

# Topcon GB-1000 - Receiver Board Firmware Release History, January 3, 2008

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User visible changes in the firmware version 3.2 since version 3.1 p3

Highlights.

For G3-based boards only (GR-3, Net-G3):

N.1 GPS L2C and GLONASS L2 C/A observables are available.

N.2 Support of common loop for L2 has been implemented.

N.3 Improved tracking of P-code L2 GLONASS signal has been added.

N.4 "Coarse" RAIM has been re-designed.

N.5 Logic for computing elevation/azimuth of satellites by means of using almanac data has been tuned.

N.6 Geoidal heights are available for output (NMEA-0183 GGA contains this information).

N.7 Computing coordinates expressed in local datum has been supported.

N.8 Output of NMEA GRS and GSA messages has been corrected.

N.9 Internal logic for maintaining the correspondance between GLONASS slot and frequency channel numbers has been improved.

N.10 Conventions for file names have been changed in Net-G3 receivers.

N.11 LAT1/LON1/LAT2/LON2 options have been taken into the account.

For all boards (including GR-3 and Net-G3):

A.1 "AutoSeed" functionality (averaging of multiple base positions) has been supported.

A.2 Tracking of GLONASS' zero frequency channel number has been implemented.

A.3 Support for mmGPS functionality (transmitter ID managing and bridging) has been added.

A.4 Elimination of frequency offset for EGGDT and Net-G3 boards in case of setting the parameter "/par/frq/input" to "off" has been corrected.

A.5 The problem that could manifest itself by means of inability to resume the computing of RTK solution, if a pause on the order of tens of minutes in RTK data link occurred, has been resolved.

A.6 The support of decoding of NMEA-0183 XDR message has been implemented. The contents of XDR message is available for output via TPS message [XD].

A.7 New options have been added: SEED, \_IMU, OMSV, TPBN, TPPM, TPVC, \_L2C,

A.8 Antenna database has been updated. New types of antenna have been added to existing ones. New version antenna database is 2.1.1 (NGS: 07/06/08 231 antennas).

A.9 Logic for outputting GGA string via NTRIP/PPP protocols has been improved.

A.10 More robust checking of SV IDs in incoming RTK/DGNSS data has been implemented.

A.11 The method for turning on Extended Information Mode has been changed.

A.12 New commands for choosing internal/external antennae have been implemented.

A.13 Parameters for enabling/disabling sources of RTK/DGNSS data have been supported.

A.14 GPS satellites having zero clock parameters in almanac data can be tracked without problems in all types of the boards.

A.15 The support of GSM connection was added for receivers that work with FH/UHF Topcon, Satel and Arwest modems.

A.16 The possibility to obtain differential data through IP address and corresponding port has been added.

A.17 The size of "/par/ppp/gprs/pdp/apn" parameter was extended to 64 bytes ( string[0..64]) instead of 32 as before.

A.18 CMR numbers was changed for antenna types listed below:

CMR=229 correspond now to "TPSGR3" antenna (was "TPSGR\_3").

CMR=234 correspond now to "TPS\_MC.A5" antenna (was "TPSMG\_A5").

CMR=230 correspond now to "TPSCR.G3 NONE" (was "TPSCR\_G3").

A.19 For supporting the onboard Wavecom modems, PPP timeout for TPS UHF/FH internal modem was changed from 5 to 10 seconds.

A.20 New PPP parameters have been added: mtu, ping, idle for better CDMA support.

A.21 The support of new GLONASS datum PZ-90.02 has been implemented.

A.22 The command init,/setup/ has been made working properly for not G3-based boards.

A.23 SBAS processing has been improved (corresponding changes have been added to the troposphere model).

A.24 The parameter for switching between PZ-90 and PZ-90.02 dynamic constants has been implemented. This parameter is required to maintain compatibility with previous versions of firmware.

A.25 Datum ID "P90" corresponds to PZ-90.02 datum now. Previous PZ-90 datum has got "P90-I" designation.

A.26 Support of Satel and ArWest modems has been tuned.

A.27 Problems connected with using jps/max and jps/min messages sets in RTK mode have been resolved. This problem might affect performances when working with combined GPS+GLONASS constellation.

A.28 Internal logic that deals with procesing new GLONASS satellites has been modified.

A.29 Support of mmGPS functionality in EG3 boards has been tuned and modified.

## 0. Compatibility Notes.

0.1 Starting at the version 3.2, new method for turning the Extended Information Mode on/off has been supported. It is required to push FN button three times over the period of three seconds to enable/disable this mode.

0.2 It is not recommended using the parameter "/par/lock/pcode". Use the parameters "/par/lock/gps/pcode" and "/par/lock/glo/pcode" instead.

0.3 Argument of the parameter "/par/lock/gps/l2c" has been changed. Now it contains two arguments for turning on/off tracking of CL and CM signals separately from each other.

0.4 File name conventions for AFRM mode have been changed for Net-G3

receivers: files created at hour borders have the following names:

XXXXa, XXXXa001, XXXXa002... for interval 00:00:00-00:59:59;

XXXXb, XXXXb001, XXXXb002... for interval 01:00:00-01:59:59 etc.

0.5 TPS message [EN] has been outdated. Use [E3] instead.

0.6 Parameters "/par/ant/inp" and "/par/ant/curinp" are obsolete. Use the

parameters "/par/ant/rcv/inp" and "/par/ant/rcv/curinp" instead.

0.7 The default value of the parameter "/par/lock/notvis" is set to "on" for

G3-based boards (it is a read only parameter for these boards).

0.8 The range of arguments in parameters for locking/using GLONASS satellites

have been changed (parameters "/par/lock/glo/fcn/N" and

"/par/pos/glo/fcn/N"): now N is in the range of -7 - +13 (previous

range was +1 - +24).

0.9 The change in GLONASS datum leads to incompatibility when working with

previous versions of the firmware provided RTCM Message Types

20/21/31/32/34 are in use. In other words, the problem arises when

working in code differential mode or in RTK mode (if Message Types 20/21

are used). It is recommended to upload both the base and

the rover receiver with the same version 3.2. When working with Message

Types 20/21, it is required, also, to change the parameter

"/par/pos/datum/glo/dyn" to maintain compatibility with previous versions.

## 1. Messages.

1.1 Observables for GPS L2C and GLONASS L2 C/A signals (for G3-based boards only).

### 1.1.1 [R3] Full GPS L2C / GLONASS L2 C/A Pseudoranges

Contains full GPS L2C / GLONASS L2 C/A pseudoranges for all the satellites specified in the latest [SI] message.

```
struct PR_L2C {  
    f8 prange[nSats]; // Pseudorange [s]  
    + u1 cs; // Checksum  
};
```

### 1.1.2 [3R] Relative GPS L2C / GLONASS L2 C/A Pseudoranges

Contains relative GPS L2C / GLONASS L2 C/A pseudoranges for all

the satellites specified in the latest [SI] message. Relative GPS L2C / GLONASS L2 C/A pseudorange is defined as difference between full GPS L2C / GLONASS L2 C/A pseudorange and full C/A L1 pseudorange.

```
struct DPR_L2C {
f4 prangeDelta[nSats]; // PR GPS L2C / GLONASS L2 C/A - PR C/A L1 [s]
+ u1 cs; // Checksum
};
```

### 1.1.3 [P3] Full GPS L2C / GLONASS L2 C/A Carrier Phases

Contains the full GPS L2C / GLONASS L2 C/A carrier phases for all the satellites specified in the latest [SI] message.

```
struct PhaseL2C {
f8 phase[nSats]; // GPS L2C / GLONASS L2 C/A carrier phase [cycles]
+ u1 cs; // Checksum
};
```

### 1.1.4 [3P] GPS L2C / GLONASS L2 C/A Carrier Phases Computed Relative to [RC] Pseudoranges

Contains the differences between the full GPS L2C / GLONASS L2 C/A carrier phases and the corresponding [RC] pseudoranges for all the satellites specified in the latest [SI] message.

True GPS L2C / GLONASS L2 C/A carrier phase [cycles] =  
((carrier phase from [3P]) +(pseudorange from [RC])[s])\* L2\_freq [Hz],  
where L2\_freq = nominal L2 carrier frequency (i.e., 1.22760 GHz)

```
struct PhaseD_L2C {
f4 phaseDelta[nSats]; // GPS L2C / GLONASS L2 C/A carrier phase -
// [RC] pseudorange [s]
+ u1 cs; // Checksum
};
```

### 1.1.5 [D3] GPS L2C / GLONASS L2 C/A Doppler

Contains GPS L2C / GLONASS L2 C/A doppler estimates for all the satellites specified in the latest [SI] message.

```
struct DopplerL2C {
i4 doppler[nSats]; // Doppler [Hz*10-4]
+ u1 cs; // Checksum
};
```



int - use internal antenna for OmniStar

ext - use external antenna for OmniStar

Note: this command is not supported in the current receivers.

Name: /par/ant/rcv/inp

Access: rw

Type: enumerated

Values: [ int | ext | auto ]

Default: int

Description: Set /query receiver antenna input mode:

int - use internal antenna for receiver;

ext - use external antenna for receiver;

auto - automatic mode;

2.2 mmGPS (NBEAM) parameters.

Name: /par/pos/pd/nbeam/id

Access: rw

Type: enumerated

Values: 1 | 2 | 3 | 4 | any | auto

Default: auto

Description: Selection of ID of the transmitter the sensor must work

with. The best one from rms point of view will be selected

if the value is set to 'any'. In this case the receiver will try

to switch the best one. If you choose 'auto' PZS itself

will try to find ID from present in view according

its own rules. Anytime it is possible to change 'any' to

'auto' to acquire signal again if there is any problem with

signal availability.

Do not forget properly set serial port used by PZS with help

of command /par/pos/pd/nbeam/port!

Name: /par/pos/pd/nbeam/any

Access: rw

Type: enumerated

Values: permanent | auto | arrange

Default: permanent

Description: In case of id==any this command instructs receiver what to do in cases:

- disappearing laser signal because of e.g. shading;

- unsuccessful switching to the best transmitter;

Value 'permanent' instructs receiver try to continue acquiring signal up

to success. 'auto' instructs PZS to try to find ID from

present in view according its own rules. 'arrange' instructs

receiver to arrange all enabled IDs according rms and to try

consecutively catch one from available

Name: /par/pos/pd/nbeam/wait

Access: rw

Type: list {float t1, float t2}

Values: {0.099...60, 0.099...60}

Default: {4.,60.}

Description: t1 defines time interval in seconds how long it is necessary to waiting for choosed signal acquiring in cases of dissapering signal and unsuccessful switching for values any==auto or any==arrange. t2 defines how long it is necessary to work with found signal. After t2 passing away the receiver will try to acquire the best ID again.

Name: /par/pos/pd/nbeam/bridging

Access: rw

Type: boolean

Values: on | off

Default: off

Description: Setting this parameter to 'on' instructs receiver to bridge (to compensate jump) mmGPS height estimation at ID changing. If you choose 'on' be sure there is not considerable changing of height during laser signal absence

Name: /par/pos/pd/nbeam/type

Access: rw

Type: enumerated

Values: const | dissap

Default: const

Description: This parameter defines type of bridging. Value 'const' means the compensation is distributed uniformly (constantly) over all zone where you works with current ID. This type is recommended only for case compact site (non-stretched) and when height installation / initialization error of transmitter is dominant source of error. Value 'dissap' means a jump is instantaneously compensated but then height estimation is slowly returning back to original level (compensation is disappearing). Dissapering process has linear behaviour and distibuted over zone with radius equal to double distance between receiver and transmitter in moment of ID changing. This type allow to avoid accumulation of error as  $\sqrt{N} \cdot \sigma$  where N- is total number of used transmitter along path;  $\sigma$  - standard deviation of error of single transmitter. With help of this technique it is possible to provide standard deviation of just  $\sigma$  between design (project) profile and measured by mmGPS. This technique is recommended for stretched site (e.g. road work) when number N is large enough ( $N > 10$ ) and when dominant error is either:

- horizontal installation/initialization error of transmitter
- thermal variation of self leveling mechanism of transmitter (wrong level calibration)



- strong beam refraction at long distances
- strong beam nonlinearity at long distances
- any other effect with non constant yield over distance

### 2.3 Parameters of tracking loops for GPS L2C / GLONASS L2 C/A signals (for G3-based boards only)

Name: /par/raw/l2pll/order

Access: rw

Type: int

Values: [ 1 | 2 ]

Default: 1

Description: This parameter specifies the order of GPS L2C and GLONASS L2 C/A phase lock loop (PLL).

Name: /par/raw/l2pll/band

Access: rw

Type: float

Values: [ 0.000001 | 50. ]

Default: 2.5

Description: This parameter sets the bandwidth of GPS L2C and GLONASS L2 C/A PLL.

Name: /par/raw/l2dll/order

Access: rw

Type: int

Values: [ 1 | 2 ]

Default: 1

Description: This parameter defines the order of the receiver's GPS L2C and GLONASS L2 C/A delay lock loop (DLL).

Name: /par/raw/l2dll/band

Access: rw

Type: float

Values: [ 0.000001 | 10. ]

Default: 0.4

Description: This parameter sets the bandwidth of the receiver's GPS L2C and GLONASS L2 C/A DLL.

### 2.4 Tracking of GPS/GLONASS L1/L2 P-codes

Name: /par/lock/gps/pcode,{P1,P2}

Access: rw

Type: bool

Values: [ on | off ]

Default: off,off

Description: This parameter turns on/off GPS P1/P2 signals tracking.

Valid combinations are {on,on} or {off,off} only.

Name: /par/lock/glo/pcode,{P1,P2}

Access: rw

Type: bool

Values: [ on,on | off,off ]

Default: off,off

Description: This parameter turns on/off GLONASS P1/P2 signals tracking.

Valid combinations are {on,on} or {off,off} only.

## 2.5 Tracking of GPS L2C / GLONASS L2 C/A signals

Name: /par/lock/gps/l2c,{CL,CM}

Access: rw

Type: bool

Values: [ on,on | off,off ]

Default: off,off

Description: This parameter turns on/off GPS CL and CM signals tracking.

Valid combinations are {on,on} or {off,off} only.

Name: /par/lock/glo/l2c

Access: rw

Type: bool

Values: [ on | off ]

Default: off

Description: This parameter turns on/off GLONASS L2 C/A signal tracking.

## 2.6 Parameters related to AutoSeed functionality

### 2.6.1 Commands for working with current point.

#### 2.6.1.1 Name of current point.

Name: /par/ref/avg/list/curpnt/name

Access: rw

Type: string[0..19]

Values:

Default: "UNUSED"

Description: Set/print the name of the current point

#### 2.6.1.2 Identifier of the current point.

Name: /par/ref/avg/list/curpnt/id

Access: rw

Type: integer

Values: 0..4095

Default: 0

Description: print/set identifier of the current point

### 2.6.1.3 L1 PC coordinates of the current point.

Name: /par/ref/avg/list/curpnt/pos/[xyz | geo]

Access: rw

Type: [{datum,lat,lon,alt} | {datum,x,y,z}]

Values: see GRIL, please

Default: [{W84,0,0,0} | {W84,6378137,0,0}]

Description: print/set L1 PC coordinates of the current point. Datum must be "W84".

### 2.6.1.4 ARP coordinates of the current point.

Name: /par/ref/avg/list/curpnt/arp/[xyz | geo]

Access: rw

Type: [{datum,lat,lon,alt} | {datum,x,y,z}]

Values: see GRIL, please

Default: [{W84,0,0,0} | {W84,6378137,0,0}]

Description: print/set ARP coordinates of the current point. Datum must be "W84".

2.6.1.5 Fill curpnt fields automatically (all, only position, only name, only identifier, information from concrete point from the list). Date and time will be written automatically upon finishing the point to list addition.

Name: /par/ref/avg/list/curpnt/fill

Access: w

Type: enum

Values: [all, pos, name, id, [0..99]]

Default:

Description: set (all fields, only position, only name, only identifier, information from concrete point from the list) for fill curpnt fields automatically. Date and time will be written automatically upon finishing the point to list addition

## 2.6.2 Commands for working with the list of points.

### 2.6.2.1 Print parameters of the given point from the list

#### 2.6.2.1.1 Print the name of the point

Name: /par/ref/avg/list/pnts/[00..99]/name

Access: r

Type: string[0..19]

Values:

Default: "UNUSED"

Description: print the name of the point

#### 2.6.2.1.2 Print L1PC coordinates of the point

Name: /par/ref/avg/list/pnts/[00..99]/pos/[xyz | geo]

Access: r

Type: [ {datum,lat,lon,alt} | {datum,x,y,z} ]

Values:

Default:

Description: print L1PC coordinates of the point

#### 2.6.2.1.3 Print ARP coordinates of the point

Name: /par/ref/avg/list/pnts/[00..99]/arp/[xyz | geo]

Access: r

Type: [ {datum,lat,lon,alt} | {datum,x,y,z} ]

Values:

Default:

Description: print ARP coordinates of the point

#### 2.6.2.1.4 Print date of the point

Name: /par/ref/avg/list/pnts/[00..99]/date

Access: r

Type: string

Values:

Default:

Description: print date of the point

#### 2.6.2.1.5 Print index of the point

Name: /par/ref/avg/list/pnts/[00..99]/index

Access: r

Type: integer

Values: [0..99]

Default:

Description: print index of the point

#### 2.6.2.1.6 Print id of the point

Name: /par/ref/avg/list/pnts/[00..99]/id

Access: r

Type: integer

Values: [0..4095]

Default:

Description: print id of the point

#### 2.6.2.1.7 Print "auto" flag that indicates that the point was created automatically

Name: /par/ref/avg/list/pnts/[00..99]/auto

Access: r

Type: boolean

Values:

Default:

Description: print "auto" flag that indicates that the point was created automatically

2.6.2.1.8 Print "protect" flag that indicates that the point is protected from deleting

Name: /par/ref/avg/list/pnts/[00..99]/protect

Access: r

Type: boolean

Values:

Default:

Description: print "protect" flag that indicates that the point is protected from deleting

2.6.2.1.9 Print distance from current point to given point

Name: /par/ref/avg/list/pnts/[00..99]/dist

Access: r

Type: f8

Values:

Default:

Description: print distance from current point to given point (in meters)

2.6.2.2 Print parameters of the [used | auto | manual | all] points from the list

Name: /par/ref/avg/list/pnts/[used|auto|manual|all]

Access: r

Type: {index, date, name, pos={xyz, geo}, arp={xyz, geo}, id, auto, protect}

Values:

Default:

Description: print list of the points

2.6.2.3 Print total number of the points having the given flag

Name: /par/ref/avg/list/pnts/count/[used | auto | manual | free | protect]

Access: r

Type: int

Values: [0..100]

Default:

Description: print total number of the points having the given flag

#### 2.6.2.4 Add current point to list

Name: /par/ref/avg/list/pnts/add

Access: w

Type: integer

Values: [-1..99]

Default:

Description: add current point to list. "-1": index will be assigned automatically, [0..99]: index specified by user.

#### 2.6.2.5 Delete one point (or all points) from list

Name: /par/ref/avg/list/pnts/del

Access: w

Type: integer

Values: [-1..99]

Default:

Description: [0..99]: Delete one point from list. "-1": delete all points.

#### 2.6.2.6 Sort out the list of the points in accordance with specified criterion.

Name: /par/ref/avg/list/pnts/sort

Access: w

Type: enum

Values: [date | near | protect | name]

Default:

Description: Use set comand for sort out the list of the points in accordance with specified criterion (near - the nearest points with respect to curpnt).

#### 2.6.2.7 Set the flag "protect" that prevents the given point from deleting.

Name: /par/ref/avg/list/pnts/[00..99]/option/protect

Access: w

Type: bool

Values: [on | off]

Default:

Description: set the flag "protect" that prevents the given point from deleting

#### 2.7 Enable/disable work of RTK engine.

Name: /par/pos/pd/engine

Access: rw

Type: bool

Values: [on | off]

Default: on

Description: This parameter was added in order to avoid interference with other engines that can produce RTK-level solution.

2.8 Enable/disable the use of RTK data for carrier phase differential mode from given source.

Name: /par/pos/pd/src/ext

Access: w

Type: bool

Values: [on | off]

Default: on

Description: This parameter allows the receiver to use RTK data obtained from an external source (such as a base station, for example) for computing RTK-level solution.

Name: /par/pos/pd/src/hp

Access: rw

Type: bool

Values: [on | off]

Default: on

Description: This parameter allows the receiver to use RTK data obtained from HP service for computing RTK-level solution.

Name: /par/pos/pd/src/

Access: w

Type: bool

Values: [on | off]

Default: on

Description: It is a method to enable/disable the use of any RTK data (parameters /par/pos/pd/src/ext and /par/pos/pd/src/hp will be set to specified value).

2.9 Enable/disable the use of DGNSS data for carrier phase differential mode from given source.

Name: /par/pos/cd/src/ext

Access: rw

Type: bool

Values: [on | off]

Default: on

Description: This parameter allows the receiver to use DGNSS data obtained from an external source (such as a base station, for example) for computing DGNSS solution.

Name: /par/pos/cd/src/sbas

Access: rw

Type: bool

Values: [on | off]

Default: on

Description: This parameter allows the receiver to use DGNSS data obtained from SBAS satellites for computing DGNSS solution.

Name: /par/pos/cd/src/vbs

Access: w

Type: bool

Values: [on | off]

Default: on

Description: This parameter allows the receiver to use DGNSS data obtained from VBS service for computing DGNSS solution.

Name: /par/pos/cd/src/

Access: w

Type: bool

Values: [on | off]

Default: on

Description: It is a method to enable/disable the use of any DGNSS data (parameters /par/pos/cd/src/ext, /par/pos/pd/src/sbas and /par/pos/pd/src/vbs) will be set to specified value).

## 2.10 Parameters for GSM data support

Name: /par/modem/N/model

Access: rw

Type: enumerated

Values: generic | tps | satel | arwest

Default: generic

Description: This parameter sets the correct modem model type on port N for later use as master or slave to provide correction data transfer from the base to the rover

Name: /par/modem/debug

Access: rw

Type: enumerated

Values: on | off

Default: off

Description: This parameter sets the debug mode for data transfer over GSM.

## 2.11 Parameters for obtaining data via TCP/IP connection

Name: /par/mobile



Access: r

Type: list {mode, service, state, ip, rover, base, data, debug, error}

Description: The list of MOBILE parameters.

Name: /par/mobile/mode

Access: rw

Type: enumerated

Values: on | off

Default: off

Description: MOBILE mode parameter to turn on/off MOBILE procedure.

Name: /par/mobile/service

Access: rw

Type: enumerated

Values: rover | base | ip

Default: ip

Description: MOBILE service parameter to select procedure type

Name: /par/mobile/state

Access: r

Type: enumerated

Values: off | available | unavailable | terminated | data | terminal

Default: off

Description: MOBILE state parameter

Name: /par/mobile/ip

Access: r

Type: list { addr, port, gga, user, passwd }

Description: The list of IP parameters.

Name: /par/mobile/ip/addr

Access: rw

Type: string[15]

Values: Any valid IP address

Default: "0.0.0.0"

Description: IP address of the data stream

Name: /par/mobile/ip/port

Access: rw

Type: integer

Values: [0..65535]

Default: 0

Description: Port of the data stream

Name: /par/mobile/ip/user

Access: rw

Type: string[0..32]

Default: ""

Description: the user-ID for future use

Name: /par/mobile/ip/passwd

Access: rw

Type: string[0..32]

Default: ""

Description: the password for future use

Name: /par/mobile/ip/gga

Access: rw

Type: integer

Values: [0..86400]

Default: 0

Description: Period in seconds to send NMEA GGA message to the data source. If 0 then GGA message will not send.

Name: /par/mobile/rover

Access: r

Type: list { base, port, passwd }

Description: The list of ROVER parameters.

Name: /par/mobile/rover/base

Access: rw

Type: string[15]

Values: Any valid IP address

Default: "0.0.0.0"

Description: IP address of the base to connect

Name: /par/mobile/rover/port

Access: rw

Type: integer

Values: [0..65535]

Default: 0

Description: Port of the base to connect

Name: /par/mobile/rover/passwd

Access: rw

Type: string[0..32]

Default: ""

Description: the password for the base to connect

Name: /par/mobile/base

Access: r

Type: list { addr, port, passwd }

Description: The list of ROVER parameters.

Name: /par/mobile/base/addr

Access: r

Type: string[15]

Values: IP address of the receiver, obtained after PPP connection was established

Default: "0.0.0.0"

Description: IP address of the base

Name: /par/mobile/base/port

Access: r

Type: integer

Values: [0..65535]

Default: 0

Description: Port of the base

Name: /par/mobile/base/passwd

Access: r

Type: string[0..32]

Default: ""

Description: the password for the base

Name: /par/mobile/data

Access: r

Type: list { port, imode }

Description: The list of MOBILE data parameters.

Example:

Name: /par/mobile/data/port

Access: rw

Type: enumerated

Values: any input port name

Default: /dev/ser/d

Description: MOBILE data port. The data received from the data stream will be passed to the appropriate decoder as if they were received from the specified port. The 'imode' of the specified port should be set by the user (using /par/[port]/imode parameter) to match the data format of the mountpoint.

Name: /par/mobile/data/imode

Access: r

Type: enumerated

Values: refer to the /par/[port]/imode description

Default: refer to the /par/[port]/imode description

Description: current input mode of the receiver input port that is selected as MOBILE data port.

Name: /par/mobile/error

Access: r

Type: string[0..64]

Default: "No errors"

Description: Human readable description of the failure reason if any.

Name: /par/mobile/debug

Access: rw

Type: enumerated

Values: on | off

Default: off

Description: This parameter sets the debug mode for MOBILE.

## 2.12 Parameters for locking/using GLONASS satellites

Name: /par/lock/glo/frq/N

Access: rw

Type: bool

Values: on | off

Default: on

Description: enables/disables tracking of given GLONASS satellite with frequency channel number equal to N (-7...13).

Name: /par/pos/glo/frq/N

Access: rw

Type: bool

Values: on | off

Default: on

Description: enables/disables the use of given GLONASS satellite with frequency channel number equal to N (-7...13) for positioning.

## 2.13 Parameters for PPP connection

Name: /par/ppp/mtu

Access: rw

Type: integer

Values: [1000..1500]

Default: 1500

Description: MTU value to change the default PPP settings during server negotiations

Name: /par/ppp/ping

Access: rw

Type: integer

Values: [0..300]

Default: 10

Description: Number of echo packets send to server to check if line is dead, before disconnect. For CDMA usually set to 0. Depends on the CDMA provider settings

Name: /par/ppp/idle

Access: rw

Type: integer

Values: [0..7200]

Default: 0

Description: The interval in seconds if ping is set to 0 to define line dead if no data received from the server. Mostly used for CDMA

2.14 Switching between dynamic constants that are used in the definition of PZ-90 and PZ-90.02 datum

Name: /par/pos/datum/glo/dyn

Access: rw

Type: enumerated

Values: P90 | P90-I

Default: P90

Description: PZ-90 and PZ-90.02 datum use different dynamic constants. In order to maintain compatibility with previous versions of the firmware, this parameter needs to be changed when working with RTCM Message Types 20/21.

**July 18, 2007**

**User visible changes in the firmware version 3.1 p3 since version 3.1 p2**

Highlights.

1. Support of external/internal CDMA modem has been implemented.
2. The output of the state of the parameter "/par/frq/amp" for NET-G3 boards has been implemented.
3. If the parameter "/par/frq/input" was set to "off", EGGDT and NET-G3 boards did not correct the oscillator frequency offset upon turning the power on. This problem has been resolved now.
4. The logic for locking SBAS satellites have been modified. Now all the available SBAS satellites can be tracked.

5. New commands that allow specifying the timeouts for SBAS fast corrections in manual mode have been added.

6. Performances of DGNSS (code differential) mode have been improved.

7. Corrections connected with identification of GLONASS satellites, in which C/A L2 signal is available, have been implemented.

8. RTK mode: internal logic improvements (in particular, for G3-based receivers).

9. [DL] message: the format has been corrected (a comma has been added to the end of the group of parameters embraced with {...}).

10. The problem connected with AFRM mode (the receiver does not open a new file, if a pre-defined amount of free memory remains) has been resolved.

Note: this problem was not resolved in the version 3.1p1.

11. The contents of [CC], [C1] and [C2] messages has been corrected for G3-based receivers.

12. The logic of "coarse" RAIM has been modified.

0. Compatibility notes.

0.1 The format of [DL] message has been corrected to make it compatible with rules defined for ASCII messages.

1. Messages.

No changes.

2. Parameters.

2.1 Parameters for SBAS fast corrections

Name: /par/waas/fastcor/maxage

Access: rw

Type: int

Values: [1..1200]

Default: 18

Description: This parameter specifies the maximum age (timeout) of SBAS fast corrections. This setting will affect processing of SBAS fast corrections provided the parameter

/par/waas/fastcor/mode is set to "manual".

Name: /par/waas/fastcor/mode

Type: enumerated

Values: auto | manual

Default: auto

Description: Being set to "manual", this parameter allows the user to specify a user-defined timeout for SBAS fast corrections else the timeouts will be determined automatically in accordance with broadcast data.

2.2 For CDMA support, new PPP parameters have been added:

Name: /par/ppp

Access: r

Type: list {state, speed, xt, modem, addr, debug, auth, compression, gprs, cdma, dialup}

Description: The list of PPP parameters.

Name: /par/ppp/cdma

Access: r

Type: list { dial, user }

Description: The list of gprs parameters.

Name: /par/ppp/cdma/dial

Access: rw

Type: string[0..31]

Default: "#777"

Description: Dial number for CDMA data connection

Name: /par/ppp/cdma/user

Access: rw

Type: string[0..31]

Default: ""

Description: User name

Name: /par/ppp/cdma/passwd

Access: rw

Type: string[0..31]

Default: ""

Description: CDMA password.

NOTE:

To create PPP link through internal or external CDMA modem connected to the receiver serial port, the user has to set the modem mode of corresponding modem port to "cdma":

```
set,/par/modem/c/mode,cdma
```

To close PPP connection the user has to set modem mode to "off":

```
set,/par/modem/c/mode,off
```

For CDMA modem, PPP connection works the same way as PPP connection established through GPRS.

2.3 The speed parameter of PPP was changed to rewrite.

Name: /par/ppp/speed

Access: rw

Type: enumerated

Values: 9600 | 19200 | 38400 | 57600 | 115200

Default: 9600

Description: PPP connection speed (baud rate).

Notes. If you change the speed parameter before set modem mode to gprs, cdma or dialup, the firmware start searching from the modem response from the specified baud rate. Was made to speed up the modem search if the real baud rate is known and the user don't want wait for automatical definition.

**April 16, 2007**

**User visible changes in the firmware version 3.1 p2 since version 3.1 p1.**

Highlights.

1. Support of ArWest modems has been implemented.
2. The correspondence between slot and frequency numbers in GLONASS has been tuned.
3. RTK mode: internal logic improvements.

0. Compatibility notes.

No changes.

1. Messages.



No changes.

## 2. Parameters.

### 2.1 Select internal modem type

Name: /par/ppp/modem

Access: rw

Type: enumerated

Values: wavecom | tps | satel | arwest

Default: wavecom

Description: Support for modems over standard AT commands. Currently used for FH/UHF Topcon modems, ArWest and Satel

## 3. Options.

No changes.

## 4. Commands.

No changes.

## 5. Obsolete parameters/commands/messages

### 5.1 Parameter /par/ppp/xt

This parameter is obsolete. It can be removed from the future versions of the firmware. Instead of this parameter, use the new parameter /par/ppp/modem. The state "off" of the parameter /par/ppp/xt corresponds to the argument "wavecom" of the parameter /par/ppp/modem. The state "on" of the parameter /par/ppp/xt corresponds to any other argument of the parameter /par/ppp/modem.

<END>

January 24, 2007

User visible changes in the firmware version 3.1 p1 since version 3.1.

Highlights.

1. Support of G24 and AirLink modems has been implemented.
2. Parameter for turning on "no delay" mode in TCP connection has been added.
3. New firmware for GR-3 Power Board has been released. Corresponding modification was added to the GNSS firmware.
4. Power save mode for Ethernet chip in EG-3 board (Net-G3 receiver) has been tuned.
5. The problem connected with AFRM mode (the receiver does not open a new file, if a pre-defined amount of free memory remains) has been resolved.
6. Untimely exit from sleep mode has been corrected (for not G3-based boards).

#### 0. Compatibility notes.

0.1 To support "SATEL" modem the new command separator "@" in the script strings was changed to "|". It affects the following parameters:

/par/ppp/gprs/extras

/par/ppp/dialup/init

0.2 Default value for /par/ppp/dialup/init parameter was changed to "TIMEOUT|10||+++||ATH1|OK|ATI|OK|ATE0|OK|".

#### 1. Messages.

No changes.

#### 2. Parameters.

2.1 Turn on and off "no delay" mode in TCP connection.

Name: /par/net/tcp/nodelay

Access: rw

Type: boolean

Values: on | off

Default: off

Description: Turns on/off "no delay" mode in TCP connection

<END>

**August 14, 2006**

**User visible changes in the firmware version 3.0 since version 2.6.**

## Highlights.

1. New type of the board (GR-3), which is based on Paradigm-G3 chip, is supported.
2. It is not recommended to use the command "init,/par/". Instead, use the command "init,/setup/".
3. The bug connected with the output of [GD] and [LD] messages has been fixed.
4. RTCM 3.0 messages: some corrections have been made. These corrections have to improve overall compatibility with the standard.

## More Detailed Description

(refer to GRIL for even more details)

## 0. Compatibility notes.

### 0.1 GR-3: the list of the parameters, which are not supported in the version 3.0:

- 0.1.1 /par/ant/inp (GR-3 has got only one antenna input)
- 0.1.2 /par/pos/cd/ionofree (this parameter will be available in next versions)
- 0.1.3 /par/pos/cd/rlim (this parameter will be available in next versions)
- 0.1.4 /par/pos/fix/pld (this parameter will be available in next versions)
- 0.1.5 /par/pos/gpsglo (this parameter will be available in next versions)
- 0.1.6 /par/pos/pld (this parameter will be available in next versions)
- 0.1.7 /par/pwr/extports (hardware support is not available)
- 0.1.8 /par/pwr/ports (hardware support is not available)
- 0.1.9 /par/pwr/ports&def (hardware support is not available)
- 0.1.10 /par/pwr/swd (hardware support is not available)
- 0.1.11 /par/pwr/swd/2 (hardware support is not available)
- 0.1.12 /par/pwr/swd/2&def (hardware support is not available)
- 0.1.13 /par/pwr/swd/3 (hardware support is not available)
- 0.1.14 /par/pwr/swd/3&def (hardware support is not available)
- 0.1.15 /par/pwr/swd/4 (hardware support is not available)
- 0.1.16 /par/pwr/swd/4&def (hardware support is not available)
- 0.1.17 /par/pwr/switch/3 (hardware support is not available)
- 0.1.18 /par/pwr/switch/3&def (hardware support is not available)
- 0.1.19 /par/pwr/switch/4 (hardware support is not available)
- 0.1.20 /par/pwr/switch/4&def (hardware support is not available)
- 0.1.21 /par/raw/dopp/smi
- 0.1.22 /par/pos/raim/\* (RAIM will be available in next versions)
- 0.1.23 /par/pos/cd/mult/\* (Multibase DGPS mode is not supported)
- 0.1.24 /par/raw/iono/\* (these parameters will be available in next versions)
- 0.1.25 /par/pos/filt/\* (these parameters are obsolete)

0.1.26 /par/ref/avg/\* (these parameters will be available in next versions)

0.2 GR-3: the list of the parameters, in which arguments were changed in the version 3.0:

Name: /par/pwr/mode

Access: rw

Type: enumerated

Values: auto | a | b | mix | ext | extbat

Default: auto

Alteration: New argument "extbat" has been added: it corresponds to the case when an external battery powers GR-3.

Name: /par/pwr/charge/bat

Access: rw

Type: enumerated

Values: off | auto

Default: auto

Alteration: Arguments: "a" and "b" have been removed.

Name: /par/pwr/charge/curbat

Access: r

Type: enumerated

Values: off | a | b | ab

Alteration: New argument "ab" has been added. It corresponds to the case when both batteries "a" and "b" are in use.

Name: /par/pwr/switch

Access: r

Type: array [2...2]

Values: on | off

Alteration: Only the first argument (switch 2) is available, two other arguments (third and fourth ones) are not available.

Name: /par/lock/notvis

Access: rw

Type: boolean

Values: on | off

Alteration: This parameter is always set to "off".

1. Messages.

No changes.

## 2. Parameters.

### 2.1 GR-3 new parameters (these parameters are available for GR-3 boards only)

Name: /par/pwr/extbat

Access: r

Type: float

Description: External battery voltage [volts].

Name: /par/pwr/chrge/[a/b]

Access: r

Type: float

Description: External battery current [milliamperes].

Name: /par/raw/dopp/band

Access: r/w

Type: float

Values: [0.1..10]

Default: 3.0

Description: The bandwidth of the loop that relates to computing of Doppler observables [Hertz].

## 3. Options.

No changes.

## 4. Commands.

### 4.1 init/setup/

This command sets all the receiver parameters to their default values, and makes a re-start of the receiver. Collected navigation data (satellite ephemerides and almanac) will not be erased upon issuing this command.

This command can be considered as an analog of the command "init,/par/" except that a receiver re-start occurs after the command "init/setup/".

## 5. Obsolete parameters/commands/messages

### 5.1 init,/par/

It is not recommended to use this command since there are too many initializations, which are done on-the-fly. Such initializations may affect the normal work of the receivers. Instead, the command `init/setup/` should be used.

<END>

**March 16, 2006**

**User visible changes in the firmware version 2.6 since version 2.5p1.**

Highlights.

1. GPRS/PPP support has been implemented.
2. NTRIP client support has been implemented.
3. Under some circumstances the receiver could "hang up" when both Co-Op tracking and code multipath reduction were turned on. This problem has been fixed now.
4. Some improvement of receiver time synchronization accuracy to an external source of event pulses (primary for mmGPS goal).

More Detailed Description

(refer to GRIL for even more details)

1. Messages.

1. [ha] Heading and pitch.

```
struct {  
f4 heading; // Heading of the baseline between the base and the rover  
// receiver [radians]  
f4 pitch; // Pitch of the baseline between the base and the rover  
// receiver [radians]  
+ u1 cs; // Checksum  
};
```

This message is available in RTK mode only.

## 2. Parameters.

### 2.1 GPRS/PPP parameters (these parameters are available for boards that have 4096 Kbytes RAM)

The parameters below are mostly useful to provide a method for establishing either GPRS or dialup connection to a provider of Internet services using point-to-point protocol (PPP).

Name: /par/ppp

Access: r

Type: list {state, speed, xt, addr, debug, auth, compression, gprs, dialup}

Description: The list of PPP parameters.

Name: /par/ppp/state

Access: r

Type: enumerated

Values: off | connecting | connected | disconnected

Default: off

Description: PPP connection state.

Name: /par/ppp/speed

Access: r

Type: enumerated

Values: 9600 | 19200 | 38400 | 57600 | 115200

Default: 9600

Description: PPP connection speed (baud rate).

Name: /par/ppp/xt

Access: rw

Type: boolean

Values: on | off

Default: off

Description: Extension support for modem over standard IT commands. Currently used for Motorola G-20 modem with Hiper XT GPS receiver.

Name: /par/ppp/addr

Access: rw

Type: string

Values: Any valid IP address

Default: "0.0.0.0"

Description: IP address of a peer of this PPP connection. If (0.0.0.0), the peer will have to supply the local IP address during

IPCP negotiations. When connected, the actual local IP address is accessible through /par/net/stat/if/ppp0/addr parameter.

Name: /par/ppp/debug

Access: rw

Type: boolean

Values: on | off

Default: off

Description: Enable connection debugging facilities.

Name: /par/ppp/auth

Access: r

Type: list { pap, chap }

Description: The list of PPP authentication parameters.

Name: /par/ppp/auth/pap

Access: rw

Type: boolean

Values: on | off

Default: on

Description: Use unencrypted password (PAP)

Name: /par/ppp/auth/chap

Access: rw

Type: boolean

Values: on | off

Default: on

Description: Use challenge handshake authentication protocol (CHAP).

Name: /par/ppp/comp

Access: r

Type: list { vj, vjc }

Description: The list of PPP compression parameters.

Name: /par/ppp/comp/vj

Access: rw

Type: boolean

Values: on | off

Default: off

Description: Enabled/disabled Van Jacobson style TCP/IP header compression in both the transmit and receive direction.

Name: /par/ppp/comp/vjc

Access: rw

Type: boolean

Values: on | off



Default: off

Description: Enabled/disabled the connection-ID compression in Van Jacobson style TCP/IP header compression.

Name: /par/ppp/gprs

Access: r

Type: list { dial, user, passwd, pdp }

Description: The list of gprs parameters.

Name: /par/ppp/gprs/dial

Access: rw

Type: string[0..32]

Default: "\*99\*\*\*1#"

Description: dial number for gprs connection

Name: /par/ppp/gprs/user

Access: rw

Type: string[0..32]

Default: ""

Description: user name

Name: /par/ppp/gprs/passwd

Access: rw

Type: string[0..32]

Default: ""

Description: GPRS password. This parameter is never printed implicitly.

Name: /par/ppp/gprs/pdp

Access: r

Type: list { id, apn }

Description: The list of Packet Data Protocol (PDP) context parameters.

Name: /par/ppp/gprs/pdp/id

Access: rw

Type: integer

Values: [1..4]

Default: 1

Description: PDP context identifier.

Name: /par/ppp/gprs/pdp/apn

Access: rw

Type: string[0...32]

Default: ""

Description: Access Point Name.

Name: /par/ppp/gprs/extras

Access: rw

Type: string[0..32]

Default: ""

Description: Extra modem initialization string to let the user add other AT command. Example: "AT+CGQMIN=1"

Name: /par/ppp/dialup

Access: r

Type: list { dial, user, passwd, init }

Description: The list of dialup parameters.

Name: /par/ppp/dialup/dial

Access: rw

Type: string[0..32]

Default: ""

Description: dial number for dialup internet provider

Name: /par/ppp/dialup/user

Access: rw

Type: string[0..32]

Default: ""

Description: user (login) name

Name: /par/ppp/dialup/passwd

Access: rw

Type: string[0..32]

Default: ""

Description: dialup password. This parameter is never printed implicitly.

Name: /par/ppp/dialup/init

Access: rw

Type: string[0..64]

Default: "@AT@OK@ATI@OK@ATT@OK@"

Description: chat script string to initialize the dialup modem. Use the '@' character instead of carriage return to separate the commands.

Name: /par/ppp/error

Access: r

Type: string[0..256]

Default: ""

Description: string to display most ppp error messages.

Notes:

To create PPP link through internal or external GSM modem connected to the

receiver serial port, the user should set modem mode of corresponding modem port to "gprs":

```
set,/par/modem/c/mode,gprs
```

To close PPP connection the user should set modem mode to "off":

```
set,/par/modem/c/mode,off
```

The firmware allows the user to set modem mode to "gprs" on all ports independently. The firmware scans modem mode parameter for each port from modem/a to modem/d and selects the first one with the value "gprs" to create PPP link. Should the 'mode' parameter of this modem port be set to "off", the PPP connection for this port will be terminated and the firmware will repeat search for modem mode equal to "gprs" value from port a to d.

Example:

```
%%set,/par/modem/c/pin,"0000" #set SIMCard PIN as modem parameter
```

```
%%print,/par/modem/c/pin,on
```

```
RE019%%/par/modem/c/pin="0000"
```

```
%%set,/par/ppp/gprs/user,"mts"
```

```
%%set,/par/ppp/gprs/passwd,"mts"
```

```
%%set,/par/ppp/gprs/pdp/apn,"internet.mts.ru"
```

```
%%set,/par/modem/c/mode,gprs
```

```
%%print,/par/ppp:on
```

```
RE02F%%/par/ppp={state=connected,speed=19200,xt=off,
```

```
RE024%% gprs={dial="*99***1#",user="mts",
```

```
RE026%% pdp={id=1,apn="internet.mts.ru"}},
```

```
RE039%% dialup={dial="",user="",init="@AT@OK@ATI@OK@ATT@OK@"},
```

```
RE019%% auth={pap=on,chap=on},
```

```
RE019%% comp={vj=off,vjc=off},
```

```
RE01A%% addr=0.0.0.0,debug=off}
```

```
%%print,/par/ppp/state:on
```

```
RE01A%%/par/ppp/state=connected
```

```
%%print,/net/stat/if/ppp0/addr:on
```

```
RE02A%%/par/net/stat/if/ppp0/addr=213.87.12.147
```

```
%%set,/par/modem/c/mode,off
```

```
%%print,/par/ppp/state:on
```

```
RE014%%/par/ppp/state=off
```

## 2.2 NTRIP client parameters.

data from particular mountpoint, and then receive the data and use them as RTK/DGPS corrections.

Name: /par/ntrip

Access: r

Type: list {mode, state, caster, data, error}

Description: The list of NTRIP parameters.

Name: /par/ntrip/mode

Access: rw

Type: enumerated

Values: on | off

Default: off

Description: NTRIP mode parameter to turn on/off NTRIP procedure.

Name: /par/ntrip/state

Access: r

Type: enumerated

Values: off | wait | data | sleep

Default: off

Description: NTRIP connection state. If state is "wait", receiver trying to connect to the caster. If state is "data", receiver gets correction data from NTRIP mountpoint. State "sleep" means that the receiver ntrip client was unable to connect to the caster, in this case see /par/ntrip/error for the reason.

Name: /par/ntrip/caster

Access: r

Type: list { addr, port, mountpt, user, passwd, nmea }

Description: The list of caster parameters.

Name: /par/ntrip/caster/addr

Access: rw

Type: string[15]

Values: Any valid IP address

Default: "0.0.0.0"

Description: IP address of the NTRIP caster

Name: /par/ntrip/caster/port

Access: rw

Type: integer

Values: [0..65535]

Default: 0

Description: Port of the NTRIP caster

Name: /par/ntrip/caster/mountpt

Access: rw

Type: string[15]

Default: ""

Description: Mountpoint of the NTRIP caster.

Name: /par/ntrip/caster/user

Access: rw

Type: string[0..32]

Default: ""

Description: the user-ID for the protected space of the requested mountpoint. The only basic authentication scheme is supported. If empty no user and password values will be send to the NTRIP caster.

Name: /par/ntrip/caster/passwd

Access: rw

Type: string[0..32]

Default: ""

Description: the password for the protected space of the requested mountpoint. Only basic authentication scheme is supported. This parameter is never printed implicitly.

Name: /par/ntrip/caster/nmea

Access: rw

Type: integer

Values: [-1..86400]

Default: 0

Description: Period in seconds to send NMEA GGA message to the mountpoint. -1 means that no GGA string will send to the caster. If 0 then GGA message will send only once after connection to the caster.

Name: /par/ntrip/caster/table

Access: r

Description: Force the receiver to download the sourcetable from the NTRIP caster and output it in the reply.

Example:

```
%%print,/par/ntrip/caster/table
```

```
RE016%% SOURCETABLE 200 OK
```

```
RE01C%% Content-Type: text/plain
```

```
RE017%% Content-Length: 234
```

```
RE004%%
```

RE050%% STR;NET1;NET1;CMR+;0(1);2;GPS;Moscow;RUS;55.69;37.43;1;1;TopNET-N;none;B;N;;  
RE050%% STR;NET3;NET3;CMR+;0(1);2;GPS;Moscow;RUS;55.69;37.43;1;1;TopNET-N;none;B;N;;  
RE050%% STR;NETP;NETP;CMR+;0(1);2;GPS;Moscow;RUS;55.69;37.43;1;1;TopNET-N;none;B;N;;  
RE012%% ENDSOURCETABLE  
RE002%%

Name: /par/ntrip/data

Access: r

Type: list { port, imode }

Description: The list of NTRIP data parameters.

Example:

Name: /par/ntrip/data/port

Access: rw

Type: enumerated

Values: any input port name

Default: /dev/ser/d

Description: NTRIP data port. The data received from NTRIP mountpoint will be passed to the appropriate decoder as if they were received from the specified port. The 'imode' of the specified port should be set by the user (using /par/[port]/imode parameter) to match the data format of the mountpoint.

Name: /par/ntrip/data/imode

Access: r

Type: enumerated

Values: refer to the /par/[port]/imode description

Default: refer to the /par/[port]/imode description

Description: current input mode of the receiver input port that is selected as NTRIP data port.

Name: /par/ntrip/error

Access: r

Type: string[0..64]

Default: "No errors"

Description: Human readable description of the failure reason if any.

Before starting NTRIP connection the receiver should be configured to receive corrections data. It's recommended to use "extrap" RTK mode due to potentially large delays on the Internet/GPRS.

NTRIP support requires access to an NTRIP server, so either Ethernet or PPP/GPRS connection should be active for this feature to work.

The parameters below are mostly useful to provide a method for establishing either GPRS or dialup connection to a provider of Internet services using point-to-point protocol (PPP).

3. Options.

No changes.

4. Commands.

No changes.

<END>

**December 1, 2005**

**User visible changes in the firmware version 2.5p2 since version 2.5p1.**

Highlights.

1. Leap second processing has been corrected.
2. Remote uploading of the firmware via USB and Ethernet in Turbo boards has been improved.
3. The contents of [ZA] and [ZB] messages has been improved.

**July 8, 2005**

**User visible changes in the firmware version 2.5p1 since version 2.5.**

Highlights.

1. Fixed bug in PPS in Turbo boards - under some seldom circumstances PPS was wrong.
2. Turbo boards: a bug that slows down RTK has been fixed.
3. BINEX: more records have been implemented.
4. BINEX: parameters to enable/disable of output of separate fields in 00\_00 record have been implemented.

5. BINEX record 00\_00: support for more fields has been implemented.
6. BINEX record 00\_00: support for turning separate fields on/off has been implemented.
7. Antenna database has been updated to the latest available from NGS.
8. RTCM 3.0 GPS ephemeris (Type 1019) and RTCM 3.0 GLONASS ephemeris (Type 1020) messages have been added.
9. A proprietary RTCM 3.0 text (Type 4091) message has been implemented.
10. The current values of obsolete options, CDDDB, CDDR, RTKB, and RTKR are now set according to the current values of regular options provided that the above obsolete options aren't loaded.
11. The firmware now detects that the board is installed in GB500 or GB1000 receiver and sets /par/rcv/model parameter accordingly.
12. RTCM Message Types 18/19 and 20/21: the sign of clock offset has been changed. Note: this correction does not affect compatibility with previous versions of the firmware.
13. Bug outputting wrapped [PM] message has been fixed.

#### More Detailed Description

(refer to GRIL for even more details)

#### 1. Messages.

##### 1.1 BINEX record 00\_00 improvements.

The following new fields have been implemented:

0x04, 0x0f, 0x17, 0x19, 0x1a, 0x1b, 0x1d, 0x1f.

The values for fields 0x04 and 0x0f could be specified using new parameters '/par/binex/site' and '/par/binex/data\_id', respectively.

Capability to turn on/off the output of each of supported fields has been implemented (refer to '/par/binex/00\_00' parameter description below).

##### 1.2 New BINEX messages.



The following BINEX messages have been implemented:

/msg/binex/7D\_00 - BINEX record 0x7D-00

/msg/binex/7E\_00 - BINEX record 0x7E-00

/msg/binex/7F\_03 - BINEX record 0x7F-03

/msg/binex/7F\_04 - BINEX record 0x7F-04

Meteorological data for BINEX record 0x7E-00 could be obtained by connecting MET3-compatible sensor to a receiver port, setting the 'imode' of the port to 'jps' and enabling output of /msg/misc/MET3 to this port.

For example, to get data every minute (60 seconds) from MET3 sensor working at 9600 baud and connected to the serial port B, the following commands could be used:

```
set,/par/dev/ser/b/rate,9600
```

```
set,/par/dev/ser/b/imode,jps
```

```
em,/dev/ser/b,/msg/misc/MET3:60
```

1.3 RTCM 3.0 GPS ephemeris and GLONASS ephemeris messages.

The following messages have been added:

/msg/rtcm3/1019 - GPS ephemeris

/msg/rtcm3/1020 - GLONASS ephemeris

These messages include GPS ephemeris and GLONASS ephemeris in accordance with current RTCM documents. In order to enable the output of these messages through, e.g., serial port C, use the following command:

```
em,/dev/ser/c,/msg/rtcm3/{1019,1020}
```

1.4 RTCM 3.0 proprietary text message.

The following message has been added:

/msg/rtcm3/4091t - proprietary text message

This message provides a possibility to transmit a text message from the base to the rover receiver. It is a proprietary message, thus the receivers of other developers cannot use this message. The command that enables the output of this message is the following:

```
em,/dev/ser/c,/msg/rtcm3/4091t
```

2. Parameters.

## 2.1 BINEX parameters.

The following new parameters have been implemented:

Name: /par/binex

Access: r

Type: list {site, data\_id, 00\_00}

Description: set of parameters to control BINEX records generation.

Name: /par/binex/site

Access: rw

Type: string[0..127]

Values: arbitrary string

Default: "" (empty string)

Description: the value of this parameter will be output into the 0x04 field of the /msg/binex/00\_00 (BINEX 0x00-00 record).

Name: /par/binex/data\_id

Access: rw

Type: string[0..4]

Values: arbitrary string

Default: "" (empty string)

Description: the value of this parameter will be output into the 0x0f field of the /msg/binex/00\_00 (BINEX 0x00-00 record). If the length of the string is less than 4 characters, the value output to the 0x0f field will be padded on the right to 4 characters. The padding is performed using spaces.

Name: /par/binex/00\_00

Access: r

Type: list {04, 0f, 17, 19, 1a, 1b, 1d, 1f} of boolean

Description: each element of this list reflects the status of output of corresponding field of /msg/binex/00\_00 (BINEX 0x00-00 record). When an element is 'on', the output of corresponding field is enabled, when an element is 'off', the output of corresponding field is disabled.

Note1: to turn all the fields on or off, use

set,/par/binex/00\_00,on

or

set,/par/binex/00\_00,off

, respectively.

Note2: use separate field parameters described below to control separate fields.

Name: /par/binex/00\_00/04

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x04 field of BINEX record 0x00-00.

Name: /par/binex/00\_00/0f

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x0f field of BINEX record 0x00-00.

Name: /par/binex/00\_00/17

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x17 field of BINEX record 0x00-00.

Name: /par/binex/00\_00/19

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x19 field of BINEX record 0x00-00.

Name: /par/binex/00\_00/1a

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x1a field of BINEX record 0x00-00.

Name: /par/binex/00\_00/1b

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x1b field of BINEX record 0x00-00.

Name: /par/binex/00\_00/1d

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x1d field of BINEX record 0x00-00.

Name: /par/binex/00\_00/1f

Access: rw

Type: boolean

Values: on|off

Default: on

Description: enable/disable output of 0x1f field of BINEX record 0x00-00.

## 2.2 RTCM 3.0 parameters.

Name: /par/rtcm3/base/text

Access: rw

Type: string[0..127]

Values: arbitrary string

Default: "" (empty string)

Description: the value of this parameter will be included into proprietary RTCM 3.0 text message (Message Type 4091).

## 2.3 Support for GB500 and GB1000 in /par/rcv/model.

/par/rcv/model parameter could now have two more values, GB500 and GB1000. The fact of working inside GB500/GB1000 receiver is determined using the value of /par/rcv/sn parameter that for the above receivers contains their respective names.

## 3. Options.

The current values of obsolete options, CDDDB, CDDR, RTKB, and RTKR are now set according to the current values of regular options provided that the above obsolete options aren't loaded. It allows for third-party software that checks status of those obsolete options to work properly when only corresponding new options are loaded.

## 4. Commands.

No changes.

<END>

March 4, 2005

## User visible changes in the firmware version 2.5 since version 2.4.

Highlights.

1. Support for new Turbo160 (EGGDT) board has been implemented.
2. Support for mmGPS functionality has been added.
3. New options "\_NBM" and "OPEN".
4. For Hiper, the threshold for switching to external antenna has been increased to prevent false switches at high temperatures.
5. Power management for internal devices (modems, etc.) has been improved.
6. New firmware variant, hggdt\_2\_5, has been added (hggdt with Omnistar support, similar to hgdo\_2\_5).
7. New parameter, "/par/rcv/vendor" has been added, receiver/board names for Javad were changed.
8. Correction has been added to the computation of System 34 grid coordinates.

0. Compatibility Notes.

0.1 "Turbo" boards have different options encryption algorithm.

The consequences are:

- Universal OAF for these boards is different compared to all other boards.
- Users of Hiper Turbo with firmware 2.4x have to get new OAF from Options@topcon.com and re-download it after firmware upgrade to 2.5 version. They must use PcCdu version 1.2.14b1 or newer

0.2 Javad's "Turbo" receivers and boards have different names:

- "HGGDT\_X" changed to "MGGDT\_X" (board name).
- "HIPER" changed to "MAXOR" (receiver name).
- "LEGACY\_E" changed to "PREGO" (receiver name).
- "AT4" changed to "GYRO4" (receiver name).

0.3 The support of System 34 grid coordinates has been removed from HE\_GG and HE\_GD boards.

More Detailed Description

(refer to GRIL for even more details)

1. Messages.

1.1 Power parameters.

New parameters: Switch is direct.

Parameter: `/par/pwr/swd`

Access: rw

Type: array[2..4] of boolean

Values: {n|y,n|y,n|y}

Default: `{/par/pwr/swd/2&def,...,/par/pwr/swd/4&def}`

Description: Array of "switch is direct" values for each internal slot. See `/par/pwr/swd/N` description below.

Parameter: `/par/pwr/swd/N` (N = 2|3|4)

Access: rw

Type: boolean

Values: n|y

Default: `/par/pwr/swd/N&def`

Description: Switch is direct indicator. Every internal slot has in fact two hardware pins. Value 'n' (default) of this parameter means that one of these pins is 1 whenever another is 0 (i.e., a pin has inverse value with respect to another). Value 'y' means both pins are either 0 or 1 simultaneously (i.e., a pin has direct value with respect to another).

Parameter: `/par/pwr/swd/N&def` (N = 2|3|4)

Access: rw

Type: boolean

Values: n|y

Default: n

Description: The default value for corresponding `/par/pwr/swd/N` parameter.

New parameters: Parameters to set the default values for `/par/pwr/switch`, `/par/pwr/ports`, and `/par/pwr/slots`.

Parameter: `/par/pwr/switch/N&def` (N = 2|3|4)

Access: rw

Type: enumerated

Values: {y|n|always}

Default: y

Description: The default value for corresponding `/par/pwr/switch/N` parameter.

Parameter: `/par/pwr/ports&def`

Access: rw

Type: enumerated

Values: {on|off|always}

Default: on

Description: The default value for corresponding `/par/pwr/ports` parameter.

Parameter: /par/pwr/slots&def

Access: rw

Type: enumerated

Values: {on|off|always}

Default: on

Description: The default value for corresponding /par/pwr/slots parameter.

## 1.2 Vendor parameters

Parameter: /par/rcv/vendor

Access: r

Type: enumerated

Values: {Topcon|Javad}

Description: Exists only in Turbo boards.

## 1.3 Network parameters

Parameter: /par/net/ip/mtu

Access: rw

Type: integer

Values: [128..16384]

Default: 1500

Description: MTU for the Ethernet interface.

Note: this parameter (as well as other /par/net/ip parameters) is not reset to its default value when NVRAM is cleared.

## 2. Options.

### 2.1 New option "\_NBM"

Being enabled (1), this option enables the mmGPS mode functionality.

### 2.2 New option "OPEN"

Being enabled (1), this option enables both "open" (i.e. non-encrypted) and encrypted GRIL mmGPS commands. Otherwise receiver will accept "set" commands for all the mmGPS parameters in the encrypted form only.

<END>

