LaneTo-EC Protocol

Abstract

This document defines the data input and output protocols for the LaneTo EC series products.

Revision History

Version	Date	Description
1	January 2023	first edition of LaneTo-EC data protocol

Contents

1. NMEA Output Messages

LaneTo outputs GGA, RMC, GSA, and GSV NMEA messages by default. Their data formats conform to the NMEA standard specifications.

2. Proprietary Navigation Results -- $PBSOL,1

Field	*Data Type*	*Description*
Message String ID	String	$PBSOL
Message String sub-ID	Integer	0x01
UTC Year	Integer	
UTC Month	Integer	
UTC Day	Integer	
UTC Hour	Integer	
UTC Minute	Integer	
UTC Millisecond	Integer	
Sensor Time	Integer	Unit：ms
GPS Week	Integer	
Time of Week	Integer	Unit：ms
Navigation Mode	Integer	Value 0x00: invalid positioning bit 0: reserved bit 1: GNSS only bit 2: IMU only bit 3: integrated positioning bit 4~11: reserved bit 12: DGNSS bit 13: RTK Fixed bit 14: RTK Float bit 15~ 31: reserved
Latitude	Double	Unit：degree, 8 decimals
Longitude	Double	Unit：degree, 8 decimals
Ellipsoid Altitude	Double	Unit：meter, 3 decimals
Mean Sea Level	Double	Unit：meter, 3 decimals
North Velocity	Integer	Unit：cm/s
East Velocity	Integer	Unit：cm/s
Down Velocity	Integer	Unit：cm/s
Ground Speed	Integer	Unit：cm/s
Travel Distance	Integer	Unit：cm
Roll	Integer	Unit：degree, scaled by 100
Pitch	Integer	Unit：degree, scaled by 100
Heading	Integer	Unit：degree, scaled by 100

Reserved	Integer	
Reserved	Integer	
North Position Error (1σ)	Integer	Unit：cm
East Position Error (1σ)	Integer	Unit：cm
Vertical Position Error (1σ)	Integer	Unit：cm
North Velocity Error (1σ)	Integer	Unit：cm/s
East Velocity Error (1σ)	Integer	Unit：cm/s
Vertical Velocity Error (1σ)	Integer	Unit：cm/s
Roll Error (1σ)	Integer	Unit：degree, scaled by 100
Pitch Error (1σ)	Integer	Unit：degree, scaled by 100
Heading Error (1σ)	Integer	Unit：degree, scaled by 100
Installation Roll Angle	Integer	Unit：degree, scaled by 100
Installation Pitch Angle	Integer	Unit：degree, scaled by 100
Installation Yaw Angle	Integer	Unit：degree, scaled by 100
Reference Station ID	String	
Differential Age	Integer	Unit: second
Reserved		
Reserved		
Checksum	*Hex	

3. Sensor Data -- $PSNSR,21

Field	*Data Type*	*Description*
Message String ID	String	$PSNSR
Message String sub-ID	Integer	21
Number of Data Sets (num)	Integer	
Repeated num times, N = 0 ~ (num-1)		
Timestamp[N]	Integer	Unit：ms
Gyro X [N]	Integer	Unit：deg/s, scaled by 1000
Gyro Y [N]	Integer	Unit：deg/s, scaled by 1000
Gyro Z [N]	Integer	Unit：deg/s, scaled by 1000
Accel X [N]	Integer	Unit: m/s², scaled by 1000
Accel Y [N]	Integer	Unit: m/s², scaled by 1000
Accel Z [N]	Integer	Unit: m/s², scaled by 1000
Reserved[N]	Integer	
Reserved[N]	Integer	
Checksum	*Hex	

4. Rover Measurements -- $PGNSS,3

Field	*Data Type*	*Description*
Message String ID	String	$PGNSS
Message String sub-ID	Integer	3
SVID	Integer	
Time of GPS Week	double	Unit：sec
Pseudorange	double	Unit：m
Carrier Phase	double	Unit：Cycles
Reserved		
CN0	Float	Unit： dB-Hz
Reserved		
Reserved		
Reserved		
Checksum	*Hex	

5. Rover SV States-- $PGNSS,5

Field	*Data Type*	*Description*
Message String ID	String	$PGNSS
Message String sub-ID	Integer	5
SVID	Integer	See note
Time of GPS Week	double	Unit：sec
ECEF-X	double	Unit：m
ECEF-Y	double	Unit：m
ECEF-Z	double	Unit：m
ECEF-Vx	double	Unit：m/s
ECEF-Vy	double	Unit：m/s
ECEF-Vz	double	Unit：m/s
Reserved		
Reserved		
Satellite Clock Drift	DOUBLE	In m/s
Satellite Clock Bias	DOUBLE	In m
Satellite Status	tUINT8	1: Health; 0: unhealth
Checksum	*Hex	

Note： 1—32 GPS, 401—463 BDS, 301—336 GAL

6. Base Measurements -- $PGNSS,4

Field	*Data Type*	*Description*
Message String ID	String	$PGNSS
Message String sub-ID	Integer	4
SVID	Integer	
Time of GPS Week	double	Unit：sec
Pseudorange	double	Unit：m
Carrier Phase	double	Unit：Cycles
Reserved		
CN0	Float	Unit： dB-Hz
Reserved		
Reserved		
Checksum	*Hex	

7. Base Position -- $PGNSS,9

Field	*Data Type*	*Description*
Message String ID	String	$PGNSS
Message String sub-ID	Integer	9
Station ID	String	
ECEF-X	Double	Unit：m
ECEF-Y	Double	Unit：m
ECEF-Z	Double	Unit：m
Reserved		
Checksum	*Hex	

8. Data Block End-- $PBEND

Field	*Data Type*	*Description*
Message String ID	String	$PBEND
Message String sub-ID	Integer	255
Reserved	Integer	255
Checksum	*Hex	

9. Function and Message Configuration Commands

The LaneTo can receive user input configuration commands for adjusting functions and output messages. Configuration command inputs are in hexadecimal format, using the following fixed structure: 8 bytes, unsigned, little-endian encoding.

Sync-1	Sync-2	Type	Group	Reserved	Cmd-1	Cmd-2	Sync-3
0x50	0x42	Class	Group	0x00	Cmd-1	Cmd-2	0x00

（1）Factory Reset

50 42 **E0** 01 00 81 81 00

（2）Query Software Version and Current Configuration

50 42 **E3** 01 00 00 00 00

（3）Set Navigation Rate

1Hz: 50 42 **E4** 01 00 80 80 00 （default）

10Hz: 50 42 **E4** 01 00 82 82 00

（4）Enable DR hot-reset

disable: 50 42 **E6** 01 00 80 80 00 （default）

enable: 50 42 **E6** 01 00 81 81 00

（5）Enable all Messages

50 42 **E7** 01 00 80 80 00 （default）

（6）Disable Single Message E7

Disable：Set corresponding bit to 1

CMD-1：*bit 7 always 1*；CMD-1 bit 6—0 and CMD-2 bit 7—0 Set to Disable Single Message

Messages	Class	Group	Cmd-1 bit 6--0	Cmd-2 bit 7--0	Command
$GGA	0xE7	0x02	0x00	0x01	50 42 E7 02 00 80 01 00
$RMC			0x00	0x02	50 42 E7 02 00 80 02 00
$GSA			0x00	0x04	50 42 E7 02 00 80 04 00
$GSV			0x00	0x08	50 42 E7 02 00 80 08 00
$PBSOL			0x00	0x10	50 42 E7 02 00 80 10 00
$PGNSS,3			0x00	0x20	50 42 E7 02 00 80 20 00
$PGNSS,4			0x00	0x40	50 42 E7 02 00 80 40 00
$PGNSS,5			0x00	0x80	50 42 E7 02 00 80 80 00
$PGNSS,6,			0x01	0x00	50 42 E7 02 00 81 00 00
PGNSS,9			0x02	0x00	50 42 E7 02 00 82 00 00

$PSNSR,21,			0x04	0x00	50 42 E7 02 00 84 00 00
$PSNSR,23,			0x08	0x00	50 42 E7 02 00 88 00 00
$PBEND			0x10	0x00	50 42 E7 02 00 90 00 00
$PBATT			0x20	0x00	50 42 E7 02 00 A0 00 00

（7）Set to GNSS Only

(Disable by default)

enable：50 42 **E9** 01 00 81 81 00

disable：50 42 **E9** 01 00 80 80 00

（8）Wheel Speed Input Mode Setting

No wheel speed or from UART：50 42 **EA** 01 00 80 80 00 （default)

Pulse input：50 42 **EA** 01 00 81 81 00

（9）IMU Axes Setting

If any IMU axis is aligned with the vehicle forward direction, the fixed-axis installation configuration can be used; otherwise, the free installation configuration should be selected.

Auto-Detection or Free Installation		50 42 EB 01 00 80 80 00
Fixed Axis	Z forward	50 42 EB 01 00 81 81 00 （default)
	Negative Z forward	50 42 EB 01 00 82 82 00
	X forward	50 42 EB 01 00 83 83 00
	Negative X forward	50 42 EB 01 00 84 84 00
	Y forward	50 42 EB 01 00 85 85 00
	Negative Y forward	50 42 EB 01 00 86 86 00

（10）Other Configuration Commands (string format, transmitted via UART1; effective after power restart)

Baud rate *115200* by default，configurable to 230400, 460800

UART-1	$PAIR864,0,0,115200*1B\r\n
UART-2	$PAIR864,0,1,115200*1A\r\n

10. Optionally External Wheel Speed Input

Users can choose to input wheel speed information. There are two input methods: the first is via UART1 data input, and the second is via hardware pulse input.

Method 1: Wheel Speed Input via UART1

10 Hz input. Each message ends with \r\n.

Example: $GPODO,210000,9.3,0*68

Field	*Data Type*	*Description*
Message String ID	String	$GPODO
Timestamp	Integer	Unit: ms
Speed	Float	Unit：m/s
Gear Position	Integer	0：Forward；1：Reverse
Checksum	*Hex	Checksum

Method 2: Pulse Input

Please contact the company support team.

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