

**KNCTEK GPS/GLONASS Mouse**  
**UGM-1533GL Specification**

Version 1.0  
2019/12/27

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**UGM-1533GL Specification**

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## **Revision History**

1. 2019-12-27 : Initiated Version 1.0

# UGM-1533GL Operational Manual

## INTRODUCTION

The **UGM-1533GL** is the newest generation of KNCTEK GPS/GLONASS Mouse.

The GPS/GLONASS Mouse is powered by U-blox technology and KNCTEK's proprietary navigation algorithm that provide you more stable navigation data.

The miniature design is the best choice to be embedded in the portable devices, various Trackers, Vehicle & Personal Locaters and etc. The excellent sensitivity of **UGM-1533GL** gets the great performance when going through the urban canyon and foliage environmental condition.

## PRODUCT FEATURES

- ✧ GPS, GLONASS, QZSS, SBAS(WAAS, MSAS, EGNOS, GAGAN) supported
- ✧ 72-channel u-blox M8 Engine
- ✧ Operable from 3.3V to 5.5V / 60mA for Acquisition and 50mA for Tracking Mode
- ✧ Signal Detection better than -167dBm in Ultra High Tracking Sensitivity
- ✧ Enhanced Cold Acquisition Sensitivity at -148dBm and Reacquisition at -160dBm
- ✧ Fast TTFF 26 seconds for Cold start
- ✧ Advanced Multipath detection and suppression
- ✧ Jamming detection and mitigation
- ✧ AssistNow Autonomous 3days
- ✧ Excellent Sensitive for Urban Canyon and Foliage Environmental condition
- ✧ NMEA-0183 compliant protocol
- ✧ Automotive-grade Quality GPS/GLONASS solution
- ✧ Small form factor with case(22 x 45.6 x 9.9mm)
- ✧ ODM/OEM development is fully supported Application Engineering
- ✧ RoHS compliant

## PRODUCT APPLICATION

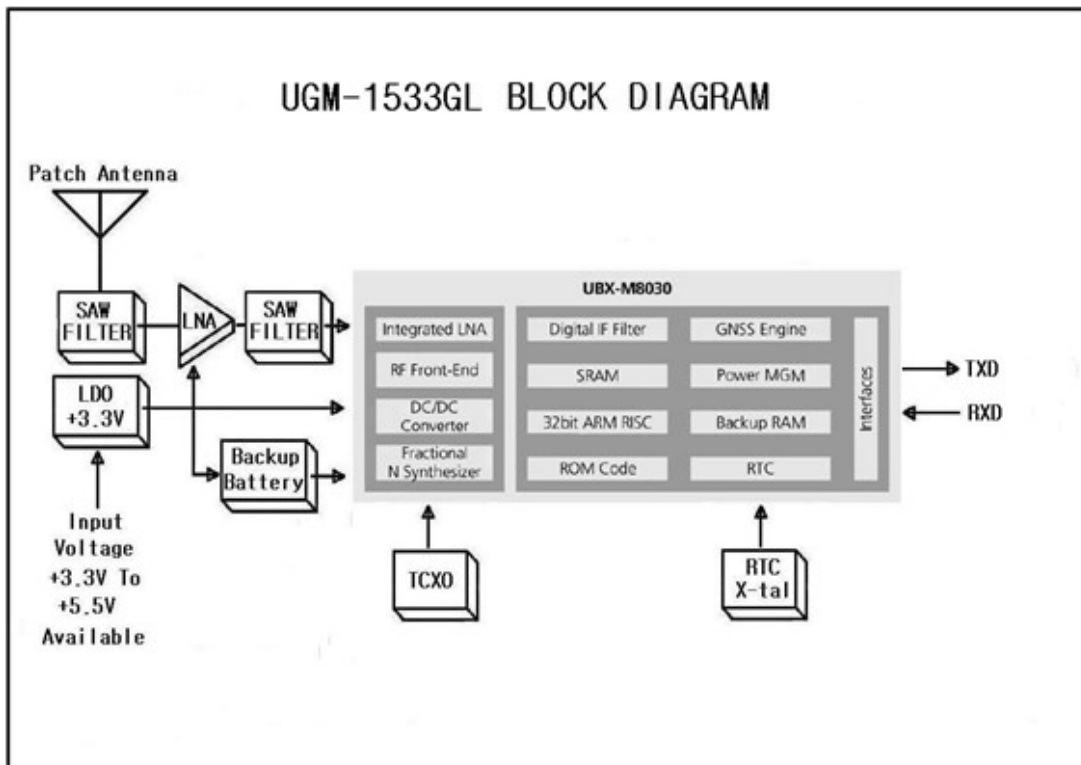
- ✧ Automotive applications
- ✧ Speed camera detector
- ✧ Personal and Car navigation
- ✧ Marine navigation
- ✧ Timing application and the others

**PRODUCT PICTURE**



**UGM-1533GL SYSTEM BLOCK DIAGRAM**

The UGM-1533GL consists of u-blox M8 chipsets Technology, KNCTEK LNA and proprietary software. The system is described as follows.



**TECHNICAL SPECIFICATION**
**1. Electrical Characteristics**
**1.1 Absolute Maximum Rating**

| Parameter   | Symbol | Min  | Max | Units |
|---|--------|------|-----|-------|
| <b>Power Supply</b>                               |        |      |     |       |
| Power Supply Volt.                                | VCC    | -0.3 | 6   | V     |
| <b>Input Pins</b>                                 |        |      |     |       |
| Input Pin Voltage I/O                             | RX     | -0.3 | 3.6 | V     |
| Backup Battery                                    | Vbat   | 1.6  | 3.6 | V     |
| <b>Environment</b>                                |        |      |     |       |
| Operating Temperature                             | Topr   | -30  | 85  | °C    |
| Storage Temperature                               | Tstg   | -40  | 85  | °C    |
| Backup Battery operating temperature <sup>1</sup> | Tbat   | -20  | 60  | °C    |
| Humidity  |        |      | 95  | %     |

\*\* 1 Backup Battery operating temperature depends on Battery characteristics

Note : Absolute maximum ratings are stress ratings only, and functional operation at the maximums is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device.

For functional operating conditions, please refer to the operating conditions tables as follow.

**1.2 Operating Condition**

| Parameter                   | Symbol          | Condition        | Min | Typ | Max | Units |
|-----------------------------|-----------------|------------------|-----|-----|-----|-------|
| Power supply voltage        | Vcc             |                  | 3.3 | 5.0 | 5.5 | V     |
| Power Supply voltage ripple | Vcc_PP          | Vcc = 3.3 ~ 5.5V |     |     | 50  | mV    |
| Acquisition current         | IccA            | Vcc = 3.3 ~ 5.5V |     | 60  |     | mA    |
| Tracking current            | IccT            | Vcc = 3.3 ~ 5.5V |     | 50  |     | mA    |
| Input high voltage          | V <sub>IH</sub> |                  | 2.0 |     |     | V     |
| Input low voltage           | V <sub>IL</sub> |                  | 0   |     | 0.8 | V     |
| Output high voltage         | V <sub>OH</sub> |                  | 2.8 |     |     | V     |
| Output low voltage          | V <sub>OL</sub> |                  |     |     | 0.3 | V     |

**2. General & Performance Specification**

| Parameter                   | Specification                            |  |
|-----------------------------|--|--|
| Receiver Type               | GPS/GLONASS, 72 Channel u-blox M8 engine |  |
| Sensitivity                 | Tracking                                 | -167dBm  |
|                             | Re-acquisition                           | -160dBm  |
|                             | Cold Start                               | -148dBm  |
| Accuracy                    | Position                                 | 2.5m CEP   |
|                             | Velocity                                 | 0.05m/s  |
| Acquisition Time            | Cold Start                               | 26 sec. typical (Open sky <sup>1</sup> )           |
|                             | Hot Start                                | 1 sec. typical (Open sky)                          |
|                             | Reacquisition Time                       | 1 sec(Open sky, re-appear after some seconds)      |
|                             | AssistNow Autonomous                     | Self-aided ephemeris estimation : 15 ~ 20 sec. avg |
| Power Consumption           | Tracking                                 | 50mA @ 3.3 ~ 5.5V                                  |
|                             | Acquisition                              | 60mA @ 3.3 ~ 5.5V                                  |
|                             | Back-up                                  | 15uA @ 3V  |
| Navigation Data Update Rate | 1Hz_Default                              | In case of using Binary input : Max 10Hz           |
| Operational Limits          | Velocity                                 | Max 500 m/s  |
|                             | Altitude                                 | Max 50,000m  |
|                             | Acceleration                             | Less than 4g( 39.2m/sec <sup>2</sup> )             |
| Mechanical data             | Dimension                                | 22X45.6X9.9mm                                      |
|                             | Weight                                   | 27.5grams ±5%(1m Cable)                            |
| Protocol                    | NMEA-0183 V4.0                           | GNRMC 1Hz( one time per sec)                       |
|                             |  | GNVTG 1Hz  |
|                             |  | GNGGA 1Hz  |
|                             |  | GNGSA 1Hz  |
|                             |  | GPGSV 1Hz  |
|                             |  | GLGSV 1Hz  |
|                             |  | GNGLL 1Hz  |

\*\* <sup>1</sup>Open Sky means no obstructions in the sky

**ORDERING INFORMATION [Example]**

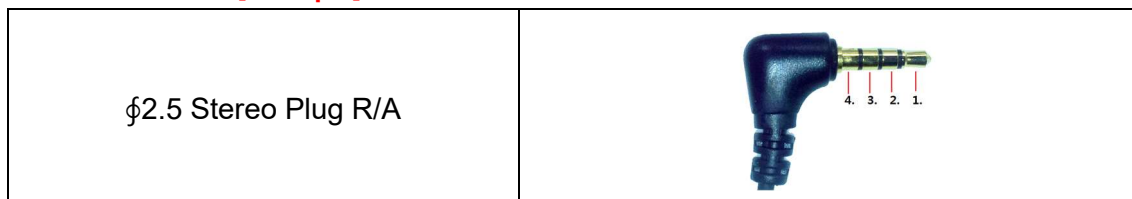


| ITEM                        | DESCRIPTION    | NOTE  |
|-----------------------------|----------------|-------|
| GPS Data Output Level       | UART TTL Level |       |
| Baudrate                    | 9600bps        |       |
| Connector Type              |                |       |
| Pin Map                     |                |       |
| Cable Length                |                | meter |
| 3M Tape Type                | 3M5952         | Black |
| 3M Tape Attachment Location | Bottom Side    |       |
| GPS Antenna Position        | Bottom Side    |       |

( Customer : )



## I/O INTERFACE [Example]



## Pin Description [Example]

| PIN | SIGNAL NAME | I/O | DESCRIPTION                   | CHARACTER                |
|-----|-------------|-----|-------------------------------|--------------------------|
| 1   | VCC         | P   | DC Power Supply Voltage input | DC 3.3V to 5V $\pm$ 10%  |
| 2   | TXD         | O   | NMEA TXD : NMEA TX OUTPUT     | 3.3V LVTTTL              |
| 3   | RXD         | I   | SERIAL DATA INPUT             | 3.3V LVTTTL              |
| 4   | GND         | P   | Digital Reference Ground      | Digital Reference Ground |

### VCC DC Power Input

This is the main power supply for the Engine board. The power range is **DC 3.3V to 5.5V Acceptable**. Suitable decoupling must be provided by external decoupling circuitry.

### GND

GND provides the ground for the Engine board. Connect all grounds.

### TXD

UART Interface TX for serial communication to a host CPU. This is the main transmit channel and used to output standard NMEA\_0183 sentence or response to input binary command. The default setup is NMEA Output, 9600bps, 8 data bits, no parity, 1 stop bit. The default sentences are GNRMC, GNVTG, GNGGA, GNGSA, GPGSV, GLGSV, GNLL.

### RXD

UART Interface RX for serial communication to a host CPU. This is the main receiving channel and is used to input binary commands to the Engine board from host CPU.

**Packing Information****1. Packing Method**

**TBD : To be determined**

### GPS/GLONASS Receiver User's Tip

1. GPS/GLONASS signal will be affected by weather and environment conditions, thus suggest using the GPS/GLONASS receiver under less shielding environments to ensure GPS/GLONASS receiver has better receiving performance.
2. When GPS/GLONASS receiver is moving, it will prolong the time to fix the position, so suggest to wait for the satellite signals to be locked at a fixed point when first power-on the GPS/GLONASS receiver to ensure to lock the GPS/GLONASS signal at the shortest time.
3. The following situation will affect the GPS/GLONASS receiving performance:
  - a. Solar control filmed windows.
  - b. Metal shielded, such as umbrella, or in vehicle.
  - c. Among high buildings.
  - d. Under bridges or tunnels.
  - e. Under high voltage cables or nearby radio wave sources, such as mobile phone base stations.
  - f. Bad or heavy cloudy weather.
4. If the satellite signals cannot be locked or encounter receiving problem (while in the urban area), the following steps are suggested:
  - a. Move to another open space or reposition GPS/GLONASS receiver toward the direction with fewer blockages.
  - b. Move the GPS/GLONASS receiver away from the interference resources.
  - c. Wait until the weather condition is improved.

While a GPS/GLONASS with a backup battery, the GPS/GLONASS receiver can fix a position immediately at next power-on if the build-in backup battery is full-recharged.

**Contact Information Section**

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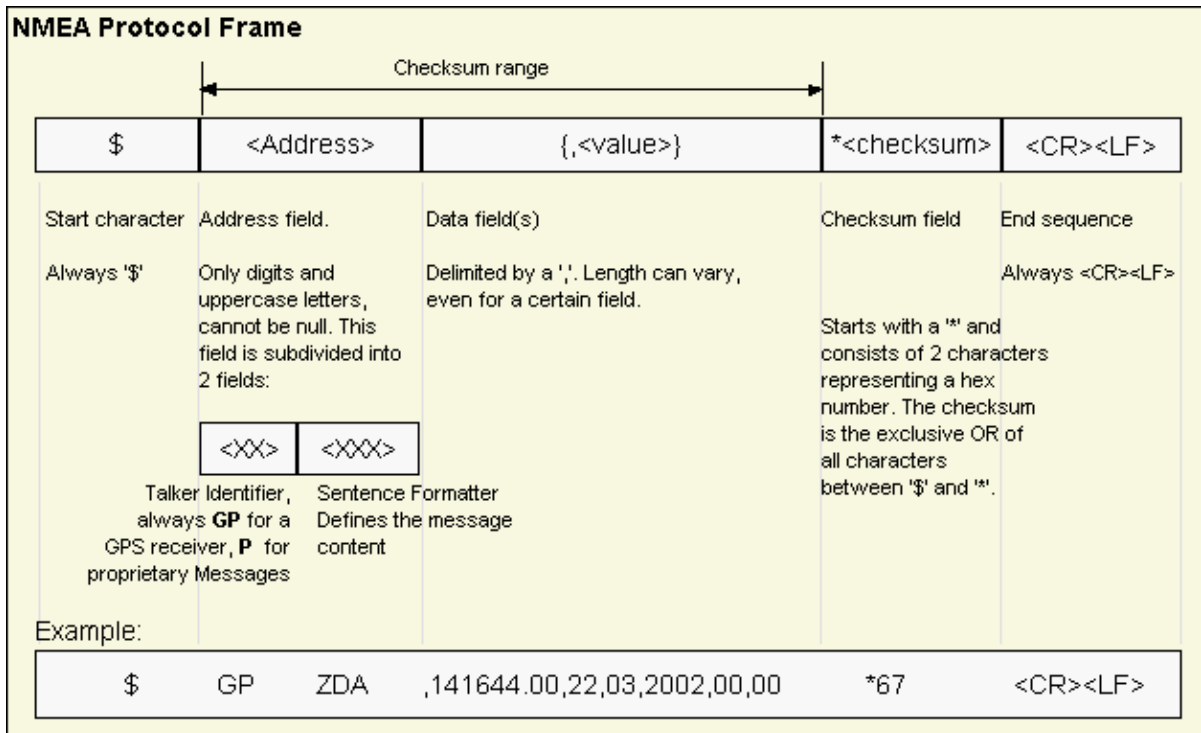
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# NMEA Protocol

## 19 Protocol Overview

### 19.1 Message Format

NMEA messages sent by the GNSS receiver are based on NMEA 0183 Version 4.0. The following picture shows the structure of a NMEA protocol message.



For further information on the NMEA Standard, refer to *NMEA 0183 Standard For Interfacing Marine Electronic Devices*, Version 4.00, November 1, 2008. See <http://www.nmea.org/> for ordering instructions.

The NMEA standard allows for proprietary, manufacturer-specific messages to be added. These shall be marked with a manufacturer mnemonic. The mnemonic assigned to u-blox is UBX and is used for all non-standard messages. These proprietary NMEA messages therefore have the address field set to PUBX. The first data field in a PUBX message identifies the message number with two digits.

### 19.2 Talker ID

One of the ways the NMEA standard differentiates between GNSS is by using a two-letter message identifier, the 'Talker ID'. The specific Talker ID used by a u-blox receiver will depend on the device model and system configuration. The table below shows the Talker ID that will be used for various GNSS configurations.

#### NMEA Talker IDs

| Configured GNSS         | Talker ID |
|-------------------------|-----------|
| GPS, SBAS, QZSS         | GP        |
| GLONASS                 | GL        |
| Galileo                 | GA        |
| BeiDou                  | GB        |
| Any combination of GNSS | GN        |

### 19.3 Protocol Configuration

The [NMEA protocol](#) on u-blox receivers can be configured to the need of customer applications using [CFG-NMEA](#). For backwards compatibility various versions of this message are supported, however, any new users should use the version that is not marked as deprecated.

There are four NMEA standards supported. The default NMEA version is 4.0. Alternatively versions 4.1, 2.3, and 2.1 can be enabled (for details on how this affects the output refer to section [Position Fix Flags in NMEA Mode](#)).

NMEA defines satellite numbering systems for some, but not all GNSS (this is partly dependent on the NMEA version). Satellite numbers for unsupported GNSS can be configured using [CFG-NMEA](#). Unknown satellite numbers are always reported as a null NMEA field (i.e. an empty string)

The NMEA specification indicates that the GGA message is GPS specific. However, u-blox receivers support the output of a GGA message for each of the Talker IDs.

#### NMEA filtering flags

| <i>Parameter</i>         | <i>Description</i>  |
|--------------------------|---|
| Position filtering       | Enable to permit positions from failed or invalid fixes to be reported (with the "V" status flag to indicate that the data is not valid). |
| Valid position filtering | Enable to permit positions from invalid fixes to be reported (with the "V" status flag to indicate that the data is not valid).           |
| Time filtering           | Enable to permit the receiver's best knowledge of time to be output, even though it might be wrong.                                       |
| Date filtering           | Enable to permit the receiver's best knowledge of date to be output, even though it might be wrong.                                       |
| GPS-only filtering       | Enable to restrict output to only report GPS satellites.  |
| Track filtering          | Enable to permit course over ground (COG) to be reported even when it would otherwise be frozen.  |

#### NMEA flags

| <i>Parameter</i>   | <i>Description</i>  |
|--------------------|---|
| Compatibility Mode | Some older NMEA applications expect the NMEA output to be formatted in a specific way, for example, they will only work if the latitude and longitude have exactly four digits behind the decimal point. u-blox receivers offer a compatibility mode to support these legacy applications.  |
| Consideration Mode | u-blox receivers use a sophisticated signal quality detection scheme, in order to produce the best possible position output. This algorithm considers all SV measurements, and may eventually decide to only use a subset thereof, if it improves the overall position accuracy. If Consideration mode is enabled, all satellites, which were considered for navigation, are communicated as being used for the position determination. If Consideration Mode is disabled, only those satellites which after the consideration step remained in the position output are marked as being used. |
| Limit82 Mode       | Enabling this mode will limit the NMEA sentence length to a maximum of 82 characters.   |

#### Extended configuration

| <i>Option</i>       | <i>Description</i>  |
|---------------------|---|
| GNSS to filter      | Filters satellites based on their GNSS  |
| Satellite numbering | This field configures the display of satellites that do not have an NMEA-defined value. Note: this does not apply to satellites with an unknown ID. |

Extended configuration continued

| Option         | Description  |
|----------------|--|
| Main Talker ID | By default the main Talker ID (i.e. the Talker ID used for all messages other than GSV) is determined by the GNSS assignment of the receiver's channels (see <a href="#">UBX-CFG-GNSS</a> ). This field enables the main Talker ID to be overridden. |
| GSV Talker ID  | By default the Talker ID for GSV messages is GNSS specific (as defined by NMEA). This field enables the GSV Talker ID to be overridden.  |
| BDS Talker ID  | By default the Talker ID for BeiDou is 'GB'. This field enables the BeiDou Talker ID to be overridden.   |

## 19.4 Satellite Numbering

The NMEA protocol (V4.0) identifies satellites with a two digit number, reserving the numbers 1 to 32 for GPS, 33-64 for SBAS and 65-96 for GLONASS. So, for example, GLONASS SV4 is reported using number 68. u-blox receivers support this method in their NMEA output when "strict" SV numbering is selected. In most cases this is the default setting, but can be checked or set using [UBX-CFG-NMEA](#).

Unfortunately there is currently no standard way of identifying satellites from any other GNSS within the NMEA protocol. In order to support QZSS within current receivers and prepare for support of other systems (e.g. Galileo) in future receivers, an "extended" SV numbering scheme can be enabled (using [UBX-CFG-NMEA](#)). This uses the NMEA-defined numbers where possible, but adds other number ranges to support other GNSS. Note however that these non-standard extensions require 3 digit numbers, which may not be supported by some NMEA parsing software. For example QZSS satellites are reported using numbers in the range 193 to 197.

See [Satellite Numbering Summary](#) for a complete list of satellite numbers.



*GLONASS satellites can be tracked before they have been identified. In NMEA output, such unknown satellite numbers are always reported as a null field (i.e. an empty string).*

## 19.5 Latitude and Longitude Format

According to the NMEA Standard, Latitude and Longitude are output in the format Degrees, Minutes and (Decimal) Fractions of Minutes. To convert to Degrees and Fractions of Degrees, or Degrees, Minutes, Seconds and Fractions of seconds, the 'Minutes' and 'Fractional Minutes' parts need to be converted. In other words: If the GPS Receiver reports a Latitude of 4717.112671 North and Longitude of 00833.914843 East, this is

Latitude 47 Degrees, 17.112671 Minutes

Longitude 8 Degrees, 33.914843 Minutes

**or**

Latitude 47 Degrees, 17 Minutes, 6.76026 Seconds

Longitude 8 Degrees, 33 Minutes, 54.89058 Seconds

**or**

Latitude 47.28521118 Degrees

Longitude 8.56524738 Degrees

## 19.6 Position Fix Flags

This section shows how u-blox implements the NMEA protocol and the conditions determining how flags are set.

### Flags in NMEA 2.3 and above

## Flags in NMEA 2.3 and above continued

|                             |  |                                    |  |   |             |             |  |
|-----------------------------|--|------------------------------------|--|---|-------------|-------------|--|
| NMEA Message: Field         | No position fix (at power-up, after losing satellite lock)                               | GNSS fix, but user limits exceeded | Dead reckoning fix, but user limits exceeded | Dead reckoning fix (ADR with external sensors, linear extrapolation, or map matching) | 2D GNSS fix | 3D GNSS fix | Combined GNSS/dead reckoning fix (ADR with external sensors) |
| NMEA Message: Field         | No position fix (at power-up, after losing satellite lock)                               | GNSS fix, but user limits exceeded | Dead reckoning fix, but user limits exceeded | Dead reckoning fix (ADR with external sensors, linear extrapolation, or map matching) | 2D GNSS fix | 3D GNSS fix | Combined GNSS/dead reckoning fix (ADR with external sensors) |
| GLL, RMC: status            | V  | V                                  | V  | A   | A           | A           | A  |
|                             | V=Data Invalid, A=Data Valid   |                                    |  |   |             |             |  |
| GGA: quality                | 0  | 0                                  | 6  | 6   | 1 / 2       | 1 / 2       | 1 / 2  |
|                             | 0=No Fix, 1=Autonomous GNSS Fix, 2=Differential GNSS Fix, 6=Estimated/Dead Reckoning Fix |                                    |  |   |             |             |  |
| GSA: navMode                | 1  | 1                                  | 2  | 2   | 2           | 3           | 3  |
|                             | 1=No Fix, 2=2D Fix, 3=3D Fix   |                                    |  |   |             |             |  |
| GLL, RMC, VTG, GNS: posMode | N  | N                                  | E  | E   | A / D       | A / D       | A / D  |
|                             | N=No Fix, E=Estimated/Dead Reckoning Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix |                                    |  |   |             |             |  |

**Flags in NMEA 2.1 and below**

The flags in NMEA 2.1 and below are the same as NMEA 2.3 and above but with the following differences:

- The posMode field is not output for GLL, RMC and VTG messages (each message has one field less).
- The GGA quality field is set to 1 (instead of 6) For both types of dead reckoning fix.

**Extra fields in NMEA 4.1 and above**

| Message | Extra fields       |
|---------|--------------------|
| GBS     | systemId, signalId |
| GNS     | navStatus          |
| GRS     | systemId, signalId |
| GSA     | systemId           |
| GSV     | signalId           |
| RMC     | navStatus          |

**19.7 Multi-GNSS considerations**

Many applications which process NMEA messages assume that only a single GNSS is active. However, when multiple GNSS are configured, the NMEA specification requires the output to change in the following ways:

**NMEA output for Multi-GNSS**

| Change         | Description   |
|----------------|---|
| Main Talker ID | The main Talker ID will be 'GN' (e.g. instead of 'GP' for a GPS receiver)   |
| GSV Talker IDs | The GSV message reports the signal strength of the visible satellites. However, the Talker ID it uses is specific to the GNSS it is reporting information for, so for a multi-GNSS receiver it will not be the same as the main Talker ID. (e.g. other messages will be using the 'GN' Talker ID but the GSV message will use GNSS-specific Talker IDs) |



NMEA output for Multi-GNSS continued

| Change                        | Description  |
|-------------------------------|--|
| Multiple GSA and GRS Messages | Multiple GSA and GRS messages are output for each fix, one for each GNSS. This may confuse applications which assume they are output only once per position fix (as is the case for a single GNSS receiver). |

## 19.8 Output of Invalid/Unknown Data

By default the receiver will not output invalid data. In such cases, it will output empty fields.

A valid position fix is reported as follows:

```
$GPGLL,4717.11634,N,00833.91297,E,124923.00,A,A*6E
```

An invalid position fix (but time valid) is reported as follows:

```
$GPGLL,,,,,124924.00,V,N*42
```

If Time is unknown (e.g. during a cold-start):

```
$GPGLL,,,,,V,N*64
```

Note:



An exception from the above default are dead reckoning fixes, which are also output when invalid (user limits exceeded).



Output of invalid data marked with the 'Invalid/Valid' Flags can be enabled using the UBX protocol message [CFG-NMEA](#).



Differing from the NMEA standard, u-blox reports valid dead reckoning fixes with user limits met (not exceeded) as valid (A) instead of invalid (V).

## 19.9 Messages Overview

When configuring NMEA messages using the UBX protocol message [CFG-MSG](#), the Class/Ids shown in the table shall be used.

| Page                          | Mnemonic   | Cls/ID                   | Description  |
|-------------------------------|------------|--------------------------|--|
| <b>NMEA Standard Messages</b> |            | <b>Standard Messages</b> |  |
| 65                            | <b>DTM</b> | 0xF0 0x0A                | Datum Reference  |
| 66                            | <b>GBQ</b> | 0xF0 0x44                | Poll a standard message (if the current Talker ID is GB)     |
| 66                            | <b>GBS</b> | 0xF0 0x09                | GNSS Satellite Fault Detection                               |
| 67                            | <b>GGA</b> | 0xF0 0x00                | Global positioning system fix data                           |
| 68                            | <b>GLL</b> | 0xF0 0x01                | Latitude and longitude, with time of position fix and status |
| 69                            | <b>GLQ</b> | 0xF0 0x43                | Poll a standard message (if the current Talker ID is GL)     |
| 70                            | <b>GNQ</b> | 0xF0 0x42                | Poll a standard message (if the current Talker ID is GN)     |
| 70                            | <b>GNS</b> | 0xF0 0x0D                | GNSS fix data  |
| 71                            | <b>GPQ</b> | 0xF0 0x40                | Poll a standard message (if the current Talker ID is GP)     |
| 72                            | <b>GRS</b> | 0xF0 0x06                | GNSS Range Residuals   |
| 73                            | <b>GSA</b> | 0xF0 0x02                | GNSS DOP and Active Satellites                               |
| 74                            | <b>GST</b> | 0xF0 0x07                | GNSS Pseudo Range Error Statistics                           |
| 75                            | <b>GSV</b> | 0xF0 0x03                | GNSS Satellites in View                                      |
| 76                            | <b>RMC</b> | 0xF0 0x04                | Recommended Minimum data                                     |
| 77                            | <b>TXT</b> | 0xF0 0x41                | Text Transmission  |

*NMEA Messages Overview continued*

| Page                      | Mnemonic        | Cls/ID                      | Description                         |
|---------------------------|-----------------|-----------------------------|-------------------------------------|
| 78                        | <b>VLW</b>      | 0xF0 0x0F                   | Dual ground/water distance          |
| 78                        | <b>VTG</b>      | 0xF0 0x05                   | Course over ground and Ground speed |
| 79                        | <b>ZDA</b>      | 0xF0 0x08                   | Time and Date                       |
| <b>NMEA PUBX Messages</b> |                 | <b>Proprietary Messages</b> |                                     |
| 81                        | <b>CONFIG</b>   | 0xF1 0x41                   | Set Protocols and Baudrate          |
| 82                        | <b>POSITION</b> | 0xF1 0x00                   | Lat/Long Position Data              |
| 83                        | <b>SVSTATUS</b> | 0xF1 0x03                   | Satellite Status                    |
| 84                        | <b>TIME</b>     | 0xF1 0x04                   | Time of Day and Clock Information   |

Example:

```
$GPGBS,235503.00,1.6,1.4,3.2,,,,,*40
```

```
$GPGBS,235458.00,1.4,1.3,3.1,03,, -21.4,3.8,1,0*5B
```

| Field No. | Name     | Unit | Format      | Example   | Description  |
|-----------|----------|------|-------------|-----------|--|
| 0         | xxGBS    | -    | string      | \$GPGBS   | GBS Message ID (xx = current Talker ID)  |
| 1         | time     | -    | hhmmss.ss   | 235503.00 | UTC time to which this RAIM sentence belongs, see <a href="#">note on UTC representation</a> |
| 2         | errLat   | m    | numeric     | 1.6       | Expected error in latitude   |
| 3         | errLon   | m    | numeric     | 1.4       | Expected error in longitude  |
| 4         | errAlt   | m    | numeric     | 3.2       | Expected error in altitude   |
| 5         | svid     | -    | numeric     | 03        | Satellite ID of most likely failed satellite   |
| 6         | prob     | -    | numeric     | -         | Probability of missed detection, not supported (empty)                                       |
| 7         | bias     | m    | numeric     | -21.4     | Estimate on most likely failed satellite (a priori residual)                                 |
| 8         | stddev   | m    | numeric     | 3.8       | Standard deviation of estimated bias   |
| 9         | systemId | -    | numeric     | 1         | NMEA defined GNSS System ID<br><b>NMEA v4.1 and above only</b>                               |
| 10        | signalId | -    | numeric     | 0         | NMEA defined GNSS Signal ID (0 = All signals)<br><b>NMEA v4.1 and above only</b>             |
| 11        | cs       | -    | hexadecimal | *5B       | Checksum   |
| 12        | <CR><LF> | -    | character   | -         | Carriage return and line feed  |

## 20.4 GGA

### 20.4.1 Global positioning system fix data

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>GGA</b>   |                  |  |
| Description  | <b>Global positioning system fix data</b>  |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul>   |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | <p><b>The output of this message is dependent on the currently selected datum (default: WGS84). The NMEA specification indicates that the GGA message is GPS specific. However, when the receiver is configured for multi-GNSS, the GGA message contents will be generated from the multi-GNSS solution. For multi-GNSS use, it is recommended that the <a href="#">NMEA-GNS</a> message is used instead.</b></p> <p>Time and position, together with GPS fixing related data (number of satellites in use, and the resulting HDOP, age of differential data if in use, etc.).</p> |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x00  | 17               |  |

Message Structure:

```
$xxGGA,time,lat,NS,long,EW,quality,numSV,HDOP,alt,M,sep,M,diffAge,diffStation*cs<CR><LF>
```

Example:

```
$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,08,1.01,499.6,M,48.0,M,,*5B
```

| Field No. | Name | Unit | Format | Example | Description |
|-----------|------|------|--------|---------|-------------|
|-----------|------|------|--------|---------|-------------|

## GGA continued

| Field No. | Name        | Unit | Format         | Example     | Description  |
|-----------|-------------|------|----------------|-------------|--|
| 0         | xxGGA       | -    | string         | \$GPGGA     | GGA Message ID (xx = current Talker ID)  |
| 1         | time        | -    | hhmmss.ss      | 092725.00   | UTC time, see <a href="#">note on UTC representation</a>   |
| 2         | lat         | -    | ddmm.<br>mmmm  | 4717.11399  | Latitude (degrees & minutes), see <a href="#">format description</a>                                   |
| 3         | NS          | -    | character      | N           | North/South indicator  |
| 4         | long        | -    | dddmm.<br>mmmm | 00833.91590 | Longitude (degrees & minutes), see <a href="#">format description</a>                                  |
| 5         | EW          | -    | character      | E           | East/West indicator  |
| 6         | quality     | -    | digit          | 1           | Quality indicator for position fix, see table below and <a href="#">position fix flags description</a> |
| 7         | numSV       | -    | numeric        | 08          | Number of satellites used (range: 0-12)  |
| 8         | HDOP        | -    | numeric        | 1.01        | Horizontal Dilution of Precision   |
| 9         | alt         | m    | numeric        | 499.6       | Altitude above mean sea level  |
| 10        | uAlt        | -    | character      | M           | Altitude units: meters (fixed field)   |
| 11        | sep         | m    | numeric        | 48.0        | Geoid separation: difference between geoid and mean sea level  |
| 12        | uSep        | -    | character      | M           | Separation units: meters (fixed field)   |
| 13        | diffAge     | s    | numeric        | -           | Age of differential corrections (blank when DGPS is not used)  |
| 14        | diffStation | -    | numeric        | -           | ID of station providing differential corrections (blank when DGPS is not used)                         |
| 15        | cs          | -    | hexadecimal    | *5B         | Checksum   |
| 16        | <CR><LF>    | -    | character      | -           | Carriage return and line feed  |

**Table Quality Indicator**

| Quality Indicator | Description, see also <a href="#">position fix flags description</a> |
|-------------------|--|
| 0                 | No Fix / Invalid   |
| 1                 | Standard GPS (2D/3D)   |
| 2                 | Differential GPS   |
| 6                 | Estimated (DR) Fix   |

**20.5 GLL**
**20.5.1 Latitude and longitude, with time of position fix and status**

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>GLL</b>   |                  |  |
| Description  | <b>Latitude and longitude, with time of position fix and status</b>                                  |                  |  |
| Firmware     | Supported on: <ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul>      |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | <b>The output of this message is dependent on the currently selected datum (default: WGS84)</b><br>- |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x01  | 10               |  |

Message Structure:

```
$xxGLL, lat, NS, long, EW, time, status, posMode*cs<CR><LF>
```

Example:

```
$GPGLL, 4717.11364, N, 00833.91565, E, 092321.00, A, A*60
```

| Field No. | Name     | Unit | Format         | Example     | Description  |
|-----------|----------|------|----------------|-------------|--|
| 0         | xxGLL    | -    | string         | \$GPGLL     | GLL Message ID (xx = current Talker ID)  |
| 1         | lat      | -    | ddmm.<br>mmmm  | 4717.11364  | Latitude (degrees & minutes), see <a href="#">format description</a>                                       |
| 2         | NS       | -    | character      | N           | North/South indicator  |
| 3         | long     | -    | dddmm.<br>mmmm | 00833.91565 | Longitude (degrees & minutes), see <a href="#">format description</a>                                      |
| 4         | EW       | -    | character      | E           | East/West indicator  |
| 5         | time     | -    | hhmmss.ss      | 092321.00   | UTC time, see <a href="#">note on UTC representation</a>   |
| 6         | status   | -    | character      | A           | V = Data invalid or receiver warning, A = Data valid. See <a href="#">position fix flags description</a> . |
| 7         | posMode  | -    | character      | A           | Positioning mode, see <a href="#">position fix flags description</a> .<br><b>NMEA v2.3 and above only</b>  |
| 8         | cs       | -    | hexadecimal    | *60         | Checksum   |
| 9         | <CR><LF> | -    | character      | -           | Carriage return and line feed  |

## 20.6 GLQ

### 20.6.1 Poll a standard message (if the current Talker ID is GL)

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>GLQ</b>   |                  |  |
| Description  | <b>Poll a standard message (if the current Talker ID is GL)</b>                                    |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul> |                  |  |
| Type         | Input Message  |                  |  |
| Comment      | Polls a standard NMEA message if the current Talker ID is GL                                       |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x43  | 4                |  |

Message Structure:

```
$xxGLQ, msgId*cs<CR><LF>
```

Example:

```
$EIGLQ, RMC*3A
```

| Field No. | Name     | Unit | Format      | Example | Description   |
|-----------|----------|------|-------------|---------|---|
| 0         | xxGLQ    | -    | string      | \$EIGLQ | GLQ Message ID (xx = Talker ID of the device requesting the poll) |
| 1         | msgId    | -    | string      | RMC     | Message ID of the message to be polled                            |
| 2         | cs       | -    | hexadecimal | *3A     | Checksum  |
| 3         | <CR><LF> | -    | character   | -       | Carriage return and line feed                                     |

## Table Mode

| Mode | Description   |
|------|---|
| 0    | Residuals were used to calculate the position given in the matching <a href="#">GGA</a> sentence. |
| 1    | Residuals were recomputed after the <a href="#">GGA</a> position was computed.                    |

## 20.11 GSA

### 20.11.1 GNSS DOP and Active Satellites

| Message      | <b>GSA</b>  |                  |  |
|--------------|---|------------------|--|
| Description  | <b>GNSS DOP and Active Satellites</b>   |                  |  |
| Firmware     | Supported on: <ul style="list-style-type: none"> <li>• u-blox M8 firmware version 2.00</li> </ul>   |                  |  |
| Type         | Output Message  |                  |  |
| Comment      | The GPS receiver operating mode, satellites used for navigation, and DOP values. <ul style="list-style-type: none"> <li>• If less than 12 SVs are used for navigation, the remaining fields are left empty. If more than 12 SVs are used for navigation, only the IDs of the first 12 are output.</li> <li>• The SV numbers (fields 'sv') are in the range of 1 to 32 for GPS satellites, and 33 to 64 for SBAS satellites (33 = SBAS PRN 120, 34 = SBAS PRN 121, and so on)</li> </ul> <b>In a multi-GNSS system this message will be output multiple times, once for each GNSS.</b> |                  |  |
| Message Info | ID for CFG-MSG  | Number of fields |  |
|              | 0xF0 0x02   | 21               |  |

Message Structure:

```
$xxGSA,opMode,navMode{,sv},PDOP,HDOP,VDOP,systemId*cs<CR><LF>
```

Example:

```
$GPGSA,A,3,23,29,07,08,09,18,26,28,,,,,1.94,1.18,1.54,1*0D
```

| Field No.                          | Name     | Unit | Format      | Example | Description  |
|------------------------------------|----------|------|-------------|---------|--|
| 0                                  | xxGSA    | -    | string      | \$GPGSA | GSA Message ID (xx = current Talker ID)  |
| 1                                  | opMode   | -    | character   | A       | Operation mode, see first table below  |
| 2                                  | navMode  | -    | digit       | 3       | Navigation mode, see second table below and <a href="#">position fix flags description</a> |
| Start of repeated block (12 times) |          |      |             |         |  |
| 3 +<br>1*N                         | sv       | -    | numeric     | 29      | Satellite number   |
| End of repeated block              |          |      |             |         |  |
| 15                                 | PDOP     | -    | numeric     | 1.94    | Position dilution of precision   |
| 16                                 | HDOP     | -    | numeric     | 1.18    | Horizontal dilution of precision   |
| 17                                 | VDOP     | -    | numeric     | 1.54    | Vertical dilution of precision   |
| 18                                 | systemId | -    | numeric     | 1       | NMEA defined GNSS System ID<br><b>NMEA v4.1 and above only</b>                             |
| 19                                 | cs       | -    | hexadecimal | *0D     | Checksum   |
| 20                                 | <CR><LF> | -    | character   | -       | Carriage return and line feed  |

## Table Operation Mode

| Operation Mode | Description                                   |
|----------------|---|
| M              | Manually set to operate in 2D or 3D mode      |
| A              | Automatically switching between 2D or 3D mode |

## Table Navigation Mode

| Navigation Mode | Description, see also <a href="#">position fix flags description</a> |
|-----------------|--|
| 1               | Fix not available  |
| 2               | 2D Fix   |
| 3               | 3D Fix   |

## 20.12 GST

### 20.12.1 GNSS Pseudo Range Error Statistics

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>GST</b>   |                  |  |
| Description  | <b>GNSS Pseudo Range Error Statistics</b>  |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul> |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | This message reports statistical information on the quality of the position solution.              |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x07  | 11               |  |

Message Structure:

```
$xxGST,time,rangeRms,stdMajor,stdMinor,orient,stdLat,stdLong,stdAlt*cs<CR><LF>
```

Example:

```
$GPGST,082356.00,1.8,,,,,1.7,1.3,2.2*7E
```

| Field No. | Name     | Unit | Format      | Example   | Description   |
|-----------|----------|------|-------------|-----------|---|
| 0         | xxGST    | -    | string      | \$GPGST   | GST Message ID (xx = current Talker ID)   |
| 1         | time     | -    | hhmmss.ss   | 082356.00 | UTC time of associated position fix, see <a href="#">note on UTC representation</a> |
| 2         | rangeRms | m    | numeric     | 1.8       | RMS value of the standard deviation of the ranges                                   |
| 3         | stdMajor | m    | numeric     | -         | Standard deviation of semi-major axis (blank - not supported)                       |
| 4         | stdMinor | m    | numeric     | -         | Standard deviation of semi-minor axis (blank - not supported)                       |
| 5         | orient   | deg  | numeric     | -         | Orientation of semi-major axis (blank - not supported)                              |
| 6         | stdLat   | m    | numeric     | 1.7       | Standard deviation of latitude error  |
| 7         | stdLong  | m    | numeric     | 1.3       | Standard deviation of longitude error   |
| 8         | stdAlt   | m    | numeric     | 2.2       | Standard deviation of altitude error  |
| 9         | cs       | -    | hexadecimal | *7E       | Checksum  |
| 10        | <CR><LF> | -    | character   | -         | Carriage return and line feed   |

## 20.13 GSV

### 20.13.1 GNSS Satellites in View

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>GSV</b>   |                  |  |
| Description  | <b>GNSS Satellites in View</b>   |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul>   |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | The number of satellites in view, together with each SV ID, elevation azimuth, and signal strength (C/No) value. Only four satellite details are transmitted in one message.<br><b>In a multi-GNSS system sets of GSV messages will be output multiple times, one set for each GNSS.</b> |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x03  | 8..16            |  |

Message Structure:

```
$xxGSV,numMsg,msgNum,numSV,{,sv,elv,az,cno},signalId*cs<CR><LF>
```

Example:

```
$GPGSV,3,1,10,23,38,230,44,29,71,156,47,07,29,116,41,08,09,081,36,0*7F
```

```
$GPGSV,3,2,10,10,07,189,,05,05,220,,09,34,274,42,18,25,309,44,0*72
```

```
$GPGSV,3,3,10,26,82,187,47,28,43,056,46,0*77
```

| Field No.                                   | Name     | Unit     | Format      | Example | Description  |
|---|----------|----------|-------------|---------|--|
| 0   | xxGSV    | -        | string      | \$GPGSV | GSV Message ID (xx = GSV Talker ID)  |
| 1   | numMsg   | -        | digit       | 3       | Number of messages, total number of GSV messages being output                    |
| 2   | msgNum   | -        | digit       | 1       | Number of this message   |
| 3   | numSV    | -        | numeric     | 10      | Number of satellites in view   |
| <i>Start of repeated block (1..4 times)</i> |          |          |             |         |  |
| 4 +<br>4*N                                  | sv       | -        | numeric     | 23      | Satellite ID   |
| 5 +<br>4*N                                  | elv      | deg      | numeric     | 38      | Elevation (range 0-90)   |
| 6 +<br>4*N                                  | az       | deg      | numeric     | 230     | Azimuth, (range 0-359)   |
| 7 +<br>4*N                                  | cno      | dBH<br>z | numeric     | 44      | Signal strength (C/N0, range 0-99), blank when not tracking                      |
| <i>End of repeated block</i>                |          |          |             |         |  |
| 5..<br>16                                   | signalId | -        | numeric     | 0       | NMEA defined GNSS Signal ID (0 = All signals)<br><b>NMEA v4.1 and above only</b> |
| 6..<br>16                                   | cs       | -        | hexadecimal | *7F     | Checksum   |
| 7..<br>16                                   | <CR><LF> | -        | character   | -       | Carriage return and line feed  |



## 20.14 RMC

### 20.14.1 Recommended Minimum data

|              |   |                  |  |
|--------------|---|------------------|--|
| Message      | <b>RMC</b>  |                  |  |
| Description  | <b>Recommended Minimum data</b>   |                  |  |
| Firmware     | Supported on: <ul style="list-style-type: none"> <li>• u-blox M8 firmware version 2.00</li> </ul>   |                  |  |
| Type         | Output Message  |                  |  |
| Comment      | <b>The output of this message is dependent on the currently selected datum (default: WGS84)</b><br>The recommended minimum sentence defined by NMEA for GNSS system data. |                  |  |
| Message Info | ID for CFG-MSG  | Number of fields |  |
|              | 0xF0 0x04   | 16               |  |

Message Structure:

```
$xxRMC,time,status,lat,NS,long,EW,spd,cog,date,mv,mvEW,posMode,navStatus*cs<CR><LF>
```

Example:

```
$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,A,V*57
```

| Field No. | Name      | Unit        | Format         | Example     | Description   |
|-----------|-----------|-------------|----------------|-------------|---|
| 0         | xxRMC     | -           | string         | \$GPRMC     | RMC Message ID (xx = current Talker ID)   |
| 1         | time      | -           | hhmmss.ss      | 083559.00   | UTC time, see <a href="#">note on UTC representation</a>  |
| 2         | status    | -           | character      | A           | Status, V = Navigation receiver warning, A = Data valid, see <a href="#">position fix flags description</a>                       |
| 3         | lat       | -           | ddmm.<br>mmmm  | 4717.11437  | Latitude (degrees & minutes), see <a href="#">format description</a>  |
| 4         | NS        | -           | character      | N           | North/South indicator   |
| 5         | long      | -           | dddmm.<br>mmmm | 00833.91522 | Longitude (degrees & minutes), see <a href="#">format description</a>   |
| 6         | EW        | -           | character      | E           | East/West indicator   |
| 7         | spd       | knot<br>s   | numeric        | 0.004       | Speed over ground   |
| 8         | cog       | degr<br>ees | numeric        | 77.52       | Course over ground  |
| 9         | date      | -           | ddmmyy         | 091202      | Date in day, month, year format, see <a href="#">note on UTC representation</a>   |
| 10        | mv        | degr<br>ees | numeric        | -           | Magnetic variation value (blank - not supported)  |
| 11        | mvEW      | -           | character      | -           | Magnetic variation E/W indicator (blank - not supported)  |
| 12        | posMode   | -           | character      | -           | Mode Indicator, see <a href="#">position fix flags description</a><br><b>NMEA v2.3 and above only</b>                             |
| 13        | navStatus | -           | character      | V           | Navigational status indicator (V = Equipment is not providing navigational status information)<br><b>NMEA v4.1 and above only</b> |
| 14        | cs        | -           | hexadecimal    | *57         | Checksum  |
| 15        | <CR><LF>  | -           | character      | -           | Carriage return and line feed   |

## 20.15 TXT

### 20.15.1 Text Transmission

|              |   |                  |  |
|--------------|---|------------------|--|
| Message      | <b>TXT</b>  |                  |  |
| Description  | <b>Text Transmission</b>  |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul>  |                  |  |
| Type         | Output Message  |                  |  |
| Comment      | <b>This message is not configured through UBX-CFG-MSG, but instead through UBX-CFG-INF.</b><br>This message outputs various information on the receiver, such as power-up screen, software version etc. This message can be configured using UBX Protocol message <a href="#">UBX-CFG-INF</a> . |                  |  |
| Message Info | ID for CFG-MSG  | Number of fields |  |
|              | 0xF0 0x41   | 7                |  |

Message Structure:

```
$xxTXT,numMsg,msgNum,msgType,text*cs<CR><LF>
```

Example:

```
$GPTXT,01,01,02,u-blox ag - www.u-blox.com*50
```

```
$GPTXT,01,01,02,ANTARIS ATR0620 HW 00000040*67
```

| Field No. | Name     | Unit | Format      | Example        | Description   |
|-----------|----------|------|-------------|----------------|---|
| 0         | xxTXT    | -    | string      | \$GPTXT        | TXT Message ID (xx = current Talker ID)   |
| 1         | numMsg   | -    | numeric     | 01             | Total number of messages in this transmission, 01..99   |
| 2         | msgNum   | -    | numeric     | 01             | Message number in this transmission, range 01..xx   |
| 3         | msgType  | -    | numeric     | 02             | Text identifier, u-blox GPS receivers specify the type of the message with this number.<br>00: Error<br>01: Warning<br>02: Notice<br>07: User |
| 4         | text     | -    | string      | www.u-blox.com | Any ASCII text  |
| 5         | cs       | -    | hexadecimal | *67            | Checksum  |
| 6         | <CR><LF> | -    | character   | -              | Carriage return and line feed   |

## 20.16 VLW

### 20.16.1 Dual ground/water distance

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>VLW</b>   |                  |  |
| Description  | <b>Dual ground/water distance</b>  |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul> |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | The distance traveled, relative to the water and over the ground.                                  |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x0F  | 11               |  |

Message Structure:

```
$xxVLW, twd, twdUnit, wd, wdUnit, tgd, tgdUnit, gd, gdUnit *cs<CR><LF>
```

Example:

```
$GPVLW, ,N, ,N, 15.8, N, 1.2, N*06
```

| Field No. | Name     | Unit | Format      | Example | Description                                 |
|-----------|----------|------|-------------|---------|---|
| 0         | xxVLW    | -    | string      | \$GPVLW | VLW Message ID (xx = current Talker ID)     |
| 1         | twd      | nm   | numeric     | -       | Total cumulative water distance, not output |
| 2         | twdUnit  | -    | character   | N       | Fixed field: nautical miles                 |
| 3         | wd       | nm   | numeric     | -       | Water distance since reset, not output      |
| 4         | wdUnit   | -    | character   | N       | Fixed field: nautical miles                 |
| 5         | tgd      | nm   | numeric     | 15.8    | Total cumulative ground distance            |
| 6         | tgdUnit  | -    | character   | N       | Fixed field: nautical miles                 |
| 7         | gd       | nm   | numeric     | 1.2     | Ground distance since reset                 |
| 8         | gdUnit   | -    | character   | N       | Fixed field: nautical miles                 |
| 9         | cs       | -    | hexadecimal | *06     | Checksum                                    |
| 10        | <CR><LF> | -    | character   | -       | Carriage return and line feed               |

## 20.17 VTG

### 20.17.1 Course over ground and Ground speed

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>VTG</b>   |                  |  |
| Description  | <b>Course over ground and Ground speed</b>   |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul> |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | Velocity is given as Course over Ground (COG) and Speed over Ground (SOG).                         |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x05  | 12               |  |

Message Structure:

```
$xxVTG, cogt, T, ,M, 0.004, N, 0.008, K, posMode *cs<CR><LF>
```

Example:

```
$GPVTG, 77.52, T, ,M, 0.004, N, 0.008, K, A*06
```

| Field No. | Name | Unit | Format | Example | Description |
|-----------|------|------|--------|---------|-------------|
|-----------|------|------|--------|---------|-------------|

## VTG continued

| Field No. | Name     | Unit    | Format      | Example | Description   |
|-----------|----------|---------|-------------|---------|---|
| 0         | xxVTG    | -       | string      | \$GPVTG | VTG Message ID (xx = current Talker ID)   |
| 1         | cogt     | degrees | numeric     | 77.52   | Course over ground (true)   |
| 2         | T        | -       | character   | T       | Fixed field: true   |
| 3         | cogm     | degrees | numeric     | -       | Course over ground (magnetic), not output   |
| 4         | M        | -       | character   | M       | Fixed field: magnetic   |
| 5         | knots    | knots   | numeric     | 0.004   | Speed over ground   |
| 6         | N        | -       | character   | N       | Fixed field: knots  |
| 7         | kph      | km/h    | numeric     | 0.008   | Speed over ground   |
| 8         | K        | -       | character   | K       | Fixed field: kilometers per hour  |
| 9         | posMode  | -       | character   | A       | Mode Indicator, see <a href="#">position fix flags description NMEA v2.3 and above only</a> |
| 10        | cs       | -       | hexadecimal | *06     | Checksum  |
| 11        | <CR><LF> | -       | character   | -       | Carriage return and line feed   |

## 20.18 ZDA

### 20.18.1 Time and Date

|              |  |                  |  |
|--------------|--|------------------|--|
| Message      | <b>ZDA</b>   |                  |  |
| Description  | <b>Time and Date</b>   |                  |  |
| Firmware     | Supported on:<br><ul style="list-style-type: none"> <li>u-blox M8 firmware version 2.00</li> </ul> |                  |  |
| Type         | Output Message   |                  |  |
| Comment      | -  |                  |  |
| Message Info | ID for CFG-MSG   | Number of fields |  |
|              | 0xF0 0x08  | 9                |  |

## Message Structure:

```
$xxZDA, hhmmss.ss, day, month, year, ltzh, ltzn*cs<CR><LF>
```

## Example:

```
$GPZDA, 082710.00, 16, 09, 2002, 00, 00*64
```

| Field No. | Name  | Unit  | Format      | Example   | Description  |
|-----------|-------|-------|-------------|-----------|--|
| 0         | xxZDA | -     | string      | \$GPZDA   | ZDA Message ID (xx = current Talker ID)                  |
| 1         | time  | -     | hhmmss.ss   | 082710.00 | UTC Time, see <a href="#">note on UTC representation</a> |
| 2         | day   | day   | dd          | 16        | UTC day (range: 1-31)                                    |
| 3         | month | month | mm          | 09        | UTC month (range: 1-12)                                  |
| 4         | year  | year  | yyyy        | 2002      | UTC year   |
| 5         | ltzh  | -     | -xx         | 00        | Local time zone hours (fixed to 00)                      |
| 6         | ltzn  | -     | zz          | 00        | Local time zone minutes (fixed to 00)                    |
| 7         | cs    | -     | hexadecimal | *64       | Checksum   |