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High Speed M8G GPS Tracking

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OVERVIEW

Raveon's M8G series data radio modems and M21 series are very good high-speed GPS transponders. Built into them are many features to enable the user to modify the operation of the unit, and optimize it for the user's system. This document describes the main features related to configuring the M8G series radios for fast GPS tracking. The M21 Tech Series radio modems use the RV-M8G series radio modules

Out of the box, the RV-M8G GPS transponder is configured to just work. This document describes many of the parameters users may want to optimize. The M8G GPS transponder is an OEM module also available from Raveon in the Tech Series enclosure (<http://www.raveon.com/tech-series/>) at an RV-M21 series product. The RV-M21 products have the same features and options as the RV-M8G transponder because the RV-M8G is the radio module used inside the Tech Series RV-M21 enclosures.

There are a couple type of parameters that a user can optimize the M8G for GPS tracking speed. When setting up the M8G for high-speed GPS tracking, there always is a trade-off between number of units tracked, reporting rate, and power consumption. This document will explain these issues.

FEATURES AND COMMANDS

The M8G has many of the same features as Raveon's M7-GX GPS transponders. The primary performance differences between the M7-GX and the M8G are:

- A. 2mS timing resolution in the M8G. The M7-GX had a 1 second resolution. Many parameters such as TXRATE, TDMATIME, and SLOTTIME can be set with 2mS accuracy.
- B. The M8G uses a UBLOX MAX7 GPS chip, with faster acquisition and lower power consumption.
- C. The M8G can use either or GPS or GLONASS satellites. The M7-GXX was GPS only. (Future will radios will have the capabilities utilize both GLONASS and GPS simultaneously)
- D. On the M8G, the over-the-air baud rate can be set differently for transmissions and receptions.

The GPS transponder related commands that the M8G support as of version A15 firmware are:

ATMC",	"RF Channel access. 0=CSMA, 1=TDMA"
FREEWHEEL",	"The max GPS out-of-lock time (sec). 0=ignore."
GPS",	"GPS mode command ",
GXF",	"Display/set GPS related features
GX",	"Display GPS statistics and settings
SLOTNUM",	"The TDMA slot number this unit uses.",
SLOTTIME",	"The system slot time in mS. "

NMEAMASK",	"NMEAMASK bits. GGA=0, GLL=1 "
NMEARATE",	"NMEA message output rate in seconds. "
LOCRATE",	"Interval between GPS position reads (mS). "
ODOCAL",	"Odometer calibration. -100~100 = -10.0~10.0%",
ODO",	"Set or read the odometer.",
OUTPUT",	"Set the position message output format.",
SATMODE",	"Set/read Sat mode. 0=GPS, 6=GLONASS",
OTAFORMAT",	"The over-the-air transmission format. 0=default.
TDMATIME",	"Set/read TDMA epoch time (s) ",
TDMA",	"Display the TDMA timing.",
TRIGSPEED",	"Report Trigger speed threshold, km/s.",
TRIGDX",	"Report Trigger distance threshold, meters",
TXRATE",	"The number of seconds between position reports.",
IDLERATE",	"Report interval when idling, not moving. 0=never."

Some WMX commands that may be of interest are as follows:

WMX ",	" WMX protocol. 0=off 1=on."
QSIZE",	"Get the number of queued WMX frames"
QCLR",	"Clear the WMX queue or all messages."
WMXINFO",	"Get WMX protocol version."

CONFIGURATION

REPORTING RATE

TDMATIME The TDMATIME parameter is very important. The TDMA epoch time is set with this command. This is then limits the GPS reporting rate because the M8G can report once every TDMATIME interval, and no faster.

SLOTTIME The SLOTTIME is the amount of air-time each transmission on the system is allocated. This number is entered in milliseconds. SLOTTIME 100 would set the radio to 100mS time slots.

The number of available TDMA time slots on a system is the TDMATIME/SLOTTIME. For example, with 10 second epoch and 100mS slots, there are 100 slots available for transmitting GPS messages in. Each transponder is assigned one of these slots to use to report its location information in.

TXRATE The interval between GPS position reports is set with the TXRATE command. It has a 2mS resolution. For example, the command TXRATE 2.5 will set the unit to try to transmit its position every 2.5 seconds.

NUMBER OF UNITS TRACKED

LOCAL GPS MESSAGES

The internal GPS in the M8G GPS transponder periodically measures the transponders location. The interval between the measurements defaults to 1.0 seconds. It may be changed with the LOCRAE command. It may be set between 0.2 and 32000 seconds. The faster the rate, the more power consumption the GPS receiver draws.

LOCRATE Sets or reads then interval between GPS position readings taken by the internal GPS. The factory default is 1.0 seconds. In most cases, users are not aware of this rate, because the M8G transponder by default does not output these internal GPS readings to the serial port.

GXF GPS Features. The GXF command sets and reads various GPS related features in the M8G transponder. To enable the M8G to automatically forward all internal GPS readings out the local serial port, issue the **GXF 3 1** command. Feature #3 is the GPS message pass-through feature. When enabled, all of the GPS messages coming from the internal GPS receiver will be forwarded out the serial port as they are output by the internal GPS receiver.

The GPS messages that the M8G uses may change over time or software version. Typically the messages the M8G uses are the GPVTG, GPGGA, GPGSA, GPRMC, and GPGLL. It is unlikely the GPGGA and the GPRMC code will ever be turned off. The others may. Example NMEA messages from the internal GPS are:

```
$GPVTG,,T,,M,1.082,N,2.004,K,A*2E
$GPGGA,221628.00,3308.66604,N,11714.46710,W,1,07,1.40,122.2,M,-33.3,M,,*60
$GPGSA,A,3,21,08,24,14,18,22,27,,,,,2.65,1.40,2.25*07
$GPGLL,3308.66604,N,11714.46710,W,221628.00,A,A*7A
$GPRMC,221628.50,A,3308.66602,N,11714.46710,W,0.782,,071115,,,A*6E
$GPVTG,,T,,M,0.782,N,1.449,K,A*26
```

CONFIGURATION EXAMPLES

FAST 1-SECOND TRACKING

To use the M8G to track something with one-second updates, and still be able to send data messages to the M8G transponder, it could be configured as follows.

GPS 11	GPS model 11 set the unit to transmit its location, but not receive the location of other transponders. It can send and receive data over the air in its TDMA time slot with data priority.
WMX 1	Turns on WMX protocol
OUTPUT 1	Turns on PRAVE message output format
TDMATIME 1.0	1 second TDMA epoch
TXRATE 1.0	1 second transmission intervals.
SLOTTIME 100	100mS TDMA slots
LOCRATE 0.5	Measure the location twice per second.
OTAFORMAT 5	Set the OTA packet to Latitude Longitude mode.
ATR2 10	Set the receive frequency to 14400Baud 4 level
ATB2 5	Set the transmit frequency to 9600 Baud 2 level (Note: the transmit and receive frequencies will be swapped on the transponder)

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