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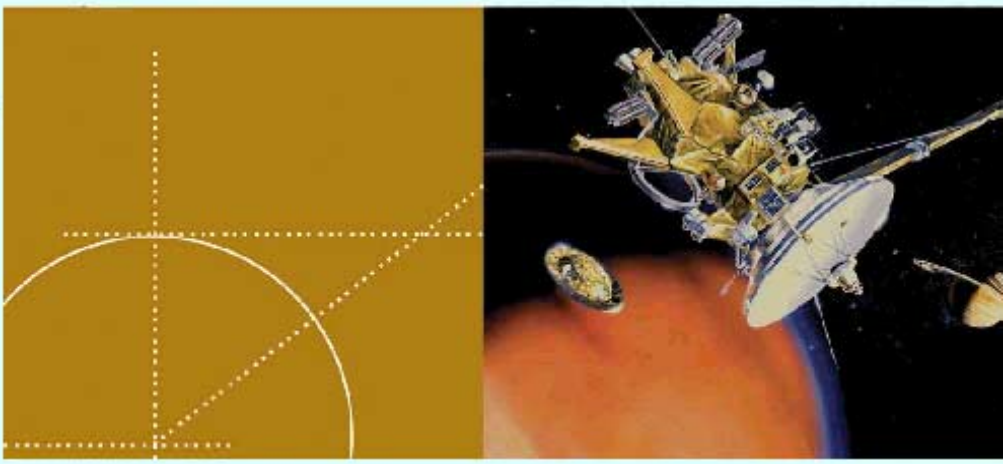

REV 1.0

NMEA-0183

This document describes the commands in the NMEA-0183 protocol.

Nov. 26th , 2003

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CIROCOMM

Table of Contents

1.0 Agenda

This document is designed for the NMEA commands employed by Cirocomm's GPS Receiver Modules. The NMEA commands and messages listed in this document comply with the international standard NMEA 0183 protocol.

- What's NMEA?

The National Marine Electronics Association is dedicated to the education and advancement of the marine electronics industry and the market which it serves.

It is a non-profit association composed of manufacturers, distributors, dealers, educational institutions, and others interested in peripheral marine electronics occupations

2 NMEA Standard

For the purposes of this article, an NMEA standard defines an electrical interface and data protocol for communications between marine instrumentation. (They may also have standards for other things.)

2.1 NMEA Address

NMEA

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3. NMEA 0183 Protocol

NMEA COMMANDS

This chapter describes the supported NMEA commands.

3.1 General NMEA commands

The following sections introduces the general-purpose NMEA commands.

START – Start Navigation

Commands the module to start navigation. The command has no effect if called while the module is already navigating. After the start command has been given, it takes some time for the module to acquire satellites, gather data from the signal and calculate the first fix.

$PFST,START,<startmode>

<start mode>	Navigation start modes: 0=Autostart. Always uses the fastest possible start mode (1-4). Default value. 1=Force cold start. Module will behave as if no valid ephemeris or PVT data were available. 2=Request warm start. 3=Request hot start. Requires RTC time, valid ephemeris and PT data. Calculates a fix as soon as PS time is acquired from the GPS signal. 4=Request quick start. Requires RTC time and recent ephemeris. Assumes that RTC time is very accurate and doesn't wait for GPS time. Notice that if the host requests faster start mode than possible (e.g. hot start when there is no ephemeris data available) start mode 0 will be used. RTC time is available if the module has already been navigating after the previous power-up, or if the time has been given by using the $PFST,INITAID command. Valid ephemeris data is available if the module has been navigating within the last two hours and the navigation has been stopped properly by giving the $PFST,STOP command.

STOP – Stop Navigation

Commands the module to stop navigating and enter the idle state. While in idle state, the receiver doesn't navigate but still accept commands. Less power is consumed in the idle state than in the navigation state; however, remarkably more than in the power-down mode. This command also stores the "LastKnownGood" fix, ephemeris and almanac data in flash memory.

$PFST,STOP,<1|0>

<1|0> 1 to save, 0 not to save "LastKnownGood" fix, ephemeris and almanac data to flash memory.

PWRDOWN – Sleep Mode

Commands the module to sleep mode.

Using the sleep mode is recommended when navigation isn't needed. Modules consume remarkably little power in the sleep mode and still re-acquires the navigation fix quickly after waking up.

The module wakes up from the sleep mode when the timeout has expired or the GPIO pin 11 state is toggled. If the receiver was navigating when the PWRDOWN command was given, navigation will restart automatically after waking up from the sleep mode.

$PFST,PWRDOWN,<hours>,<minutes>,<seconds>

or

$PFST,PWRDOWN

<hours>	Sleeping hours
<minutes>	Sleeping minutes
<seconds>	Sleeping seconds

SW – software revision

Shows the firmware revision of the receiver module.

$PFST,SW,<customer id>,<major revision>,<minor revision>,<build number>

<customer id>	Customer identifier, if the module has a customer-modified

	firmware. Value “0” means the original Cirocomm releases.
<major revision>	Major firmware revision. This number together with the following two defines the firmware release.
<minor revision>	Minor firmware revision.
<build number>	Firmware build number.

HW –hardware revision

Shows the Bill-Of-Material date (year, month, day) of the receiver module.

$PFST,HW,<BOM date>

3.2 Configuration commands

The following sections introduce the commands used for controlling the behavior of CT5550.

NMEA – NMEA Serial Communication

Sets the NMEA message mask and NMEA serial port communication speed. This message mask defines which of the NMEA messages are being outputted.

$PFST,NMEA,<mask>,<speed>

<mask>

NMEA messaging mask bitmap in hexadecimal notation. If it’s desired to change only the speed while keeping the old message mask, this parameter may be omitted and use “,,” instead.
Mask bits for message are defined as follows:

Message	bit
GSV	0x0001
GSA	0x0002
ZDA	0x0004
PPS	0x0010
FOM	0x0020
Reserved*	0x0040
GLL	0x1000
GGA	0x2000
VTG	0x4000
RMC	0x8000

I.e. to allow GLL and RMC messages one would set mask as 0x1000 + 0x8000 = 0x9000. See examples below.

	Note that hexadecimal digits A, B, C, D, E and F must be in capital letters. * Enables a message used for special purposes.
<speed>	Communication speed. Either 1200, 2400, 4800, 9600,19200, 57600 or 115200.

NOTE 1:

Using message mask FFFF (command $PFST,NMEA,FFFF)is not recommended. Although it may be used to turn on all messages, the side effect of this would be that all new messages in future CT5550 versions will also be turned on. The following messages are enabled by default: GGA, RMC, GSA, GSV.

NOTE 2:

NMEA Serial port settings other than speed cannot be changed. The settings for the port are:

- Default speed 4800 bps
- No parity (cannot be changed)
- 8 data bits (cannot be changed)
- 1 stop bit (cannot be changed)

NOTE 3:

In order to preserve this setting after reset or power-up, the new setting has to be stored in flash memory by using the $PFST,STORE command.

AUTOSTART – Set Autostart Mode

Defines if CT5550 automatically starts navigation when power is turned on or CT5550 is reset.

$PFST,AUTOSTART,<1|0>

<1|0>	1 to enable, 0 to disable autostart.

NOTE: In order for this message to have an effect, the new setting has to be stored in flash memory by using the $PFST,STORE command.

NOTE: Since CT5550 doesn’t save parameters in non-volatile memory, AUTOSTART command has no effect in CT5550.

CONF – Set configuration parameters

This command is used for setting the configuration parameters of CT5550.

$PFST,CONF,<ID>,<VALUE>

<ID>	Configuration parameter ID number. See the table below for possible values.
<VALUE>	New value for the parameter. If omitted, the command shows the current value of the configuration parameter.

Available configuration parameter ID's are:

Param ID	Param. Type	Default value	Description
1	BOOL	1	Position pinning on/off (1=on)
3	BOOL	1	Velocity smoothing on/off
4	BOOL	1	Position smoothing on/off
10	BOOL	1	Carrier smoothing on/off
17	BOOL	0	Route nav- & msg-task messages to host (enables calculating the navigation fix in host)
45	WORD	12	Number of receiver channels
47	BOOL	0	Disable fast search (=> uses slower but more sensitive search mode)
48	WORD	7000	Acq search window width (Hz, from middle of the window)
50	DOUBLE	5	Timeout for resetting the post filters
51	DOUBLE	0.4	Coefficient for position smoothing, high
52	DOUBLE	0.12	Coefficient for position smoothing, low
53	DOUBLE	0.0001	Velocity filter coefficient, low limit
54	DOUBLE	0.5	Velocity filter coefficient, high limit
55	DOUBLE	3.0	Pinning lag criteria (meters). In pinning mode, the position may lag behind the actual position by this amount.
59	DOUBLE	1.0	Pinning velocity limit. Goes to pinning mode if velocity is below this limit.
70	DOUBLE	50	FOM limit. Fix is marked invalid if FOM is larger than this value.
71	DOUBLE	22	HDOP limit. Fix is marked invalid if HDOP is larger than this value.

NOTE: In order to preserve this setting after reset or power-up, the new setting has to be stored to flash memory by using the *$PFST,STORE* command.

DATUM – Set Local Coordinate System

Selects the local coordinate system. After this command, the CT5550 will return positions in the selected coordinate system.

$PFST,DATUM,<datum_id>

<datum_id>	Coordinate system id. See appendix for supported DATUM id's.

NOTE: In order to preserve this setting after reset or power-up, the new setting has to be stored to flash memory by using the *$PFST,STORE* command.

FIXRATE – Set Fixrate

Defines how often CT5550 should acquire navigation fix and thus output the NMEA messages.

$PFST,FIXRATE,<fixrate>

<fixrate>	Number of seconds to between navigation fixes

NOTE: In order to preserve this setting after reset or power-up, the new setting has to be stored to flash memory by using the *$PFST,STORE* command.

SYNCMODE – synchronous NMEA output mode

Enables or disables the synchronous NMEA output mode. In the synchronous output mode, all the enabled NMEA navigation messages are outputted approx. once per second, regardless of the availability of a valid navigation fix. The synchronous mode is enabled by default.

$PFST,SYNCMODE,<mode>

<mode>	Set synchronous mode on or off, 0 = off, 1 = on (default).

NOTE: In order to preserve this setting after reset or power-up, the new setting has to be stored to flash memory by using the *$PFST,STORE* command.

STORE – Store Current Parameter Set

Stores the current parameter set in CT5550's flash memory. These parameters include those that are defined by the commands, ALTAID, AUTOSTART, CONF, CABLEDEL, DATUM, FIXRATE, NMEA, PPSMODE, PULSEPOL, PULSELEN, SETLIMIT, SURVEYLEN, and SYNCMODE.

$PFST,STORE

NOTE: Navigation has to be stopped before giving this command.
NOTE: CT5550 doesn't store configuration parameters in flash memory, and thus this command doesn't have any effects on the CT5550 modules. For CT5550, the preferred way is to set parameters each time, when the module is reset or switched on.

RESETDATA

Erases the navigation data stored in the flash memory, i.e. erases the last good known navigation fix, ephemeris, almanac and UTC/Ionosphere model data. The module has to be reset after this command to abandon all the above data; otherwise, some of the data may still reside in RAM memory.

$PFST,RESETDATA

NOTE: Navigation has to be stopped before giving this command.
NOTE: This command doesn't affect logged data. Log data is cleared with *$PFST,LOGCLEAR* command.

RESTORE – Restores Default Parameter Set

Restores factory default parameter set.
$PFST,RESTORE

NOTE: Navigation has to be stopped before giving this command.

NOTE: CT5550 doesn't store configuration parameters to flash memory, and thus this command is irrelevant with CT5550 module.

NOTE: This command doesn't affect the last good navigation fix, ephemeris, UTC/ionosphere model data or log data. Navigation,

ephemeris and model data is erased with the *$PFST,RESETDATA* command. Log data is cleared with the *$PFST,LOGCLEAR* command.

3.3 PPS mode commands

The following sections introduce commands used for controlling the one-pulse-per-second (PPS) timing signal mode.

PPSMODE – Set Pulse Per Second mode

Activates the One Pulse Per Second (1PPS) operating mode.

The PPS mode requires precise information about antenna positioning to allow precise timing pulse. Thus CT5550 supports several PPS modes for acquiring the antenna position.

This command can be given only when navigation is stopped, otherwise an error code results.

$PFST,PPSMODE,<mode>

<mode>	PPS operating mode, may be one of the following: 0 = PPS mode off. CT5550 doesn't output PPS pulse. 1 = PPS survey mode. CT5550 outputs PPS pulse. 2 = PPS static mode. CT5550 outputs PPS pulse. 3 = PPS roving mode. CT5550 outputs PPS pulse.

PPSPOS – PPS static mode antenna position

Sets the antenna coordinates for PPS static mode. The CT5550 module can't start outputting the PPS signal until the antenna position is defined with this command.

$PFST,PPSPOS,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,D

xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N|S>	Either character N or character S, (N = North, S = South)
yyymm.dddd	Longitude yyy = degrees mm = minutes dddd = decimal part of minutes
<E|W>	Either character E or character W, E = East, W = West
D	Altitude, meters from sea level.

SURVEYLEN – PPS Survey period length

Set PPS survey mode averaging period length.

$PFST,SURVEYLEN,<LEN>

<len>	Survey mode length (number of valid fixes that are averaged during the survey mode).

CABLEDEL – Set PPS cable delay

Set 1PPS mode cable delay.

$PFST,CABLEDEL,<DELAY>

< DELAY >	Cable delay in units of 0.01 ms. The cable delay can be either positive or negative in range of approx –21 .. +21 ms.

PULSEPOL – Set PPS pulse polarity

Set PPS mode electric pulse polarity.

$PFST,PULSEPOL,<POL>

< POL >	0 = The PPS signal sets from high to low at PPS pulse 1 = The PPS signal raises from low to high at PPS pulse

PULSELEN – Set 1PPS pulse length

Set PPS mode electric pulse length.

$PFST,PULSELEN,<LEN>

< LEN >	1 PPS pulse length in ms. (range 10 – 900 ms)

3.4 Navigation Aiding Commands

The following sections introduce the commands that provide the CT5550 receiver with additional data, which may be helpful for starting and during navigations.

INITAID – Initial position and time aiding

Gives the CT5550 module the current position and time information for aiding the navigation startup. Setting this information before navigation starts with the *$PFST,START* command reduces the time required for finding the satellites, and receiving the first valid navigation fix.

If the position isn't known, the initial time may also be given alone by omitting the position parameters, i.e. using the command with only the two first parameters. The altitude information is not critical and can be set to zero (i.e. mean sea level) if not known.

NOTE: Even when INITAID is being used, the CT5550 module reports navigation data of the previous actual navigation fix until a new fix is acquired, not the position and time data given in the INITAID command.

$PFST,INITAID,<time>,<date>,<lat>,<N/S>,<long>,<E/W>,<altitude>

<time>	UTC time in "hhmmss.dd" format, hh = hours (2 digits), mm = minutes (2 digits), ss.dd = seconds with two decimals (2+2 digits).
<date>	UTC date in "ddmmyy" format, dd = day (2 digits), mm = month (2 digits), yy = year (2 digits).
<lat>	Latitude in degrees and minutes in "xxmm.dddd" format, xx = degrees (1-2 digits), mm.dddd = minutes with four decimals (2+4 digits).
<N/S>	Either a character N or S (N = north, S = south).
<long>	Longitude in degrees and minutes in "yyymm.dddd" format, yyy = degrees (1-3 digits), mm.dddd = minutes with four decimals (2+4 digits).
<E/W>	Either a character E or W (E = east, W = west).
<altitude>	Altitude from the sea level in meters (1-5 digits).

ALTAID – Set the altitude aiding mode

Sets or disables the altitude aiding mode, where the navigation is assisted by using the given altitude value or an altitude value from a previous fix. Altitude aiding enables a navigation fix with fewer than four satellites, and as a matter of fact altitude aiding is used only if there are four or less satellites visible. Note that the aided altitude is used as an additional observation and the altitude is still calculated, not fixed to the given or aided altitude.

Altitude aiding commands can be given before starting or during the navigation. The altitude aiding mode is reset to "no altitude aiding" when navigation is stopped.

By default, the altitude aiding mode is disabled.

$PFST,ALTAID,<mode>,<altitude>

<mode>	A numeric value indicating the new altitude aiding mode: 0 : No altitude aiding (default) 1 : Altitude hold mode: Use an altitude from the previous fix 2 : External altitude mode: Use constant altitude given in the <altitude> parameter.
<altitude>	Constant altitude in meters above the sea level, used in altitude aiding mode 2. This parameter is ignored in other modes. The constant altitude is subject to the altitude limits as defined in the command *$PFST,SETLIMITS*

SETLIMIT – Set limits for altitude, velocity and acceleration

Sets the upper limits for altitude, velocity and acceleration parameters that the CT5550 navigation subsystem accepts for a valid fix. Setting realistic, lower-than-default limits for these parameters hastens finding a valid navigation fix.

$PFST,SETLIMIT,<altitude>,<velocity>,<acceleration>

<altitude>	Maximum value for altitude (meters).
<velocity>	Maximum value for velocity (m/s).
<acceleration>	Maximum value for acceleration (m/s2).

The CT5550 module checks the given parameters values against fixed upper limits for each of these parameters (same as the factory defaults, see below), thus the user cannot set the parameters beyond these values.

If necessary, the <altitude>, <velocity> and <acceleration> parameters may be omitted. If all the three parameters are omitted, the command displays the current maximum limit values.

3.5 Logging Commands

The following sections introduce commands related to the CT5501 logging system.

LOGCLEAR – Clear log data

Erases logs in CT5501's memory.

$PFST,LOGCLEAR,<MODE>

<MODE>	"Clear" operation. 0 - Reclaim the flash file system only. Doesn't delete any logged data, only frees up data clusters that have been deleted but not freed yet. 1 – Delete log data (default). Deletes logged data but keeps the current logging settings. 2 – Format the flash file system. Formats the file system used by the logging system. Not recommended for normal use, useable only for recovering from an extreme system disaster.

LOGFREE – Amount of free space for log data

Calculates how much space is available for log data.

$PFST,LOGFREE

This command outputs the amount of free space in the reply message:

*$PFST,LOGFREE,<WORDS>,<ITEMS>*hh*

Where <WORDS> is the amount of free space in 16bit words and <ITEMS> is how many log items fit into the free space with the current logging settings.

LOGGET – Output logged data

Output logged data items. This command outputs the logged data in standard NMEA format messages according to the current NMEA settings.

$PFST,LOGGET,<LOGNUM>,<FIRSTITEM>,<NUMITEMS>

<LOGNUM>	Log number.
<FIRSTITEM>	(optional)The first item that is outputted. If omitted, starts from the first item of the log.
<NUMITEMS>	(optional) The amount of items being outputted. If omitted, outputs all items until the end of the log.

LOGINFO – Show log information

Show log information, including log name, how many items have been stored to the log and what data level has been used.

$PFST,LOGINFO,<LOGNUM>

<LOGNUM>	Number of the log of interest.

The log information is displayed on the reply message:

$PFST,LOGINFO,<LOGNUM>,<NAME>,<ITEMS>,<DATALEVEL>

**hh*

Where <NAME> is name of the log, <ITEMS> is the amount of items (data points) that are in the log and <DATALEVEL> is the data level setting.

LOGMODE – Set logging start mode

Set logging start mode.

$PFST,LOGMODE,<MODE>

<MODE>	Log start mode. May be one of the following: **0 -Logging disabled (default).** **1 -Logging is started so that a new log is created once when navigation is started for the next time. On consecutive navigation starts, logging won't be used after that.** **2 -The previous log is continued once when navigation is started for the next time. On the consecutive navigation starts, logging won't be used after that.** **3 -Logging is started so that a new log is created each time when navigation is started. Logging is active until user changes the start mode again.** 4 -The previous log is continued each time when navigation is started. Logging is active until user changes the start mode again.

LOGNAME – Set log name

Set log name. This name concatenated with the log number is displayed in the log information.

$PFST,LOGNAME,<NAME>

<NAME>	New name to be used with new logs. If omitted, displays

	the current name.

LOGNUM – Get number of logs

Show how many logs are currently stored in the memory.

$PFST,LOGNUM

The number of logs <NUM> is displayed on the reply message:

*$PFST,LOGNUM,<NUM>*hh*

LOGSETTING - Set logging settings

Sets the logging settings.

$PFST,LOGSETTING,<LEVEL>,<MININT>,<MINMOVE>,<MAXINT>,<MAXMOVE>

<LEVEL>	How much information is saved along each log item, may have values between 1..6
<MININT>	Minimum interval time (seconds): A new point won't be added to a log if the time elapsed is less the set value since the previous log point. An exception is that if the maximum movement limit is exceeded, then a new point is logged.
<MINMOVE>	Minimum movement (meters): A new point won't be added to a log if the distance traveled from the previous log point is less than this limit. An exception is that if the maximum interval time from the previous log point is exceeded, then a new point is logged.
<MAXINT>	(optional) Maximum interval time (seconds): If this time or longer has elapsed since the previous log point, a new point is logged. If omitted or set to zero, the maximum limit isn't used.
<MAXMOVE>	(optional) Maximum movement (meters): If distance from the previous log point is this distance or more, a new point is logged. If omitted or set to zero, the maximum limit isn't used.

If all parameters are omitted, the command shows the current settings in the reply message.

LOGSTOP – Stop Logging

$CIRO,LOGSTOP

This command can be used to stop logging while navigating without stopping navigation at the same time.

When navigation is started next time, logging is started in a normal fashion as defined by the logging start mode.

3.6 NMEA MESSAGES

This chapter describes the supported NMEA output messages.

GGA – Global Positioning System Fix Data

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

*$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 hh = hours mm = minutes ss = seconds dd = decimal part of seconds
xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N|S>	Either character N or character S, (N = North, S = South)
yyymm.dddd	Longitude yyy = degrees mm = minutes dddd = decimal part of minutes
<E|W>	Either character E or character W, E = East, W = West
V	Fix valid indicator 0=Fix not valid 1=Fix valid
Ss	Number of satellites used in position fix, 00-12. Fixed length
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	NULL (missing)
xxxx	NULL (missing).

GLL – Geographic Position – Latitude/Longitude

Latitude and Longitude, UTC time of fix and status.

$GPGLL,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,<CR><LF>

xxmm.dddd	Latitude xx = degrees mm = minutes dddd = decimal part of minutes
<N|S>	Either character N or character S, (N = North, S = South)
yyymm.dddd	Longitude yyy = degrees mm = minutes dddd = decimal part of minutes
<E|W>	Either character E or character W, E = East, W = West

GSA – DOP and Active Satellites

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

$GPGSA,a,b,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p.p,h.h,<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

GSV – Satellites in view

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

Only the SNR (signal to noise ratio) value is available until a position fix is attained. The elevation and azimuth angles are also added after a fix. Note that there CAN be “theoretical” satellites in the GSV message. These are the satellites with known angles (elevation, azimuth), but for some reason, e.g. due to an obstruction, have not been found by CT5550. The SNR value for these satellites are set to zero.

Please notice that as all viewable satellites are reported, the amount of satellites may occasionally be exceed the number of receiver tracking channels, 12.

*$GPGSV,n,m,ss,xx,ee,aaa,cn,…… ,xx,e 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
cn	SNR (C/No) 00-99 dB-Hz. zero when not tracking

RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data.

$GPRMC,hhmmss.dd,S,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,s.s,h.h,ddmmyy,<CR><LF>

hhmmss.dd	**UTC time + 8 Hours(If over 24 ,day will be increase 1 day)** **hh = hours** **mm = minutes** **ss = seconds** dd = decimal part of seconds
S	**Status indicator** **A = valid** V = invalid
xxmm.dddd	**Latitude** **xx = degrees** **mm = minutes** dddd = decimal part of minutes
<N|S>	**Either character N or character S, (N = North, S =** South)
yyymm.ddd d	**Longitude** **yyy = degrees** **mm = minutes** dddd = decimal part of minutes
<E|W>	Either character E or character W, E = East, W = West
s.s	Speed, knots.
h.h	Heading
ddmmyy	**Date** **dd – date** **mm = month** yy = year

VTG – Course Over Ground and Ground Speed

Course and speed

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

h.h	Heading
T	Degrees (heading units).
m.m	Magnetic heading. This value is available if magnetic model data has been stored to the flash memory (available since firmware rev. 1.08)
M	Degrees. Magnetic heading units.
s.s	Speed, knots.
N	Knots (Speed unit)
s.s	Speed, km/h.
K	km/h (Speed units).
M	Antenna State Y = connect N = No connect S = Short P = Power Off

ZDA – Time and Date

Outputs the current UTC time and date. Unlike other messages, the time outputted by this message is bound to CT5550's internal realtime clock (RTC) and thus it is updated even when navigation fix is unavailable. The RTC time is maintained also while the module is in sleep mode.

$GPZDA,hhmmss.dd,ddmmyyyy

hhmmss.dd	UTC time in hours, minutes, seconds and fractions of a second.
ddmmyyyy	UTC data in day-month-year format

PFST,FOM – Position figure of merit

Figure of merit (FOM) value for the position fix. Indicates the accuracy of the position in meters. The FOM value cannot be calculated before at least one fix has been made with more than four observations (five satellites, or four satellites and an altitude aid); before that a value of "–1" is reported, indicating that FOM is not available yet. After this the FOM value is always available. The only exception being the altitude aiding modes, when a fix has been calculated using three satellites.

*$PFST,FOM,n*hh<CR><LF>*

N	Position FOM value, i.e. the position accuracy in meters.

PFST,PPS – PPS signal

The pulse per second message. Indicates the parameters of the PPS pulse that will shortly be outputted. Outputs the current GPS time and timing correction term for the coming PPS pulse.

*$PFST,PPS,wwww,tttttt,n,xxxx*hh <CR><LF>*

wwww	GPS Week (i.e. number of full weeks elapsed since midnight 5-6 January 1980).
tttttt	Time of Week (seconds from the beginning of the current GPS week).
n	Number of satellites used when calculating the solution.
xxxx	Short-time pulse offset of the physical PPS pulse signal (units of 0.01 ns, in range of approx. -15.3 .. 15.3 ns). The correct pulse time can be calculated by subtracting this offset from the physical PPS pulse instant.