameters modified and stored by the user. At system startup the SW configuration managements checks if a valid configuration block is available in the NVM backup memory. In case the stored configuration is available, it will be used for system configuration. If not available the default setting will be used.

6.1 $PSTMSETPAR

This command sets the defined parameter (indicated by “ID”) to the value provided as “param_value” in the commands parameter.

Synopsis:

```
$PSTMSETPAR,<ConfigBlock><ID>,<param_value>[,<mode>]<cr><lf>
```

Arguments:

Parameter	Format	Description
ConfigBlock	Decimal,1 digit	Indicates one of configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see, Configuration Data Block)
param_value	1 up to 80 bytes	Parameter to be set, see “Allowed values”
mode	Decimal, 1 digit	This parameter is optional. It allows to perform bit-to-bit “OR” or “AND” operations between the selected parameter in the configuration block and the param_value in input. It has the following meaning: 0: the parameter in the configuration block is overwritten by the param_value. This is the default action as in the case mode is omitted. 1: the parameter in the configuration block is the result of bit-to-bit “OR” between old value and the param_value.This is useful for bit mask setting. 2: the parameter in the configuration block is the result of bit-to-bit “AND” between old value and NOT(param_value). This is useful for bit mask resetting.

Results:

- The parameter indicated by the ID value is set according to the parameters included in param_value. In case of no errors, the following message is returned

```
$PSTMSETPAROK ,<ConfigBlock><ID>*<checksum><cr><lf>
```

- In case of errors, the error message is returned

```
$PSTMSETPARERROR*<checksum><cr><lf>
```

Where:

Parameter	Format	Description
ConfigBlock	Decima1,1 digit	Indicates one of configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see, Configuration Data Block)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

Example:

Issuing the command:

```
$PSTMSETPAR,1121,10
```

You could have this answer:

```
$PSTMSETPAROK,1121*
```

Note: The configuration block parameter is ignored by the "SET" command because only the current configuration, stored in the RAM memory, can be written. It is used only to keep same syntax as for the "GET" command. The configuration block stored in NVM will be overwritten by current configuration after the $PSTMSAVEPAR command.

Note: There is no comma and no space between ConfigBlock and ID parameters.

Note: The input param_value must be expressed in hexadecimal format without "0x" prefix for any integer value except DOP configuration. It must be decimal for any not integer value and DOP setting.

6.2 $PSTMGETPAR

This command reads the defined parameter (indicated by “ID”) from the “Configuration Data Block” and returns it as a specific message.

Synopsis:

```
$PSTMGETPAR,<ConfigBlock><ID><cr><lf>
```

Arguments:

Parameter	Format	Description
ConfigBlock	Decima1,1 digit	Indicates one of configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see, Configuration Data Block)

Results:

- In case of no errors, the selected parameter ID value is returned in the following message

```
$PSTMSETPAR,<ConfigBlock><ID>,<value>*<checksum><cr><lf>
```

- In case of errors, the error message is returned

```
$PSTMGETPARERROR*<checksum><cr><lf>
```

Where:

Parameter	Format	Description
ConfigBlock	Decima1,1 digit	Indicates one of configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see, Configuration Data Block)
value	Hexadecimal or Decimal	The value of returned parameter. According to the parameter type it could be expressed in hexadecimal format (in case parameter is integer) or decimal format (in case the parameter is floating).

checksum	Hexadecimal, 2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

Example:

Issuing the command:

```
$PSTMGETPAR,1403
```

You could have this answer:

```
$PSTMSET,1403,15,12,12,18*<checksum><cr><lf>
```

Note: there is no comma and no space between `ConfigBlock` and `ID` parameters.

Note: In case of no errors the answer is deliberately `$PSTMSET` and not `$PSTMGET`.

Note: if the parameter ID is "000" all the configuration block is printed out using one message for each parameter. The message syntax is the same as reported above.

6.3 $PSTMSAVEPAR

Save current configuration data block into the backup memory.

Synopsis:

```
$PSTMSAVEPAR<cr><lf>
```

Arguments:

None.

Results:

- The current configuration data block, including changed parameters, will be stored into the backup memory (NVM).

Note: the factory setting parameters can be restored using the $PSTMRESTOREPAR command.

Example:

```
$PSTMSAVEPAR
```

6.4 $PSTMRESTOREPAR

Restore the factory setting parameters. The configuration data block stored in NVM, if present, will be invalidated. Any changed parameter will be lost.

Synopsis:

```
$PSTMRESTOREPAR<cr><lf>
```

Arguments:

None.

Results:

- The factory setting parameters will be restored and the configuration block in the backup memory will be lost. A system reboot is needed to complete the factory reset restoring ad to get system working with default setting.

Example:

```
$PSTMRESTOREPAR
```

7 Appendix

A. Local Geodetic Datum Tables

AFRICA			
REGION		CODE	CDB-ID VALUE
ADINDAN			
	MeanSolution(Ethiopia-Sudan)	ADI-M	0
	BurkinaFaso	ADI-E	1
	Cameroon	ADI-F	2
	Ethiopia	ADI-A	3
	Mali	ADI-C	4
	Senegal	ADI-D	5
	Sudan	ADI-B	6
AFGOOYE			
	Somalia	AFG	7
ARC_1950			
	Mean_Solution	ARF-M	8
	Botswana	ARF-A	9
	Burundi	ARF-H	10
	Lesotho	ARF-B	11
	Malawi	ARF-C	12
	Swaziland	ARF-D	13
	Zaire	ARF-E	14
	Zambia	ARF-F	15
	Zimbabwe	ARF-G	16
ARC_1960			
	Mean_Solution	ARS-M	17
	Kenya	ARS-A	18
	Tanzania	ARS-B	19
AYABELLE_LIGHTHOUSE			
	Djibouti	PHA	20
BISSAU			
	Guinea-Bissau	BID	21
CAPE			
	South_Africa	CAP	22
CARTHAGE			

	Tunisia	CGE	23
DABOLA			
	Guinea	DAL	24
EUROPEAN_1950			
	Egypt	EUR-F	73
	Tunisia	EUR-T	83
LEIGON			
	Ghana	LEH	25
LIBERIA_1964			
	Liberia	LIB	26
MASSAWA			
	Eritrea(Ethiopia)	MAS	27
MERCHICH			
	Morocco	MER	28
MINNA			
	Cameroon	MIN-A	29
	Nigeria	MIN-B	30
M'PORALOKO			
	Gabon	MPO	31
NORTH_SAHARA_1959			
	Algeria	NSD	32
OLD_EGYPTIAN_1907			
	Egypt	OEG	33
POINT_58			
	Mean_Solution (BurkinaFaso-Niger)	PTB	34
POINTE_NOIRE_1948			
	Congo	PTN	35
SCHWARZECK			
	Namibia	SCK	36
SIERRA_LEONE_1960			
	SierraLeone	SRL	37
VOIROL_1960			
	Algeria	VOR	38

ASIA		
REGION	**CODE**	**CDB-ID VALUE**
AIN_EL_ABD_1970		
Bahrain_Island	AIN-A	39

	Saudi_Arabia	AIN-B	40
DJAKARTA(BATAVIA)			
	Sumatra(Indonesia)	BAT	41
EUROPEAN_1950			
	Iran	EUR-H	77
HONG_KONG_1963			
	Hong_Kong	HKD	42
HU-TZU-SHAN			
	Taiwan	HTN	43
INDIAN			
	Bangladesh	IND-B	44
	India-Nepal	IND-I	45
INDIAN_1954			
	Thailand	INF-A	46
INDIAN_1960			
	Vietnam(near_16DegNorth)	ING-A	47
	ConSonIsland(Vietnam)	ING-B	48
INDIAN_1975			
	Thailand	INH-A	49
	Thailand	INH-A1	50
INDONESIAN_1974			
	Indonesia	IDN	51
KANDAWALA			
	SriLanka	KAN	52
KERTAU_1948			
	WestMalaysia-Singapore	KEA	53
KOREAN_1995			
	SouthKorea	KGS	54
NAHRWAN			
	MasirahIsland(Oman)	NAH-A	55
	UnitedArabEmirates	NAH-B	56
	SaudiArabia	NAH-C	57
OMAN			
	Oman	FAH	58
QATAR_NATIONAL			
	Qatar	QAT	59
SOUTH_ASIA			
	Singapore	SOA	60
TIMBALAI_1948			
	Brunei-East_Malaysia	TIL	61
TOKYO			

	MeanSolution	TOY-M	62
	Japan	TOY-A	63
	Okinawa	TOY-C	64
	South Korea	TOY-B	65
	South Korea	TOY-B1	66

AUSTRALIA			
REGION		CODE	CDB-ID VALUE
AUSTRALIAN_1966			
	Australia-Tasmania	AUA	67
AUSTRALIAN_1984			
	Australia-Tasmania	AUG	68

EUROPE			
REGION		CODE	CDB-ID VALUE
CO-ORDINATE SYSTEM 1937 OF ESTONIA			
	Estonia	EST	69
EUROPEAN_1950			
	MeanSolution	EUR-M	70
	WesternEurope	EUR-A	71
	Cyprus	EUR-E	72
	Egypt	EUR-F	73
	England,ChannelIslands,Scotland,ShetlandIslands	EUR-G	74
	England,Ireland,Scotland,ShetlandIslands	EUR-K	75
	Greece	EUR-B	76
	Iran	EUR-H	77
	ItalySardinia	EUR-I	78
	ItalySicily	EUR-J	79
	Malta	EUR-L	80
	Norway,Finland	EUR-C	81
	Portugal,Spain	EUR-D	82
	Tunisia	EUR-T	83
EUROPEAN_1979			
	MeanSolution	EUS	84
HJORSEY_1955			
	Iceland	HJO	85

IRELAND_1965			
	Ireland	IRL	86
ORDNANCE SURVEY OF GREAT BRITAIN 1936			
	MeanSolution	OGB-M	87
	England	OGB-A	88
	England,IsleOfMan,Wales	OGB-B	89
	Scotland,ShetlandIslands	OGB-C	90
	Wales	OGB-D	91
ROME_1940			
	Sardinia	MOD	92
S-42(PULKOVO_1942)			
	Hungary	SPK-A	93
	Poland	SPK-B	94
	Czechoslovakia*	SPK-C	95
	Latvia	SPK-D	96
	Kazakhstan	SPK-E	97
	Albania	SPK-F	98
	Romania	SPK-G	99
S-JTSK			
	Czechoslovakia	CCD	100

NORTH AMERICA			
REGION		**CODE**	**CDB-ID VALUE**
CAPE_CANAVERAL			
	MeanSolution(Florida,Bahamas)	CAC	101
NORTH AMERICAN 1927			
	MeanSolution	NAS-C	102
	WesternUnitedStates	NAS-B	103
	EasternUnitedStates	NAS-A	104
	Alaska(ExcludingAleutianIslands)	NAS-D	105
	AleutianIslands(East180°W)	NAS-V	106
	AleutianIslands(West180°W)	NAS-W	107
	Bahamas(Excluding San Salvador Island)	NAS-Q	108
	SanSalvadorIsland	NAS-R	109
	CanadaMeanSolution(Including Newfoundland)	NAS-E	110
	Alberta,BritishColumbia	NAS-F	111
	EasternCanada	NAS-G	112

	Manitoba,Ontario	NAS-H	113
	NorthwestTerritories,Saskatchewan	NAS-I	114
	Yukon	NAS-J	115
	CanalZone	NAS-O	116
	Caribbean	NAS-P	117
	CentralMerica	NAS-N	118
	Cuba	NAS-T	119
	Greenland	NAS-U	120
	Mexico	NAS-L	121
NORTH AMERICAN 1983			
	Alaska(ExcludingAleutianIslands)	NAR-A	122
	AleutianIslands	NAR-E	123
	Canada	NAR-B	124
	CONUS	NAR-C	125
	Hawaii	NAR-H	126
	Mexico,CentralAmerica	NAR-D	127

SOUTH AMERICA

REGION		CODE	CDB-ID VALUE
BOGOTA OBSERVATORY			
	Colombia	BOO	128
CAMPO NCHAUSPE 1969			
	Argentina	CAI	129
CHUA ASTRO			
	Paraguay	CHU	130
CORREGO ALEGRE			
	Brazil	COA	131
PROVISIONAL SOUTH AMERICAN 1956			
	MeanSolution	PRP-M	132
	Bolivia	PRP-A	133
	Northern Chile(near 19°S)	PRP-B	134
	Southern Chile(near 43°S)	PRP-C	135
	Colombia	PRP-D	136
	Ecuador	PRP-E	137
	Guyana	PRP-F	138
	Peru	PRP-G	139
	Venezuela	PRP-H	140

PROVISIONAL SOUTH CHILEAN			
	Southern Chile(near 53°S)	HIT	141
SOUTH AMERICAN 1969			
	MeanSolution	SAN-M	142
	Argentina	SAN-A	143
	Bolivia	SAN-B	144
	Brazil	SAN-C	145
	Chile	SAN-D	146
	Colombia	SAN-E	147
	Ecuador (Excluding Galapagos Islands)	SAN-F	148
	Baltra,Galapagos Islands	SAN-J	149
	Guyana	SAN-G	150
	Paraguay	SAN-H	151
	Peru	SAN-I	152
	Trinidad and Tobago	SAN-K	153
	Venezuela	SAN-L	154
SOUTH AMERICAN GEOCENTRIC REFERENCE SYSTEM(SIRGAS)			
	South America	SIR	155
ZANDERIJ			
	Suriname	ZAN	156

ATLANTIC OCEAN

REGION		CODE	CDB-ID VALUE
ANTIGUA ISLAND ASTRO 1943			
	Antigua,Leeward Islands	AIA	157
ASCENSION ISLAND 1958			
	Ascension Island	ASC	158
ASTRO DOS 71/4			
	St.Helena Island	SHB	159
BERMUDA 1957			
	Bermuda Islands	BER	160
CAPE CANAVERAL			
	Mean Solution (Bahamas and Florida)	CAC	101
DECEPTION ISLAND			
	Deception Islandand Antarctica	DID	161
FORT THOMAS 1955			
	Nevis, St.Kitts and Leeward Islands	FOT	162
GRACIOSA BASE SW 1948			

	Faial, Graciosa, Pico, SaoJorge and Terceira Islands (Azores)	GRA	163
HJORSEY 1955			
	Iceland	HJO	85
ISTS 061 ASTRO 1968			
	South Georgia Island	ISG	164
L.C. 5 ASTRO 1961			
	Cayman Brac Island	LCF	165
MONTSERRAT ISLAND ASTRO 1958			
	Montserrat and Leeward Islands	ASM	166
NAPARIMA,BWI			
	Trinidad and Tobago	NAP	167
OBSERVATORIO METEOROLOGICO 1939			
	Corvo and Flores Islands (Azores)	FLO	168
PICO DE LAS NIEVES			
	Canary Islands	PLN	169
PORTO SANTO 1936			
	Porto Santo and Madeira Islands	POS	170
PUERTO RICO			
	Puerto Rico and Virgin Islands	PUR	171
QORNOQ			
	South Greenland	QUO	172
SAO BRAZ			
	Sao Miguel and Santa Maria Islands (Azores)	SAO	173
SAPPER HILL 1943			
	East Falkland Island	SAP	174
SELVAGEM GRANDE 1938			
	Salvage Islands	SGM	175
TRISTAN ASTRO 1968			
	Tristan da Cunha	TDC	176

INDIAN OCEAN

REGION	CODE	CDB-ID VALUE
ANNA 1 ASTRO 1965		
Cocos Islands	ANO	177
GAN 1970		
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