Technical Brief
AN177 Rev B6

$PRAVE Message Format

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Overview

The $PRAVE message is sent out for Raveon *Data Radios with GPS/GNSS features, w*hen it is configured for **GPS 2** mode of operation. This mode is typically used with the *RavTrack PC* program, or other computer programs that can process position and status information. It is sent at 38.4K bytes/second out the serial port.

Structured like a standard NMEA GPS message, the $PRAVE message contains a rich set location and status information.

Along with ID and position information, it contains a host of other status information. The length of this message may exceed the standard NMEA limit of 79 characters. Any product or software that uses this message must take this into account.

Raveon's GPS over-the-air OTA protocol to send the $PRAVE message wirelessly via a data radio is compressed, and data radios use about 15 bytes of compressed data to send this message OTA.

PRAVE Message Format

Following is a list of the fields sent in this message

Field	Usage	Comments
1	$PRAVE	Raveon Proprietary Header
2	From ID	The ID of the transponder that transmitted its position over the air. It is a decimal number, 0 – 9999 when used with Raveon Data Radios of GPS transponders. It may be 1-8 decimal digits with other GPS transponders.
3	To ID	The ID that this position report was sent to. It is a decimal number, 0 – 9999 when used with Raveon Radio GPS transponders. It may be 1-8 decimal digits with other GPS transponders.
4	Latitude	dddmm.mmmm format. It is signed. + is north, - is south. No sign means north. Note: typically there are 4 decimal places, but as few as 0 decimal places are possible. Null field if no GPS lock.
5	Longitude	dddmm.mmmm format. It is signed. + is east, - is west. No sign means east. Note: typically there are 4 decimal places, but as few as 0 decimal places are possible. Null field if no GPS lock.
6	UTC time	The UTC time at the time the transmission was made. Hhmmss format. Null field if no GPS lock.
7	GPS Status	0=not valid position. 1=GPS locked and valid position. 2=Differential or WAAS fix.

8	Numb Satellites	The number of satellites tracked.
9	Altitude	The altitude in meters. Null field if no GPS lock.
10	Temperature	The internal temperature of the Data Radio in degrees C. Typically this is 5-20 degrees above ambient.
11	Voltage	Input voltage to the device that sent this position.
12	IO status	A decimal number representing the binary inputs. Various products have different IO bits. Typical radio modem status is: bit0:(DTR) bit1:(RTS) bit2: (IOA) Typical GPIO of FIO status is: Input Bit status.
13	RSSI	The signal-strength of this message as measured by the receiver, in dBm. Note, if the message went through a repeater, it is the signal lever of the repeated message.
14	Speed	The speed of the device in km/hour, 0-1800
15	Heading	The heading of the device 0-360 degrees
16	Status	Status flags received from the device. Not all products support generating all status flag codes. NULL means no alerts. "**P**" means a proximity alert. "**M**" means man-down alert "**A**" General alert, usually due to pressing an alert button "**C**" Critical alert, usually due to pressing and holding alert button "**I**" Impact alert "**V**" Vibration "**S**" Service required on product "**X**" Gas fume sensor detects CO or other gas.
17	Spare	A spare field. May be used for UTC date in the future. Typically NULL.
18 (Optional Field)	Optional Odometer	The odometer reading if this option is available. It is in kilometers and may or may not have decimal places. Most reported values typically have are one decimal place. NULL/empty or no field if reading is not available or transponder did not send it.
19	*	The "*" NMEA end-of-message identifier. Before a Checksum
19	Checksum	The NMEA 0183 checksum.

Example Standard $PRAVE Sentence:

$PRAVE,0001,0001,3308.9051,-11713.1164,195348,1,10,168,31,13.3,3,-83,0,0,,*66

This example shows a unit at 33° 8.9051 north latitude and 117° 13.1164 east longitude. It is not moving (0 speed). Its signal strength was -83dBm. Its altitude is 168 meters.

Example $PRAVE with Odometer Readings:

$PRAVE,0001,0001,3308.9051,-11713.1164,195348,1,10,168,31,13.3,3,-83,1051,0,,1003.4*66

This example shows a unit at 3308.9051 north latitude and 117° 13.1164 east longitude. It is moving fast (0 speed). Its signal strength was -83dBm. Its altitude is 168 meters. The odometer is 1003.4km.

Example $PRAVE with High Speed:

$PRAVE,1234,0005,3336.85897,-11436.02272,213955,1,10,10037,0, 0, 5, 0,1051, 154,,0*4A

It is moving High Speed (1051 K/M speed). K/M is Kilometers/Hour.
Its signal strength was 10dBm. Its altitude is 10037 meters. The odometer is 0.
The Speed from GPS was 300(Meters/Sec) that is 584(Miles/Hour) this is 1051(K/M)

Field 19 NMEA 0183 Checksum in the PRAVE Message

The Checksum ***xx** for this message is the same as NMEA 0183 used.
Before the checksum is a: *

The checksum is the eight-bit exclusive OR (no start or stop bits) of all characters in the sentence, including "," delimiters, between but not including the "$" and the "*" delimiters. The two characters are hexadecimal values four bits of the result. Two ASCII characters (0-9, A-F) for transmission. A significant character is transmitted first.

The checksum is preceded by the '*' character back to before the $. So to compute this in your software, use a variable 8 bit char. This char will compute the Checksum. Set it to 0 when the math will start. Then add every Byte into the char after $ and when * is at ten end do not add * to the char. A "char" is 8 bits, and every time in add a byte to it, it goes up, or turns down.

This is normal Checksum method NMEA uses. PRAVE messages use this and send out the char checksum in Hexadecimal format at end of the message, so the Checksum changes every message. Similar hex messages are 66 62 6D 47 F2 70 or any other hex format…

Field 12 IO Status Information:

Field 12 in a $PRAVE message represents the binary inputs and outputs (IOs).. Typical radio modems with serial ports have status bits set in this byte. Various products have different IO bits.
Normal: List of Bits in $PRAVE Field 12 for **RS-232** serial port radios:

0. Bit 0: (DTR) Data Terminal Ready DTR input line pin 4 on RS-232.
1. Bit 1: (RTS) Request to Send RTS input pin 7 on RS-232.
2. Bit 2: (IOA) Data Radio modules with UWORK Tech Series
3. Open for Users to control.
4. Open for Users to control.
5. Open for Users to control.
6. Open for Users to control.
7. Open for Users to control.

The Tech Series USB version also uses pins 0-2. Pin2 is connected to an Link LED.
On the UWORC 20 pin interface, some input pins set these Field 12 Bits
Pin 0: UWORC 8, Pin 1: UWORC 10, Pin 2: UWORC 13

In the Tech Series Radios with the **GPIO**, the bits:

0. IO PIN A input status in on GPIO Tech Series.
1. IO PIN B input status in on GPIO Tech Series.
2. IO PIN C input status in on GPIO Tech Series.
3. Open for Users to control.
4. Open for Users to control.

5. Open for Users to control.
6. Open for Users to control.
7. Open for Users to control.

Input bits 3-7 are unused on RS-232 data radios. The Tech Series RV-M21 and RV-M22 ***GPIO*** terminal versions do use pins 0-2 as shown above. Tech Series ***FIO*** terminal uses 0-7 for 8 digital inputs

Features in (Tech Series Radios) and (RV-M6G, RV-M8G, RV-M50G) Radio Modems

The sections below describe features added in Software version **J4**.
Commands **SETIO**, **CLRIO**, **GETIO**, and the **QQQ** feature were added in **J4** and all versions above **J4** also.

Commands to control bits in Field 12

For users to set or clear bits on Field 12, there are commands to set and clear them. Software version J4 or above are able to execute these **SETIO** and **CLRIO** commands to set the IO bits or clear the IO bits.

The **SETIO XX** command can set any of these 8 bits. The **CLRIO XX** command can clear any of these bits.
XX is a hexadecimal number to specify the bits in Field 12 to manage. Any data radio (RV-M6G, RV-M8G, RV-M50G) with the GPS transponder feature sends this Field 12 over the air with the information sent out in the $PRAVE message. Users can also preset these bits so they are sent over the air and output in the $PRAVE message. The **GETIO** command reads the current IO bit status in hexadecimal. Upon power-up, all bits in Field 12 are reset to 0.

SETIO and **CLRIO** commands can be run in the Command mode, or just send the command into the data radio using the Wireless Modem Exchange (WMX) protocol. See the WMX Application Note on how WMX communication works to send command or send data directly into the data radio without having to use the command mode. WMX mode lets computers send data, receive data, or send commands.

Input Data to control bits in Field 12 QQQ.

For users to set or clear bits on Field 12, there is a feature to enable that will let you send 6 data bytes into the radio's serial port to control these bits. You will not need to be in the command mode. Enable the QQQ feature with the **ENQQQ 99** command, or have Raveon preset this on your data radio. When this QQQ feature is enabled, you can send two types of data formats into the radio that will setup the bits to be sent out in Field 12 of the $PRAVE information. When this QQQ feature is enabled, the QQQ message will not be sent over the air. You must pass into the radio only 6 bytes as shown here.

A. **QQQSXX** will enable the hex bits specified in **XX**. **S** means Set the bits in that **XX** mask.

B. **QQQCXX** will disable the hex bits specified in **XX**. **C** means Clear the bits in that **XX** mask.

For example, send **QQQS38** to set bits 3,4, and 5 ON. 38 hex is bit mask: 00111000. (56 decimal)
For example, send **QQQC08** to clear one bit 3 off. 08 hex is bit mask: 00001000. (8 decimal)
For example, send **QQQCFF** to clear all bits 0-7 off. FF hex is bit mask: 11111111. (255 decimal)

XX parameter in setting and clearing bits are expressed as hexadecimal. The numerical values in the resultant $PRAVE field 12 are expressed as decimal. Here is a list of bits with decimal and hexadecimal information. .

Bit	7	6	5	4	3	2	1	0
Hex	80	40	20	10	8	4	2	1
Dec	***128***	***64***	***32***	***16***	***8***	***4***	***2***	***1***

The 6 QQQ data bytes must come into the modem together faster than the serial port time out rate. The default time out is typically 20mS and the **ATR3** command can be used to make it longer so this can be done manually or slower.

Auto Reset the Field 12 bits.

The **QQQ** feature listed above and the **SETI** command can be used to set bits in the Field 12 bits. If you would want them to be reset back to 0 automatically, there is a command **ATVAR XX** where **XX** is the number of seconds the bits set ON stay ON and then after that time they are set OFF to 0.

The default **XX** is 0, so this is ignored. An **XX** number larger than 0 will be used to monitor the on-time of any bit and after **XX** seconds a bit will be turned off and then on $PRAVE messages, the turned off bit in Field 12 will be 0.

To have the Field 12 bits automatically reset to zero after 2 seconds you can execute the command:
ATVAR XX command sets the time in seconds to automatically reset to zero. Max **XX** value is 255.
ATVAR 2 to tell the data radio to reset the bits after 2 seconds. The time on for each bit is monitored by the data radio per a bits on time. So if multiple bits are set on at different times, different bits are reset to zero at the **ATVAR** parameter based on a particular bit's on time duration. If you set **ATVAR XX** to a reset time shorter than the GPS transmission rate, then the Field 12 bits set may be turned off before the transmission. Make sure **XX** is longer that the **TXRATE** set in the transponder.

End of $PRAVE Information

The $PRAVE message is sent out for Raveon *Data Radios with GPS/GNSS features. Many GPS tracking software can utilizes this $PRAVE message format.*

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