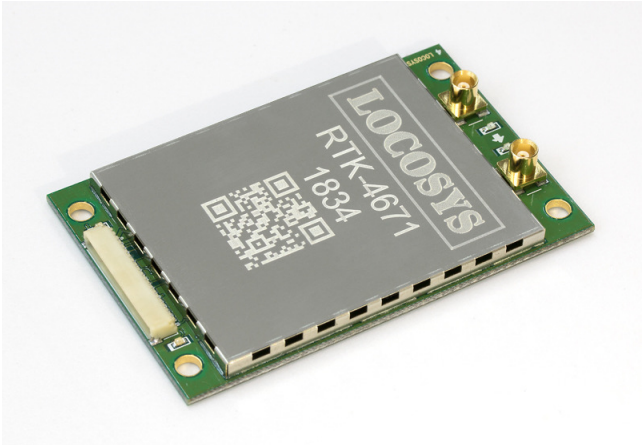
LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

Product name	Description	Version
RTK-4671	GPS/BeiDou/SBAS Receiver, Dual Antenna, Precise Positioning/Heading, TTL(USB), 115200BPS	1.1



1. Introduction

The RTK-4671 is a dual-antenna-input GNSS Precise Positioning/Heading receiver; it can provide DGPS accuracy position from SBAS and high precision heading to end user applications. The RTK-4671 features a highly sensitive receiver to capture and maintain the satellite signals, combined with low power consumption, even when receiving multi-constellation satellites signals.

The RTK-4671 GNSS receiver provides two independent signal processing chains (two GNSS modules) each with 99 channels of combined GPS L1 and BeiDou B1 code and carrier phase tracking. Using a pair of antennas, the receiver computes the precise vector between two antenna phase centers to provide a heading for marine or aircraft based system.

2. Features

- Two antenna inputs
- Fast Time to First Heading
- Support GPS, BeiDou constellation
- Capable of SBAS (WAAS, EGNOS, MSAS, GAGAN)
- Heading (rms) 0.2 deg @ 1m antenna separation
- Low-power consumption and compact size
- Current limited feature (limited to 50mA typ.) with each active GNSS antennas
- Easy and simply to integrate
- Support update rate 1/2/4Hz output

3. Application

- Unmanned aerial vehicle (Delivery drone)
- Marine navigation
- Self-driving bus
- Unmanned food truck
- Patrol robot

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
886-2-8698-3698
886-2-8698-3699
www.locosystech.com

4. Product feature

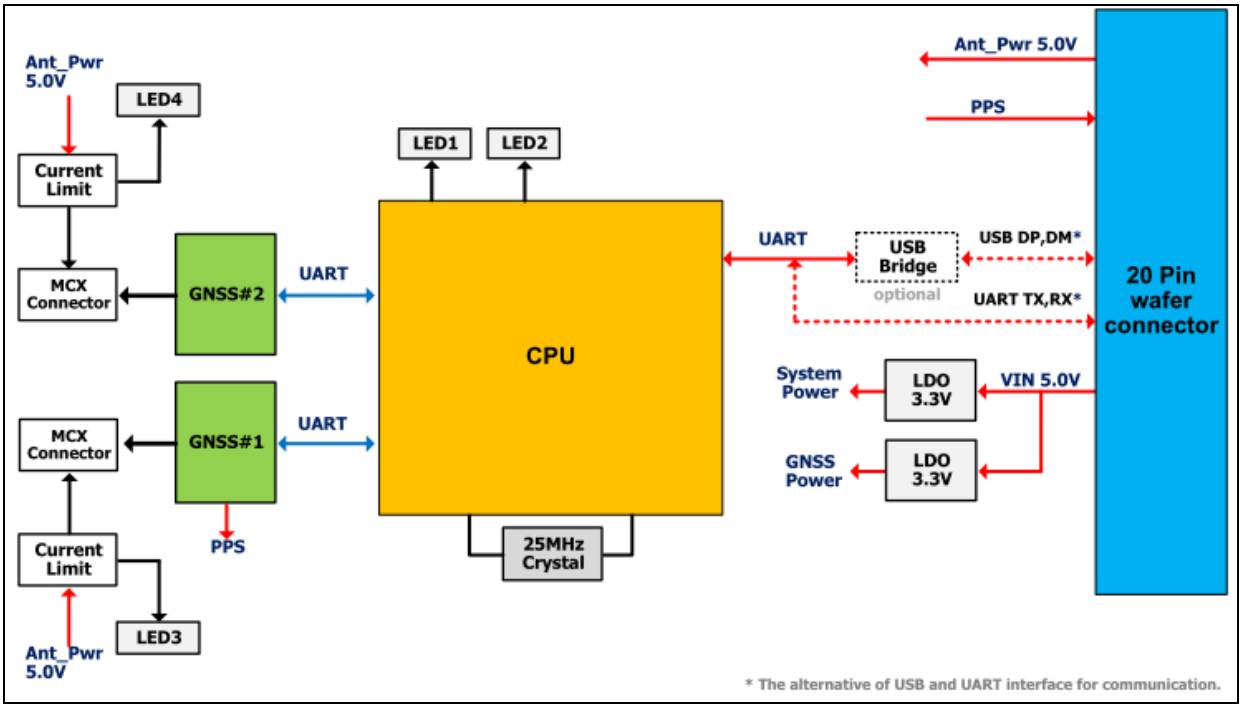
GNSS feature	Description	
GPS	L1 1575.42MHz, C/A code.	
BeiDou	B1 1561.098MHz, C code.	
SBAS	WAAS, EGNOS, MSAS, GAGAN	
Channels	2x 99 channels (33 Tracking, 99 Acquisition) each independent signal chains	
Update rate[1]	1(default), 2, or 4 Hz	
Acquisition Time[2]	TTFF (Open Sky)	61s (typical)
Position Accuracy	Autonomous	2.5m CEP
	SBAS	2.5m (depends on accuracy of correction data)
Limitations	Max. Altitude	< 18,000 m, up to 50,000m by request
	Max. Velocity	< 515 m/s
Heading Accuracy[3] (rms)	0.2 deg @ 1m antenna separation	
Protocols support	NMEA 0183 ver. 4.0 & LOCOSYS proprietary protocol	115200 bps, 8 data bits, no parity, 1 stop bits (default) 1Hz: GGA, GSA, RMC, GSV, VTG, HDT

Note 1: The GSV message is fixed at 1Hz even the update rate at 2 or 4 Hz.

Note 2: No almanac or ephemeris and no approximate position or time.

Note 3: using GNSS Helix antenna

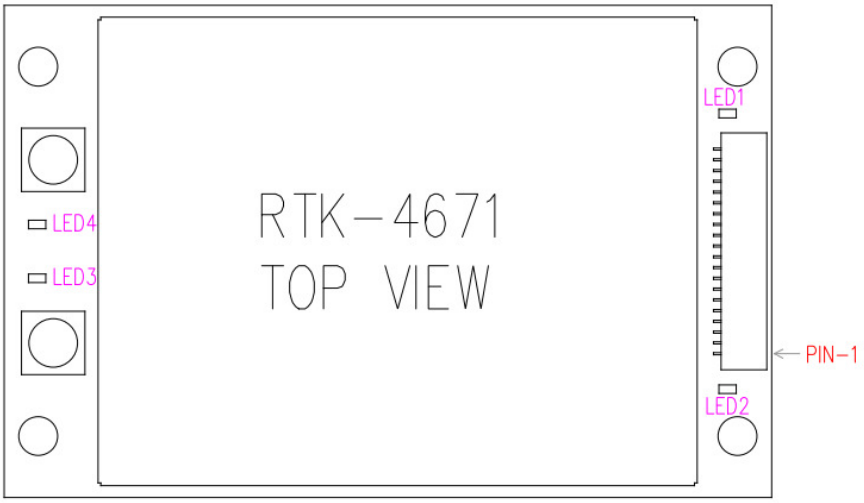
5. Block diagram



LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

6. Pin definition

6.1. Pin assignment



6.2. Pin description

Pin No	Name	Description
1	ANT_PWR	External active antenna supply
2	VIN	Power supply input
3	USB_DM[1]	USB data minus
4	USB_DP[1]	USB data plus
5	RESETN	System reset, Low active
6	Reserved	Microprocessor BOOT pin, it should be set to high for firmware update.
7	VBAT[2]	GNSS backup power supply (This pin is optional.)
8	Reserved	Reserved, this pin should be left floating
9	Reserved	Reserved, this pin should be left floating
10	GND	Ground
11	TX	UART transmitter output
12	RX	UART receiver input
13	GND	Ground
14	Reserved	Reserved, this pin should be left floating
15	Reserved	Reserved, this pin should be left floating
16	GND	Ground
17	Reserved	Reserved, this pin should be left floating
18	GND	Ground

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

19	PPS	GNSS 1PPS output, default 100ms pulse/sec when 3D position fix is available.
20	3V3 OUT	3.3V power output

Note 1: The alternative of USB and UART interface for communication.

Note 2: The receiver doesn't have hot start and hybrid ephemeris prediction when this pin and VCC pin are not applied.

7. Electrical specifications

7.1. Power consumption

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input voltage	VCC		4.5	5	5.5	V
Input Backup Battery Voltage	V_BCKP		2.0		4.3	V
External Active Antenna Supply Voltage	ANT_PWR		2.8		5.5	V
Input current[1]	Icc	with USB bridge		125		mA

Note 1: Measured when position fix (1Hz) is available, input voltage is 5.0V.

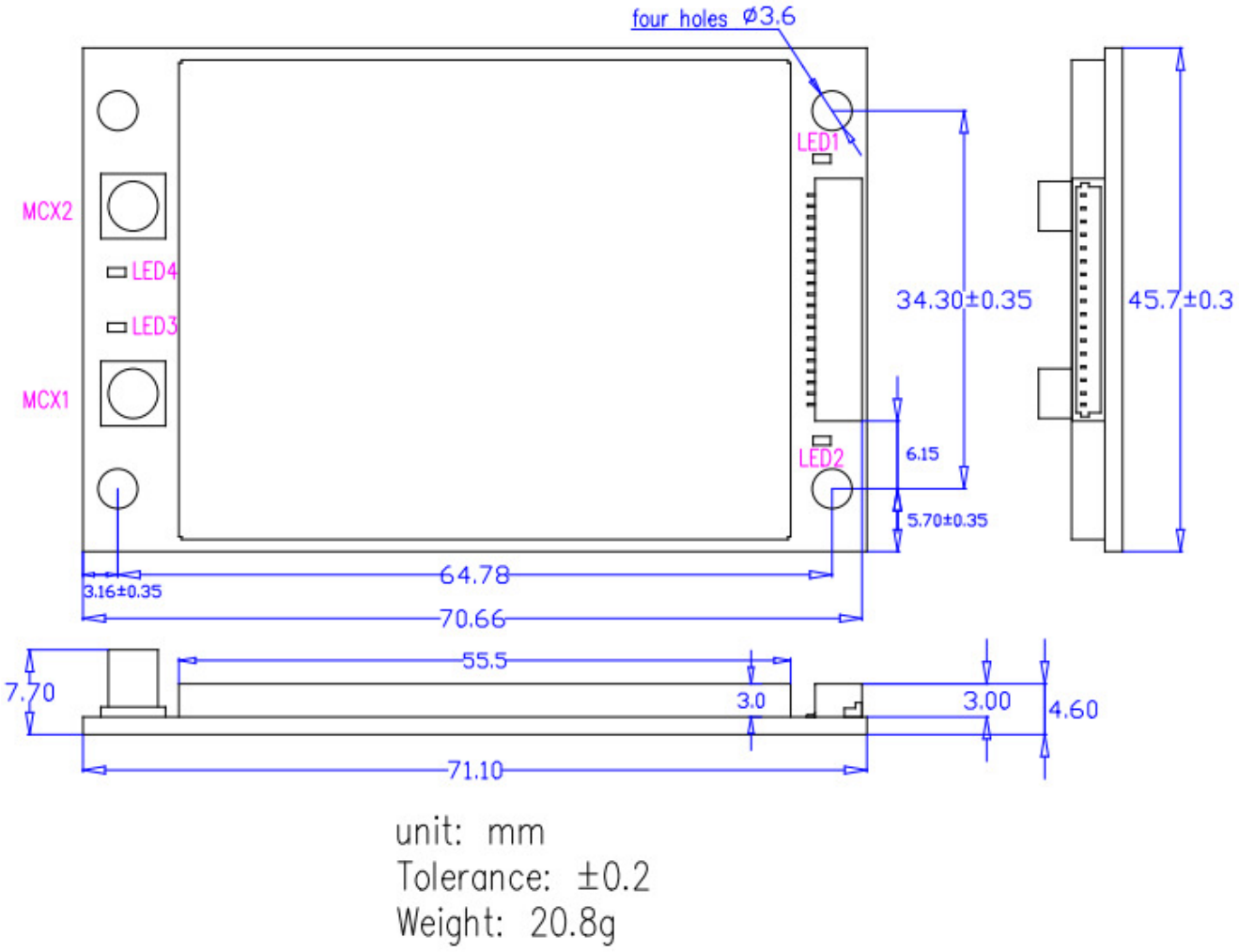
7.2. Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-25*	-	85	℃
Storage Temperature	Tstg	-25*	-	85	℃

*The operating ambient temperature of the receiver is -40~85℃ except wafer connector.

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

8. Board Layout and Dimensions



The connector's part number is 1W1001WOR0-20NA from the company, TOKUTSU. It belongs to WAFER horizontal SMT single row connector, pitch 1.0mm.

9. LED indicator

Blue LED flash (location on LED1, 1Hz): Means the receiver is normal operation

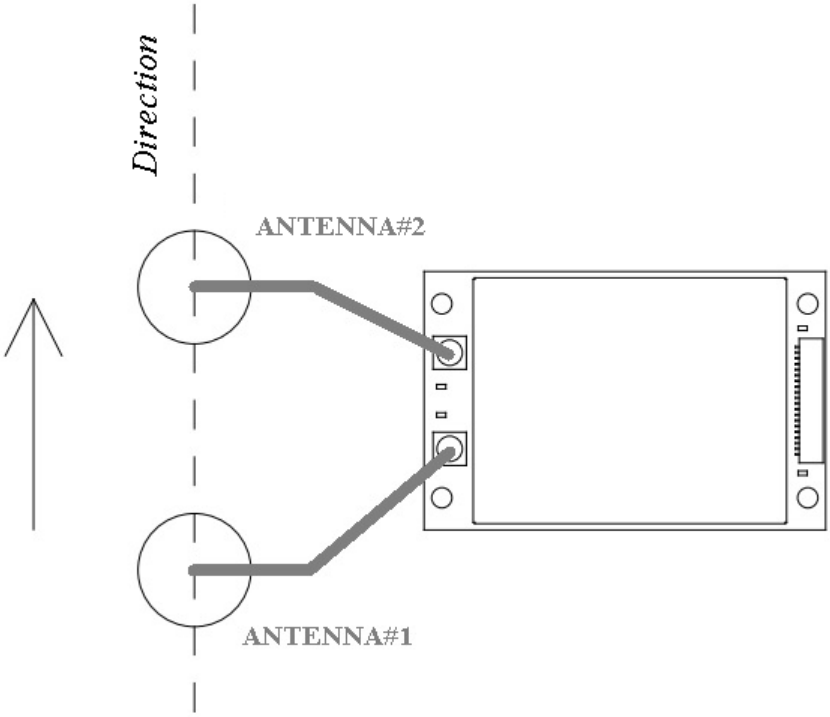
Green LED flash (location on LED2, 1Hz): Means the receiver is in precise heading status.

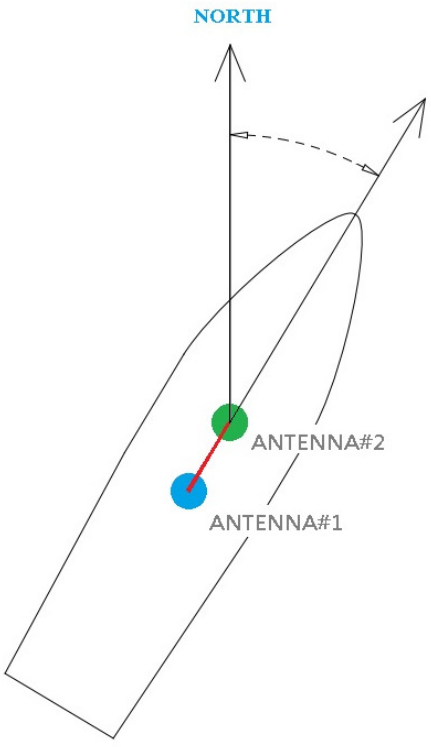
Red LED flash (location on LED3 or/and LED4): Short-circuit on the MCX1 or/and MCX2 active antenna connector.

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

10. GNSS antenna setup for heading measure

The receiver is always configured to provide precise heading when both antennas are connected and have a clear view of the sky. The Heading is alignment of two antennas from “Antenna # 1” to “Antenna #2”, and it is relative to True North. As shown in the diagram below:





LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

11. Software interface

11.1. NMEA output message

Table 11.1-1 NMEA output message

NMEA record	Description
GGA	Global positioning system fixed data
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed
HDT	Heading from true north message fields

- **GGA--- Global Positioning System Fixed Data**

Table 11.1-2 contains the values for the following example:

$GNGGA,054506.000,2503.7191,N,12138.7473,E,2,18,0.66,126.1,M,15.3,M,,*7D

Table 11.1- 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header (GNGGA)
UTC Time	054506.000		hhmmss.sss
Latitude	2503.7191		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7473		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	2		See Table 11.1-3
Satellites Used	18		Range 0 to 33
HDOP	0.66		Horizontal Dilution of Precision
MSL Altitude	126.1	meters	
Units	M	meters	
Geoid Separation	15.3	meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID			
Checksum	*7D		
<CR> <LF>			End of message termination

Table 11.1-3 Position Fix Indicators

Value	Description
0	Fix not available or invalid

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

1	GNSS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not supported
6	Dead Reckoning Mode, fix valid

● GSA---GNSS DOP and Active Satellites

Table 11.1-4 contains the values for the following example:

$GPGSA,A,3,23,11,22,28,19,06,09,17,03,01,30,,0.94,0.62,0.71*06

$BDGSA,A,3,07,10,04,02,03,06,13,01,,,,,0.94,0.62,0.71*1A

Table 11.1-4 GSA Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 11.1-5
Mode 2	3		See Table 11.1-6
ID of satellite used	23		Sv on Channel 1
ID of satellite used	11		Sv on Channel 2
….			….
ID of satellite used			Sv on Channel 12
PDOP	0.94		Position Dilution of Precision
HDOP	0.62		Horizontal Dilution of Precision
VDOP	0.71		Vertical Dilution of Precision
Checksum	*06		
<CR> <LF>			End of message termination

Table 11.1-5 Mode 1

Value	Description
M	Manual- forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

Table 11.1-6 Mode 2

Value	Description
1	Fix not available
2	2D
3	3D

● GSV---GNSS Satellites in View

Table 11.1-7 contains the values for the following example:

$GPGSV,4,1,13,28,77,192,40,50,50,134,40,17,48,344,41,03,47,058,40*7D

$GPGSV,4,2,13,06,40,271,37,19,29,317,34,22,26,046,35,01,18,046,32*75

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

$GPGSV,4,3,13,11,14,067,30,30,13,202,30,23,12,116,33,09,10,146,32*77

$GPGSV,4,4,13,02,02,250,19*44

$BDGSV,2,1,10,10,60,238,41,03,60,206,39,01,55,141,40,17,55,106,*6A

$BDGSV,2,2,10,07,51,193,40,13,47,299,38,02,40,242,35,04,39,117,35*66

Table 11.1-7 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Total number of messages[1]	4		Range 1 to 4
Message number[1]	1		Range 1 to 4
Satellites in view	13		
Satellite ID	28		Channel 1 (Range 01 to 196)
Elevation	77	degrees	Channel 1 (Range 00 to 90)
Azimuth	192	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	40	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
….			….
Satellite ID	03		Channel 4 (Range 01 to 196)
Elevation	47	degrees	Channel 4 (Range 00 to 90)
Azimuth	058	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	40	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)
Checksum	*7D		
<CR> <LF>			End of message termination

Note 1: Depending on the number of satellites tracked multiple messages of GSV data may be required.

● RMC---Recommended Minimum Specific GNSS Data

Table 11.1-8 contains the values for the following example:

$GNRMC,081419.000,A,2503.7150,N,12138.7463,E,0.01,0.00,160415,,,A*7B

Table 11.1-8 RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header
UTC Time	081419.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2503.7150		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12138.7463		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.01	knots	True
Course over ground	0.00	degrees	

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

Date	160415		ddmmyy
Magnetic variation		degrees	
Variation sense			E=east or W=west (Not shown)
Mode	A		A=autonomous, D=DGPS, E=DR, N=Data not valid, R=Coarse Position, S=Simulator
Checksum	*7B		
<CR> <LF>			End of message termination

● VTG---Course Over Ground and Ground Speed

Table 11.1-9 contains the values for the following example:

$GNVTG,172.67,T,,M,0.00,N,0.01,K,D*22

Table 11.1-9 VTG Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPVTG		VTG protocol header
Course over ground	172.67	degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	0.00,	knots	Measured speed
Units	N		Knots
Speed over ground	0.01	km/hr	Measured speed
Units	K		Kilometer per hour
Mode	D		A=autonomous, D=DGPS, E=DR, N=Data not valid, R=Coarse Position, S=Simulator
Checksum	*38		
<CR> <LF>			End of message termination

● GPHDT---Heading from true north message fields

Table 11.1-10 contains the values for the following example:

$GPHDT,40.14,T*34

Table 11.1-10 GPHDT Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPHDT		HDT protocol harder
Heading	40.14	degrees	Heading in degrees
Relative to True North	T		Indicates heading relative to True North
Checksum	*34		
<CR> <LF>			End of message termination

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

11.2. LOCOSYS proprietary commands

11.2.1. Query firmware version

Synopsis:

```
$PLSC,VER*CK<CR><LF>
```

Response:

```
$PLSR,<VER>*CK<CR><LF>
```

Examples:

```
$PLSC,VER*61<CR><LF>
```

11.2.2. Get setting for the two antenna distance;

Synopsis:

```
$PLSC,GETDIST*CK<CR><LF>
```

Response:

```
$PLSR,DIST,<DIST>*CK<CR><LF>
```

Parameter	Format	Description
DIST	Decimal	setting for the two antenna distance (unit: mm); if the value = 0, means antenna distance is not set

Examples:

```
$PLSC,GETDIST*7C<CR><LF>
```

11.2.3. Set antenna distance

Synopsis:

```
$PLSC,SETDIST,<DIST>*CK<CR><LF>
```

Response:

```
$PLSR,DIST,<DIST>*CK<CR><LF>
```

Parameter	Format	Description
DIST	Decimal	To set the distance between two antenna

Examples:

```
$PLSC,SETDIST,500[1]*71<CR><LF>
```

Note 1: Set two antenna distance is 500 mm

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

11.2.4. Get setting for the update rate

Synopsis:

```
$PLSC,GETRATE*CK<CR><LF>
```

Response:

```
$PLSR,<RATE>*CK<CR><LF>
```

Parameter	Format	Description
RATE	Decimal	The output data update rate, in Hz.(included 1, 2, or 4 Hz)

Examples:

```
$PLSC,GETRATE*74<CR><LF>
```

11.2.5. Set update rate

Synopsis:

```
$PLSC,SETRATE,<RATE>*CK<CR><LF>
```

Response:

```
$PLSR,RATE,<RATE>*CK<CR><LF>
```

Parameter	Format	Description
RATE	Decimal	The output data update rate, in Hz.(included 1, 2, or 4 Hz)

Examples:

```
$PLSC,SETRATE,4*78<CR><LF>
```

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi City, Taipei County 221, Taiwan
☎ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

12. Document change list

Revision 1.0

- First release on Sep. 28, 2018.

Revision 1.1

- Add the output data update rate in the section 11.2.4 and 11.2.5.