Technical Brief
AN246 Rev B2

NMEA GNSS Messages

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Summary

Global Navigation Satellite Systems (GNSS) Modes in data radio modems. Raveon's data radio modems all have GNSS tracking options called GPS. The GPS receiver inside the radio modem will output various NMEA messages from its serial port to the radio, and the radio modem may pass along this NMEA message data. These messages can be setup on RV-M6, RV-M8, RV-M50, and all Tech Series data radios with the GPS (G)feature.

NMEA messages are in many different formats and structures, so this document explains the NMEA message structures of most type of NMEA messages commonly used in Raveon's GPS trackers.

Traditionally, the NMEA messages start with $GP, for example the GPS NMEA message GGA starts with the text: $GPGGA. But because various GNSS tracking systems use different systems instead of GPS, some NMEA messages change the second text byte. A GLONASS sometimes uses N instead of P, so a GLONASS GGA message may come out starting with $GNGGA.

Local NMEA data from the internal GPS

Raveon GPS transponders and the Atlas PL personal locators may be configured to output NMEA 0183 types of GPS messages using the ***NMEAMASK*** command. This NMEA data comes from the GNSS transponder in this radio. For GPS tracking, these GPS transponders can receive GPS position reports from other radios, and they may also be configured to output their own GPS location via their serial port.

Following is a list of the NMEA messages that are available (as of revision C2 of the Firmware).

NMEA Message	***Bit Number*** ***(zero based)***	***Bit Mask*** ***(hex format / decimal)***
GGA	0	0×001 / 1
GLL	1	0×002 / 2
GSV	3	0×008 / 8
PRAVE	7	0×80 / 128
RMC	8	0×100 / 256

Once you set the "GPS Mode" of the radio using the GPS X command, you can change the **NMEAMASK** parameter to modify with of the NMEA sentences will come out the serial port. The **NMEARATE** command sets how often these message come out. The radio tries to output them at the rate you choose, but the internal GPS outputs these messages and the exact time is controlled

by the GPS and not always exactly the rate needed. The **GXF** command can be used to pass all the internal GPS data directly out to the serial port.

The **NMEAMASK** parameter is the sum of all of the decimal values of the individual bits corresponding to the NMEA messages.

Command Examples:

For example, to have only the RMC sentence come out the serial port:
NMEAMASK 256 (RMC)

For example, to have only the GGA sentence come out the serial port:
NMEAMASK 1 (GGA)

To have the GGA and the GLL come out the serial port use these commands:

NMEAMASK 3 (GGA, GLL)
NMEAMASK 11 (GGA, GLL, GSV)
NMEAMASK 267 (GGA, GLL, GSV, RMC)
NMEAMASK 395 (GGA, GLL, GSV, PRAVE, RMC)
NMEAMASK 129 (GGA, PRAVE)
NMEAMASK 130 (GLL, PRAVE)
NMEAMASK 258 (RMC, GLL)
NMEAMASK 259 (RMC, GLL, GGA)

Many different NMEA messages can be sent out from the Receiver base station.

The **Output** command can be used to configure the RX output message to send when over-the-aid data from a Raveon GPS transponder Data Radio is received. The **PRAVE** message is popular and common to output, and some systems prefer **NMEA** messages.

NMEA Message Structure Information

The NMEA GGA Fields are described here:

$GPGGA,hhmmss,llll.lll,a,nnnnn.nnn,b,t,uu,v.v,w.w,M,x.x,M,y.y,zzzz*hh

Locked-Up Message Example:

1 2 3 4 5 6 7 8 9 10 11 12 13
$GPGGA,193144.00,3308.67241, N, 11714.46945, W, 1, 06, 1.15, 119.2, M, -33.3, M, ,*7A

Field	Type	Description of this Field	Symbol	Example Data
1	$GPGGA	Log header. See Messages for more information.		$GPGGA
2	utc	UTC time status of position (hours/minutes/seconds/ decimal seconds)	hhmmss.ss	202134.00
3	lat	Latitude (DDmm.mm)	llll.ll	5106.9847

4	lat dir	Latitude direction (N = North, S = South)	a	N
5	lon	Longitude (DDDmm.mm)	yyyyy.yy	11402.2986
6	lon dir	Longitude direction (E = East, W = West)	a	W
7	quality	refer to Table: GPS Quality Indicators	x	1
8	# sats	Number of satellites in use. May be different to the number in view	xx	10
9	hdop	Horizontal dilution of precision	x.x	1.0
10	alt	Antenna altitude above/below mean sea level	x.x	1062.22
11	a-units	Units of antenna altitude (M = meters)	M	M
12	undulation	Undulation - the relationship between the geoid and the WGS84 ellipsoid	x.x	-16.271
13	u-units	Units of undulation (M = meters)	M	M
14	age	Age of correction data (in seconds) The maximum age reported here is limited to 99 seconds. empty when no differential data	xx	
15	stn ID	Differential base station ID, empty when no differential data	xxxx	
16	*xx	Check sum	*hh	*48
17	[CR][LF]	Sentence terminator		[CR][LF]

The NMEA RMC Fields are described here:

Locked-Up Message Example

1 2 3 4 5 6 7 8 9 10 11 12 13

$GNRMC, 143909.00, A, 5107.0020216, N, 11402.3294835, W, 0.036, 348.3, 210307, 0. 0, E, A*31
$GPRMC, 195830.00, A, 3308.66275, N, 11714.46501, W, 1.131, , 180420, , , A*65

Field	Type	Description of this Field	Example Data
1	$GPRMC	Log header. See Messages for more information.	$GPRMC
2	utc	UTC time status of position (hours/minutes/seconds/ decimal seconds)	143909.00
3		Position status (A = data valid, V = data invalid)	A
4	lat	Latitude (DDmm.mm)	5107.00202

			16
5	lat dir	Latitude direction (N = North, S = South)	N
6	lon	Longitude (DDDmm.mm)	11402.3294835
7	lon dir	Longitude direction (E = East, W = West)	W
8	quality	Speed over the ground in knots	0.036
9	t/f	Track angle in degrees True	348.3
10	Date	Date: dd/mm/yy	
11		Unused	
12		Unused	
13	mode	Positioning system mode indicator, A=Autonomous, D=Differential, E=Estimated, F=Float RTK, M=Manual input, N=No fix, P=Precise, R=Real time kinematic, S=Simulator	E
14		Navigational Status: S=Safe, C=Caution, U=Unsafe, V=Void	A
15		The checksum data, beginings with *	

When unlocked, a message will look like this: $GPGGA,235425.00,,,,,0,00,99.99,,,,,,*61

The NMEA GLL Fields are described here:

$GPGLL,llll.lll,N,llll.lll,N,nnnnn.nnn,b,hhmmss,v.v,*hh

Locked-Up Message Example:

1 2 3 4 5 6 7 8 9

$GNGLL, 3308.58360, N, 11714.49673, W, 170642.00, A, A *6E

Field	Type	Description of this Field	Symbol	Example Data
1	$GPGLL	Log header. See Messages for more information.		$GPGLL
2	lat	Latitude (DDmm.mm)	llll.ll	5106.9847
3	lat dir	Latitude direction (N = North, S = South)	a	N
4	lon	Longitude (DDDmm.mm)	yyyyy.yy	11402.2986
5	lon dir	Longitude direction (E = East, W = West)	a	W

6	utc	UTC time status of position (hours/minutes/seconds/ decimal seconds)	hhmmss.ss	202134.00
7	data status	Data status: A = Data valid, V = Data invalid	x	A
8	mode ind	Positioning system mode indicator,	x	A
9	*xx	Check sum	*hh	*48
10	[CR][LF]	Sentence terminator		[CR][LF]

The NMEA WPL described here:

The waypoint location sentence is used by GPS receivers and plotters in different ways, often to share waypoint data or to show waypoints on-screen.

$GPWPL,1,2,3,4,5,6 * cks

Field	Usage	Comments
	$ GPWPL	Waypoint Location Message Header
1	Lat	Latitude of the point.
2	N/S	North or South. One character.
3	Lon	Longitude of the position
4	E/W	East or west. One character.
5	WP Name	The ID of the unit that transmitted its position plus any user-set prefix.
cks		NMEA checksum

When the Data Radio is set to **GPS 4** mode of operation, it will output this message every time it receives a position report from another transponder. Within the WPL message, is the latitude, longitude, and “waypoint ID”. In the waypoint ID field, the Raveon Data Radio GX puts the ID of the radio (**MYID**) that transmitted the position.

For example, receiving a position report from radio ID 0003 located at 4917.16N , 12310.64W it sends out the following message.

$GPWPL,4917.16,N,12310.64,W,3*65

The lat/lon is sent using the dddmm.mm format, where ddd is the degrees, and mm.mmmm is the decimal minutes. There is no sign to these numbers.

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