



smart
positioning

smart
positioning

REV 1.8

NMEA Manual for Fastrax IT500 Series GPS receivers

NMEA command manual for modules based on MediaTek chipset

August 31, 2011

Fastrax Ltd.

TRADEMARKS

Fastrax is a registered trademark of Fastrax Ltd.

All other trademarks are trademarks or registered trademarks of their respective holders.

CHANGE LOG

Rev.	Notes	Date
1.0	Initial revision	2009-06-02
1.1	Added chapters 2.9.1 and 2.92. Fixed some typos. Added notes to 2.14.2 and 2.14.3	2009-06-09
1.2	Added numbering into command title. Removed chapter 2.14.2 and 2.14.3	2009-09-15
1.3	Added description of default output messages	2009-10-09
1.4	Some changes to command 300 text	2009-11-20
1.5	Addition to GGA message status field. Added clear EPO and query EPO status commands. Integrated reply messages to configuration commands.	2010-02-17
1.6	GGA message fix valid indicator values updated. Note for enabling SBAS with PMTK313. Added note about supported NMEA messages.	2010-04-18
1.7	Added datums. Fixed PMTK30x responses	2010-07-21
1.8	PMTK390: modified msg support changed lockbit to zero on example Added message descriptions: GLL – Geographic position VTG – Course and speed ZDA – Time and date Added commands: PMTK220 set position fix interval PMTK331 set user defined datum PMTK335 set RTC time PMTK337 set static nav threshold PMTK660 query available ephemeris PMTK661 query available almanac	2011-08-31

CONTENTS

1	NMEA OUTPUT	7
1.1	GGA - Global Positioning System Fix Data	7
1.2	GLL – Geographic Position – Latitude/Longitude	8
1.1	RMC - Recommended Minimum Specific GNSS Data	8
1.2	GSV - Satellites in view	9
1.3	GSA - DOP and Active Satellites	10
1.4	VTG – Course Over Ground and Ground Speed	10
1.5	ZDA – Time and Date	10
2	NMEA commands	12
2.1	PMTK000 TEST	13
2.2	PMTK001 ACK	13
2.3	PMTK010 Startup message	14
2.4	PMTK101 CMD HOT START	14
2.5	PMTK102 CMD WARM START	15
2.6	PMTK101 CMD COLD START	15
2.7	PMTK104 CMD FULL COLD START	15
2.8	PMTK127 CLEAR EPO FILE	15
2.9	PMTK220 SET POS FIX	16
2.10	PMTK251 SET NMEA BAUDRATE	16
2.11	PMTK300 API SET FIX CTL	17
2.11.1	Setting 5 Hz navigation	17
2.11.2	Setting 10 Hz navigation	18
2.12	PMTK301 API SET DGPS MODE	18
2.13	PMTK313 API SET SBAS ENABLED	19
2.14	PMTK314 API SET NMEA OUTPUT	19
2.15	PMTK330 API SET DATUM	21
2.16	PMTK331 API SET DATUM ADVANCE	21
2.17	PMTK335 API SET RTC TIME	22
2.18	PMTK337 API SET STATIC NAV THD	22
2.19	PMTK390 API SET USER OPTION	23

2.19.1	Setting 4800 baud rate permanently	23
3	Query commands.....	25
3.1	PMTK400 API Q FIX CTL	25
3.2	PMTK401 API Q DGPS MODE.....	25
3.3	PMTK413 API Q SBAS ENABLED.....	25
3.4	PMTK414 API Q NMEA OUTPUT	26
3.5	PMTK430 API Q DATUM	26
3.6	PMTK431 API Q DATUM ADVANCE	26
3.7	PMTK490 API GET USER OPTION.....	27
4	Firmware STATUS.....	28
4.1	PMTK605 QUERY FIRMWARE INFO	28
4.2	PMTK607 QUERY EPO STATUS	28
4.3	PMTK660 Q AVAILABLE SV EPH	29
4.4	PMTK661 Q AVAILABLE SV ALM	29
5	FIX Valid flag.....	31
6	Appendix A.....	32

COMPLEMENTARY READING

The following reference documents are complementary reading for this document:

Ref. #	File name	Document name
1		NMEA0183 specification

1 NMEA OUTPUT

Standard NMEA0183 messages that are supported by IT500 series receivers

In default configuration outputted messages are GGA, RMC, GSV and GSA messages. Receiver can be configured to have user defined set of output messages by command PMTK314 described in chapter 2.12.

Outputted messages are utilized in GPS Workbench 4 to visualize the GPS data. Default output messages can cover most of the applications.

1.1 GGA - Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.

Example:

```
$GPGGA,114353.000,6016.3245,N,02458.3270,E,1,10,0.81,35.2,M,19.5,M,,*50
```

Format:

```
$GPGGA,hhmmss.dd,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,v,ss,d.d,h.h,M,g.g,M,a.a,xxxx*hh<CR><LF>
```

hhmmss.dd	UTC time of the fix. hh = hours mm = minutes ss = seconds dd = decimal part of seconds
xxmm.dddd	Latitude coordinate. xx = degrees mm = minutes dddd = decimal part of minutes
<N/S>	Character denoting either N = North or S = South.
yyymm.dddd	Longitude coordinate. yyy = degrees mm = minutes dddd = decimal part of minutes
<E/W>	Character denoting either E = East or W = West.
v	Fix valid indicator 1 = GPS fix (SPS) 2 = DGPS fix 3 = PPS fix 4 = Real Time Kinematic 5 = Float RTK 6 = estimated (dead reckoning) (2.3 feature) 7 = Manual input mode 8 = Simulation mode
ss	Number of satellites used in position fix, 00-12. Notice: Fixed length field of two letters.
d.d	HDOP - Horizontal Dilution Of Precision.
h.h	Altitude (mean-sea-level, geoid)
M	Letter M.
g.g	Difference between the WGS-84 reference ellipsoid surface and the mean-sea-level altitude.
M	Letter M.
a.a	-
xxxx	-

1.2 GLL – Geographic Position – Latitude/Longitude

Latitude and Longitude, UTC time of fix and status

Example:

```
$GPGLL,6012.5674,N,02449.6545,E,072022.000,A,A*50
```

Format:

```
$GPGLL,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,hhmss.ddd,S,M*hh<CR><LF>
```

xxmm.dddd	Latitude coordinate. xx = degrees mm = minutes dddd = decimal part of minutes
<N S>	Character denoting either N = North or S =South.
yyymm.dddd	Longitude coordinate. yyy = degrees mm = minutes dddd = decimal part of minutes
<E W>	Character denoting either E = East or W = West.
hhmss.ddd	UTC time of the fix. hh = hours mm = minutes ss = seconds ddd = decimal part of seconds
S	Status indicator. A = valid V = invalid
M	Mode indicator. A = autonomous N = data not valid

1.1 RMC - Recommended Minimum Specific GNSS Data.

Time, date, position, course and speed data.

Example:

```
$GPRMC,114353.000,A,6016.3245,N,02458.3270,E,0.01,0.00,121009,,,A*69
```

Format:

```
$GPRMC,hhmss.dd,S,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,s.s,h.h,ddmmyy,d.d,<E|W>,M*hh<CR><LF>
```

hhmss.dd	UTC time of the fix. hh = hours mm = minutes ss = seconds dd = decimal part of seconds
S	Status indicator

	A = valid V = invalid
xxmm.dddd	Latitude coordinate. xx = degrees mm = minutes dddd = decimal part of minutes
<N S>	Character denoting either N = North or S = South.
yyymm.dddd	Longitude coordinate yyy = degrees mm = minutes dddd = decimal part of minutes
<E W>	Character denoting either E = East or W = West.
s.s	Speed in knots.
h.h	Heading
ddmmyy	UTC Date of the fix. dd = day of month mm = month yy = year
d.d	Magnetic variation in degrees, not supported
<E W>	Letter denoting direction of magnetic variation. Either E = East or W = West. Not supported
M	Mode indicator A=autonomous N=data not valid

1.2 GSV - Satellites in view

Number of satellites in view, satellite ID (PRN) numbers, elevation, azimuth, and SNR value. The information for four satellites is a maximum per one message, additional messages up to maximum of eight are sent if needed. The satellites are in PRN number order.

Example:

```
$GPGSV,3,1,11,29,68,228,47,30,59,151,47,31,44,284,45,02,38,062,44*7C
$GPGSV,3,2,11,12,28,130,41,10,14,102,35,05,12,110,35,04,11,040,34*70
$GPGSV,3,3,11,21,05,196,29,16,05,297,28,13,02,021,30*4E
```

Format:

```
$GPGSV,n,m,ss,xx,ee,aaa,cn,.....,xx,ee,aaa,cn*hh<CR><LF>
```

n	Total number of messages, 1 to 9
m	Message number, 1 to 9
ss	Total number of satellites in view
xx	Satellite ID (PRN) number
ee	Satellite elevation, degrees 90 max
aaa	Satellite azimuth, degrees True, 000 to 359
ch	Signal-to-noise ration (C/No) 00-99 dB-Hz. Value of zero means that the satellite is predicted to be on the visible sky but it isn't being tracked.

1.3 GSA - DOP and Active Satellites

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA sentence, and DOP values.

Example:

```
$GPGSA,A,3,02,21,30,04,16,05,10,12,31,29,,,1.33,0.81,1.06*02
```

Format:

```
$GPGSA,a,b,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p,p,h,h,v,v*hh<CR><LF>
```

a	Mode: M = Manual, forced to operate in 2D or 3D mode. A = Automatic, allowed to automatically switch 2D/3D.
b	Mode: 1 = Fix not available, 2 = 2D, 3 = 3D
xx	ID (PRN) numbers of GPS satellites used in solution
p.p	PDOP
h.h	HDOP
v.v	VDOP

1.4 VTG – Course Over Ground and Ground Speed

Course and speed.

Example:

```
$GPVTG,0.00,T,,M,0.00,N,0.00,K,A*3D
```

Format:

```
$GPVTG,h.hh,T,m.m,M,s.ss,N,s.ss,K,M*hh<CR><LF>
```

h.hh	Heading in degrees.
T	Letter 'T' denoting True heading in degrees.
m.m	Magnetic heading in degrees.
M	Letter 'M' denoting Magnetic heading in degrees.
s.ss	Speed in knots.
N	Letter 'N' denoting speed in knots.
s.ss	Speed, km/h.
K	Letter 'K' denoting speed in km/h.
M	Mode indicator. A=autonomous N=data not valid

1.5 ZDA – Time and Date

Current UTC time and date.

Example:

\$GPZDA,071850.000,31,08,2011,,*55

Format:

\$GPZDA,hhmmss.ddd,dd,mm,yyyy,xx,yy*hh

hhmmss.ddd	UTC time in hours, minutes, seconds and fractions of a second.
dd	UTC day of month
mm	UTC month
yyyy	UTC year
xx	Local zone hours. Not implemented
yy	Local zone minutes. Not implemented

2 NMEA commands

Nmea commands are used to change or query settings of the module.

Command Length:

The maximum length of each packet is restricted to **255** bytes

Commands Contents:

Preamble: One byte character.

'\$'

NMEA ID: This will identify for the NMEA parser that it is command for MediaTek.
Four bytes character string.

"PMTK"

Command Number: Three bytes character string.

From "000" to "999"

DataField: An identifier used to tell the decoder how to decode the command

The DataField has variable length depending on the command type.

A comma symbol ',' must be inserted ahead each data field to help the decoder process the DataField.

*: 1 byte character.

The star symbol is used to mark the end of DataField.

CHK1, CHK2: Two bytes character string.

CHK1 and CHK2 are the checksum of the data between Preamble and '*'.

CR, LF: Two bytes binary data.

The two bytes are used to identify the end of a command.

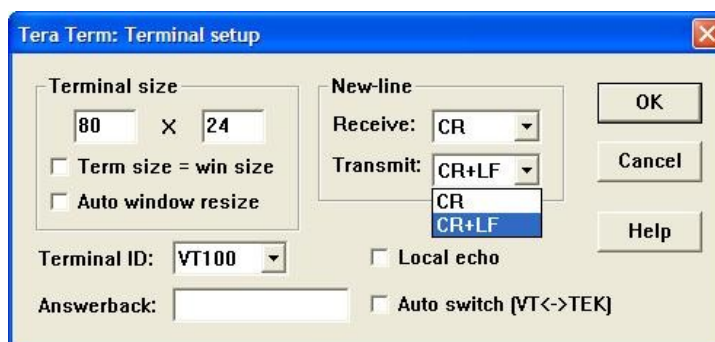
Sample Command:

\$PMTK000*32<CR><LF>

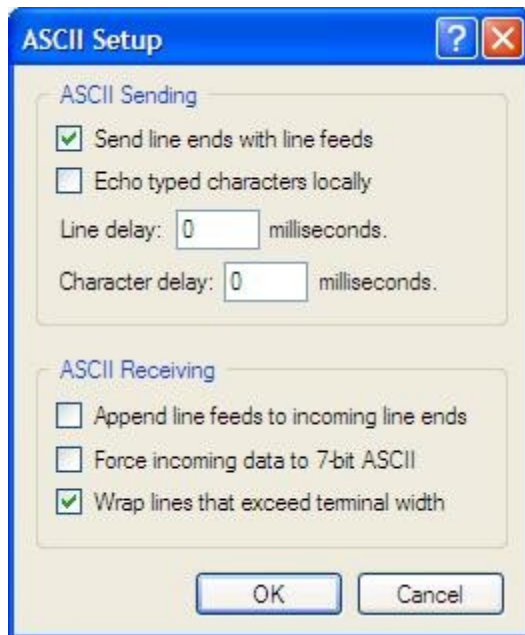
You can use for example TeraTerm as terminal program for giving the commands.

It can be downloaded from e.g. here: <http://en.sourceforge.jp/projects/ttssh2/releases/>

Remember to set the CR+LF for sending the command from terminal program.



Picture 1. TeraTerm: Terminal setup



Picture 2. HyperTerminal setup

2.1 PMTK000 TEST

Command purpose:

Testing the communication between the receiver and host.

Command number: 000

DataField:

None

Example:

```
$PMTK000*32<CR><LF>
```

Reply: see next chapter.

2.2 PMTK001 ACK

Command purpose:

Acknowledge of PMTK000 command

Command number: 001

DataField:

PMTK001, Cmd, Flag

Cmd: The command / packet type the acknowledge responds.

Flag: 0 = Invalid command / packet.

1 = Unsupported command / packet type

2 = Valid command / packet, but action failed

3 = Valid command / packet, and action succeeded

Example:

```
$PMTK001,604,3*32<CR><LF>
```

2.3 PMTK010 Startup message

Command purpose:

Output system message

Command number: 010

DataField:

Msg: The system message.

'0': UNKNOWN

'1': STARTUP

Example:

```
$PMTK010,001*2E<CR><LF>
```

2.4 PMTK101 CMD HOT START

Command purpose:

Hot Restart: Use all available data in the NV Store.

Command number: 101

DataField:

None

Example:

```
$PMTK101*32<CR><LF>
```

2.5 PMTK102 CMD WARM START

Command purpose:

Warm Restart: Don't use Ephemeris at re-start.

Command number: 102

DataField:

None

Example:

```
$PMTK102*31<CR><LF>
```

2.6 PMTK101 CMD COLD START

Command purpose:

Cold Restart: Don't use Time, Position, Almanacs and Ephemeris data at re-start.

Command number: 101

DataField:

None

Example:

```
$PMTK103*30<CR><LF>
```

2.7 PMTK104 CMD FULL COLD START

Command purpose:

Full Cold Restart: It's essentially a Cold Restart, but additionally clear system/user configurations at re-start. That is, reset the receiver to the factory status.

Command number: 104

DataField:

None

Example:

```
$PMTK104*37<CR><LF>
```

2.8 PMTK127 CLEAR EPO FILE

Command purpose:

Clear predicted Ephemeris file (EPO) from flash memory.

Command number: 127

DataField:

'0' Clear

Example:

\$PMTK127,0*2A<CR><LF>

Reply:

\$PMTK001,127,3*34

2.9 PMTK220 SET POS FIX

Command purpose:

Set position fix interval

Command number: 220

DataField:

Interval: Position fix interval [msec]. Must be larger than 200.

Example:

\$PMTK220,1000*1F<CR><LF>

Reply:

\$PMTK001,220,3 *30<CR><LF>

2.10 PMTK251 SET NMEA BAUDRATE

Command purpose:

Set NMEA port baudrate

Command number: 251

DataField:

PMTK251,Baudrate

Baudrate: Baudrate setting

0 – default setting

4800

9600

14400

19200

38400

57600

115200

Example:

```
$PMTK251,38400*27<CR><LF>
```

2.11 PMTK300 API SET FIX CTL

Command purpose:

This parameter controls the rate of position fixing activity.

Command number: 300

DataField:

```
PMTK300,FixInterval,0,0,0,0
```

FixInterval: Position fix interval [msec].

Example:

```
$PMTK300,1000,0,0,0,0*1C<CR><LF>
```

Reply:

```
$PMTK001,300,3*33 <CR><LF>
```

2.11.1 Setting 5 Hz navigation

For 5 Hz you need to change the baudrate to 38400 in order to handle the increased message load in serial port.

Command for changing the Baud Rate to 38400:

```
$PMTK251,38400*27
```

The output in terminal should show obscured data.

Then you need to change baud rate from terminal program to 38400.

After you can see NMEA sentences again you are ready to give next command.

Command for setting the Fix Rate to 5 Hz:

```
$PMTK300,200,0,0,0,0*2F
```

2.11.2 Setting 10 Hz navigation

Note: 10 Hz setting works only with IT500 receiver

You can do it with first giving command `PMTK251(baudrate)` followed by command `PMTK300(fixrate)`.

Command for changing the Baud Rate to 115200:

```
$PMTK251,115200*1F
```

The output in terminal should show obscured data.

Then you need to change baud rate from terminal program to 115200.

After you can see NMEA sentences again you are ready to give next command.

Command for setting the Fix Rate to 10 Hz:

```
$PMTK300,100,0,0,0,0*2C
```

You can reset the settings by powering off the module and removing the backup battery jumper from application board.

Remember to set the CR+LF for sending the command from terminal program.

e.g. In Tera Term program setting looks like in picture1.

2.12 PMTK301 API SET DGPS MODE

Command purpose:

DGPS correction data source mode.

Command number: 301

DataField:

PMTK301,Mode

Mode: DGPS data source mode.

'0': No DGPS source

'1': RTCM

'2': WAAS

Example:

```
$PMTK301,1*2D<CR><LF>
```

Reply:

\$PMTK001,301,3*32

2.13 PMTK313 API SET SBAS ENABLED

Command purpose:

Enable/Disable search of SBAS satellite.

Command number: 313

DataField:

Enabled: Enable or disable

'0' = Disable

'1' = Enable

Example:

\$PMTK313,1*2E<CR><LF>

Reply:

\$PMTK001,313,3*31<CR><LF>

Note: SBAS can be used only with 1Hz(Default) output rate!

2.14 PMTK314 API SET NMEA OUTPUT

Command purpose:

Set NMEA sentence output frequencies.

Command number: 314

DataField:

There are totally 19 data fields that present output frequencies for the 19 supported NMEA sentences individually.

Supported NMEA Sentences

0 NMEA_SEN_GLL, // GPGLL interval - Geographic Position - Latitude longitude

1 NMEA_SEN_RMC, // GPRMC interval - Recommended Minimum Specific GNSS Sentence

2 NMEA_SEN_VTG, // GPVTG interval - Course Over Ground and Ground Speed

- 3 NMEA_SEN_GGA, // GPGGA interval - GPS Fix Data
- 4 NMEA_SEN_GSA, // GPGSA interval - GNSS DOPS and Active Satellites
- 5 NMEA_SEN_GSV, // GPGSV interval - GNSS Satellites in View
- 6 NMEA_SEN_GRS, // GPGRS interval - GNSS Range Residuals **(not supported on fw 150M)**
- 7 NMEA_SEN_GST, // GPGST interval - GNSS Pseudorange Errors Statistics **(not supported on fw 150M)**
- 13 NMEA_SEN_MALM, // PMTKALM interval - GPS almanac information **(not supported, all versions)**
- 14 NMEA_SEN_MEPH, // PMTKEPH interval - GPS ephemeris information **(not supported, all versions)**
- 15 NMEA_SEN_MDGP, // PMTKDGP interval - GPS differential correction information **(not supported, all versions)**
- 16 NMEA_SEN_MDBG, // PMTKDBG interval – MTK debug information **(not supported, all versions)**
- 17 NMEA_SEN_ZDA, // GPZDA interval – Time & Date
- 18 NMEA_SEN_MCHN, // PMTKCHN interval – GPS channel status

Supported Frequency Setting

- 0 - Disabled or not supported sentence
- 1 - Output once every one position fix
- 2 - Output once every two position fixes
- 3 - Output once every three position fixes
- 4 - Output once every four position fixes
- 5 - Output once every five position fixes

Example:

```
$PMTK314,1,1,1,1,1,5,1,1,1,1,1,0,1,1,1,1,1*2C<CR><LF>
```

This command set GLL output frequency to be outputting once every 1 position fix, and RMC to be outputting once every 1 position fix, and so on.

Reply:

```
$PMTK001,314,3*36<CR><LF>
```

You can also restore the system default setting via issue:

```
$PMTK314,-1*04<CR><LF>
```

Note: messages ALM, EPH, DGB and DBG are not currently supported.

messages GRS, GST, ZDA and MCHN are not supported on 150M firmware.

2.15 PMTK330 API SET DATUM

Command purpose:

Set default datum.

Command number: 330

DataField:

PMTK330,Datum

Datum: 0: WGS84

1: TOKYO-M

2: TOKYO-A

Support 219 different datums. The total datums list in, **Appendix A**.

Example:

```
$PMTK330,0*2E<CR><LF>
```

Reply:

```
$PMTK001,330,3*30<CR><LF>
```

2.16 PMTK331 API SET DATUM ADVANCE

Command purpose:

Set user defined datum.

Command number: 331

DataField:

PMTK331,majA,ecc,dX,dY,dZ

majA: User defined datum semi-major axis [m]

ecc: User defined datum eccentric [m]

dX: User defined datum to WGS84 X axis offset [m]

dY: User defined datum to WGS84 X axis offset [m]

dZ: User defined datum to WGS84 X axis offset [m]

Example:

```
$PMTK331, 6377397.155, 299.1528128, -148.0, 507.0,685.0*16<CR><LF>
```

Reply:

```
$PMTK001,331,3*31<CR><LF>
```

2.17 PMTK335 API SET RTC TIME**Command purpose:**

This command set RTC UTC time. To be noted, the command doesn't update the GPS time which maintained by GPS receiver. After setting, the RTC UTC time finally may be updated by GPS receiver with more accurate time after 60 seconds..

Command number: 335

DataField:

```
PMTK335,Year,Month,Day,Hour,Min,Sec
```

Year: Year

Month: 1 ~ 12

Day: 1 ~ 31

Hour: 0 ~ 23

Min: 0 ~ 59

Sec: 0 ~ 59

Example:

```
$PMTK335,2007,1,1,0,0*02<CR><LF>
```

Reply:

```
$PMTK001,335,3*35<CR><LF>
```

2.18 PMTK337 API SET STATIC NAV THD**Command purpose:**

Set the speed threshold for static navigation. If the actual speed is below the threshold, output position will keep the same and output speed will be zero. If threshold value is set to 0, this function is disabled.

Command number: 337

DataField:

```
PMTK397,speed_threshold
```

speed_threshold: 0=disable; >0 = speed threshold in m/s

Example:

```
$PMTK397,0.7*3A<CR><LF>
```

Reply:

```
$PMTK001,337,3*3D<CR><LF>
```

2.19 PMTK390 API SET USER OPTION

Command purpose:

Change default settings of the NMEA output permanently. Write the user setting to the flash to override the default setting. Maximum 8 times without erase the chip.

Command number: 390

DataField:

PMTK390, Lock, Update_Rate, Baud_Rate, GLL_Period, RMC_Period, VTG_Period, GSA_Period, GSV_Period, GGA_Period, ZDA_Period, MCHN_Period, Datum, DGPS_Mode, RTCM_Baud_Rate

Lock: nonzero: freeze the setting; 0: allow further setting.

Update_Rate: 1~5 (Hz)

Baud_Rate: 115200, 57600, 38400, 19200, 14400, 9600, 4800

RTCM_Baud_Rate: 115200, 57600, 38400, 19200, 14400, 9600, 4800

XXX_Period: NMEA sentence output period

DGPS_Mode: 0 (disable), 1 (RTCM), 2 (SBAS)

Datum: We support more than 200 datum. Please refer to Appendix A for the supported datum list.

The typical value is: 0 (WGS84), 1 (Tokyo-M), 2 (Tokyo-A)

Example:

```
$PMTK390,0,1,38400,1,1,1,1,1,1,0,0,2,9600*0A<CR><LF>
```

Reply:

```
$PMTK001,390,3
```

Warning: Keep the lockbit zero. If you enable lockbit, you might corrupt the firmware!

Note: Command PMTK390 settings are stored to non-volatile flash memory. It is restricted to change the settings only 8 times/module. If exceeding the limit, settings cannot be changed until module is re-flashed.

2.19.1 Setting 4800 baud rate permanently

Note: This setting is not supported with UP500 AGPS enabled firmware

5Hz is maximum rate that can be set for navigation with this command

Please note that with default NMEA message mask the 4800 baud rate is not enough in conditions where there is lot of satellites tracked. GSV messages might have four lines and exceed the capacity of 4800 bit/second.

```
$PMTK390,0,1,4800,0,1,0,1,1,1,0,0,0,2,9600*38
```

and back to default 9600:

```
$PMTK390,0,1,9600,0,1,0,1,1,1,0,0,0,2,4800*38
```

Note: Command PMTK390 settings are stored to non-volatile flash memory. It is restricted to change the settings only 8 times/module. If exceeding the limit, settings cannot be changed until module is re-flashed.

3 Query commands

These commands are for querying the settings on the receiver.

3.1 PMTK400 API Q FIX CTL

Command purpose:

Query Position fix interval

Command number: 400

DataField:

None

Return:

PMTK_DT_FIX_CTL

Example:

```
$PMTK400*36<CR><LF>
```

3.2 PMTK401 API Q DGPS MODE

Command purpose:

Query DGPS mode.

Command number: 401

DataField:

None

Return:

PMTK500 DT DGPS MODE

Example:

```
$PMTK401*37<CR><LF>
```

3.3 PMTK413 API Q SBAS ENABLED

Command purpose:

Query SBAS status.

Command number: 413

DataField:

None

Return:

PMTK513 DT SBAS ENABLED

Example:

\$PMTK413*34<CR><LF>

3.4 PMTK414 API Q NMEA OUTPUT

Command purpose:

Query current NMEA sentence output frequencies.

Command number: 414

DataField:

None

Return:

PMTK514 DT NMEA OUTPUT

Example:

\$PMTK414*33<CR><LF>

3.5 PMTK430 API Q DATUM

Command purpose:

Query default datum

Command number: 430

DataField:

None

Return:

PMTK530 DT DATUM

Example:

\$PMTK430*35<CR><LF>

3.6 PMTK431 API Q DATUM ADVANCE

Command purpose:

Query user defined datum.

Command number: 431

DataField:

None

Return:

PMTK_DT_DATUM

Example:

\$PMTK431*34<CR><LF>

Reply:

\$PMTK530,6377397.155,299.152812800,-148.0,507.0,685.0*11

3.7 PMTK490 API GET USER OPTION

Command purpose:

Returns the current user setting from the flash memory.

Command number: 490

DataField:

None

Return:

PMTK590 DT FLASH USER OPTION

Example:

\$PMTK490*3F<CR><LF>

Reply:

\$PMTK590,8,1,9600,0,1,0,1,1,1,0,0,0,0,9600*37

4 Firmware STATUS

4.1 PMTK605 QUERY FIRMWARE INFO

Command purpose:

Query the firmware release information.

Command number: 605

DataField:

NONE

Return:

PMTK705 DT RELEASE

Example:

\$PMTK605*31<CR><LF>

Reply:

\$PMTK705,AXN_1.50,1139,Fastrax IT500,*6C

4.2 PMTK607 QUERY EPO STATUS

Command purpose:

Query the status of EPO file loaded into flash memory.

Command number: 607

DataField:

'0' Status

Example:

\$PMTK607,0*2F<CR><LF>

Reply:

PMTK707,56,1565,345600,1567,324000,1565,367200,1565,367200*1E

Explanation:

Receive: PMTK_DT_EPO_INFO

Number Epoch:56

First Epoch Week:1565

First Epoch TOW:345600

Final Epoch Week:1567

Final Epoch TOW:324000

Crnt Min Epoch Week:1565

Crnt Min Epoch TOW:388800

Crnt Max Epoch Week:1565

Crnt Max Epoch TOW:388800

4.3 PMTK660 Q AVAILABLE SV EPH

Command purpose:

Query valid ephemeris after specified interval.

Support PMTK660 which report valid Ephemeris SV

(a) Host -> MT3329: A PMTK660 command to request the EPH info, together with a time interval parameter

(for example, 1800sec).

(b) MT3329 -> Host: Reply 32-bit flags of 32SV to indicate which EPHs will be available after the specified time interval.

Command number: 660

DataField:

PMTK660, Time interval

Time interval: Set the time interval for MT3329 to reply 32-bit flags of 32SV. Note that the Time interval > 0 and <= 7200 (2 hours).

Example:

\$PMTK660,1800*17<CR><LF>

Reply:

\$PMTK001,660,3,40449464*17<CR><LF>

Note the Hex 40449464 means 0100 0000 0100 0100 1001 0100 0110 0100 and the Valid SV's numbers are 3, 6, 7, 11, 13, 16, 19, 23, 31.

4.4 PMTK661 Q AVAILABLE SV ALM

Command purpose:

Query valid Almanac after specified interval.

(a) Host -> MT3329: A PMTK661 command to request the Almanac info, together with a time interval parameter (for example, 30 days).

(b) MT3329 -> Host: Reply 32-bit flags of 32SV to indicate which Almanac will be available after the specified time interval.

Command number: 661

DataField:

PMTK661, Time interval

Time interval: Set the time interval for MT3329 to reply 32-bit flags of 32SV. Note that the Time interval > 0

Example: Indicate which Almanac will be available after 30 days

```
$PMTK661,30*1C<CR><LF>
```

Reply:

```
$PMTK001,661,3,fe0bfff*49<CR><LF>
```

Note the Hex fe0bfff means 111111101100000101111111111111 and the Valid SV's numbers are 1,2,3,4,5,6,7,8,9,10,11,12,13,14,16,23,24,26,27,28,29,30,31,32.

5 FIX Valid flag

Note: This chapter concerns only UP500 antenna module.

It is important to notice that current UP500 receiver firmware output position coordinates in RMC and GGA messages even if the position is flagged as invalid in the NMEA RMC message.

This is contrary to most other GPS receivers and the consequence is that a trace displayed on a map might look inaccurate. The advantage for some applications is that you do get some kind of position even if you know the output is not validated.

This is a feature that can very easily be filtered by monitoring Valid "A" flag and invalid "V" flag in the RMC message.

Here is an example of a NOT VALID output fix:

```
$GPRMC,000040.026,V,6016.3376,N,02458.3604,E,0.00,0.00,060180,,,N*73
```

```
$GPVTG,0.00,T,,M,0.00,N,0.00,K,N*32
```

```
$GPGGA,000041.026,6016.3376,N,02458.3604,E,0,0,,130.5,M,19.5,M,,*42
```

```
$GPGSA,A,1,,,,,,,,,,,,,*1E
```

```
$GPGSV,1,1,00*79
```

And here is an example of a VALID output fix:

```
$GPRMC,065343.000,A,6016.3204,N,02458.3279,E,0.02,0.00,190309,,,A*69
```

```
$GPVTG,0.00,T,,M,0.02,N,0.03,K,A*3C
```

```
$GPGGA,065344.000,6016.3206,N,02458.3278,E,1,7,1.06,29.3,M,19.5,M,,*6A
```

```
$GPGSA,A,3,03,22,16,21,27,06,08,,,,,1.33,1.06,0.81*01
```

```
$GPGSV,3,1,12,06,66,201,48,03,65,236,48,22,56,163,48,21,30,090,42*7E
```

```
$GPGSV,3,2,12,37,21,183,,08,14,331,34,16,13,204,33,27,09,026,33*76
```

```
$GPGSV,3,3,12,07,03,296,30,19,,,45,18,,,48,15,,,37*4C
```

6 Appendix A

Map datums

No	Datum	Region
0	WGS1984	International
1	Tokyo	Japan
2	Tokyo	Mean For Japan, South Korea, Okinawa
3	User Setting	User Setting
4	Adindan	Burkina Faso
5	Adindan	Cameroon
6	Adindan	Ethiopia
7	Adindan	Mali
8	Adindan	Mean For Ethiopia, Sudan
9	Adindan	Senegal
10	Adindan	Sudan
11	Afgooye	Somalia
12	Ain El Abd1970	Bahrain
13	Ain El Abd1970	Saudi Arabia
14	American Samoa1962	American Samoa Islands
15	Anna 1 Astro1965	Cocos Island
16	Antigua Island Astro1943	Antigua(Leeward Islands)
17	Arc1950	Botswana
18	Arc1950	Burundi
19	Arc1950	Lesotho
20	Arc1950	Malawi
21	Arc1950	Mean For Botswana, Lesotho, Malawi, Swaziland, Zaire,Zambia, Zimbabwe
22	Arc1950	Swaziland

23	Arc1950	Zaire
24	Arc1950	Zambia
25	Arc1950	Zimbabwe
26	Arc1960	Mean For Kenya Tanzania
27	Arc1960	Kenya
28	Arc1960	Tanzania
29	Ascension Island1958	Ascension Island
30	Astro Beacon E 1945	Iwo Jima
31	Astro Dos 71/4	St Helena Island
32	Astro Tern Island (FRIG) 1961	Tern Island
33	Astronomical Station 1952	Marcus Island
34	Australian Geodetic 1966	Australia, Tasmania
35	Australian Geodetic 1984	Australia, Tasmania
36	Ayabelle Lighthouse	Djibouti
37	Bellevue (IGN)	Efate and Erromango Islands
38	Bermuda 1957	Bermuda
39	Bissau	Guinea-Bissau
40	Bogota Observatory	Colombia
41	Bukit Rimpah	Indonesia(Bangka and Belitung Ids)
42	Camp Area Astro	Antarctica(McMurdi Camp Area)
43	Campo Inchauspe	Argentina
44	Canton Astro1966	Phoenix Island
45	Cape	South Africa
46	Cape Canaveral	Bahamas, Florida
47	Carthage	Tunisia
48	Chatham Island	New Zealand(Chatham Island)

	Astro1971	
49	Chua Astro	Paraguay
50	Corrego Alegre	Brazil
51	Dabola	Guinea
52	Deception Island	Deception Island, Antarctica
53	Djakarta (Batavia)	Indonesia(Sumatra)
54	Dos 1968	New Georgia Islands (Gizo Island)
55	Easter Island 1967	Easter Island
56	Estonia Coordinate System1937	Estonia
57	European 1950	Cyprus
58	European 1950	Egypt
59	European 1950	England, Channel Islands, Scotland, Shetland Islands
60	European 1950	England, Ireland, Scotland, Shetland Islands
61	European 1950	Finland, Norway
62	European 1950	Greece
63	European 1950	Iran
64	European 1950	Italy (Sardinia)
65	European 1950	Italy (Sicily)
66	European 1950	Malta
67	European 1950	Mean For Austria, Belgium,Denmark, Finland, France, W Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portuga,l Spain, Sweden, Switzerland
68	European 1950	Mean For Austria, Debnmark,France, W Germany, Netherland , Switzerland
69	European 1950	Mean For Irag, Israel, Jordan, Lebanon, Kuwait, Saudi Arabia, Syria
70	European 1950	Portugal, Spain

71	European 1950	Tunisia,
72	European 1979	Mean For Austria, Finland ,Netherlands ,Norway, Spain, Sweden, Switzerland
73	Fort Thomas 1955	Nevis St Kitts (Leeward Islands)
74	Gan 1970	Republic Of Maldives
75	Geodetic Datum 1970	New Zealand
76	Graciosa Base SW1948	Azores (Faial, Graciosa, Pico, Sao, Jorge, Terceria)
77	Guam1963	Guam
78	Gunung Segara	Indonesia (Kalimantan)
79	Gux I Astro	Guadalcanal Island
80	Herat North	Afghanistan
81	Hermannskogel Datum	Croatia-Serbia, Bosnia-Herzegovina
82	Hjorsey 1955	Iceland
83	Hongkong 1963	Hongkong
84	Hu Tzu Shan	Taiwan
85	Indian	Bangladesh
86	Indian	India,Nepal
87	Indian	Pakistan
88	Indian 1954	Thailand
89	Indian 1960	Vietnam (Con Son Island)
90	Indian 1960	Vietnam (Near 16 deg N)
91	Indian 1975	Thailand
92	Indonesian 1974	Indonesian
93	Ireland 1965	Ireland
94	ISTS 061 Astro 1968	South Georgia Islands
95	ISTS 073 Astro 1969	Diego Garcia
96	Johnston Island 1961	Johnston Island

97	Kandawala	Sri Lanka
98	Kerguelen Island 1949	Kerguelen Island
99	Kertau 1948	West Malaysia and Singapore
100	Kusaie Astro 1951	Caroline Islands
101	Korean Geodetic System	South Korea
102	LC5 Astro 1961	Cayman Brac Island
103	Leigon	Ghana
104	Liberia 1964	Liberia
105	Luzon	Philippines (Excluding Mindanao)
106	Luzon	Philippines (Mindanao)
107	M'Poraloko	Gabon
108	Mahe 1971	Mahe Island
109	Massawa	Ethiopia (Eritrea)
110	Merchich	Morocco
111	Midway Astro 1961	Midway Islands
112	Minna	Cameroon
113	Minna	Nigeria
114	Montserrat Island Astro 1958	Montserrat (Leeward Island)
115	Nahrwan	Oman (Masirah Island)
116	Nahrwan	Saudi Arabia
117	Nahrwan	United Arab Emirates
118	Naparima BWI	Trinidad and Tobago
119	North American 1927	Alaska (Excluding Aleutian Ids)
120	North American 1927	Alaska (Aleutian Ids East of 180 degW)
121	North American 1927	Alaska (Aleutian Ids West of 180 degW)

122	North 1927	American	Bahamas (Except San Salvador Islands)
123	North 1927	American	Bahamas (San Salvador Islands)
124	North 1927	American	Canada (Alberta, British Columbia)
125	North 1927	American	Canada (Manitoba, Ontario)
126	North 1927	American	Canada (New Brunswick, Newfoundland, Nova Scotia, Quebec)
127	North 1927	American	Canada (Northwest Territories, Saskatchewan)
128	North 1927	American	Canada (Yukon)
129	North 1927	American	Canal Zone
130	North 1927	American	Cuba
131	North 1927	American	Greenland (Hayes Peninsula)
132	North 1927	American	Mean For Antigua, Barbados, Barbuda, Caicos Islands, Cuba, Dominican, Grand Cayman, Jamaica, Turks Islands
133	North 1927	American	Mean For Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
134	North 1927	American	Mean For Canada
135	North 1927	American	Mean For Conus
136	North 1927	American	Mean For Conus (East of Mississippi, River Including Louisiana, Missouri, Minnesota)
137	North 1927	American	Mean For Conus (West of Mississippi, Rive Excluding Louisiana,

		Minnesota, Missouri)
138	North American 1927	Mexico
139	North American 1983	Alaska (Excluding Aleutian Ids)
140	North American 1983	Aleutian Ids
141	North American 1983	Canada
142	North American 1983	Conus
143	North American 1983	Hahawii
144	North American 1983	Mexico, Central America
145	North Sahara 1959	Algeria
146	Observatorio Meteorologico 1939	Azores (Corvo and Flores Islands)
147	Old Egyptian 1907	Egypt
148	Old Hawaiian	Hawaii
149	Old Hawaiian	Kauai
150	Old Hawaiian	Maui
151	Old Hawaiian	Mean For Hawaii, Kauai, Maui, Oahu
152	Old Hawaiian	Oahu
153	Oman	Oman
154	Ordnance Survey Great Britian 1936	England
155	Ordnance Survey Great Britian 1936	England, Isle of Man, Wales
156	Ordnance Survey Great Britian 1936	Mean For England ,Isle of Man, Scotland, Shetland Island, Wales
157	Ordnance Survey Great Britian 1936	Scotland, Shetland Islands
158	Ordnance Survey	Wales

	Great Britian 1936	
159	Pico de las Nieves	Canary Islands
160	Pitcairn Astro 1967	Pitcairn Island
161	Point 58	Mean For Burkina Faso and Niger
162	Pointe Noire 1948	Congo
163	Porto Santo 1936	Porto Santo, Maderia Islands
164	Provisional South American 1956	Bolovia
165	Provisional South American 1956	Chile (Northern Near 19 deg S)
166	Provisional South American 1956	Chile (Southern Near 43 deg S)
167	Provisional South American 1956	Colombia
168	Provisional South American 1956	Ecuador
169	Provisional South American 1956	Guyana
170	Provisional South American 1956	Mean For Bolivia Chile,Colombia, Ecuador, Guyana, Peru, Venezuela
171	Provisional South American 1956	Peru
172	Provisional South American 1956	Venezuela
173	Provisional South Chilean 1963	Chile (Near 53 deg S) (Hito XVIII)
174	Puerto Rico	Puerto Rico, Virgin Islands
175	Pulkovo 1942	Russia
176	Qatar National	Qatar
177	Qornoq	Greenland (South)
178	Reunion	Mascarene Island
179	Rome 1940	Italy (Sardinia)
180	S-42 (Pulkovo 1942)	Hungary

181	S-42 (Pulkovo 1942)	Poland
182	S-42 (Pulkovo 1942)	Czechoslovakia
183	S-42 (Pulkovo 1942)	Lativa
184	S-42 (Pulkovo 1942)	Kazakhstan
185	S-42 (Pulkovo 1942)	Albania
186	S-42 (Pulkovo 1942)	Romania
187	S-JTSK	Czechoslovakia (Prior 1 Jan1993)
188	Santo (Dos) 1965	Espirito Santo Island
189	Sao Braz	Azores (Sao Miguel, Santa Maria Ids)
190	Sapper Hill 1943	East Falkland Island
191	Schwarzeck	Namibia
192	Selvagem Grande 1938	Salvage Islands
193	Sierra Leone 1960	Sierra Leone
194	South American 1969	Argentina
195	South American 1969	Bolivia
196	South American 1969	Brazil
197	South American 1969	Chile
198	South American 1969	Colombia
199	South American 1969	Ecuador
200	South American 1969	Ecuador (Baltra, Galapagos)
201	South American 1969	Guyana
202	South American 1969	Mean For Argentina, Bolivia, Brazil,Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad and Tobago, Venezuela

203	South American 1969	Paraguay
204	South American 1969	Peru
205	South American 1969	Trinidad and Tobago
206	South American 1969	Venezuela
207	South Asia	Singapore
208	Tananarive Observatory 1925	Madagascar
209	Timbalai 1948	Brunei, E Malaysia (Sabah Sarawak)
210	Tokyo	Japan
211	Tokyo	Mean For Japan, South Korea, Okinawa
212	Tokyo	Okinawa
213	Tokyo	South Korea
214	Tristan Astro 1968	Tristam Da Cunha
215	Viti Levu 1916	Fiji (Viti Levu Island)
216	Voirol 1960	Algeria
217	Wake Island Astro 1952	Wake Atoll
218	Wake-Eniwetok 1960	Marshall Islands
219	WGS 1972	Global Definition
220	WGS 1984	Global Definition
221	Yacare	Uruguay
222	Zanderij	Suriname

Contact Information

Fastrax Ltd.

Street Address: Polaris Business Park, Itsehallintokuja 6,

02600 Espoo, FINLAND

Tel: +358 (0)424 733 1

Fax: +358 (0)9 8240 9691

<http://www.fastraxgps.com>

E-mail:

Sales: sales@fastraxgps.com

Support: support@fastraxgps.com