

AscenKorea Inc.

# Industrial GNSS Receiver Data sheet



|                 |             |                                             |                    |  |
|-----------------|-------------|---------------------------------------------|--------------------|--|
| <b>Title</b>    |             | <b>Ascenkorea Industrial GNSS Datasheet</b> |                    |  |
| <b>Subtitle</b> |             | <b>GNSS Receiver</b>                        |                    |  |
| <b>Doc Type</b> |             | <b>Datasheet</b>                            |                    |  |
| <b>Version</b>  | <b>Date</b> | <b>Author</b>                               | <b>Description</b> |  |
| V1.0            | 2016/07/27  | Aron                                        | Release            |  |
| V1.1            | 2017/11/28  | Lee                                         | Modify             |  |

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## 1. Highlights and Features

- ◆ 33 tracking/ 99 acquisition-channel GPS/GLONASS receiver
- ◆ Supports QZSS, SBAS(WAAS, EGNOS, MSAS) ranging
- ◆ Ultra-High Sensitivity: -165dBm
- ◆ High Update Rate: up to 10Hz<sup>(note1)</sup>
- ◆ 12 multi-tone active interference canceller<sup>(note2)</sup> [ISSCC 2011 Award -Section 26.5]  
([http://isscc.org/doc/2011/isscc2011.advanceprogrambooklet\\_abstracts.pdf](http://isscc.org/doc/2011/isscc2011.advanceprogrambooklet_abstracts.pdf) )
- ◆ High accuracy 1-PPS timing support for Timing Applications ( $\pm 10$ ns jitter)
- ◆ AGPS Support for Fast TTFF (EPO™ Enable 7 days/14 days )
- ◆ EASY™<sup>(note2)</sup>: Self-Generated Orbit Prediction for instant positioning fix
- ◆ AlwaysLocate™<sup>(note2)</sup> Intelligent Algorithm (Advance Power Periodic Mode) for power saving
- ◆ Logger function Embedded<sup>(note2)</sup>
- ◆ AscenKorea Firmware Customization Services
- ◆ GPS+GLONASS Consumption current(@3.3V):
  - Acquisition: 35mA Typical
  - Tracking: 29mA Typical
- ◆ E911, RoHS, REACH compliant
- ◆ CE, FCC Certification

Note 1: SBAS can only be enabled when update rate is less than or equal to 5Hz.

Note2: Some features need special firmware or command programmed by customer, please refer to AscenKorea documents "PMTK command List" and "Firmware check list\_C33".

## 2. Specification List

|                                                             | Description                                                                                                     |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>GNSS Solution</b>                                        | MTK MT3333                                                                                                      |
| <b>Frequency</b>                                            | GPS L1, 1575.42MHz<br>GLONASS L1, 1598.0625~1605.375MHz                                                         |
| <b>Sensitivity<sup>1</sup></b>                              | Acquisition: -148dBm, cold start<br>Reacquisition: -163dBm Hot start<br>Tracking: -165dBm                       |
| <b>SV Number</b><br><b>GPS</b><br><b>GLONASS</b>            | #1~32<br>#65~96                                                                                                 |
| <b>TTFB</b><br>(No. of SVs>4, C/N>40dB, PDop<1.5)           | Hot start: 1 second typical<br>Warm start: 33 seconds typical<br>Cold start: 35 seconds typical, 60 seconds Max |
| <b>Position Accuracy</b>                                    | Without aid:3.0m (50% CEP)<br>DGPS(SBAS(WAAS,EGNOS,MSAS)):2.5m (50% CEP)                                        |
| <b>Velocity Accuracy</b>                                    | Without aid : 0.1m/s<br>DGPS(SBAS(WAAS,EGNOS,MSAS)):0.05m/s                                                     |
| <b>Timing Accuracy</b><br>(1PPS Output)                     | ±10 ns RMS                                                                                                      |
| <b>Altitude</b>                                             | Maximum 18,000m (60,000 feet)                                                                                   |
| <b>Velocity</b>                                             | Maximum 515m/s (1000 knots)                                                                                     |
| <b>Acceleration</b>                                         | Maximum 4G                                                                                                      |
| <b>Update Rate</b>                                          | 1Hz (default), maximum 10Hz                                                                                     |
| <b>Baud Rate</b>                                            | 9600 bps (default)                                                                                              |
| <b>DGPS</b>                                                 | SBAS(default) [QZSS,WAAS, EGNOS, MSAS,GAGAN]                                                                    |
| <b>AGPS</b>                                                 | Support                                                                                                         |
| <b>Power Supply</b>                                         | VCC: 5V                                                                                                         |
| <b>Current Consumption</b><br><b>@ 3.3V,1Hz Update Rate</b> | GPS+GLONASS 35mA acquisition, 29mA tracking                                                                     |
| <b>BackupPower Consumption@</b><br><b>3V(VCC OFF)</b>       | 15uA TYP.                                                                                                       |
| <b>Working Temperature</b>                                  | -40 °C to +85 °C(Without Battery)<br>-20 °C to +60 °C(With Battery)                                             |
| <b>Dimension</b>                                            | 76 x 136 x 46 mm                                                                                                |
| <b>Weight</b>                                               | <b>200g</b>                                                                                                     |

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### 3. Absolute Maximum Ratings

|                        | Symbol  | Min. | Typ. | Max. | Unit |
|------------------------|---------|------|------|------|------|
| Power Supply Voltage   | VCC     |      | 5.0  |      | V    |
| Backup battery Voltage | VBACKUP | 2.0  | 3.0  | 4.3  | V    |

### 4. Operating Conditions

-TTI output

|                                 | Condition   | Min. | Typ. | Max. | Unit |
|---------------------------------|-------------|------|------|------|------|
| Operation supply Ripple Voltage | -           | -    | -    | 50   | mVpp |
| RX0 TTL H Level                 | VCC=3.3V    | 2.0  | -    | VCC  | V    |
| RX0 TTL L Level                 | VCC=3.3V    | 0    | -    | 0.8  | V    |
| TX0 TTL H Level                 | VCC=3.3V    | 2.4  | -    | 2.8  | V    |
| TX0 TTL L Level                 | VCC=3.3V    | 0    | -    | 0.4  | V    |
| Current Consumption @3.3V       | Acquisition |      | 25   |      | mA   |
|                                 | Tracking    |      | 20   |      | mA   |
| BackupPower Consumption@3.0V    |             |      | 7    |      | uA   |

-RS232 output

| PARAMETER                     | CONDITIONS                                     | MIN | TYP   | MAX | UNITS |
|-------------------------------|------------------------------------------------|-----|-------|-----|-------|
| <b>RS-232 TRANSMITTERS</b>    |                                                |     |       |     |       |
| Output Voltage Swing          | All transmitter outputs loaded with 3kΩ to GND | ±5  | ±8    |     | V     |
| Input Logic Threshold Low     |                                                |     | 1.4   | 0.8 | V     |
| Input Logic Threshold High    | All except MAX220                              | 2   | 1.4   |     | V     |
|                               | MAX220: VCC = 5.0V                             | 2.4 |       |     |       |
| Logic Pull-Up/Input Current   | All except MAX220, normal operation            |     | 5     | 40  | μA    |
|                               | SHDN = 0V, MAX222/242, shutdown, MAX220        |     | ±0.01 | ±1  |       |
| Output Leakage Current        | VCC = 5.5V, SHDN = 0V, VOUT = ±15V, MAX222/242 |     | ±0.01 | ±10 | μA    |
|                               | VCC = SHDN = 0V, VOUT = ±15V                   |     | ±0.01 | ±10 |       |
| Data Rate                     | All except MAX220, normal operation            |     | 200   | 116 | kb/s  |
| Transmitter Output Resistance | VCC = V+ = V- = 0V, VOUT = ±2V                 | 300 | 10M   |     | Ω     |
| Output Short-Circuit Current  | VOUT = 0V                                      | ±7  | ±22   |     | mA    |

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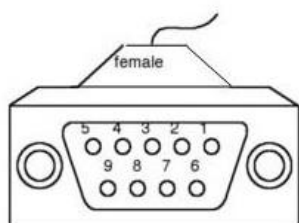
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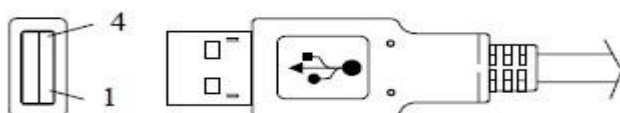
## 5. Pin Assignment

| Pin | Description |
|-----|-------------|
| 1   | VCC         |
| 2   | RX(RS-232)  |
| 3   | TX(RS232)   |
| 4   | NC          |
| 5   | GND         |
| 6   | NC          |
| 7   | NC          |
| 8   | NC          |
| 9   | NC          |



[D-Sub 9pinType]

| Pin | Function |
|-----|----------|
| 1   | Vcc(5V)  |
| 2   | Tx       |
| 3   | Rx       |
| 4   | Gnd      |



[USB Type]

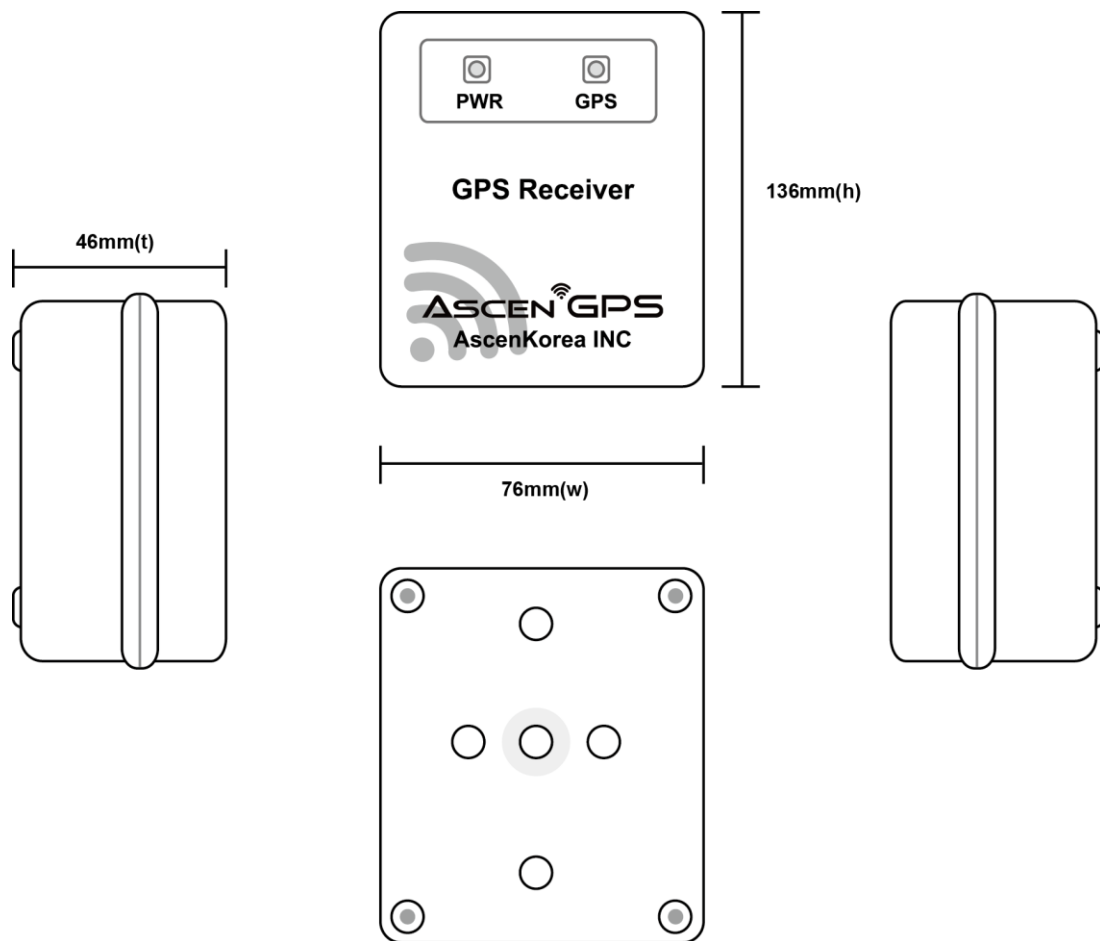
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## 6. Case Size



( Top View )

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## 7. GNSS(GPS+Glonass) Antenna



| Specifications                      |                                      |
|-------------------------------------|--------------------------------------|
| <b>Frequency Range</b>              | <b>Housing RF Connector</b>          |
| •GPS L1, Glonass Band               | •TNC Female                          |
| <b>Frequency Gain</b>               | <b>Housing Diameter</b>              |
| •38 dB(Normal)                      | •105 mm                              |
| <b>Polarization</b>                 | <b>Housing Main Element Height</b>   |
| •RHCP                               | •100 mm                              |
| <b>DC Power</b>                     | <b>Support Pipe</b>                  |
| •3.3 ~ 5.0V                         | •Inner Diameter: 25mm                |
| <b>Current</b>                      | <b>Water Proof</b>                   |
| •8~20mA                             | •IP55                                |
| <b>Noise Figure(LNA Part)</b>       | <b>Weight</b>                        |
| •<1.5dB                             | •335g                                |
| <b>Impedance</b>                    | <b>Environment temperature</b>       |
| •50Ohm (Return Loss:More than 15dB) | •Operating temperature: -20°C ~ 80°C |
| <b>VSWR</b>                         | <b>Accessories</b>                   |
| •<1.5                               | •Adaptor, Pipe                       |

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## 8. Antenna Cable Length



2m

## 9. Active Antenna (External Antenna)

| Item                  |    | Specifications                           |
|-----------------------|----|------------------------------------------|
| Center Frequency(=FC) | L1 | 1575.42 MHz±1.023 MHz                    |
| Bandwidth in 10dB     | L1 | 10 MHz min.                              |
| VWSR                  |    | ≤1.5dB                                   |
| Impedance             |    | 50Ω                                      |
| Polarization          |    | R.H.C.P.                                 |
| Gain(dBi)             | L1 | 26dB±2dB(LNA Amp)                        |
| Axial Ratio           |    | 3.0dB max.                               |
| Temperature           |    | Operating Temperature : -40 °C to +85 °C |
|                       |    | Storage Temperature : -40 °C to +90 °C   |
| Size                  |    | 38x45x15[mm]                             |
| Weight                |    | 100g                                     |
| Consumption           |    | < 10mA                                   |
| Supply Voltage        |    | DC 3 ~ 5V                                |

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## 10. Protocols

### - NMEA Output Sentence

**Table-1** lists each of the NMEA output sentences specifically developed and defined by MTK for use within MTK products

| Table-1: NMEA Output Sentence |                                                                                                 |
|-------------------------------|-------------------------------------------------------------------------------------------------|
| Option                        | Description                                                                                     |
| GGA                           | Time, position and fix type data.                                                               |
| GSA                           | GNSS receiver operating mode, active satellites used in the position solution and DOP values.   |
| GSV                           | The number of GNSS satellites in view satellite ID numbers, elevation, azimuth, and SNR values. |
| RMC                           | Time, date, position, course and speed data. Recommended Minimum Navigation Information.        |
| VTG                           | Course and speed information relative to the ground.                                            |

**Table-2** lists NMEA output sentences in GPS system and GNSS system.

| Table-2: NMEA Output Sentence for GPS and GNSS |        |        |                  |                                     |        |
|------------------------------------------------|--------|--------|------------------|-------------------------------------|--------|
| System                                         | GGA    | GSA    | GSV              | RMC                                 | VTG    |
| GPS                                            | GP GGA | GP GSA | GP GSV           | GP RMC                              | GP VTG |
| GNSS<br>(GPS+Glonass)                          | GP GGA | GN GSA | GP GSV<br>GL GSV | GP RMC <sup>1</sup><br>or<br>GN RMC | GP VTG |

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Note1: When GPS module receive GPS satellite and GLONASS satellite, and it will output \$GNRMC to replace \$GPRMC sentence.

Example:

GPS system:

```
$GPGGA,064951.000,2307.1256,N,12016.4438,E,1,8,0.95,39.9,M,17.8,M,,*65
$GPGSA,A,3,29,21,26,15,18,09,06,10,,,,,2.32,0.95,2.11*00
$GPGSV,3,1,09,29,36,029,42,21,46,314,43,26,44,020,43,15,21,321,39*7D
$GPGSV,3,2,09,18,26,314,40,09,57,170,44,06,20,229,37,10,26,084,37*77
$GPGSV,3,3,09,07,,,26*73
$GPRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260406,3.05,W,A*2C
$GPVTG,165.48,T,,M,0.03,N,0.06,K,A*37
```

GNSS system:

```
$GPGGA,064951.000,2307.1256,N,12016.4438,E,1,8,0.95,39.9,M,17.8,M,,*65
$GNGSA,A,3,08,28,20,04,32,17,11,,,,,1.00,0.63,0.77*1B
$GNGSA,A,3,77,76,86,78,65,88,87,71,72,,,,,1.00,0.63,0.77*17
$GPGSV,4,1,14,28,75,321,44,42,54,137,39,20,53,080,44,17,40,330,44*77
$GPGSV,4,2,14,04,33,253,43,32,28,055,41,08,26,212,40,11,14,055,33*7F
$GPGSV,4,3,14,10,12,198,,07,06,179,38,23,04,125,44,27,02,314,*7E
$GPGSV,4,4,14,193,,,42,01,,,36*45
$GLGSV,3,1,09,72,45,084,40,77,39,246,44,87,36,014,44,65,33,157,36*62
$GLGSV,3,2,09,78,26,306,41,88,23,315,42,76,15,192,38,86,13,067,38*64
$GLGSV,3,3,09,71,12,035,38*54
$GNRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260406,3.05,W,A*2C
$GPVTG,165.48,T,,M,0.03,N,0.06,K,A*37
```

## GGA—Fixed Data. Time, Position and fix related data

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

\$GPGGA,064951.000,2307.1256,N,12016.4438,E,1,8,0.95,39.9,M,17.8,M,,\*65

| Table-3: GGA Data Format |            |        |                                             |
|--------------------------|------------|--------|---------------------------------------------|
| Name                     | Example    | Units  | Description                                 |
| Message ID               | \$GPGGA    |        | GGA protocol header                         |
| UTC Time                 | 064951.000 |        | hhmmss.sss                                  |
| Latitude                 | 2307.1256  |        | ddmm.mmmm                                   |
| N/S Indicator            | N          |        | N=north or S=south                          |
| Longitude                | 12016.4438 |        | dddmm.mmmm                                  |
| E/W Indicator            | E          |        | E=east or W=west                            |
| Position Fix Indicator   | 1          |        | See <b>Table-4</b>                          |
| Satellites Used          | 8          |        | Range 0 to 14                               |
| HDOP                     | 0.95       |        | Horizontal Dilution of Precision            |
| MSL Altitude             | 39.9       | meters | Antenna Altitude above/below mean-sea-level |
| Units                    | M          | meters | Units of antenna altitude                   |
| Geoidal Separation       | 17.8       | meters |                                             |
| Units                    | M          | meters | Units of geoids separation                  |
| Age of Diff. Corr.       |            | second | Null fields when DGPS is not used           |
| Checksum                 | *65        |        |                                             |
| <CR> <LF>                |            |        | End of message termination                  |

| Table-4: Position Fix Indicator |                      |
|---------------------------------|----------------------|
| Value                           | Description          |
| 0                               | Fix not available    |
| 1                               | GPS fix              |
| 2                               | Differential GPS fix |

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## GSA—GNSS DOP and Active Satellites

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

\$GNGSA,A,3,08,28,20,04,32,17,11,,,,,1.00,0.63,0.77\*1B (GPS Information)

\$GNGSA,A,3,77,76,86,78,65,88,87,71,72,,,,1.00,0.63,0.77\*17 (Glonass Information)

| Table-5: GSA Data Format    |         |       |                                  |
|-----------------------------|---------|-------|----------------------------------|
| Name                        | Example | Units | Description                      |
| Message ID                  | \$GNGSA |       | GSA protocol header              |
| Mode 1                      | A       |       | See <b>Table-6</b>               |
| Mode 2                      | 3       |       | See <b>Table-7</b>               |
| Satellite Used <sup>1</sup> | 29      |       | SV on Channel 1                  |
| Satellite Used <sup>1</sup> | 21      |       | SV on Channel 2                  |
| ....                        | ....    | ....  | ....                             |
| Satellite Used <sup>1</sup> |         |       | SV on Channel 12                 |
| PDOP                        | 2.32    |       | Position Dilution of Precision   |
| HDOP                        | 0.95    |       | Horizontal Dilution of Precision |
| VDOP                        | 2.11    |       | Vertical Dilution of Precision   |
| Checksum                    | *00     |       |                                  |
| <CR> <LF>                   |         |       | End of message termination       |

Note1: GPS SV No. #1~#32

Glonass SV No. #65~#96

| Table-6: Mode 1 |                                                    |
|-----------------|----------------------------------------------------|
| Value           | Description                                        |
| M               | Manual—forced to operate in 2D or 3D mode          |
| A               | 2D Automatic—allowed to automatically switch 2D/3D |

| Table-7: Mode 2 |                    |
|-----------------|--------------------|
| Value           | Description        |
| 1               | Fix not available  |
| 2               | 2D ( < 4 SVs used) |
| 3               | 3D ( ≥4 SVs used)  |

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## GSV— Satellites in View, includes GPS(GPGSV) and GLONASS(GLGSV)

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

\$GPGSV,4,1,14,28,75,321,44,42,54,137,39,20,53,080,44,17,40,330,44\*77

\$GPGSV,4,2,14,04,33,253,43,32,28,055,41,08,26,212,40,11,14,055,33\*7F

\$GPGSV,4,3,14,10,12,198,,07,06,179,38,23,04,125,44,27,02,314,\*7E

\$GPGSV,4,4,14,193,,,42,01,,,36\*45

| Table-8: GPGSV Data Format |         |         |                                                                                                                 |
|----------------------------|---------|---------|-----------------------------------------------------------------------------------------------------------------|
| Name                       | Example | Units   | Description                                                                                                     |
| Message ID                 | \$GPGSV |         | GSV protocol header                                                                                             |
| Number of Messages         | 4       |         | Range 1 to 4<br>(Depending on the number of satellites tracked, multiple messages of GSV data may be required.) |
| Message Number1            | 1       |         | Range 1 to 4                                                                                                    |
| Satellites in View         | 14      |         |                                                                                                                 |
| Satellite ID               | 28      |         | Channel 1 (Range 1 to 32)                                                                                       |
| Elevation                  | 75      | degrees | Channel 1 (Maximum 90)                                                                                          |
| Azimuth                    | 321     | degrees | Channel 1 (True, Range 0 to 359)                                                                                |
| SNR (C/No)                 | 44      | dBHz    | Range 0 to 99,<br>(null when not tracking)                                                                      |
| ....                       | ....    | ....    | ....                                                                                                            |
| Satellite ID               | 17      |         | Channel 4 (Range 1 to 32)                                                                                       |
| Elevation                  | 40      | degrees | Channel 4 (Maximum 90)                                                                                          |
| Azimuth                    | 330     | degrees | Channel 4 (True, Range 0 to 359)                                                                                |
| SNR (C/No)                 | 44      | dBHz    | Range 0 to 99,<br>(null when not tracking)                                                                      |
| Checksum                   | *7D     |         |                                                                                                                 |
| <CR> <LF>                  |         |         | End of message termination                                                                                      |

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

\$GLGSV,3,1,09,72,45,084,40,77,39,246,44,87,36,014,44,65,33,157,36\*62

\$GLGSV,3,2,09,78,26,306,41,88,23,315,42,76,15,192,38,86,13,067,38\*64

\$GLGSV,3,3,09,71,12,035,38\*54

| Table-9: GLGSV Data Format |         |         |                                                                                                                 |
|----------------------------|---------|---------|-----------------------------------------------------------------------------------------------------------------|
| Name                       | Example | Units   | Description                                                                                                     |
| Message ID                 | \$GLGSV |         | GSV protocol header                                                                                             |
| Number of Messages         | 4       |         | Range 1 to 4<br>(Depending on the number of satellites tracked, multiple messages of GSV data may be required.) |
| Message Number1            | 1       |         | Range 1 to 4                                                                                                    |
| Satellites in View         | 09      |         |                                                                                                                 |
| Satellite ID               | 78      |         | Channel 1 (Range 1 to 32)                                                                                       |
| Elevation                  | 26      | degrees | Channel 1 (Maximum 90)                                                                                          |
| Azimuth                    | 306     | degrees | Channel 1 (True, Range 0 to 359)                                                                                |
| SNR (C/No)                 | 41      | dBHz    | Range 0 to 99,<br>(null when not tracking)                                                                      |
| ....                       | ....    | ....    | ....                                                                                                            |
| Satellite ID               | 88      |         | Channel 4 (Range 1 to 32)                                                                                       |
| Elevation                  | 23      | degrees | Channel 4 (Maximum 90)                                                                                          |
| Azimuth                    | 315     | degrees | Channel 4 (True, Range 0 to 359)                                                                                |
| SNR (C/No)                 | 42      | dBHz    | Range 0 to 99,<br>(null when not tracking)                                                                      |
| Checksum                   | *7D     |         |                                                                                                                 |
| <CR> <LF>                  |         |         | End of message termination                                                                                      |

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**RMC—Recommended Minimum Navigation Information, includes GPS(GPRMC)  
or GNSS(GNRMC)**

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

\$GPRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260406,3.05,W,A\*2C

| Table-10: RMC Data Format |            |         |                                                                 |
|---------------------------|------------|---------|-----------------------------------------------------------------|
| Name                      | Example    | Units   | Description                                                     |
| Message ID                | \$GPRMC    |         | RMC protocol header                                             |
| UTC Time                  | 064951.000 |         | hhmmss.sss                                                      |
| Status                    | A          |         | A=data valid or V=data not valid                                |
| Latitude                  | 2307.1256  |         | ddmm.mmmm                                                       |
| N/S Indicator             | N          |         | N=north or S=south                                              |
| Longitude                 | 12016.4438 |         | dddmm.mmmm                                                      |
| E/W Indicator             | E          |         | E=east or W=west                                                |
| Speed over Ground         | 0.03       | knots   |                                                                 |
| Course over Ground        | 165.48     | degrees | True                                                            |
| Date                      | 260406     |         | ddmmyy                                                          |
| Magnetic Variation        | 3.05, W    | degrees | E=east or W=west<br>(Need AscenKorea Customization Service)     |
| Mode                      | A          |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode |
| Checksum                  | *2C        |         |                                                                 |
| <CR> <LF>                 |            |         | End of message termination                                      |

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

\$GNRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260406,3.05,W,A\*2C

| Table-11: RMC Data Format |            |         |                                                                 |
|---------------------------|------------|---------|-----------------------------------------------------------------|
| Name                      | Example    | Units   | Description                                                     |
| Message ID                | \$GNRMC    |         | RMC protocol header                                             |
| UTC Time                  | 064951.000 |         | hhmmss.sss                                                      |
| Status                    | A          |         | A=data valid or V=data not valid                                |
| Latitude                  | 2307.1256  |         | ddmm.mmmm                                                       |
| N/S Indicator             | N          |         | N=north or S=south                                              |
| Longitude                 | 12016.4438 |         | dddmm.mmmm                                                      |
| E/W Indicator             | E          |         | E=east or W=west                                                |
| Speed over Ground         | 0.03       | knots   |                                                                 |
| Course over Ground        | 165.48     | degrees | True                                                            |
| Date                      | 260406     |         | ddmmyy                                                          |
| Magnetic Variation        | 3.05, W    | degrees | E=east or W=west<br>(Need AscenKorea Customization Service)     |
| Mode                      | A          |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode |
| Checksum                  | *2C        |         |                                                                 |
| <CR> <LF>                 |            |         | End of message termination                                      |

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## VTG—Course and speed information relative to the ground

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

\$GPVTG,165.48,T,,M,0.03,N,0.06,K,A\*37

| Table-12: VTG Data Format |         |         |                                                                 |
|---------------------------|---------|---------|-----------------------------------------------------------------|
| Name                      | Example | Units   | Description                                                     |
| Message ID                | \$GPVTG |         | VTG protocol header                                             |
| Course                    | 165.48  | degrees | Measured heading                                                |
| Reference                 | T       |         | True                                                            |
| Course                    |         | degrees | Measured heading                                                |
| Reference                 | M       |         | Magnetic<br>(Need AscenKorea Customization Service)             |
| Speed                     | 0.03    | knots   | Measured horizontal speed                                       |
| Units                     | N       |         | Knots                                                           |
| Speed                     | 0.06    | km/hr   | Measured horizontal speed                                       |
| Units                     | K       |         | Kilometers per hour                                             |
| Mode                      | A       |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode |
| Checksum                  | *06     |         |                                                                 |
| <CR> <LF>                 |         |         | End of message termination                                      |

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## 11. MTK NMEA Command Protocols

### Packet Type:

103 PMTK\_CMD\_COLD\_START

### Packet Meaning:

Cold Start : Don't use Time, Position, Almanacs and Ephemeris data at re-start.

### Example:

\$PMTK103\*30<CR><LF>

## 12.Contact

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