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Xizhi Dist., New Taipei City 22101, Taiwan
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886-2-8698-3699
www.locosystech.com

Product name	Description	Version
RTK-4671-MHDR	Dual-frequency RTK receiver with dead reckoning	0.1

1. Introduction

High-Precision RTK Dead Reckoning Solution for Smart Driving and Lane Level Navigation

LOCOSYS RTK-4671-MHDR is a high-precision RTK solution targeting for the smart driving and lane-level navigation markets. The latest designed LOCO II engine architecture is optimized to offer a seamless experience in dense urban canyons. RTK-4671-MHDR takes the shortest time to fix position and continues to work where GNSS signals are poor or not available.

RTK-4671-MHDR is a cost-effective RTK receiver for cm-level positioning and accurate raw measurements output, which can be integrated into autopilots and inertial navigation units. RTK-4671-MHDR supports multiple constellations, including GPS, GLONASS, BeiDou, GALILEO, QZSS and SBAS to improve the continuity and reliability of RTK solution even in harsh environment. It features powerful compatibility with other GNSS boards in the market by flexible interfaces, smart hardware design and popular log/command formats.

RTK-4671-MHDR not only supports multi-constellation RTK, but also has inertial sensors (3-axis accelerometers and 3-axis gyros). It can provide dead reckoning with or without odometer connection. The centimeter-accurate position, dead reckoning and low power consumption meet the requirement of lane-level car navigation and other location-based applications.

2. Features

- Centimeter-level position in RTK mode
- Dual-frequency and multi-constellation RTK.
- Capable of SBAS (WAAS, EGNOS, MSAS)
- Built-in MEMS sensor (3-axis Gyroscope and 3-axis Accelerometer)
- Up to 100Hz MEMS raw data output

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- Support odometer (wheel-tick pulse) input
- Support ADR/UDR fast automatic calibration
- Low-power consumption and compact size
- Built in short-circuit protection for the external GNSS antenna
- Up to 5 Hz position update rate
- Industrial operating temperature range -40 to +85°C
- Easy and simply to integrate
- LOCOSYS IATF 16949 certified production sites

3. Application

- Autonomous Vehicle Guidance
- Autonomous Vehicle (ex: AVN/T-BOX/HUD)
- Internet of Vehicles
- Unmanned Aerial Vehicles
- Precision Agriculture
- Hand-Held Device
- AGV Robotics
- V2V / V2X System
- Geographical measurement
- Geographical survey points
- Offshore / Marine Applications
- Tracker

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4. Product feature

GNSS feature	Description	
GNSS	Dual frequency and Multi-constellation	
DGPS, SBAS	WAAS, EGNOS, MSAS	
Channels	64 channels	
Update rate	1(default), 2, or 5 Hz	
Acquisition Time[1]	Cold start	35s (typical) (TBD)
	RTK initialization time	< 10s (after 3D fix)
	initialization reliability	99.9%
Position Accuracy[2]	Autonomous	< 1.5m CEP
	SBAS	< 1.5m (depends on accuracy of correction data)
	RTK[3]	0.01m + 1ppm
	ADR mode[4]	Avg 0.5% of distance travelled during GNSS outages (TBD)
	UDR mode[4]	Avg 5% of distance travelled during GNSS outages (TBD)
Limitations	Max. Altitude	< 18,000 m, up to 50,000m by request
	Max. Velocity	< 515 m/s
Navigation Outputs	NMEA 0183 ver. 4.1	115200 bps, 8 data bits, no parity, 1 stop bit (default) 1Hz: GGA, GSA, RMC, GSV, GST, SVD
Correction Input	RTCM-3.3	115200 bps, 8 data bits, no parity, 1 stop bits

Note 1: Acquisition time and position accuracy may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.

Note 2: All position values are based on Horizontal position accuracy.

Note 3: RMS, 24hr static. Accuracy specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.

Note 4: Typical error incurred without GNSS as a percentage of distance travelled.

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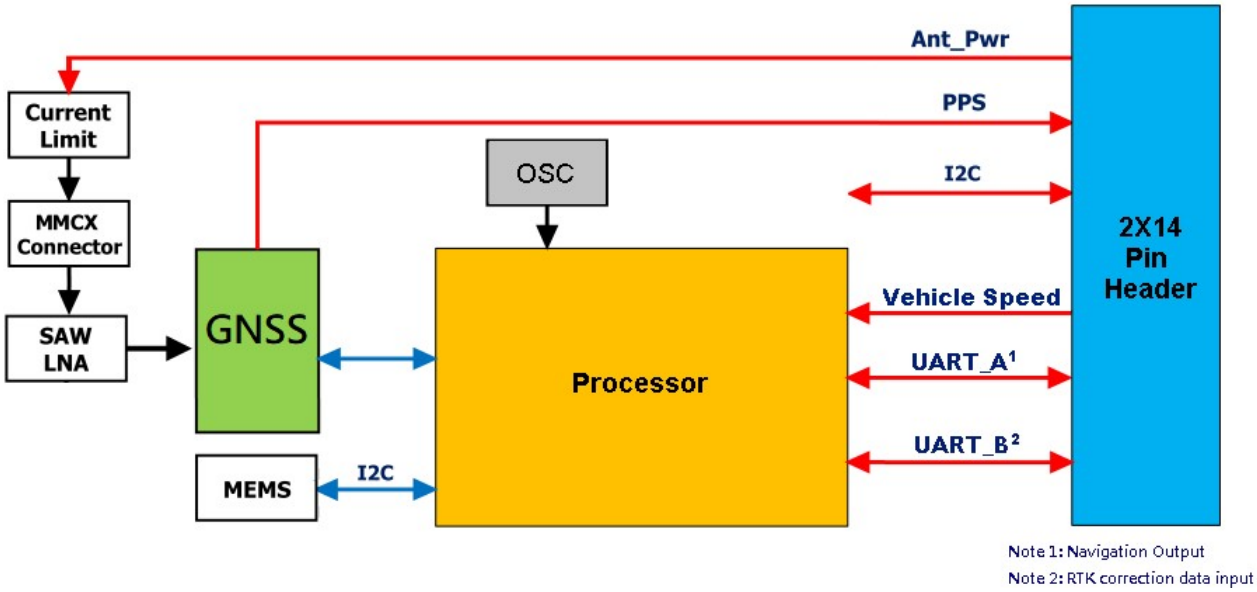
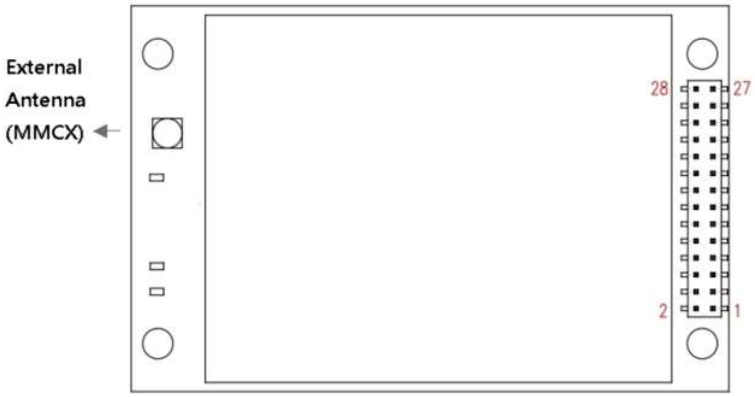
5. Block diagram



6. Pin definition

6.1. Pin assignment



Top View

28	SCL	SDA	27
26	NC	NC	25
24	Forward	PPS	23
22	GND	Reserved	21
20	GND	UART_B_RX	19
18	UART_B_TX	GND	17
16	UART_A_RX	UART_A_TX	15
14	GND	Reserved	13
12	WHEELTICK	SPEED_RXD	11
10	NC	/RESET_IN	9
8	Reserved	NC	7
6	VIN	Reserved	5
4	VBAT_GNSS	NC	3
2	NC	NC	1

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6.2. Pin description

Pin No	Name	Description
1	NC	Not connected
2	NC	Not connected
3	NC	Not connected
4	VBAT_GNSS	GNSS backup power supply. optional
5	Reserved	Microprocessor BOOT pin, this pin should be left floating
6	VIN	Device power supply
7	NC	Not connected
8	Reserved	Reserved, this pin should be left floating
9	RESET_IN	Device reset input, Low active
10	NC	Not connected
11	SPEED_RXD	UART_C, RXD, receiver asynchronous input
12	WHEELTICK	Odometer wheel-tick input. Leave floating if not used.
13	Reserved	Reserved, this pin should be left floating
14	GND	Ground
15	TXD_A	UART_A, transmitter output (Default NMEA)
16	RXD_A	UART_A, receiver input (Default NMEA)
17	GND	Ground
18	TXD_B	**UART_B transmitter output**
19	RXD_B	**UART_B receiver input, receive RTCM data streaming from base station to resolve RTK solutions.**
20	GND	Ground
21	Reserved	Reserved, this pin should be left floating
22	GND	Ground
23	PPS	Time pulse (1PPS, default 100 ms pulse/sec when 3D fix is available)
24	Forward	Direction of travel vehicle frame
25	NC	Not connected
26	NC	Not connected
27	SDA	SDA (MEMS raw date output)
28	SCL	SCL (MEMS raw date output)

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7. Data Interfaces and Protocols

7.1. Data Interface

The RTK-4671-MHDR receiver features 28 (2x14) pin header 2.0mm pitch (male) for connection to host system. It have two UART interfaces are available, and the baud rate for communication is 115200 bps.

7.2. Device Configuration

The RTK-4671-MHDR interfaces are support the following communication protocols:

UART_A	NMEA, 115200 bps. (GGA, GSA, RMC, GSV, GST, SVD)	Navigation output
UART_B	TX: NMEA, 115200 bps. (GGA) RX: RTCM-3.3, 115200 bps. See “Supported Data Messages” table.	RTK correction data input

Supported Data Messages:

Message Type	Description
1005	Stationary RTK reference station ARP
1006	Stationary RTK reference station ARP with antenna height
1019	GPS ephemeris data
1042	BeiDou ephemeris data
1074	Full GPS Pseudoranges and PhaseRanges plus CNR
1075	Full GPS Pseudoranges, PhaseRanges, PhaseRangeRate and CNR
1077	Full GPS Pseudoranges, PhaseRanges, PhaseRangeRate and CNR (high resolution)
1124	Full BeiDou Pseudoranges and PhaseRanges plus CNR
1125	Full BeiDou Pseudoranges, PhaseRanges, PhaseRangeRate and CNR
1127	Full BeiDou Pseudoranges, PhaseRanges, PhaseRangeRate and CNR (high resolution)

8. Distance Sensing input:

There are two methods to feed data to receiver as below descriptions:

(1) Feed vehicle Odometer (wheel-tick pulse) at WHEELTICK pin.

(2) Feed speed information through the UART port at Asynchronous Input pin.

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9. Electrical specifications

9.1. DC Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input voltage	VCC		3.2	5	5.5	V
Input Backup Battery Voltage	V_BCKP		2.0		4.3	V
External Active Antenna Output Voltage Current	ANT_PWR_OUT			3.3 200		V mA
Input current[1]	Icc			225		mA
High Level Input Voltage[2]	VIH		2.1		3.6	V
Low Level Input Voltage[2]	VIL				0.8	V
High Level Output Voltage	VOH		2.4			V
Low Level Output Voltage	VOL				0.4	V

Note 1: Measured when position fix (1Hz) is available, input voltage is 5.0V.
Note 2: include WHEELTICK and Forward pin.

9.2. Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-40	-	85	℃
Storage Temperature	Tstg	-40	-	85	℃

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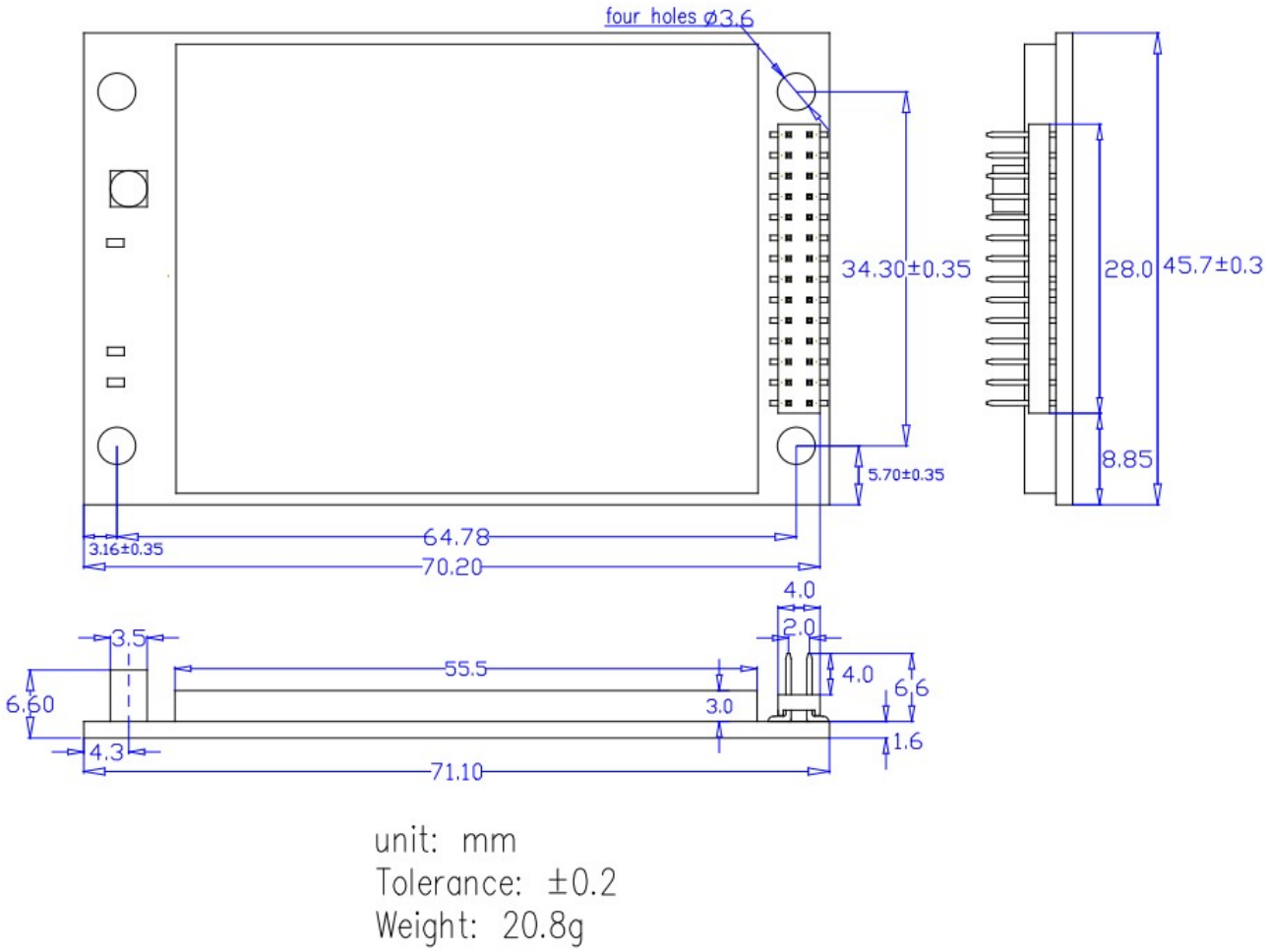
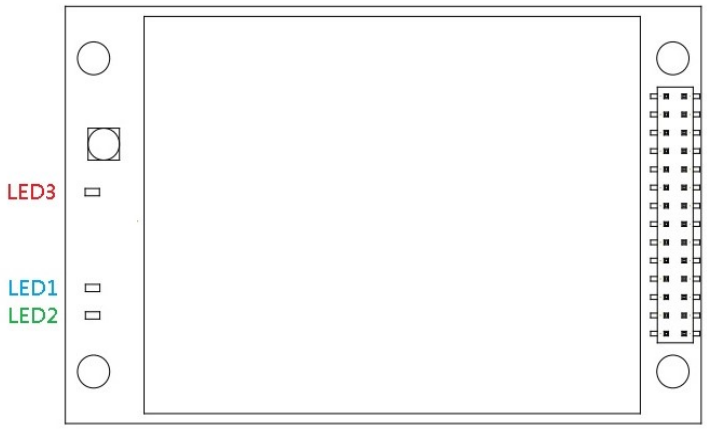
10. Board Layout and Dimensions



unit: mm
Tolerance: ±0.2
Weight: 20.8g

11. 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 RTK FIX mode status.

Red LED flash (location on LED3): Short-circuit on the MMCX active antenna connector.

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12. Software interface

12.1. NMEA output message

Table 12.1-1 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
GST	Estimated Position Error
SVD	3D velocity & deviation information

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

Table 12.1-2 contains the values for the following example:

$GNGGA,021027.000,2503.7125580,N,12138.7454063,E,4,18,0.65,121.422,M,15.3,M,1,*4D

Table 12.1- 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header (GNGGA)
UTC Time	021027.000		hhmmss.sss
Latitude	2503.7125580		ddmm.mmmmmmm
N/S indicator	N		N=north or S=south
Longitude	12138.7454063		dddmm.mmmmmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	4		See Table 12.1-3
Satellites Used	18		Range 0 to 33
HDOP	0.65		Horizontal Dilution of Precision
MSL Altitude	121.422	meters	
Units	M	meters	
Geoid Separation	15.3	meters	
Units	M	meters	
Age of Diff. Corr.	1	second	Null fields when DGPS is not used
Diff. Ref. Station ID			
Checksum	*4D		
<CR> <LF>			End of message termination

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Table 12.1-3 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GNSS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
4	Real-Time Kinematic, fixed integers
6	Dead Reckoning Mode, fix valid

● GSA---GNSS DOP and Active Satellites

Table 12.1-4 contains the values for the following example:

$GNGSA,A,3,05,13,15,21,24,29,02,20,50,42,,,1.28,0.70,1.07,1*05

$GNGSA,A,3,09,13,01,02,03,04,06,08,07,,,,1.28,0.70,1.07,4*08

Table 12.1-4 GSA Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GNGSA		GSA protocol header
Mode 1	A		See Table 12.1-5
Mode 2	3		See Table 12.1-6
ID of satellite used	05		Sv on Channel 1
ID of satellite used	13		Sv on Channel 2
….			….
ID of satellite used			Sv on Channel 12
PDOP	1.28		Position Dilution of Precision,max:99.0
HDOP	0.70		Horizontal Dilution of Precision, max:99.0
VDOP	1.07		Vertical Dilution of Precision, max:99.0
GNSS System ID	1		1: GPS, 2: GLONASS, 3: GALILEO, 4: BEIDOU, 5-F: Reserved
Checksum	*05		
<CR> <LF>			End of message termination

Table 12.1-5 Mode 1

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

Table 12.1-6 Mode 2

Value	Description
1	Fix not available
2	2D

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3	3D

● GSV---GNSS Satellites in View

Table 12.1-7 contains the values for the following example:

$GPGSV,3,1,10,02,20,151,42,05,37,076,44,13,44,029,46,15,64,324,49,0*60

$GPGSV,3,2,10,20,10,304,34,21,33,316,44,24,48,176,46,29,26,235,46,0*60

$GPGSV,3,3,10,42,51,134,35,50,51,134,34,0*66

$BDGSV,4,1,13,01,53,143,42,02,40,242,37,03,58,204,43,04,38,119,39,0*71

$BDGSV,4,2,13,05,17,259,33,06,62,329,44,07,14,171,43,08,59,185,42,0*7B

$BDGSV,4,3,13,09,48,278,43,10,03,193,,13,70,259,44,14,11,079,21,0*74

$BDGSV,4,4,13,16,58,310,,0*4E

Table 12.1-7 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header (GPGSV & BDGSV)
Total number of messages[1]	3		Range 1 to 8
Message number[1]	1		Range 1 to 8
Satellites in view	10		Total number of satellites in view
Satellite ID	02		Channel 1 (Range 01 to 330)
Elevation	20	degrees	Channel 1 (Range 00 to 90)
Azimuth	151	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	42	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
…..			…..
Satellite ID	15		Channel 4 (Range 01 to 330)
Elevation	64	degrees	Channel 4 (Range 00 to 90)
Azimuth	324	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	49	dB-Hz	Channel 4 (Range 00 to 99, null when not tracking)
Signal ID	0		See Table 12.1-8
Checksum	*60		
<CR> <LF>			End of message termination

Note1: Depending on the number of satellites tracked multiple messages of GSV data may be required.

Table 12.1-8 GNSS Identification:

System	System ID	Satellite ID	Signal ID	Signal Channel
GPS	1 (GP)	1 - 32 is reserved for GPS 33 - 64 is reserved for SBAS 65 - 99 is undefined	0 1	All signals L1 C/A

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BDS	4 (BD)	1 - 37 is reserved for BDS 38 - 99 is undefined	0 1	All signals B1I

● RMC---Recommended Minimum Specific GNSS Data

Table 12.1-9 contains the values for the following example:

$GNRMC,021027.000,A,2503.7125580,N,12138.7454063,E,0.01,171.63,030919,,,R*62

Table 12.1-9 RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header
UTC Time	021027.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2503.7125580		ddmm.mmmmmmm
N/S Indicator	N		N=north or S=south
Longitude	12138.7454063		ddmm.mmmmmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.01	knots	True
Course over ground	171.63	degrees	
Date	030919		ddmmyy
Magnetic variation		degrees	
Variation sense			E=east or W=west (Not shown)
Mode	R		A=autonomous, D=DGPS, E=DR, N=Data not valid, R=Coarse Position, S=Simulator
Checksum	*62		
<CR> <LF>			End of message termination

● GST ---Estimated Position Error

Table 12.1-10 contains the values for the following example:

$GNGST,062948.00,1366,,,,1.1,1.2,2.8*43

Table 12.1-10 GST Data Format

Name	Example	Units	Description
Message ID	$GNGST		GST protocol header
UTC Time	062948.00		hhmmss.ss
RMS value of the standard deviation of the ranges	1366		
Standard deviation of semi-major axis of error ellipse		meters	0~9999999.99

Standard deviation of semi-minor axis of error ellipse		meters	0~9999999.99
Orientation of semi-major axis of error ellipse		degree	
Standard deviation of Latitude error	1.1	meters	
Standard deviation of Longitude error	1.2	meters	
Standard deviation of altitude error	2.8	meters	
Checksum	*43		
<CR> <LF>			End of message termination

- **SVD ---3D velocity & deviation information**

Table 12.1-11 contains the values for the following example:

$PLSVD,-61,942,-3,11,10,22*57

Table 12.1-11 SVD Data Format

Name	**Example**	**Units**	**Description**
Message ID	$PLSVD		PLSVD protocol header
True east velocity	-61	cm/s	-51500~51500
True north velocity	942	cm/s	-51500~51500
True down velocity	-3	cm/s	-10000~10000
Deviation of east velocity	11	cm/s	
Deviation of north velocity	10	cm/s	
Deviation of down velocity	22	cm/s	
Checksum	*57		
<CR> <LF>			End of message termination

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12.2. Proprietary Dead Reckoning input/output messages

Table 12.2-1 The table below summarizes the set of proprietary command sets for the RTK-4671-MHDR.

NMEA record	Description
$PINVMINR	Calibration status
$PINVMVGS	Speed message info.
$PINVCRES	Clear the NVM data
$PINVCSTR	Start session
$PLSC,RESTART	Perform a Cold start or a Warm start or a Hot start
$PSTMDRSENMSG	Sensor data over UART
$PINVMSLOPE	SLOPE information
$PLSC,FORWARD	Reverse signal for High-Level or Low-Level to switch
$PLSC,SPDSRC	Vehicle speed for ODO / UART to switch
$PLSC,MEMS	MEMS RAW-DATA enable / disable
$PLSC,VER	Query firmware version
$PLSC,SETMXHZ	Set update rate

- **$PINVMINR --- Calibration status**

Table 12.2-2 contains the values for the following example:

$PINVMINR,1*04

Table 12.2-2 $PINVMINR Data Format

Name	Example	Units	Description
Message ID	$PINVMINR		$PINVMINR protocol header
Status	1		0:not initialized 1:calibrating/initializing 2:calibration done
Checksum	*04		
<CR> <LF>			End of message termination

Note: When GNSS positioning is valid, the message appears at NMEA sentence.

- **$PINVMVGS --- Speed Message info.**

Table 12.2-3 contains the values for the following example:

$PINVMVGS,2392.893,12.30,F*5C

Table 12.2-3 $PINVMVGS Data Format

Name	Example	Units	Description
Message ID	$PINVMVGS		$PINVMVGS protocol header
Time stamp	2392.893		microseconds

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Current speed	12.30	Km/h	Speed over ground in kilometers per hour
Direction	F		Direction of travel relative to vehicle frame (1) F = Forward (2) R = Reverse (3) U = Unknown
Checksum	*5C		
<CR> <LF>			End of message termination

Note1: When vehicle speed is received, the message appears at NMEA sentence.

Note2 : In the case of ADR, the vehicle's speed can taken directly from odometer wheel-tick or speed sentence to UART, otherwise the receiver will auto transfer UDR mode.

- **$PINVCRES ---Clear the NVM data**

Table 12.2-4 contains the values for the following example:

$PINVCRES,0*1A

Table 12.2-4 $PINVCRES Data Format

Name	Example	Units	Description
Message ID	$PINVCRES		$PINVCRES protocol header
Value	0		Clear the NVM data
Checksum	*1A		
<CR> <LF>			End of message termination

Note: The command need collocation start session command.

- **$PINVCSTR --- Start session**

Table 12.2-5 contains the values for the following example:

$PINVCSTR,14*3E

Table 12.2-5 $PINVCSTR Data Format

Name	Example	Units	Description
Message ID	$PINVCSTR		$PINVCSTR protocol header
Value	14		Start session
Checksum	*3E		
<CR> <LF>			End of message termination

Note1: The command need collocation clear NVM data command.

Note2: First time to use needs to do DR calibration, please follow below chart.

A Command example for DR recalibration:

$PINVCRES,0*1A

↓

$PINVCSTR,14*3E

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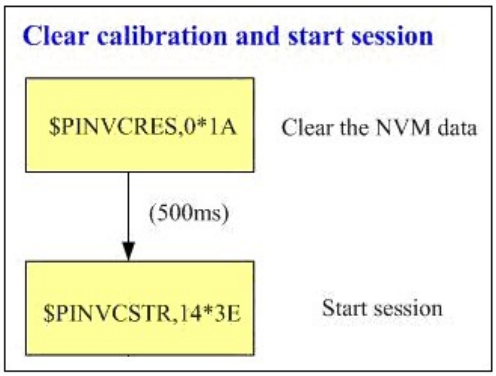

- **$PLSC --- Perform a Cold start or a Warm start or a Hot start**

Table 12.2-6 contains the values for the following example:

$PLSC,RESTART,2,2*77

$PLSC,RESTART,2,1*74

$PLSC,RESTART,2,0*75

Table 12.2-6 $CCSIR Data Format

Name	Example	Units	Description
Message ID	$PLSC		$PLSC protocol header
RESTART			
MCU	2		2: reset MCU
Action	2		0:hot start 1:warm start 2:cold start
Checksum	*77		*77 or *74 or *75
<CR> <LF>			End of message termination

- **$PSTMDRSENMSG --- Sensor data over UART**

Customer needs get vehicle speed from the micro processor and follow the table's data format to input the RTK-4671-MHDR receiver.

Table 12.2-7 contains the values for the following example:

$PSTMDRSENMSG,14,0,31*16

Table 12.2-7 $PSTMDRSENMSG Data Format

Name	Example	Units	Description
Message ID	$PSTMDRSENMSG		$PSTMDRSENMSG protocol header
MSG ID	14		Data type
MSG ID	0		Data type
Microprocessor output speed	31	Km/h	Speed over ground in kilometers per hour
Checksum	*16		

<CR> <LF>			End of message termination

Note: Default recommend input up to 5Hz to module pin11.

- **$PINVMSLOPE --- SLOPE information**

Table 12.2-8 contains the values for the following example:

$PINVMSLOPE,-3.13,-0.05,0.93,54.42,2.60,1.86*3B

$PINVMSLOPE,2.07,0.38,10.66,55.95,2.20,1.49*06

Table 12.2-8 $PINVMSLOPE Data Format

Name	Example	Units	Description
Message ID	$PINVMSLOPE		$PINVMSLOPE protocol header
Slope	-3.13	degree	slope + : up , - : down
Alt_Diff	-0.05	meters	altitude difference , + : up , - : down
Move_Dist	0.93	meters	move distance
Slope_Accu	54.42	degree	slope accuracy
Alt_Diff_Accu	2.60	meters	altitude difference accuracy
Move_Dist_Accu	1.86	meters	move distance accuracy
Checksum	*3B		
<CR> <LF>			End of message termination

- **$PLSC,FORWARD(1) --- Reverse signal for High-Level or Low-Level to switch**

Table 12.2-9 contains the values for the following example:

a. Reverse for High-Level

$PLSC,FORWARD,0*67

$PLSR,FORWARD,0,OK*5E

b. Reverse for Low-Level

$PLSC,FORWARD,1*66

$PLSR,FORWARD,1,OK*5F

c. Check status

$PLSC,FORWARD,?*68

$PLSR,FORWARD,?,0*65 : High-Level

$PLSR,FORWARD,?,1*64 : Low-Level

Table 12.2-9 $PLSC,FORWARD Data Format

Name	Example	Units	Description
Message ID	$PLSC,FORWARD		$PLSC,FORWARD protocol header
MSG ID	0		High-Level=0 , Low-Level=1
Checksum	*67		
<CR> <LF>			End of message termination

Note1: The Forward /Reverse information only works with ODO-Type.

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi Dist., New Taipei City 22101, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

- **$PLSC,SPDSRC --- Vehicle speed for ODO / UART to switch**

Table 12.2-10 contains the values for the following example:

a. Vehicle speed to ODO-Type (Default ODO-Type)
$PLSC,SPDSRC,ODO*4D
$PLSR,SPDSRC,ODO,OK*74

b. Vehicle speed to UART-Type(1) (Allow SPEED_RXD and RXD_A use to vehicle speed input)
$PLSC,SPDSRC,UART*1B
$PLSR,SPDSRC,UART,OK*22

Table 12.2-10 $PLSC,SPDSRC Data Format

Name	Example	Units	Description
Message ID	$PLSC,SPDSRC		$PLSC,SPDSRC protocol header
MSG ID	ODO		ODO-Type : ODO , UART-Type : UART
Checksum	*4D		
<CR> <LF>			End of message termination

Note1: Only be entered by one input source (RXD1 or RXD2) at the same time

- **$PLSC,MEMS --- MEMS RAW-DATA enable / disable**

Table 12.2-11 contains the values for the following example:

a. Enable MEMS RAW-DATA
$PLSC,MEMS,1*2B
$PLSR,MEMS,1,OK*12

b. Disable MEMS RAW-DATA (Default Disable)
$PLSC,MEMS,0*2A
$PLSR,MEMS,0,OK*13

Table 12.2-11 $PLSC,MEMS Data Format

Name	Example	Units	Description
Message ID	$PLSC,MEMS		$PLSC,MEMS protocol header
Enable/Disable	1		Enable : 1 , Disable : 0
Checksum	*2B		
<CR> <LF>			End of message termination

※ MEMS RAW-DATA output message (Default 100Hz output)

Table 12.2-11-1 contains the values for the following example:

$PINVMIMU,1114.106,-0.36990,1.51074,9.81383,0.67139,0.61035,-0.30518*22

Table 12.2-11-1 $INVMIMU Data Format

Name	Example	Units	Description
Message ID	$PINVMIMU		$PINVMIMU protocol header
Time_Second	1114.106	S	Time stamp
Accel_X	-0.36990	m/s^2	Accel_X output data

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20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi Dist., New Taipei City 22101, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
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Accel_Y	1.51074	m/s^2	Accel_Y output data
Accel_Z	9.81383	m/s^2	Accel_Z output data
Gyro_X	0.67139	degree /s	Gyro_X output data
Gyro_Y	0.61035	degree /s	Gyro_Y output data
Gyro_Z	-0.30518	degree /s	Gyro_Z output data
Checksum	*22		
<CR> <LF>			End of message termination

- **$PLSC,VER --- Query firmware version**

Table 12.2-12 contains the values for the following example:

$PLSC,VER*61

$PINVMVER,R20190701,TDDR-RTK4671,ADRUDR,Nov 12 2019_09:22:07*2A

Table 12.2-12 $PLSC,VER Data Format

Name	Example	Units	Description
Message ID	$PLSC,VER		$PLSC,VER protocol header
Checksum	*61		
<CR> <LF>			End of message termination

- **$PLSC,SETMXHZ --- Set update rate**

Table 12.2-13 contains the values for the following example:

$PLSC,SETMXHZ,5*7C

Table 12.2-13 $PLSC,SETMXHZ Data Format

Name	Example	Units	Description
Message ID	$PLSC,SETMXHZ		$PLSC,SETMXHZ protocol header
Rate	5		The output data update rate, in Hz.(included 1, 2, or 5 Hz)
Checksum	*7C		
<CR> <LF>			End of message termination

LOCOSYS Technology Inc.
20F.-13, No.79, Sec. 1, Xintai 5th Rd.,
Xizhi Dist., New Taipei City 22101, Taiwan
☏ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com

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