

| Product name | Description                              | Version |
|--------------|------------------------------------------|---------|
| RTK-M980     | Rugged and industrial grade RTK computer | 0.1     |



## 1. Introduction

LOCOSYS RTK-M980, a compact, rugged and industrial grade computer with Intel Atom® x5-E3930 processor dual core base clock 1.3GHz (boost up to 1.8GHz), Aluminum top case with sheet metal, is designed for the harsh or need noiseless Ad-hoc network environment.

LOCOSYS RTK-M980 has advanced RTK (Real-time kinematic) receiver supports global GPS/GLONASS/BeiDou/GALILEO/QZSS, L1+L2+L5 Dual-frequency and multi-constellation RTK positioning solution. RTK-M980 adopt full frequency 4G-LTE communication board, Worldwide LTE, UMTS/HSPA+ and GSM/GPRS/EDGE coverage. It features 10/100/1000Mbps Ethernet data and voice connectivity. With external SIM socket, it allows user to access SIM card conveniently. RTK-M980 installs Win10 (or Linux) operating system, suitable for with LOCOSYS Firebird application software, provide user-friendly graphical operation interface, whether it is used for “Base station” management or “Rover” use.

Because of the fan-less compact design, certified (-30 ~ +70 degrees) high and low temperature test and (MIL-STD-810) military standard vibration test, provide fast and easy installation. It is especially for the RTK Base Station with limited room space to locate the computer system, but without compromising with its space to scarify its features. Whether as a RTK Base station or RTK Rover, it is very fast and convenient to use and install. RTK-M980 keeps the flexibility to meet different demands for telemetric monitor or surveying applications.

## 2. Features

- Intel Atom® x5-E3930 processor dual core base clock 1.3GHz (boost up to 1.8GHz) compact and fan-less design.
- L1 +L2+ L5 Dual-frequency and multi-constellation and RTK positioning solution.
- Support GPS, GLONASS, BeiDou, GALILEO, QZSS satellite.
- Capable of SBAS (WAAS, EGNOS, MSAS, GAGAN).
- Support 1408-channel GNSS.
- RTK Position Accuracy 1cm CEP.
- GNSS Position Accuracy 1.5m CEP.
- Support 1Hz Default.
- 10/100/1000Mbps Ethernet.
- Operating temperature range -30 to +70°C.
- AC 100-240V Power adapter.
- Support wide range DC input from 9-36V.
- Certified by CE/FCC/E13 mark.
- Passed Military standard (MIL-STD-810) vibration test.
- RTK Base station management or RTK Rover use.

## 3. Application

- Vehicle RTK positioning and navigation
- Automotive navigation
- Marine navigation
- Fleet management
- Autonomous Vehicle Guidance
- Precision Agriculture
- AGV Robotics
- Structural / Land Monitoring
- RTK Ad-hoc network

#### 4. Product feature

| GNSS feature                     | Description           |                                                                                                              |
|----------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------|
| Frequency                        | GPS                   | L1 C/A,L1C,L2C,L2P(Y), L5C                                                                                   |
|                                  | GLONASS               | L1,L2                                                                                                        |
|                                  | GALILEO               | E1, E5a,E5b                                                                                                  |
|                                  | BEIDOU                | B1I, B2I,B3I,B1C,B2a,B2b                                                                                     |
|                                  | QZSS                  | L1C/A,L2,L5                                                                                                  |
|                                  | SBAS                  | L1C/A                                                                                                        |
| Channels                         | Support 1408 channels |                                                                                                              |
| Update rate                      | 1Hz (default)         |                                                                                                              |
| Sensitivity                      | Tracking              | -165dBm (with external LNA)                                                                                  |
|                                  | Cold start            | -148dBm (with external LNA)                                                                                  |
| Acquisition Time                 | Cold start            | <30s (typical)                                                                                               |
|                                  | RTK Convergence time  | < 10s (typical; after 3D fix)                                                                                |
| Position Accuracy <sup>(1)</sup> | Autonomous            | < 1.5m CEP                                                                                                   |
|                                  | RTK <sup>(2)</sup>    | 0.01m + 1ppm (Horizontal)                                                                                    |
| Max. Altitude                    | < 18,000 m            |                                                                                                              |
| Max. Velocity                    | < 500 m/s             |                                                                                                              |
| Protocol Support                 | NMEA 0183 ver. 4.1    | 115200 bps <sup>(3)</sup> , 8 data bits, no parity, 1 stop bits (default)<br>1Hz: GGA, GLL,GSA, GSV, RMC,VTG |
|                                  | Raw data              | 115200 bps, RTCM V3.3, message type 1005, 1074, 1084, 1094, 1114, 1124                                       |

Note 1: Open sky, dual band, demonstrated with a good external LNA.

Note 2: CEP, 24hr static.

Note 3: Both baud rate output message rate are configurable to be factory default.

## 5. Operation Specification

| Parameter             | Description |
|-----------------------|-------------|
| Operating Temperature | -30~70°C    |
| Storage Temperature   | -40~85°C    |

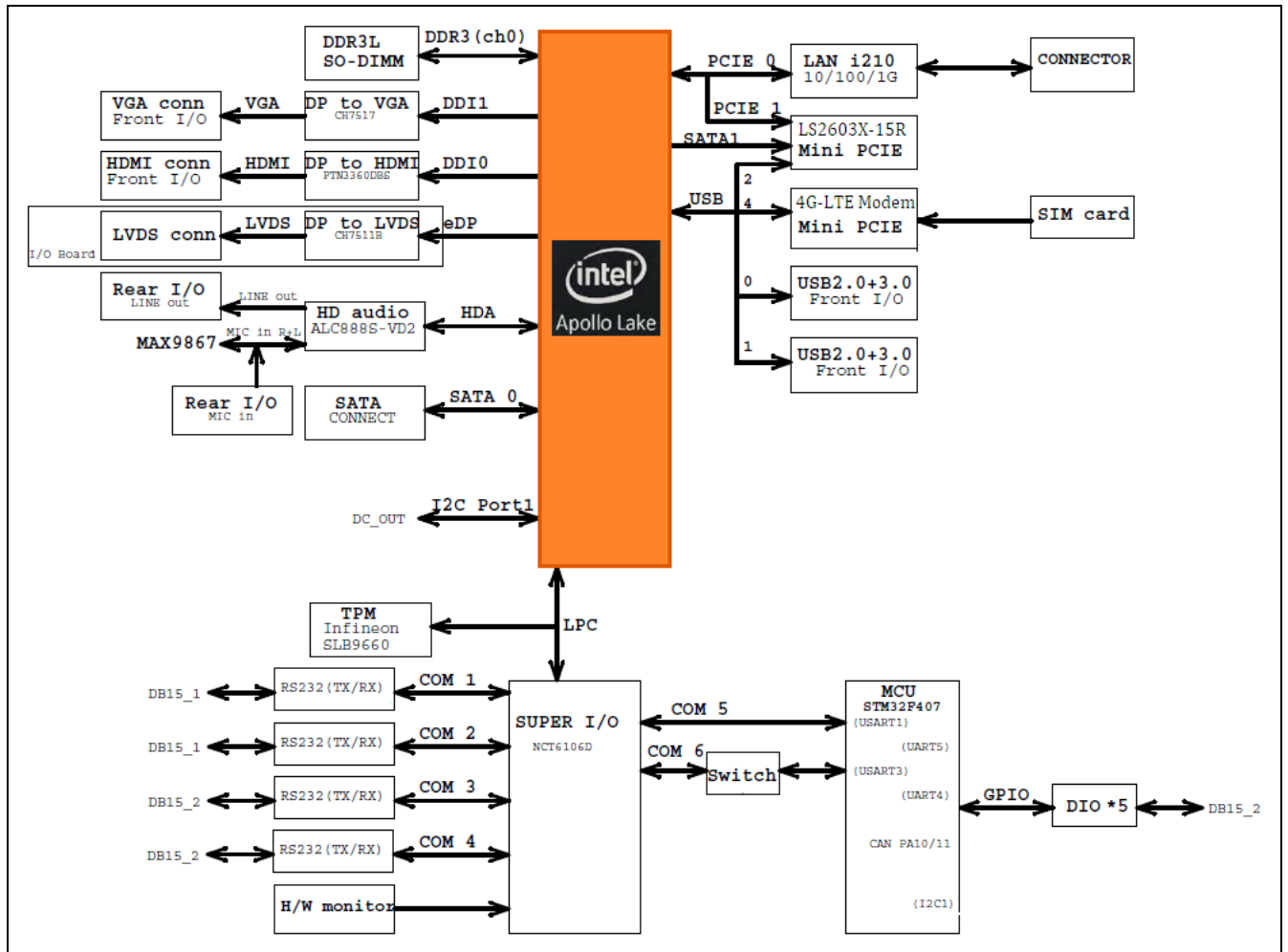
## 6. Specification

### 6.1 System Description

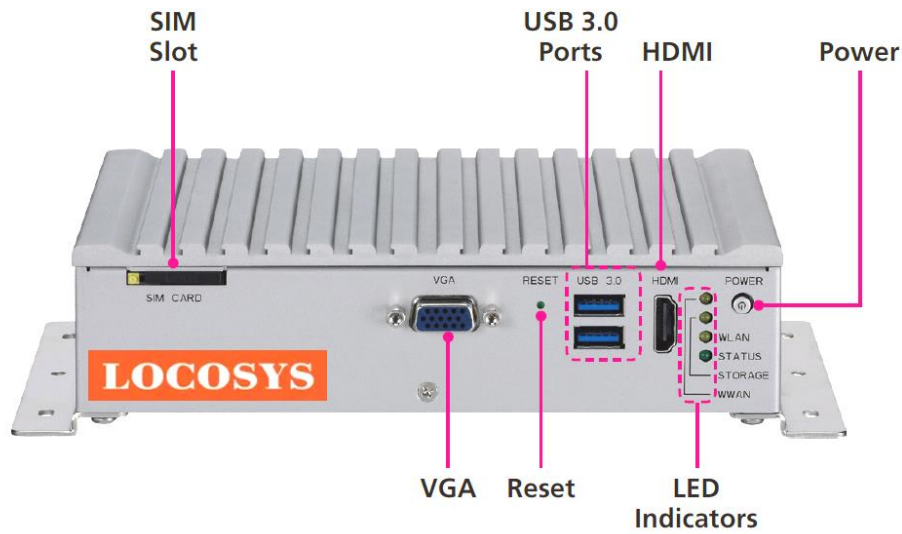
| System              | Description                                                                                                                                                           |                                                                                                                      |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| CPU                 | Intel Atom® x5-E3930 processor dual core base clock 1.3GHz (boost up to 1.8GHz)                                                                                       |                                                                                                                      |
| Memory              | 1 x 204-pin DDR3L SO-DIMM socket support 1867MHz up to 8GB.<br>(Default 4GB)                                                                                          |                                                                                                                      |
| Communication       | <b>RTK-M980-AM</b>                                                                                                                                                    | LTE FDD: Band 2,4,5,12,13,17,66,71<br>WCDMA: Band 2,4,5                                                              |
|                     | <b>RTK-M980-CN</b>                                                                                                                                                    | LTE FDD: Band 1,3,5,8<br>LTE TDD: Band 34,38,39,40,41<br>WCDMA/HSPA+: Band 1,8<br>GSM/GPRS/EDGE: 900/1800MHz         |
|                     | <b>RTK-M980-EAU</b>                                                                                                                                                   | LTE FDD: Band 1,3,5,7,8,20,28<br>LTE TDD: Band 38,40,41<br>WCDMA/HSPA+: Band 1,5,8<br>GSM/GPRS/EDGE: 850/900/1800MHz |
|                     | <b>RTK-M980-JP</b>                                                                                                                                                    | LTE FDD: Band 1,3,8,11,18,19,21,26,28<br>LTE TDD: Band 41<br>WCDMA/HSPA+: Band 1,6,8,19                              |
| Function            | LOCOSYS RTK Base Station or Rover                                                                                                                                     |                                                                                                                      |
| I/O Interface-Front | 1 x Power button<br>4 x LED indicators for Status (programmable), Storage.<br>1 x System reset button<br>2 x Type A USB 3.0 compliant host, supporting system boot up |                                                                                                                      |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | 1 x DB-15 VGA<br>1 x HDMI<br>1 x SIM card socket                                                                                                                                                                                                                                                                                                                                                                                                                       |
| I/O Interface-Rear       | 1 x 9~36VDC input with Ignition and 20W typical power consumption.<br>1 x RJ-45 with LEDs for 10/100/1000Mbps Ethernet<br>1 x Audio-in,<br>1 x Audio-out<br>1 x DB9 COM port                                                                                                                                                                                                                                                                                           |
| Expandable Storage       | 1 x 2.5" SSD SATA 3.0<br>1 x m-SATA                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Operating System         | Windows 10<br>Linux (By request)                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Power Management         | Selectable boot-up & shut-down voltage for low power protection HW design ready for 8-level delay time on/off at user's self configuration Power on/off ignition, software detectable Support S3, S4 suspend mode                                                                                                                                                                                                                                                      |
| Dimensions               | 185mm (W) x 120mm (D) x 45mm (H) (7.3" x 4.7" x 1.8")<br>1 kg (2.20 lbs)                                                                                                                                                                                                                                                                                                                                                                                               |
| Construction             | Aluminum top case with sheet metal                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Environment              | -30°C to 70°C (w/ industrial SSD) with air flow<br>Storage temperatures: -40°C to 85°C<br>Relative humidity: 10% to 90% (non-condensing)<br>Vibration: Vibration (SSD): 2g @5~500 Hz<br>Operating: MIL-STD-810F<br>Storage:<br>MIL-STD-810F, Method 514.5, Category 24, Integrity Test Shock (SSD):<br>Operating: MIL-STD-810F, Method 516.5, Procedure I, Trucks and semi-trailers=20g<br>Crash hazard: MIL-STD-810F, Method 516.5, Procedure V, Ground equipment=75g |
| Power Adapter            | AC100-240V (or 9~36V DC input with Ignition and 20W typical power)                                                                                                                                                                                                                                                                                                                                                                                                     |
| Standards Certifications | CE approval FCC Class AE13 mark                                                                                                                                                                                                                                                                                                                                                                                                                                        |

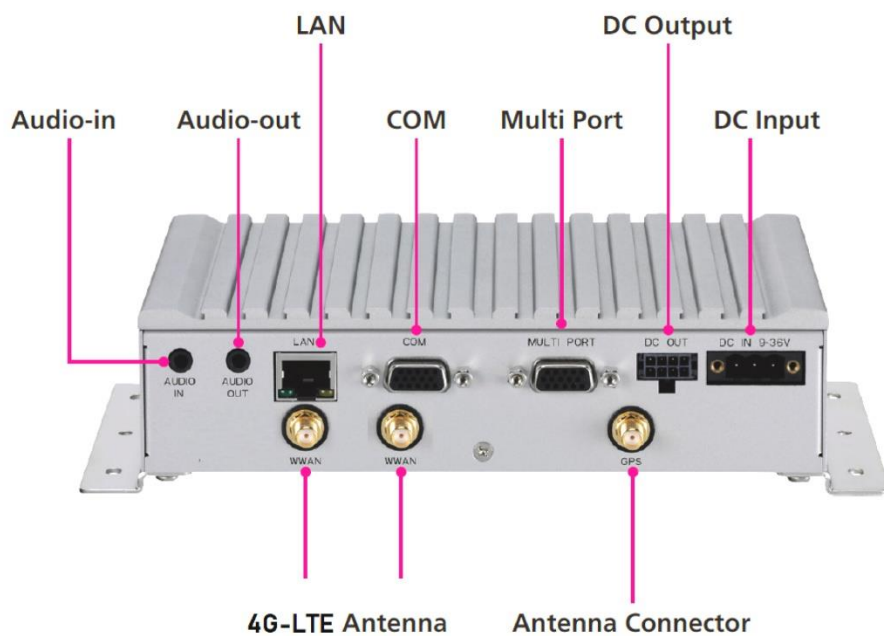
### 6.2 System Diagram



### 6.3 I/O view



**Front View**

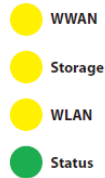


**Rear View**

## 6.4 Power and LED states

### LED Indicators

Connector number: 5



| LED     | Description                   |
|---------|-------------------------------|
| WWAN    | Blinking: Active              |
| Storage | Light On: HDD/SSD Active      |
| WLAN    | Blinking: Active              |
| Status  | Programmable. Power On: Green |

### Power Button

Connector number: 6



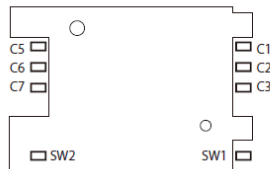
| 1 x R/B Bi-color LED |             |
|----------------------|-------------|
| LED Status           | Description |
| Off                  | Power off   |
| Blue                 | Power good  |
| Red                  | Power fail  |

When the ignition is from "low" to "high", the system will turn on automatically. When the ignition is "high", press the power button to turn on/off the system.

When the ignition is from "high" to "low", the system will turn off automatically. When the ignition is "low", pressing the power button will not turn on the system.

## 6.5 SIM Slot

### SIM Card Slot



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| C1  | UIM_PWR    | C2  | UIM_RST    |
| C3  | UIM_CLK    | C5  | GND        |
| C6  | NC         | C7  | UIM_DATA   |
| SW1 | SIM2_DET#  | SW2 | GND        |

## 6.6 DC Power input

### DC Power Input

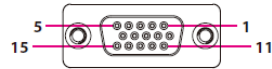


| Pin | Definition |
|-----|------------|
| 1   | GND_IN     |
| 2   | V_IN       |
| 3   | IGNITION   |



### 6.7 VGA port

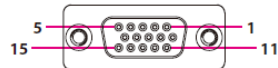
#### VGA Connector



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1   | DIRECTION  | 2   | RXD3_R     |
| 3   | GPIO1      | 4   | GPIO4      |
| 5   | GND        | 6   | 1PPS       |
| 7   | TXD3_R     | 8   | CAN1_L     |
| 9   | GPIO3      | 10  | GND        |
| 11  | ODOMETER   | 12  | CAN1_H     |
| 13  | GPIO2      | 14  | GPIO5      |
| 15  | GND        |     |            |

### 6.8 COM port

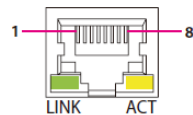
#### COM Connector



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1   | RXD_R_D    | 2   | TXD2_R     |
| 3   | RXD1_R     | 4   | RS485B_-   |
| 5   | GND        | 6   | TXD_R_D    |
| 7   | TXD_R_B    | 8   | TXD1_R     |
| 9   | RS485A_+   | 10  | GND        |
| 11  | RXD_R_D    | 12  | RXD2_R     |
| 13  | RS485A_-   | 14  | RS485B_+   |
| 15  | GND        |     |            |

### 6.9 LAN port

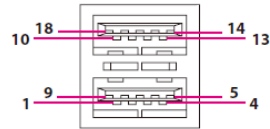
#### LAN Port



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1   | MDI0P      | 2   | MDI0N      |
| 3   | MDI1P      | 4   | MDI2P      |
| 5   | MDI2N      | 6   | MDI1N      |
| 7   | MDI3P      | 8   | MDI3N      |
| 9   | LED2-      | 10  | LED2+      |
| 11  | LED1-      | 12  | LED1+      |

### 6.10 USB 3.0 port

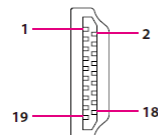
USB 3.0 Ports



| Pin | Definition | Pin | Definition |
|-----|------------|-----|------------|
| 1   | 5V         | 2   | USB_ON     |
| 3   | USB_OP     | 4   | GND        |
| 5   | USB3_TX0_N | 6   | USB3_TX0_P |
| 7   | GND        | 8   | USB3_RX0_N |
| 9   | USB3_RX0_P | 10  | 5V         |
| 11  | USB_1N     | 12  | USB_1P     |
| 13  | GND        | 14  | USB3_TX1_N |
| 15  | USB3_TX1_P | 16  | GND        |
| 17  | USB3_RX1_N | 18  | USB3_RX1_P |

### 6.11 HDMI port

HDMI



| Pin | Definition  | Pin | Definition   |
|-----|-------------|-----|--------------|
| 1   | HDMI_TX2P_L | 2   | GND          |
| 3   | HDMI_TX2N_L | 4   | HDMI_TX1P_L  |
| 5   | GND         | 6   | HDMI_TX1N_L  |
| 7   | HDMI_TX0P_L | 8   | GND          |
| 9   | HDMI_TX0N_L | 10  | HDMI_CLK_P_L |
| 11  | GND         | 12  | HDMI_CLK_N_L |
| 13  | NC          | 14  | NC           |
| 15  | HDMI_SCL    | 16  | HDMI_SDA     |
| 17  | GND         | 18  | HDMI_P5V     |
| 19  | HDMI_HPD    |     |              |

## 7. Software interface

### 7.1. NMEA output message

Table 7.1-1 NMEA output message

| NMEA record | Description                              |
|-------------|------------------------------------------|
| GGA         | Global positioning system fixed data     |
| GLL         | Geographic position - latitude/longitude |
| GSA         | GNSS DOP and active satellites           |
| GSV         | GNSS satellites in view                  |
| RMC         | Recommended minimum specific GNSS data   |
| VTG         | Course over ground and ground speed      |

#### ● GGA--- Global Positioning System Fixed Data

Table 7.1-2 contains the values for the following example:

\$GNGGA,091250.000,2503.71250,N,12138.74514,E,1,32,0.55,119.0,M,17.2,M,,\*7E

Table 7.1- 2 GGA Data Format

| Name                   | Example     | Units  | Description                                                     |
|------------------------|-------------|--------|-----------------------------------------------------------------|
| Message ID             | \$GNGGA     |        | GGA protocol header                                             |
| UTC Time               | 091250.000  |        | hhmmss.sss                                                      |
| Latitude               | 2503.71250  |        | ddmm.mmmmm                                                      |
| N/S indicator          | N           |        | N=north or S=south                                              |
| Longitude              | 12138.74514 |        | dddmm.mmmmm                                                     |
| E/W Indicator          | E           |        | E=east or W=west                                                |
| Position Fix Indicator | 1           |        | See Table 7.1-3                                                 |
| Satellites Used        | 32          |        | Number of satellites in view                                    |
| HDOP                   | 0.55        |        | Horizontal Dilution of Precision (meters)                       |
| MSL Altitude           | 119.0       | meters | Antenna Altitude above/below mean-sea-level (geoid) (in meters) |
| Units                  | M           | meters | Units of antenna altitude, meters                               |
| Geoidal Separation     | 17.2        | meters |                                                                 |
| Units                  | M           | meters | Units of geoidal separation, meters                             |
| Age of diff. GNSS data |             | second | Null fields when DGPS is not used                               |
| Diff. Ref. Station ID  |             |        | Differential reference station ID, 0000-1023                    |
| Checksum               | *7E         |        | Checksum                                                        |
| <CR> <LF>              |             |        | End of message termination                                      |

Table 7.1-3 Position Fix Indicators

| Value | Description     |
|-------|-----------------|
| 0     | No position fix |

|   |                              |
|---|------------------------------|
| 1 | Autonomous GNSS fix          |
| 2 | Differential GNSS fix        |
| 4 | RTK fixed                    |
| 5 | RTK float                    |
| 6 | Estimated/Dead reckoning fix |

## ● GLL--- Geographic Position – Latitude/Longitude

Table 7.1-4 contains the values for the following example:

\$GNGLL,2503.71193,N,12138.74582,E,094450.000,A,A\*47

Table 7.1-4 GLL Data Format

| Name          | Example     | Units | Description                                                                                                                                       |
|---------------|-------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Message ID    | \$GNGLL     |       | GLL protocol header                                                                                                                               |
| Latitude      | 2503.71193  |       | ddmm.mmmmm                                                                                                                                        |
| N/S indicator | N           |       | N=north or S=south                                                                                                                                |
| Longitude     | 12138.74582 |       | dddmm.mmmmm                                                                                                                                       |
| E/W indicator | E           |       | E=east or W=west                                                                                                                                  |
| UTC Time      | 094450.000  |       | hhmmss.sss                                                                                                                                        |
| Status        | A           |       | A=data valid or V=data not valid                                                                                                                  |
| Mode          | A           |       | N = No position fix<br>A = Autonomous GNSS fix<br>D = Differential GNSS fix<br>R = RTK fixed<br>F = RTK float<br>E = Estimated/Dead reckoning fix |
| Checksum      | *47         |       |                                                                                                                                                   |
| <CR> <LF>     |             |       | End of message termination                                                                                                                        |

## ● GSA---GNSS DOP and Active Satellites

Table 7.1-5 contains the values for the following example:

\$GNGSA,A,3,11,195,194,199,08,07,01,27,16,09,23,,1.19,0.64,1.00,1\*3F

\$GNGSA,A,3,87,81,76,,,,,,,,,1.19,0.64,1.00,2\*0F

\$GNGSA,A,3,,,,,,,,,1.19,0.64,1.00,3\*09

\$GNGSA,A,3,34,24,12,07,11,10,08,38,25,09,13,16,1.19,0.64,1.00,4\*02

Table 7.1-5 GSA Data Format

| Name                 | Example | Units | Description         |
|----------------------|---------|-------|---------------------|
| Message ID           | \$GNGSA |       | GSA protocol header |
| Mode 1               | A       |       | See Table 7.1-6     |
| Mode 2               | 3       |       | See Table 7.1-7     |
| ID of satellite used | 11      |       | SV on Channel 1     |

|                      |      |  |                                  |
|----------------------|------|--|----------------------------------|
| ID of satellite used | 195  |  | SV on Channel 2                  |
| ....                 |      |  | ....                             |
| ID of satellite used |      |  | SV on Channel 12                 |
| PDOP                 | 1.19 |  | Position Dilution of Precision   |
| HDOP                 | 0.64 |  | Horizontal Dilution of Precision |
| VDOP                 | 1.00 |  | Vertical Dilution of Precision   |
| GNSS system ID       | 4    |  | See Table 7.1-8                  |
| Checksum             | *3F  |  |                                  |
| <CR> <LF>            |      |  | End of message termination       |

Table 7.1-6 Mode 1

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

Table 7.1-7 Mode 2

| Value | Description     |
|-------|-----------------|
| 1     | No position fix |
| 2     | 2D fix          |
| 3     | 3D fix          |

Table 7.1-8 GNSS system ID

| Value | Description |
|-------|-------------|
| 1     | GPS         |
| 2     | GLONASS     |
| 3     | GALILEO     |
| 4     | BEIDOU      |
| 6     | IRNSS       |

## ● GSV---GNSS Satellites in View

Table 7.1-9 contains the values for the following example:

\$GPGSV,3,1,09,8,71,268,47,27,63,18,49,11,44,191,46,4,41,237,46,1\*54

\$GPGSV,3,2,09,16,38,42,42,9,32,279,39,26,22,70,38,31,15,131,36,1\*56

\$GPGSV,3,3,09,7,15,320,40,1\*6B

\$GPGSV,1,1,04,8,71,268,50,27,63,18,49,9,32,279,43,26,22,70,42,8\*6C

\$GLGSV,2,1,05,82,63,47,47,83,56,182,36,80,47,9,42,79,33,85,45,1\*71

\$GLGSV,2,2,05,81,15,27,37,1\*71

\$GAGSV,1,1,04,08,48,300,43,03,47,025,45,13,36,309,42,05,06,061,34,7\*79

\$GAGSV,1,1,04,08,48,300,43,03,47,025,47,13,36,309,43,05,06,061,33,1\*7B

\$GBGSV,5,1,17,12,80,182,47,24,64,5,51,7,58,355,44,3,57,205,45,1\*7C  
\$GBGSV,5,2,17,1,54,141,44,34,52,211,49,9,48,230,45,10,47,316,42,1\*79  
\$GBGSV,5,3,17,26,44,100,47,16,39,207,43,4,38,117,41,2,37,240,41,1\*77  
\$GBGSV,5,4,17,39,37,210,43,6,36,198,41,38,27,173,41,25,18,317,42,1\*4E  
\$GBGSV,5,5,17,35,16,39,40,1\*7F  
\$GBGSV,1,1,02,24,64,5,50,26,44,100,43,4\*77

Table 7.1-9 GSV Data Format

| Name                     | Example | Units   | Description                                                                                                  |
|--------------------------|---------|---------|--------------------------------------------------------------------------------------------------------------|
| Message ID               | \$GPGSV |         | GSV protocol header<br>GP=GPS/QZSS, GL=GLONSS, GA=GALILEO,<br>GB=BEIDOU, GI=IRNSS.                           |
| Total number of messages | 3       |         | Range 1 to 9                                                                                                 |
| Message number           | 1       |         | Range 1 to 9                                                                                                 |
| Satellites in view       | 09      |         |                                                                                                              |
| Satellite ID             | 8       |         | Channel 1                                                                                                    |
| Elevation                | 71      | degrees | Channel 1 (Range 00 to 90)                                                                                   |
| Azimuth                  | 268     | degrees | Channel 1 (Range 000 to 359)                                                                                 |
| SNR (C/No)               | 47      | dB-Hz   | Channel 1 (Range 00 to 99, null when not tracking)                                                           |
| ....                     |         |         | ....                                                                                                         |
| Satellite ID             | 4       |         | Channel 4 (Range 01 to 196)                                                                                  |
| Elevation                | 41      | degrees | Channel 4 (Range 00 to 90)                                                                                   |
| Azimuth                  | 237     | degrees | Channel 4 (Range 000 to 359)                                                                                 |
| SNR (C/No)               | 46      | dB-Hz   | Channel 4 (Range 00 to 99, null when not tracking)                                                           |
| Signal ID                | 1       |         | GPS/QZSS: L1 C/A=1, L5Q=8<br>GLONASS: L1 C/A=1<br>GALILEO: E1=7, E5a=1<br>BEIDOU: B1=1, B2a=4<br>IRNSS: L6=1 |
| Checksum                 | *54     |         |                                                                                                              |
| <CR> <LF>                |         |         | End of message termination                                                                                   |

## ● RMC---Recommended Minimum Specific GNSS Data

Table 7.1-10 contains the values for the following example:

\$GNRMC,070143.000,A,2503.71317,N,12138.74533,E,0.002,70.50,130220,,A,V\*01

Table 7.1-10 RMC Data Format

| Name       | Example    | Units | Description                      |
|------------|------------|-------|----------------------------------|
| Message ID | \$GNRMC    |       | RMC protocol header              |
| UTC Time   | 070143.000 |       | hhmmss.sss                       |
| Status     | A          |       | A=data valid or V=data not valid |

|                               |             |         |                                                                                                                                                   |
|-------------------------------|-------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Latitude                      | 2503.7117   |         | ddmm.mmmmm                                                                                                                                        |
| N/S Indicator                 | N           |         | N=north or S=south                                                                                                                                |
| Longitude                     | 12138.74533 |         | dddmm.mmmmm                                                                                                                                       |
| E/W Indicator                 | E           |         | E=east or W=west                                                                                                                                  |
| Speed over ground             | 0.002       | knots   | True                                                                                                                                              |
| Course over ground            | 70.50       | degrees |                                                                                                                                                   |
| Date                          | 130220      |         | ddmmyy                                                                                                                                            |
| Magnetic variation            |             | degrees |                                                                                                                                                   |
| Variation sense               |             |         | E=east or W=west                                                                                                                                  |
| Mode                          | A           |         | N = No position fix<br>A = Autonomous GNSS fix<br>D = Differential GNSS fix<br>R = RTK fixed<br>F = RTK float<br>E = Estimated/Dead reckoning fix |
| Navigational status indicator | V           |         | S = Safe<br>C = Caution<br>U = Unsafe<br>V = Void                                                                                                 |
| Checksum                      | *01         |         |                                                                                                                                                   |
| <CR> <LF>                     |             |         | End of message termination                                                                                                                        |

### ● VTG---Recommended Minimum Specific GNSS Data

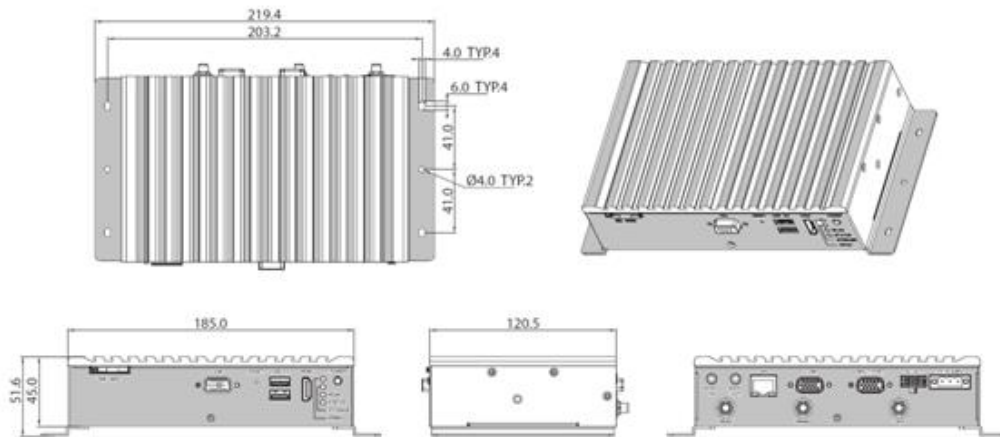
Table 7.1-11 contains the values for the following example:

\$GNVTG,0.00,T,,M,0.003,N,0.006,K,A\*26

Table 7.1-11 RMC Data Forma

| Name               | Example | Units   | Description         |
|--------------------|---------|---------|---------------------|
| Message ID         | \$GNVTG |         | VTG protocol header |
| Course over ground | 0.00    | degress | Measured heading    |
| Reference          | T       |         | True                |
| Course over ground |         | Degress | Measured heading    |
| Reference          | M       |         | Magnetic            |
| Speed over ground  | 0.003   | Knots   | Measured speed      |
| Units              | N       |         | Knots               |

## 8. Dimension Information



**RTK-M980**

## 9. Driver and Software Download

Please link to LOCOSYS company website and click RTK-M980 product icon

<https://www.locosystech.com/en/page/Evaluation-Kit-Testing-Software-Manual/support-evk.html>

## 10. Packing Material Information

Standard industrial grade carton.



## Document change list

### Revision 0.1

- Draft release on August 08, 2023.