

GPS / GNSS Receiver (G-Mouse)

1. Product Information

- 1.1 Product Name :** GR-902 (Adhesive Mount)
GR-902M (Magnetic Mount)



1.2 Product Description:

GR-902(M) is a RS232 interface, compact, high performance, and low power consumption G-Mouse.

It uses the chipset of u-blox UBX-G7020 which can track up to 56 channels at a time and perform fast TTFF in weak signal environments.

GR-902(M) is suitable for the following applications:

- Automotive navigation
- Personal positioning
- Fleet management
- Marine navigation

1.3 Product Features:

- High performance and low power consumption GNSS Chipset
- Very high sensitivity
- Extremely fast TTFF (Time To First Fix) at low signal level
- Chipset protocol

1.4 Product Specifications

GPS Performance

GPS Receiver	
Chip	UBX-G7020
Frequency	GPS, GALILEO, QZSS: L1 1575.42MHz, C/A code or GLONASS: L1 1598.0625MHz ~ 1605.375MHz, C/A code
Protocol	NMEA 0183 GALILEO L1 open service (with upgrade) Default:GGA,GSA,GSV,RMC Support:VTG,GLL,TXT ublox binary and NMEA Command
Baud Rate	9,600 bps
Channels	56
Sensitivity	Tracking:-161dBm Reacquisition:-160dBm Cold Start:-147dBm
Cold Start	29 seconds, average
Warm Start	28 seconds, average
Hot Start	1 second, average
Accuracy	Horizontal Position:Autonomous<2.5m average, SBAS < 2.0m average Velocity: 0.1 m/s Timepulse signal: RMS 30 ns
Maximum Altitude	50,000 meter
Maximum Velocity	515 m/s(1000 knots)
Dynamics	≧ 4G
Update Rate	4 Hz
A-GPS	AssistNow on-line and off-line
Physical Characteristic	
Dimensions	45.00mm * 38.00 mm * 14.30mm
Environmental Range	
Humidity Range	5% to 95% non-condensing
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 85°C

1.5 DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VCC		3.0		5.5	V
Input Backup Battery Voltage	V_BCKP		2.0		3.6	V
Supply Current	I _{ss}	VCC = 3.3V, w/o active antenna, Peak Acquisition Tracking Standby		24 16 ⁽²⁾ 365	150 ⁽¹⁾	mA mA mA uA
Backup Battery Current	I _{bat}	VCC = 0V		7		uA
High Level Input Voltage	V _{IH}		0.7xV _{cc}		V _{cc} +1.0	V
Low Level Input Voltage	V _{IL}		-0.3		0.3xV _{cc}	V
High Level Input Current	I _{IH}	no pull-up or down	-1		1	uA
Low Level Input Current	I _{IL}	no pull-up or down	-1		1	uA
High Level Output Voltage	V _{OH}		0.8xV _{cc}		V _{cc}	V
Low Level Output Voltage	V _{OL}				0.2xV _{cc}	V
High Level Output Current	I _{OH}			2		mA
Low Level Output Current	I _{OL}			2		mA

Note 1: This happens when downloading AGPS data to Module.

Note 2: Measured when position fix (1Hz) is available, input voltage is 3.3V and the function of self-generated ephemeris prediction is inactive.

Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	T _{opr}	-40	25	85	°C
Storage Temperature	T _{stg}	-40	25	85	°C

2. Physical Dimension

(Customized Specifications are Welcome.)

GR-902(M)-PS2

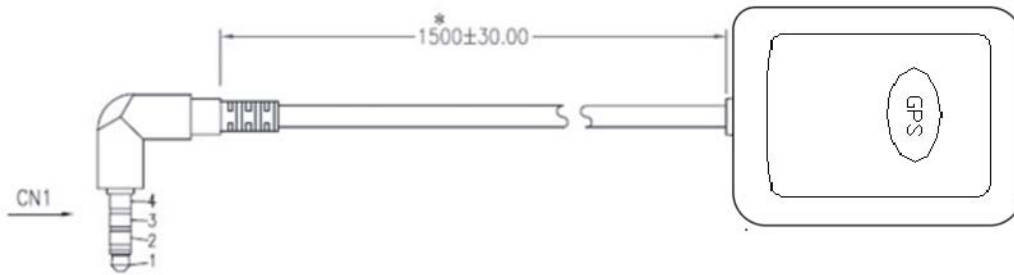


IO Interface	Voltage level
PS2 Interface	RS232 level

Pin	Pin define	Level
1	GND	Ground
2	Vcc	3.3 - 5.5V DC
3	TXD	RS232 Output
4	NC	NC
5	NC	NC
6	RXD	RS232 Input

GR-902(M)-E25

GR-902(M)-E35

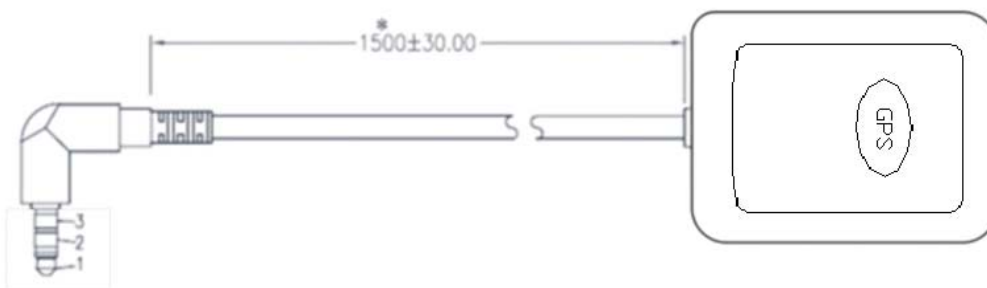


IO Interface	Voltage level
4 pin 2.5/3.5mm Earphone Jack	RS232 Level

CN1 Pin	Pin define	Level
1	Vcc	3.3 - 5.5V DC
2	RXD	RS232 input
3	TXD	RS232 output
4	GND	Ground

GR-902(M)-E253

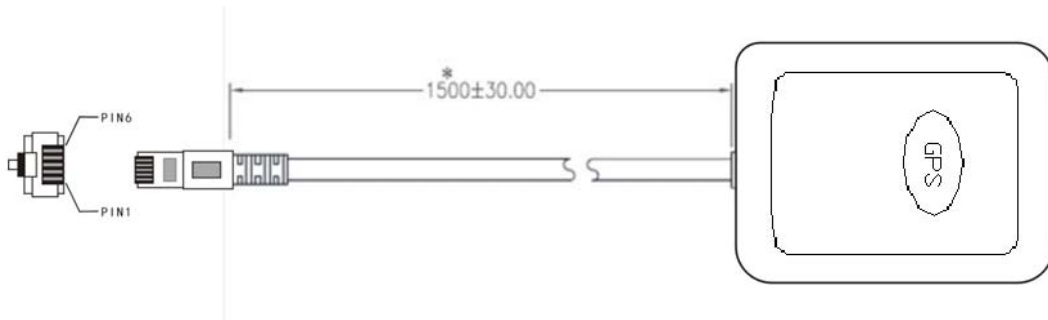
GR-902(M)-E353



IO Interface	Voltage level
3 pin 2.5/3.5mm Earphone Jack	RS232 Level

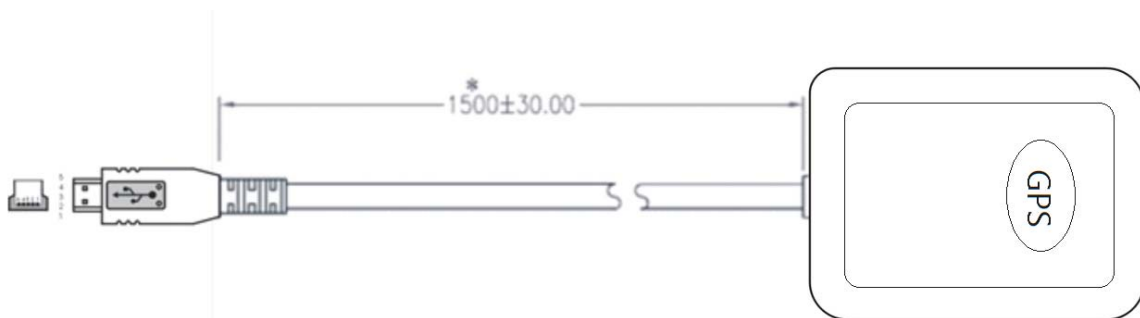
Pin	Pin define	Level
1	Vcc	3.3 - 5.5V DC
2	TXD	RS232 output
3	GND	Ground

GR-902(M)-RJ45



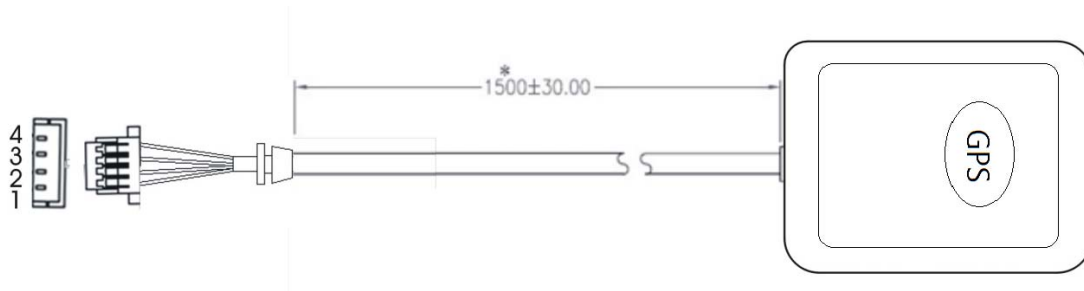
Pin	Description	Internal wire color
1	NC	
2	GND	Ground
3	RXD	RS232 input
4	TXD	RS232 output
5	Vcc	3.3 - 5.5V DC
6	NC	

GR-902(M)-MUSB (Mini USB , Male)



Pin	Pin define	Level
1	Vcc	3.3 - 5.5V DC
2	TXD	RS232 Output
3	RXD	RS232 input
4	GND	Ground
5	GND	Ground

GR-902(M)-NC4P



Pin	Pin define	Level
1	Vcc	3.3 - 5.5V DC
2	GND	Ground
3	TXD	RS232 output
4	VBAT	2.8-3.6V DC

3. NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GPS specific messages all start with \$GPxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

GR-902(M) support the following NMEA-0183 messages: GGA, GLL, GSA, GSV, RMC and VTG.

Table 1: NMEA-0183 Output Messages

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 2 contains the values of the following example:

\$GPGGA, 161229.487,3723.24751,N, 12158.34160,W, 1,07,1.0,9.0,M.0000*18

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.24571		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12158.34160		ddmm.mmmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoids Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not Used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR><LF>			End of message termination

Table 2-1: Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

GLL-Geographic Position – Latitude/Longitude

Table 3 contains the values of the following example:

\$GPGLL , 3723.24755, N,12158.34161,W,161229.487, A*2C.

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.24755		Ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		ddmm.mmmmm
E/W Indicator	W		E=east orW=west
UTC Position	161229.487		Hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR><LF>			End of message termination

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

\$GPGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , 1.8,1.0,1.5*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		See Table 4-1
Mode 2	3		See Table 4-2
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
...
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR><LF>			End of message termination

Table 4-1: Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 4-2: Mode 2

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

GSV-GNSS Satellites in View

Table 5 contains the values of the following example:

\$GPGSV , 2, 1, 07, 07, 79,048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27, 138,42*71

\$GPGSV, 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42*41.

Table 5: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum 90)
Azimuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR><LF>			End of message termination

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

RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

\$GPRMC, 161229.487, A, 3723.24751, N, 12158.34161,W, 0.13,309.62, 120598,, *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.24751		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		Ddmm.mmmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True
Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Checksum	*10		
<CR><LF>			End of message termination

VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

\$GPVTG, 309.62, T, M, 0.13, N, 0.2, K*6E

Table 7: VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		True
Course		Degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	Knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	K		Kilometer per hour
Date	*6E		
<CR><LF>			End of message termination