LC29H (BA,CA,DA)
DR&RTK Application Note

GNSS Module Series

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1 Introduction

This document describes the dead reckoning (DR) and real-time kinematic (RTK) features, including DR and RTK configurations and DR related messages for Quectel LC29H (BA), LC29H (CA) and LC29H (DA) modules. The features supported by each module are as follows:

- LC29H (BA) supports DR and RTK.
- LC29H (CA) only supports DR.
- LC29H (DA) only supports RTK.

2 Configuration

2.1. DR Configuration

2.1.1. Orientation

The LC29H (BA) and LC29H (CA) modules are designed to work on two-wheel or four-wheel vehicles. Both modules integrate an IMU as well as the GNSS receiver. Therefore, you must ensure that the device incorporating the module is firmly fixed to vehicle body. No relative movement is allowed between vehicle and device and maximum isolation from shock or vibration must be applied. Manually holding the device is not acceptable. The best way to guarantee good installation is to firmly screw the device down to the vehicle frame. Mounting location should permit easy access to power supply and GNSS antenna, and should not be exposed to excessive heat.

Definitions of reference frame axes:

- X-axis points towards the right of the vehicle.
- Y-axis points towards the front of the vehicle.
- Z-axis points towards the roof of the vehicle.

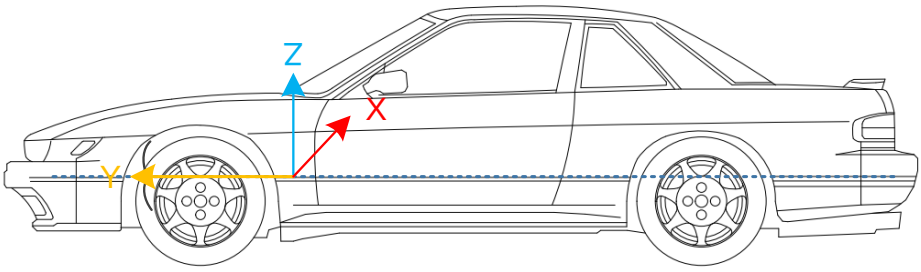

Figure 1: Reference Frame

Module orientation is shown below:

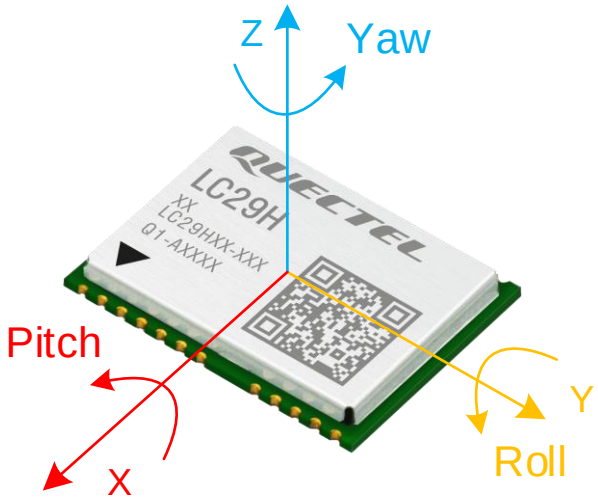

Figure 2: Module Orientation

NOTE

Firmly affix the device incorporating the module to vehicle body. Select a structurally sound location that is not prone to flexing (bending motion of vehicle chassis).

2.1.2. Mounting

There are no mounting direction and angle limitations for mounting the Quectel LC29H (BA) or LC29H (CA) module on the vehicle. The reference model is as follows:

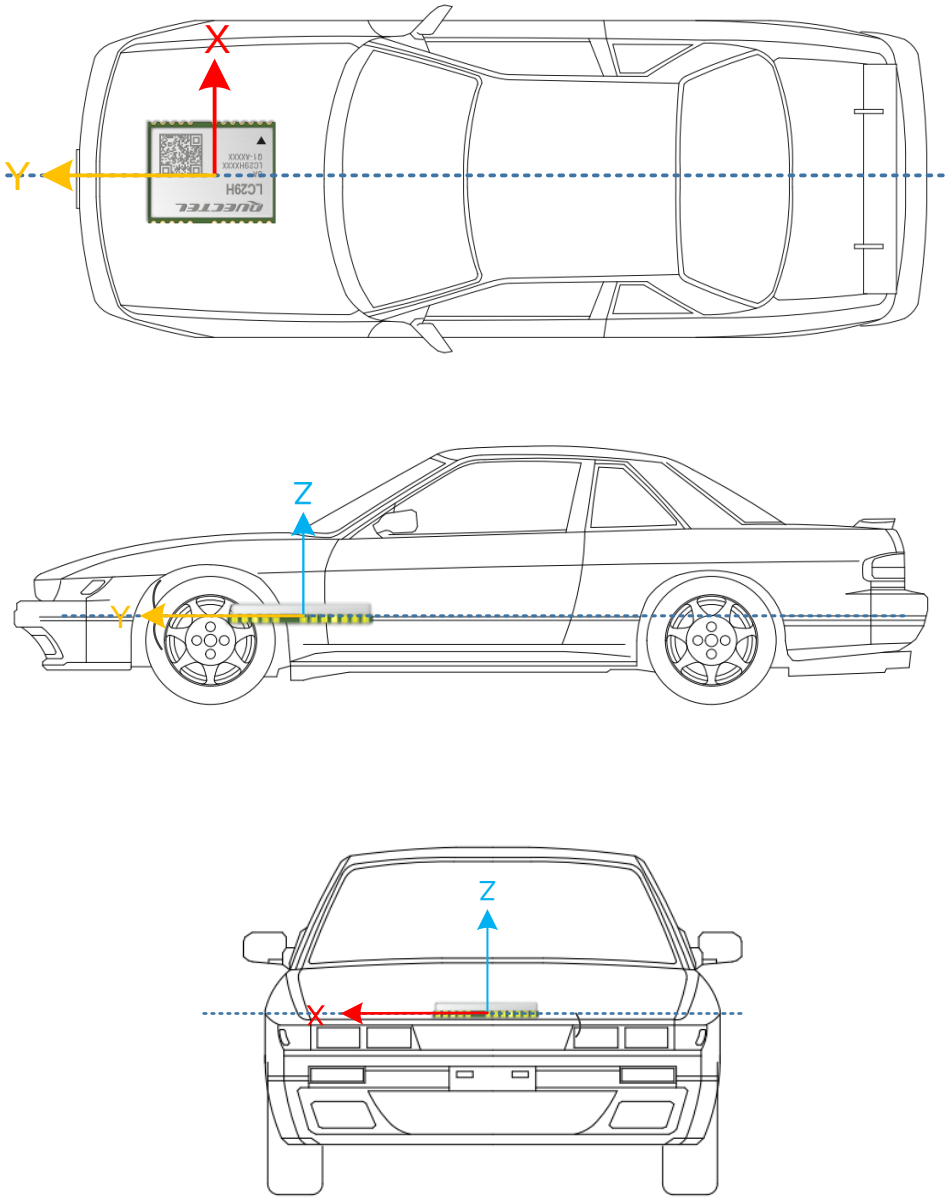

Figure 3: Module Mounting Example

2.1.3. DR Calibration

The module needs to be calibrated before the DR functionality will be useful.

The DR calibration steps are as listed below:

Step 1: Fix the device incorporating the module on the vehicle frame firmly. Any displacement, rotation or tilt of the device relative to vehicle plane, however small, may cause performance issues and/or void the calibration.

Step 2: Calibration should be performed under good GNSS signal and clear sky conditions.

Step 3: Power up the module, then start the vehicle on a plain surface.

Step 4: Drive at a speed of more than 3 m/s, and perform 3–4 turning movements. The module will start self-calibration, which would be completed in approximately 3 minutes.

Step 5: The calibration process ends when **<CalState>** of **$PQTMDRCAL** message value is 2 (DR is fully calibrated). See *Chapter 3.1.1 PQTMDRCAL* for details about the message.

After the calibration, there is no limit to driving trajectory and driving dynamics. You can perform verification tests in the following scenarios:

1) Open sky area, urban main road (high C/N_0 levels).
2) Tunnels (assessment of DR performance during absence of satellite visibility).
3) Viaduct (assessment of DR performance during weak signal conditions).
4) Underground vehicle parking (DR performance during satellite signal absence).
5) Surrounding areas with dense buildings (occurrence of multi-path signals).
6) City boulevards (weak satellite signals).
7) Urban canyon (high multi-path signals with limited sky view).

NOTE

If the speed sensor of the vehicle is connected to the module, make sure that its precision is at least 0.05 m/tick.

2.2. RTK Configuration

2.2.1. RTCM Input

Quectel LC29H (BA) and LC29H (DA) modules support the RTCM 10403.3 input messages listed in the table below.

Table 1: Supported RTCM Input Messages

Message Type	Description
1005	Stationary RTK Reference Station ARP
1006	Stationary RTK Reference Station ARP with Antenna Height
1074	GPS MSM4

Message Type	Description
1077	GPS MSM7
1084	GLONASS MSM4
1087	GLONASS MSM7
1094	Galileo MSM4
1097	Galileo MSM7
1114	QZSS MSM4
1117	QZSS MSM7
1124	BDS MSM4
1127	BDS MSM7

3 DR Related Messages

3.1. PQTM Messages

This chapter outlines the Quectel DR related PQTM (proprietary NMEA) messages supported by the Quectel LC29H (BA) and LC29H(CA) modules.

3.1.1. PQTMDRCAL

Indicates the DR calibration state.

Type:

Output

Synopsis:

```
$PQTMDRCAL,<MsgVer>,<CalState>,<NavType>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Fixed as 1.
<CalState>	Numeric	-	DR calibration state. 0 = Not calibrated 1 = DR is lightly calibrated 2 = DR is fully calibrated
<NavType>	Numeric	-	Navigation type. 0 = No position 1 = GNSS only 2 = DR only 3 = Combination

Example:

```
$PQTMDRCAL,1,0,1*5C
```

3.1.2. PQTMIMUTYPE

Outputs the IMU type once after each boot-up.

Type:

Output

Synopsis:

```
$PQTMIMUTYPE,<MsgVer>,<Type>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Fixed as 1.
<Type>	Numeric	-	IMU type. 0 = IMU error 1 = LSM6DSR 2 = ICM-40608 3 = BMI160 4 = ICM-42670

Example:

```
$PQTMIMUTYPE,1,2*52
```

3.1.3. PQTMVEHMSG

Inputs/outputs vehicle information.

Type:

Input/output

Synopsis:

```
$PQTMVEHMSG,<MsgType>,<Timestamp>,<Par1>[,<Par2>,…,<ParN>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgType>	Numeric	-	Type of message input/output via UART interface. 1 = Vehicle speed (in m/s) 2 = Cumulative wheel tick

Field	Format	Unit	Description
			3 = Speeds of four wheels (in m/s) 4 = Cumulative wheel ticks of four wheels
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer. Always 0 when this message is input.
<Par1> to <ParN>	Numeric	-	Vehicle information. This field varies with the message type. See *Chapter 3.1.3.1 If <MsgType> = 1* to *3.1.3.4 If <MsgType> = 4* for details.

NOTE

<MsgType> can only be 2 for LC29H (BA) and LC29H (CA) with software versions dedicated for two-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.3.1. If <MsgType> = 1

Synopsis:

```
$PQTMVEHMSG,1,<Timestamp>,<VehSpeed>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer. Always 0 when this message is input.
<VehSpeed>	Numeric	m/s	Speed. Range: -100 to 100.

Result:

Returns the input vehicle speed with timestamp:

```
$PQTMVEHMSG,1,<Timestamp>,<VehSpeed>*<Checksum><CR><LF>
```

Example:

```
//Input:
$PQTMVEHMSG,1,0,3.6*1C
//Output:
$PQTMVEHMSG,1,3748292,3.6*1D
```

3.1.3.2. If <MsgType> = 2

Synopsis:

```
$PQTMVEHMSG,2,<Timestamp>,<WheelTickCNT>,<FWD_Ind>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer. Always 0 when this message is input.
<WheelTickCNT>	Numeric	Tick	Cumulative wheel ticks.
<FWD_Ind>	Numeric	-	Forward/backward indicator. 0 = Invalid state 1 = Forward 2 = Backward

Result:

Returns the input cumulative wheel tick with timestamp:

```
$PQTMVEHMSG,2,<Timestamp>,<WheelTickCNT>,<FWD_Ind>*<Checksum><CR><LF>
```

Example:

```
//Input:
$PQTMVEHMSG,2,0,100,1*18
//Output:
$PQTMVEHMSG,2,153954,100,1*27
```

NOTE

1. When inputting cumulative wheel ticks through UART interface, make sure the input rate is at least 10 Hz.
2. For LC29H (BA) and LC29H (CA) with software versions dedicated for two-wheel vehicles:
   1) Keep **<FWD_Ind>** always 1;
   2) The input cumulative wheel tick with timestamp will not be output.

   Contact Quectel Technical Support for details about the software versions.

3.1.3.3. If <MsgType> = 3

Synopsis:

$PQTMVEHMSG,3,<Timestamp>,<LF_Spd>,<RF_Spd>,<LR_Spd>,<RR_Spd>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<TimeStamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer. Always 0 when this message is input.
<LF_Spd>	Numeric	m/s	Left front wheel speed. Range: -100 to 100.
<RF_Spd>	Numeric	m/s	Right front wheel speed. Range: -100 to 100.
<LR_Spd>	Numeric	m/s	Left rear wheel speed. Range: -100 to 100.
<RR_Spd>	Numeric	m/s	Left rear wheel speed. Range: -100 to 100.

Result:

Returns the input speeds of four wheels with timestamp:

$PQTMVEHMSG,3,<Timestamp>,<LF_Spd>,<RF_Spd>,<LR_Spd>,<RR_Spd>*<Checksum><CR><LF>

Example:

```
//Input:
$PQTMVEHMSG,3,0,3.6,3.6,3.6,3.6*19
//Output:
$PQTMVEHMSG,3,3748292,3.6,3.6,3.6,3.6*18
```

3.1.3.4. If <MsgType> = 4

Synopsis:

$PQTMVEHMSG,4,<Timestamp>,<LF_TickCNT>,<RF_TickCNT>,<LR_TickCNT>,<RR_TickCNT><FWD_Ind>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer. Always 0 when this message is input.

Field	Format	Unit	Description
<LF_TickCNT>	Numeric	Tick	Left front wheel tick count.
<RF_TickCNT>	Numeric	Tick	Right front wheel tick count.
<LR_TickCNT>	Numeric	Tick	Left rear wheel tick count.
<RR_TickCNT>	Numeric	Tick	Right rear wheel tick count.
<FWD_Ind>	Numeric	-	Forward/backward indicator. 0 = Invalid state 1 = Forward 2 = Backward

Result:

Returns the input cumulative wheel ticks of four wheels with timestamp:

```
$PQTMVEHMSG,4,<Timestamp>,<LF_TickCNT>,<RF_TickCNT>,<LR_TickCNT>,<RR_TickCNT><FWD_Ind>*<Checksum><CR><LF>
```

Example:

```
//Input:
$PQTMVEHMSG,4,0,100,100,100,100,1*03
//Output:
$PQTMVEHMSG,4,153954,100,100,100,100,1*3C
```

3.1.4. PQTMSAVEPAR

Saves the configurations set via **$PQTM** commands or **$PAIR6010** into NVM. Reset the module after executing this command.

Type:

Command

Synopsis:

```
$PQTMSAVEPAR*<Checksum><CR><LF>
```

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMSAVEPAR, OK*72
```

- If failed, the module returns:

```
$PQTMSAVEPAR,ERROR,<ErrCode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ErrCode>	Numeric	-	Error code. 1 = Invalid parameters 2 = Failed execution

Example:

```
$PQTMSAVEPAR*5A
$PQTMSAVEPAR,OK*72
```

3.1.5. PQTMRESTOREPAR

Restores all DR related configurations to default values.

Type:

Command

Synopsis:

```
$PQTMRESTOREPAR*<Checksum><CR><LF>
```

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMRESTOREPAR, OK*3B
```

- If failed, the module returns:

```
$PQTMRESTOREPAR,ERROR,<ErrCode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ErrCode>	Numeric	-	Error code. 1 = Invalid parameters 2 = Failed execution

Example:

```
$PQTMRESTOREPAR*13
$PQTMRESTOREPAR,OK*3B
```

3.1.6. PQTMINS

Outputs navigation results.

Type:

Output

Synopsis:

```
$PQTMINS,<Timestamp>,<SolType>,<Lat>,<Lon>,<Height>,<VEL_N>,<VEL_E>,<VEL_D>,<Roll>,<Pitch>,<Heading>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer.
<SolType>	Numeric	-	Solution type. 0 = DR not ready. Roll and pitch ready. 1 = DR not ready. GNSS, roll, pitch, and relative heading ready. 2 = GNSS + DR mode. DR calibrated. 3 = DR only mode.
<Lat>	Numeric	Degree	Latitude.
<Lon>	Numeric	Degree	Longitude.
<Height>	Numeric	Meter	Height.
<VEL_N>	Numeric	m/s	Northward velocity.
<VEL_E>	Numeric	m/s	Eastward velocity.

Field	Format	Unit	Description
<VEL_D>	Numeric	m/s	Downward velocity.
<Roll>	Numeric	Degree	Roll angle.
<Pitch>	Numeric	Degree	Pitch angle.
<Heading>	Numeric	Degree	Heading angle.

Example:

```
$PQTMINS,240951,1,31.82222216,117.11578436,62.555605,-0.004233,0.005535,-0.004011,0.00,0.00,127.41*40
```

NOTE

1. All angles are scaled from -180.0 to 179.9 with a wrap-around to 0.0 at +180.0. -180.0 = South, 180.0/0.0 = North, +90.0 = East, and -90.0 = West.
2. This message is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for two-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.7. PQTMIMU

Outputs the IMU raw data: acceleration, angular rate, and hardware wheel ticks. These values should match vehicle frame, see *Figure 1: Reference Frame* for details.

Type:

Output

Synopsis:

```
$PQTMIMU,<Timestamp>,<ACC_X>,<ACC_Y>,<ACC_Z>,<AngRate_X>,<AngRate_Y>,<AngRate_Z>,<WheelTickCNT>,<LastTick_Timestamp>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer.
<ACC_X>	Numeric	m/s^2	Acceleration in X-axis direction.
<ACC_Y>	Numeric	m/s^2	Acceleration in Y-axis direction.

Field	Format	Unit	Description
<ACC_Z>	Numeric	m/s^2	Acceleration in Z-axis direction.
<AngRate_X>	Numeric	deg/s	Angular rate in X-axis direction.
<AngRate_Y>	Numeric	deg/s	Angular rate in Y-axis direction.
<AngRate_Z>	Numeric	deg/s	Angular rate in Z-axis direction.
<WheelTickCNT>	Numeric	Tick	Cumulative wheel ticks.
<LastTick_Timestamp>	Numeric	Millisecond	Last tick timestamp.

Example:

```
$PQTMIMU,45454,-1.356730,-0.210568,9.757930,0.564879,0.549612,-0.412209,0,0*77
```

NOTE

This message is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for two-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.8. PQTMGPS

Outputs the position status in GNSS only mode.

Type:

Output

Synopsis:

```
$PQTMGPS,<Timestamp>,<TOW>,<Lat>,<Lon>,<Altitude>,<Speed>,<Yaw>,<Accuracy>,<HDOP>,<PDOP>,<NumSatUsed>,<FixMode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Timestamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer.
<TOW>	Numeric	Second	Time of week.
<Lat>	Numeric	Degree	Latitude.

Field	Format	Unit	Description
<Lon>	Numeric	Degree	Longitude.
<Altitude>	Numeric	Meter	Altitude.
<Speed>	Numeric	m/s	Ground speed (two-dimensional).
<Yaw>	Numeric	Degree	Heading of vehicle (two-dimensional).
<Accuracy>	Numeric	Meter	Horizontal accuracy estimate.
<HDOP>	Numeric	-	Horizontal dilution of precision.
<PDOP>	Numeric	-	Position dilution of precision.
<NumSatUsed>	Numeric	-	Number of satellites used in navigation.
<FixMode>	Numeric	-	Fix mode. 0 = No fix 2 = 2D fix 3 = 3D fix

Example:

```
$PQTMGPS,86139,94183,31.82218794,117.11579022,65.755080,0.027,94.68,2.533952,0.555471,0.886183,29,3*6B
```

NOTE

This message is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for two-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.9. PQTMCFGEINSMSG

Sets/gets **$PQTMINS**, **$PQTMIMU** and **$PQTMGPS** message configurations.

Type:

Set/get

Synopsis:

```
//Set message configurations:
$PQTMCFGEINSMSG,<Type>,<INS_Enabled>,<IMU_Enabled>,<GPS_Enabled>,<Rate>*<Checksum><CR><LF>
//Get message configurations:
```

$PQTMCFGEINSMSG,<Type>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Set/get message configurations. 0 = Get 1 = Set
<INS_Enabled>	Numeric	-	Enable/disable the output of **$PQTMINS** message. 0 = Disable 1 = Enable
<IMU_Enabled>	Numeric	-	Enable/disable the output of **$PQTMIMU** message. 0 = Disable 1 = Enable
<GPS_Enabled>	Numeric	-	Enable/disable the output of **$PQTMGPS** message. 0 = Disable 1 = Enable
<Rate>	Numeric	Hz	Set the output rate of **$PQTMINS**, **$PQTMIMU** or **$PQTMGPS** message. It can be 1, 2, 4, 5, 10. **$PQTMGPS** always outputs at 1 Hz even if configured to greater than 1 Hz.

Result:

- If successful, the module returns:

$PQTMCFGEINSMSGOK*16

- If failed, the module returns:

$PQTMCFGEINSMSGERROR*4A

Example:

```
//Set message configurations:
$PQTMCFGEINSMSG,1,1,1,1,10*3F
$PQTMCFGEINSMSGOK*16
//Get message configurations:
$PQTMCFGEINSMSG,0*0E
$PQTMEINSMSG,0,1,1,1,10*3E
```

NOTE

1. Send **$PQTMSAVEPAR*5A** and reset the module for **$PQTMCFGEINSMSG** to take effect.
2. This command is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated

for two-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.10. PQTMVEHMOT

Outputs vehicle motion information after DR calibration.

Type:

Output

Synopsis:

```
$PQTMVEHMOT,<MsgVer>,<PeakAcceleration>,<PeakAngularRate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Fixed as 1.
<PeakAcceleration>	Numeric	m/s^2	Peak acceleration of vehicle.
<PeakAngularRate>	Numeric	deg/s	Peak angular rate of vehicle.

Example:

```
$PQTMVEHMOT,1,0.288124,0.159930*0A
```

NOTE

This message is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for four-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.1.11. PQTMSENMSG

Outputs sensor information.

Type:

Output

Synopsis:

```
$PQTMSENMSG,<MsgVer>,<TimeStamp>,<Par1>[,<Par2>,…,<ParN>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	4 = IMU sensor data matching vehicle reference frame. See *Figure 1: Reference Frame* for details.
<TimeStamp>	Numeric	Millisecond	Timestamp since power-on. 32-bit unsigned integer.
<Par1> to <ParN>	Numeric	-	Sensor information. See *Chapter 3.1.11.1 If <MsgVer> = 4* for details.

3.1.11.1. If <MsgVer> = 4

Synopsis:

```
$PQTMSENMSG,4,<TimeStamp>,<IMU_Temp>,<IMU_GYRO_X>,<IMU_GYRO_Y>,<IMU_GYRO_Z>,<IMU_ACC_X>,<IMU_ACC_Y>,<IMU_ACC_Z>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TimeStamp>	Numeric	Millisecond	Timestamp since power-on.
<IMU_Temp>	Numeric	Celsius	IMU temperature.
<IMU_GYRO_X>	Numeric	dps	IMU X-axis gyro value.
<IMU_GYRO_Y>	Numeric	dps	IMU Y-axis gyro value.
<IMU_GYRO_Z>	Numeric	dps	IMU Z-axis gyro value.
<IMU_ACC_X>	Numeric	g	IMU X-axis accelerometer value.
<IMU_ACC_Y>	Numeric	g	IMU Y-axis accelerometer value.
<IMU_ACC_Z>	Numeric	g	IMU Z-axis accelerometer value.

Example:

```
$PQTMSENMSG,4,1977253,29.830917,1.727613,0.015743,0.804347,-0.250096,-0.467039,10.444151*24
```

NOTE

This message is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for four-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

3.2. PAIR Messages

This chapter explains DR related PAIR messages (proprietary NMEA messages defined by the chipset supplier). "**P**" means proprietary message, "**AIR**" means the command defined by the chipset supplier.

3.2.1. Packet Type: 6010 PAIR_CUSTOM_SET_MSG_OUTPUT

Enables/disables the output of **$PQTMDRCAL**, **$PQTMIMUTYPE**, **$PQTMVEHMSG**, **$PQTMVEHMOT** and **$PQTMSENMSG** messages.

Type:

Set

Synopsis:

```
$PAIR6010,<Type>,<Output_State>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Message type. -1 = Reset output state of all following sentence types to the default value 0 = $PQTMVEHMSG (Default: disabled) 1 = $PQTMSENMSG (Default: disabled) 2 = $PQTMDRCAL (Default: disabled) 3 = $PQTMIMUTYPE (Default: enabled) 4 = $PQTMVEHMOT (Default: disabled)
<Output_State>	Numeric	-	Message output state. 0 = Disabled 1 = Enabled

Result:

Returns **$PAIR001** message. See *document [1] protocol specification* for details.

Example:

```
$PAIR6010,0,1*0C
$PAIR001,6010,0*0C
```

NOTE

1. Send **$PQTMSAVEPAR*5A** and reset the module for **$PAIR6010** to take effect.
2. The output rate of **$PQTMVEHMSG** and **$PQTMSENMSG** is always 10 Hz. The output rate of **$PQTMDRCAL** and **$PQTMVEHMOT** depends on position fix rate. **$PQTMIMUTYPE** is only output once after each boot-up.

3.2.2. Packet Type: 6011 PAIR_CUSTOM_GET_MSG_OUTPUT

Gets whether the output of **$PQTMDRCAL**, **$PQTMIMUTYPE**, **$PQTMVEHMSG**, **$PQTMVEHMOT** and **$PQTMSENMSG** messages is enabled.

Type:

Get

Synopsis:

```
$PAIR6011,<Type>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Type>	Numeric	-	Message type. 0 = $PQTMVEHMSG 1 = $PQTMSENMSG 2 = $PQTMDRCAL 3 = $PQTMIMUTYPE 4 = $PQTMVEHMOT

Result:

Returns **$PAIR001** message and query result. See *document [1] protocol specification* for details.

Query result message format:

```
$PAIR6011,<Type>,<Output_State>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<Type>	Numeric	-	Message type. 0 = $PQTMVEHMSG 1 = $PQTMSENMSG 2 = $PQTMDRCAL 3 = $PQTMIMUTYPE 4 = $PQTMVEHMOT
<Output_State>	Numeric	-	Message output state. 0 = Disabled 1 = Enabled

Example:

```
$PAIR6011,1*11
$PAIR001,6011,0*0D
$PAIR6011,1,0*0D
```

NOTE

This command is only supported by LC29H (BA) and LC29H (CA) with software versions dedicated for four-wheel vehicles. Contact Quectel Technical Support for details about the software versions.

4 Appendix A References

Table 2: Related Document

Document Name
[1] Quectel_LC29H&LC79H_Series_GNSS_Protocol_Specification

Table 3: Terms and Abbreviations

Abbreviation	Description
ARP	Antenna Reference Point
BDS	BeiDou Navigation Satellite System
DR	Dead Reckoning
GLONASS	Global Navigation Satellite System (Russian)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMU	Inertial Measurement Unit
MSM	Multiple Signal Message
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
PQTM	Proprietary Protocol of Quectel
QZSS	Quasi-Zenith Satellite System
RTCM	Radio Technical Commission for Maritime Services
RTK	Real-Time Kinematic

5 Appendix B Special Characters

Table 4: Special Characters

Special Character	Definition
<CR>	Carriage return character.
<LF>	Line feed character.
<...>	Parameter name. Angle brackets do not appear in the message.
[...]	Optional field of a message. Square brackets do not appear in the message.
{…}	Repeated field of a message. Curly brackets do not appear in the message.
Underline	Default setting of a parameter.