PCM-3292

PC/104 GPS Module

Users Manual

Contents

Major Specifications

Satellite Tracking		12 Parallel channels
RF input	Center frequency	1575.42MHz L1 band, C/A code
	Characteristics impedanc	50 ohm
	Signal sensitivity	-145 dBm
Positioning system	Default	WGS-84
	Software Selectable	All major coordinate systems
Positioning accuracy	Position	10 m CEP (50%)
	Velocity	0.2m/s (50%)
Follow-up performance	Acceleration	4G
Navigation Update Rate		Default 1 second
Operation Temperature		－40˚C to 85˚C
Storage Temperature		－40˚C to 95˚C
Operating voltage		+5V±5%, ripples within 50mVp-p
Antenna supply		3.3V
Antenna		External, active antenna
Power drain		160mA (Active antenna power not included)

Communication Specification

Communication method	Start-stop synchronization
Transfer rate input/output	2400/4800(Default)/9600/19200 /115200bps
Logic levels	TTL compatible
Communication format	NMEA-0183
Default Output Message.	GGA, GSA, GSV, RMC, VTG
Time mark pulse output :	1 PPS
Weight:	less 110 g
Dimensions:	95.9 ×90.2 ×28.6 mm

1.0 Connectors Defined

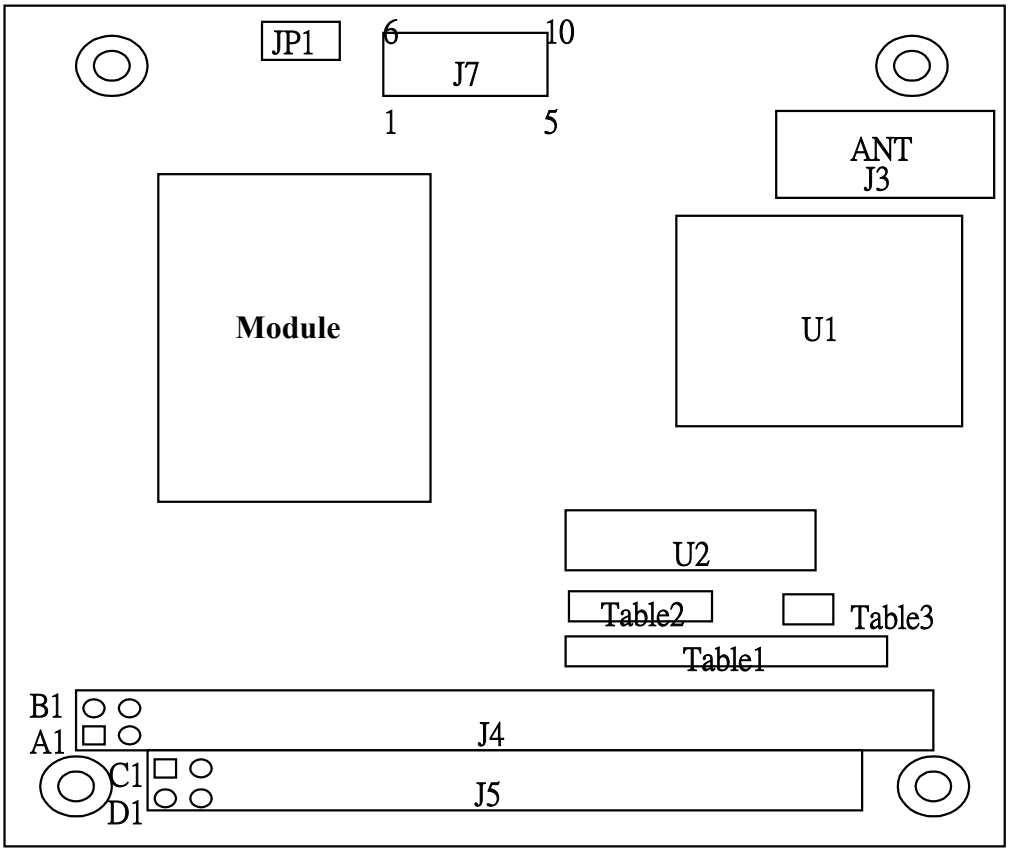


Table 1

PIN No	PIN Name	PIN No	PIN Name	PIN No	PIN Name
JP8	**IRQ3**	**JP13**	**IRQ3**	**JP18**	**IRQ11**
JP9	**IRQ4**	**JP14**	**IRQ4**	**JP19**	**IRQ12**
JP11	**IRQ5**	**JP16**	**IRQ7**	**JP20**	**IRQ14**
JP12	**IRQ7**	**JP17**	**IRQ10**	**JP21**	**IRQ15**

Table 2

PIN No	PIN Name	PIN No	PIN Name	PIN No	PIN Name
JP4	**COM1**	**JP5**	**COM2**	**JP6**	**COM3**
JP7	**COM4**				

Table 3

PIN No	PIN Name	PIN No	PIN Name
JP10	**External Interrupt Setting**	**JP15**	**IRQ5**

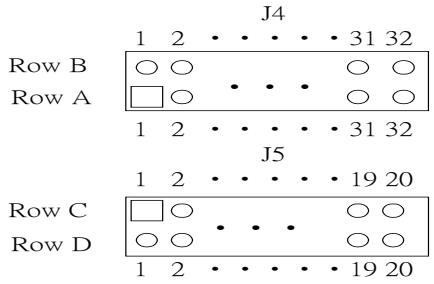
JP1

PIN No	PIN Name
JP1	**Time Mark Output Setting**

J7

PIN No	PIN Name	PIN No	PIN Name
1	**NC**	**2**	**NC**
3	**NC**	**4**	**NC**
5	**GND (Power)**	**6**	**NC**
7	**NC**	**8**	**NC**
9	**Time Mark Pulse (1PPS)(I)**	**10**	**VCC (Power)**

PC/104 connectors (J4,J5)



PC/104 connectors				
PIN No	Signal (J4) Row A	Row B	Signal (J5) Row C	Row D
1	**IOCHCHK***	**0V**	**0V**	**0V**
2	**SD7**	**RESET**	**SBHE***	**MEMCS16***
3	**SD6**	**+5V**	**LA23**	**IOCS16***
4	**SD5**	**IRQ9**	**LA22**	**IRQ10**
5	**SD4**	**-5V**	**LA21**	**IRQ11**
6	**SD3**	**DRQ2**	**LA20**	**IRQ12**
7	**SD2**	**-12V**	**LA19**	**IRQ15**
8	**SD1**	**ENDXFR***	**LA18**	**IRQ14**
9	**SD0**	**+12**	**LA17**	**DACK0***
10	**IOCHRDY**	**(KEY)**	**MEMR***	**DRQ0**
11	**AEN**	**SMEMW***	**MEMW***	**DACK5***
12	**SA19**	**SMEMR***	**SD8**	**DRQ5**
13	**SA18**	**IOW***	**SD9**	**DACK6***
14	**SA17**	**IOR***	**SD10**	**DRQ6**
15	**SA16**	**DACK3***	**SD11**	**DACK7***
16	**SA15**	**DRQ3**	**SD12**	**DRQ7**
17	**SA14**	**DACK1***	**SD13**	**+5V**
18	**SA13**	**DRQ1**	**SD14**	**MASTER***
19	**SA12**	**REFRESH***	**SD15**	**0V**
20	**SA11**	**SYSCLK**	**(KEY)**	**0V**
21	**SA10**	**IRQ7**	**—**	**—**
22	**SA9**	**IRQ6**	**—**	**—**
23	**SA8**	**IRQ5**	**—**	**—**
24	**SA7**	**IRQ4**	**—**	**—**
25	**SA6**	**IRQ3**	**—**	**—**

26	**SA5**	**DACK2***	**—**	**—**
27	**SA4**	**TC**	**—**	**—**
28	**SA3**	**BALE**	**—**	**—**
29	**SA2**	**+5V**	**—**	**—**
30	**SA1**	**OSC**	**—**	**—**
31	**SA0**	**0V**	**—**	**—**
32	**0V**	**0V**	**—**	**—**

***Low active**

2.0 Jumper Settings

Serial Port Select

Jump No	Define	Note
JP4	**COM1**	**Short :Enable ; Open :Disable**
JP5	**COM2**	**Short :Enable ; Open :Disable**
JP6	**COM3**	**Short :Enable ; Open :Disable**
JP7	**COM4**	**Short :Enable ; Open :Disable**

Jump No	Define	Note
JP8	**IRQ3**	**Short :Enable ; Open :Disable**
JP9	**IRQ4**	**Short :Enable ; Open :Disable**
JP11	**IRQ5**	**Short :Enable ; Open :Disable**
JP12	**IRQ7**	**Short :Enable ; Open :Disable**

Interrupt Port Select

The default setting is COM3, IRQ5 Enable.

Enhance

Jump No	Define	Note
JP13	**IRQ3**	**Short :Enable ; Open :Disable**
JP14	**IRQ4**	**Short :Enable ; Open :Disable**
JP15	**IRQ5**	**Short :Enable ; Open :Disable**
JP16	**IRQ7**	**Short :Enable ; Open :Disable**
JP17	**IRQ10**	**Short :Enable ; Open :Disable**
JP18	**IRQ11**	**Short :Enable ; Open :Disable**
JP19	**IRQ12**	**Short :Enable ; Open :Disable**
JP20	**IRQ14**	**Short :Enable ; Open :Disable**
JP21	**IRQ15**	**Short :Enable ; Open :Disable**

Note: If you want to add on Enhance part, please setting the jump of JP10 at enable before setting JP13~JP21.

3.0 TMARK

The TMARK pulse waveform is shown in Figure 1. This signal is a positive logic , buffered CMOS level output pulse that transitions from a logic "low" condition to a logic "high" at a 1 Hz rate. The TMARK output pulse rise times typically less than 2 nanoseconds and the pulse duration is typically 25milliseconds.

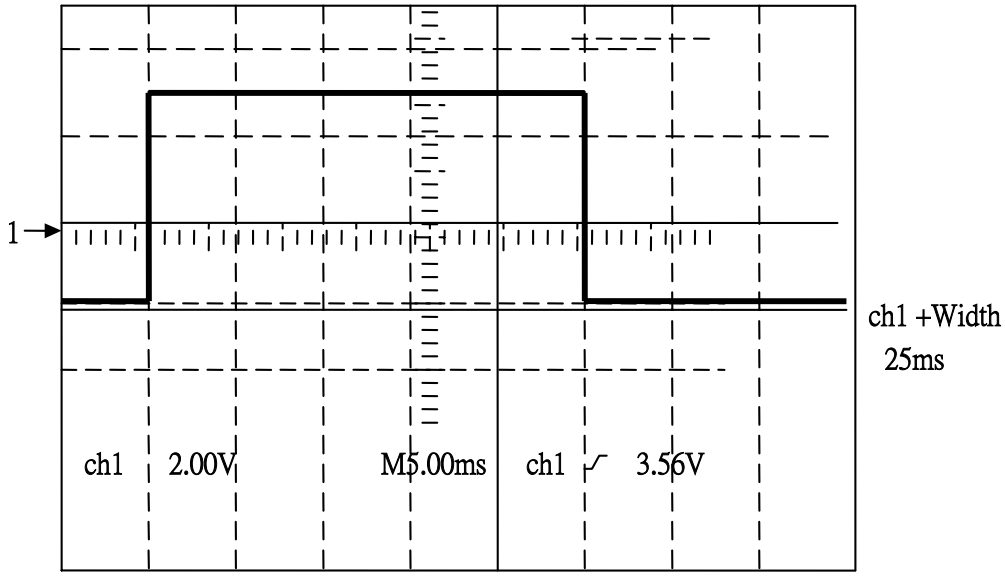
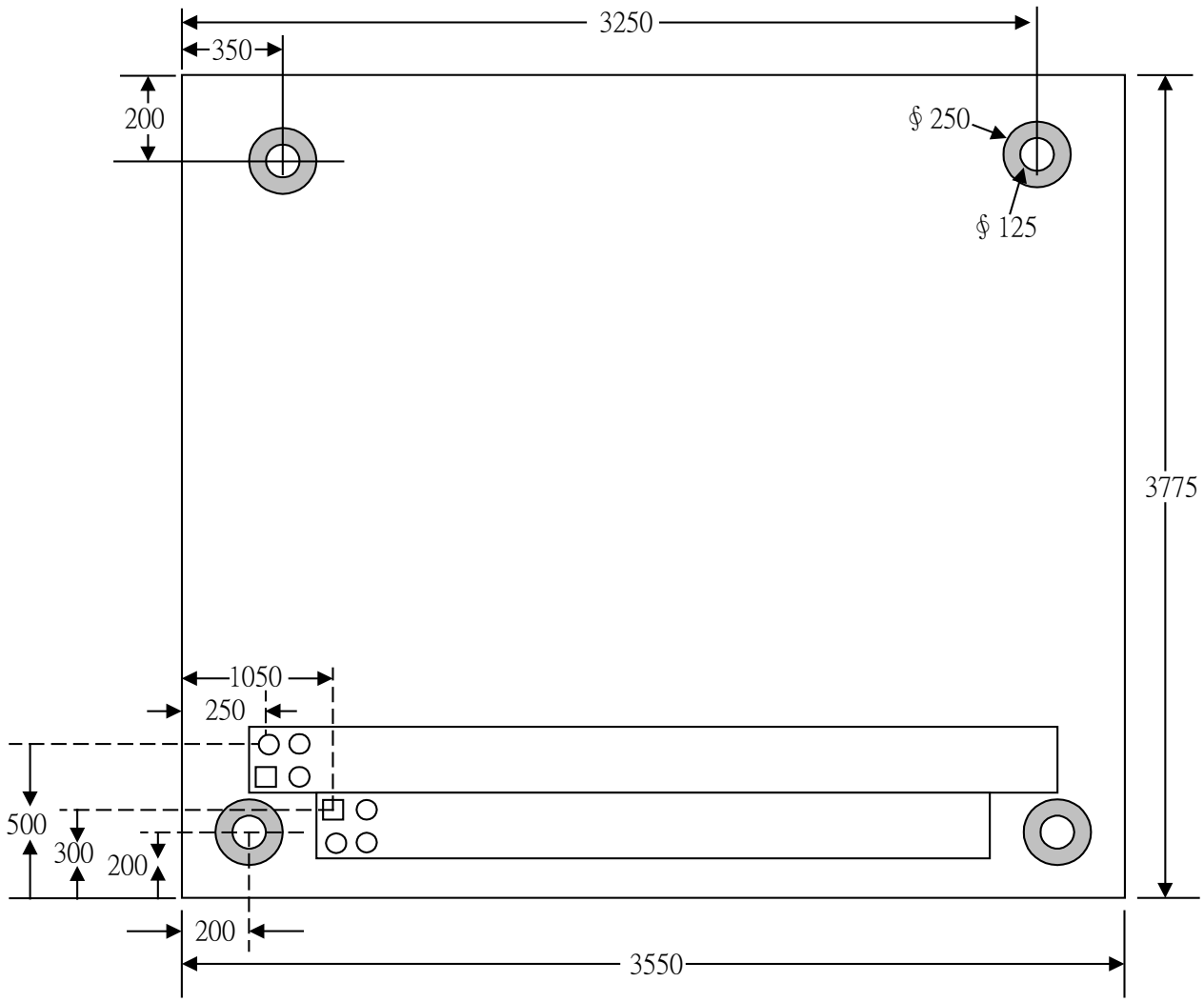
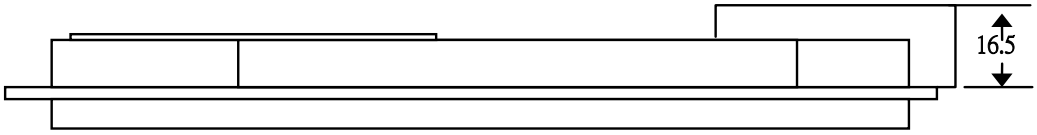


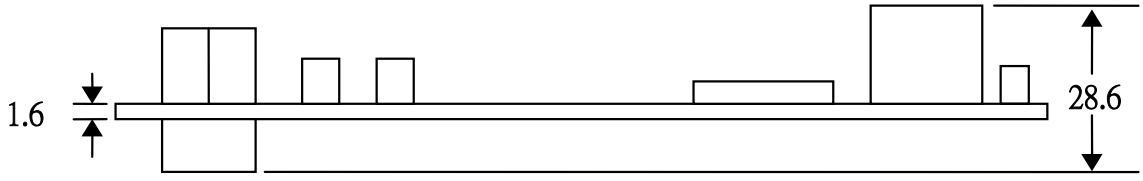
Figure 1. GPS Receiver Time Mark Pulse Waveform.

4.0 Module Dimensions



Unit:mil





Unit : mm

5.0 NMEA Protocol

NMEA Commands

This chapter describes the supported NMEA commands.

5.1 General NMEA Commands

The following sections introduces the general-purpose NMEA commands the basic PCM3292 operations.

5.1.1 START – Start Navigation

Commands PCM3292 to start navigation. The command has no effect if called while PCM3292 is already navigating. After the start command has been given, it takes some time for PCM3292 to acquire satellites, gather data from the signal and calculate a 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.

6.1.2 STOP – Stop Navigation

Commands PCM3292 to stop navigating and enter the idle state. While in idle state, the PCM3292 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.

5.1.2 PWRDOWN – PCM3292 Sleep Mode

Commands PCM3292 to sleep mode.

Using the sleep mode is recommended when navigation isn't needed. PCM3292 consumes remarkably little power in the sleep mode and still re-acquires the navigation fix quickly after waking up.

PCM3292 wakes up from the sleep mode when the timeout has expired. 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>

5.1.3 SW – PCM3292 Software Revision

Shows the firmware revision of the PCM3292 module.

5.2 Configuration Commands

The following sections introduce the commands used for controlling the behavior of PCM3292.

5.2.1 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>

<table>
<tr><td><mask></td><td>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:

<table>
<tr><th>Message</th><th>bit</th></tr>
<tr><td>GSV</td><td>0x0001</td></tr>
<tr><td>GSA</td><td>0x0002</td></tr>
<tr><td>ZDA</td><td>0x0004</td></tr>
<tr><td>PPS</td><td>0x0010</td></tr>
<tr><td>FOM</td><td>0x0020</td></tr>
<tr><td>Reserved*</td><td>0x0040</td></tr>
<tr><td>GLL</td><td>0x1000</td></tr>
<tr><td>GGA</td><td>0x2000</td></tr>
<tr><td>VTG</td><td>0x4000</td></tr>
<tr><td>RMC</td><td>0x8000</td></tr>
</table>

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.</td></tr>
<tr><td><speed></td><td>Communication speed. Either 1200, 2400, 4800, 9600,19200, 57600 or 115200.</td></tr>
</table>

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 PCM3292 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.

5.2.2 AUTOSTART – Set Autostart Mode

Defines if PCM3292 automatically starts navigation when power is turned on or PCM3292 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 PCM3292 doesn't save parameters in non-volatile memory, AUTOSTART command has no effect in PCM3292.

5.2.3 CONF – Set Configuration Parameters

This command is used for setting the configuration parameters of PCM3292.

$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.

5.2.4 DATUM – Set Local Coordinate System

Selects the local coordinate system. After this command, the PCM3292 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.

5.2.5 FIXRATE – Set Fixrate

Defines how often PCM3292 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.

5.2.6 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.

5.2.7 STORE – Store Current Parameter Set

Stores the current parameter set in PCM3292'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: PCM3292 doesn't store configuration parameters in flash memory, and thus this command doesn't have any effects on the PCM3292 modules. For PCM3292, the preferred way is to set parameters each time, when the module is reset or switched on.

5.2.8 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.

5.2.9 RESTORE – Restores Default Parameter Set

Restores factory default parameter set.
$PFST,RESTORE

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

NOTE: PCM3292 doesn't store configuration parameters to flash memory, and thus this command is irrelevant with PCM3292 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.

5.3 PPS Mode Commands

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

5.3.1 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 PCM3292 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. PCM3292 doesn't output PPS pulse. 1 = PPS survey mode. PCM3292 outputs PPS pulse. 2 = PPS static mode. PCM3292 outputs PPS pulse. 3 = PPS roving mode. PCM3292 outputs PPS pulse.

5.3.2 PPSPOS – PPS Static Mode Antenna Position

Sets the antenna coordinates for PPS static mode. The PCM3292 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.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.

5.3.3 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).

5.3.4 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.

5.3.5 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

5.3.6 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)

5.4 Navigation Aiding Commands

The following sections introduce the commands that provide the PCM3292 receiver with additional data, which may be helpful for starting and during navigations.

5.4.1 INITAID – Initial Position And Time Aiding

Gives the PCM3292 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 PCM3292 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).

5.4.2 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*

5.4.3 SETLIMIT – Set Limits For Altitude, Velocity And Acceleration

Sets the upper limits for altitude, velocity and acceleration parameters that the PCM3292 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 PCM3292 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 <acceleration>, or <velocity> and <acceleration> parameters may be omitted. If all the three parameters are omitted, the command displays the current maximum limit values.

5.5 Logging Commands

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

5.5.1 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.

5.5.2 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.

5.5.3 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.

5.5.4 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,<L LOGNUM> OGNUM>

<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.

5.5.5LOGMODE – 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.

5.5.6 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.

5.5.7 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*

5.5.8 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.

5.5.9 LOGSTOP – Stop Logging

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.

6.0 NMEA Message

This chapter describes the supported NMEA output messages.

6.1 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).

6.2 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,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

6.3 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 PCM3292. 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

6.4 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,d.d,<E|W>,M*hh<CR><LF>*

hhmmss.dd	UTC time 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
d.d	Magnetic variation. This value is available if magnetic model data has been stored to the flash memory (available since firmware rev. 1.08)
<E|W>	Declination. Either character E or character W, E = East, W = West
M	Mode indicator A=autonomous N=data not valid

6.5 VTG – Course Over Ground And Ground Speed

Course and speed

*$GPVTG,h.h,T,m.m,M,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	Mode indicator A=autonomous N=data not valid

7.0 Appendix: Datum IDS

Table below defines all coordinate systems that PCM3292 supports with appropriate datum ids .

Id	Description
-1	WGS84
000	Ethiopian+Sudan
001	Burkina Faso
002	Cameroon
003	Ethiopia
004	Mali
005	Senegal
006	Sudan
007	Somalia
008	Botswana
009	Burundi
010	Lesotho
011	Malawi
012	Swaziland
013	Zaire
014	Zambia
015	Zimbabwe
016	Kenya+Tanzania
017	Kenya
018	Tanzania
019	Djibouti
020	Guinea-Bissau
021	South Africa
022	Tunisia
023	Guinea-Bissau
024	Egypt
025	Tunisia
026	Ghana
027	Liberia
028	Eritrea
029	Morocco
030	Cameroon
031	Nigeria
032	Gabon
033	Algeria
Id	**Description**
034	Old Egypt
035	Burkina Faso and Niger
036	Congo
037	Namibia
038	Sierra Leone
039	Algeria
040	Bahrain Island
041	Saudi Arabia
042	Sumatra (Indonesia)
043	Iran
044	Hong Kong
045	Taiwan
046	Bangladesh
047	India and Nepal
048	Thailand
049	Vietnam
050	Con Son Island
051	Thailand(1997)
052	Indonesia
053	Sri Lanka
054	West Malaysia ,Singapore
055	Korean Geodetic System
056	Masirah Island
057	United Arab Emirates
058	Saudi Arabia
059	Oman
060	Qatar
061	Singapore
062	East Malaysia
063	Japan, Korea
064	Japan
065	Okinawa
066	South Korea
067	Australia 1966
068	Australia 1984
Id	**Description**
069	Estonia
070	Europe 1950
071	Westerm Europe(1950)
072	Cyprus
073	England, Channel Islands
074	England, Ireland
075	Greece
076	Italy(Sardinia)
077	Italy(Sicily)
078	Malta
079	Finland and Norway
080	Portugal and Spain
081	European 1979
082	Iceland
083	Ireland
084	England, Isle of Man,
085	England
086	England, Wales
087	Scotland, Shetland Islands
088	Wales
089	Sardinia
090	Hungary
091	Poland
092	Czechoslovakia
093	Latvia
094	Kazakhstan
095	Albania
096	Romania
097	Czechoslovakia
098	Florida and Bahamas
099	CONUS
100	Western USA
101	Eastern USA
102	Alaska(excluding Aleutian Islands)
103	Aleutian Isle (East of 180°W)
104	Aleutian Isle (West of 180° W)
105	Bahamas
106	San Salvador Island
107	Canada Mean Solution
108	Alberta and British Columbia
109	Eastern Canada
110	Manitoba and Ontario
111	NW Territories and Saskatchewan
112	Yukon
113	Canal Zone
114	Caribbean
115	Central America
116	Cuba
117	Greenland (Hayes Peninsula)
118	Mexico

119	Alaska (excluding Aleutian Islands)
120	Aleutian Islands
121	Canada
122	CONUS
123	Hawaii
124	Mexico and Central America
125	Colombia
126	Argentina
127	Paraguay
128	Brazil
129	Bolivia, Chile, Colombia, Ecuador, Guyana, Peru and Venezuela
130	Bolivia
131	Northern Chile
132	Southern Chile
133	Colombia
134	Ecuador
135	Guyana
136	Peru
137	Venezuela
138	Southern Chile
139	Mean Solution
140	Argentina
141	Bolivia
142	Brazil
143	Chile
144	Colombia
145	Ecuador (excluding Galapagos Islands)
146	Baltra, Galapagos Islands
147	Guyana
148	Paraguay
149	Peru
150	Trinidad and Tobago
151	Venezuela
152	Suriname
153	Antigua, Leeward Islands
154	Ascencion Island
155	St. Helena Island
156	Bermuda Island
157	Deception Island, Antarctica
158	Nevis, St. Kitts, Leeward Island
159	Pico, Sao Jorge
160	South Georgia Island

161	Cayman Brac Island
162	Montserrat, Leeward Islands
163	Trinidad and Tobago
164	Corvo and Flores Islands
165	Cayman Island
166	Porto Santo and Madeira Islands
167	Puerto Rico and Virgin Islands
168	South Greenland
169	Sao Miguel
170	East Falkland Island
171	Salvage Islands
172	Tristan da Cunha
173	Cocos Islands
174	Republic of Maldives
175	Diego Garcia
176	Kerguelen Island
177	Mahe Island
178	Mascarence Island
179	Ameriacn Samoa Island
180	Iwo Jima
181	Tern Island
182	Marcus Island
183	Efate and Erromango Islands
184	Phoenix Islands
185	Chatham Island New Zealand
186	Gizo Island
187	Easter Island
188	New Zealand
189	Guam
190	Guadalcanal Island
191	Johnston Island
192	Caroline Island, Fed. States of Micronesia
193	Philippines
194	Mindanao Island
195	Midway Islands
196	old Hawaiian
197	Hawaii
198	Kauai
199	Maui
200	Oahu
201	Pitcairn Island
202	Espirito Santo Island

203	Viti Levu Island (Fiji Islands)
204	Marshall Isalands
205	Wake Atoll
206	Bankga and Belitung Islands (Indonesia0
207	Camp McMurdo Area, Antarctica
208	Iraq, Israel, Jordan, Lebanon, S. Arabia and Syria
209	Kalimantan (Indonesia)
210	Afghanistan
211	former Yugoslavia
212	Pakistan
213	Russia
214	Madagascar
215	Tunisia/Algeria
216	Tunisia/Algeria
217	Uruguay
300	Kartta Koordinaatisto Jarjestelma, Finland

8.0 Appendix Agenda

The core engine of PCM-3292 is CT5510.
The design of CT5510 emphasizes on compact overall physical dimension and fast fix time. To accomplish these traits, CT5510 was designed not to carry a capacitor or backup battery onboard. This application notes will demonstrate on ways to efficiently manage the power consumption of CT5510 and achieve fast start/fix time.

Power saving methods

1. **Using the "Sleep" mode and PWRDOWN command**
2. **Using the INITAID (Initial position and time aiding) command**

Advantages:

8.1.1PWRDOWN command procedure:

Using the sleep mode is recommended when navigation isn't needed, since CT5510 consumes remarkably little power in the sleep mode and still re-acquires the navigation fix quickly after waking up.
CT5510 consume between 70 μA to 100 μA during sleep mode, comparing to 50mA in navigation mode.

INITAID command procedure:

Setting this information before starting navigating with the $PFST,START command reduces the time required for finding the satellites and receiving the first valid navigation fix. Therefore, CT5510 achieves fast starting time that's comparable to modules that have battery backup units.
(Note: comparing to the PWRDOWN command procedure, INITAID command requires the complete shut down of power supply, including the antenna.)

PWRDOWN – CT5510 to Sleep Mode

Commands CT5510 to sleep mode.

CT5510 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 automatically be restarted after waking up from the sleep mode.

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

or

$PFST,PWRDOWN

<hours>	How many hours to sleep
<minutes>	How many minutes to sleep
<seconds>	How many seconds to sleep

Examples:

$PFST,PWRDOWN,1,30,15<CR><LF>

Sleep for 1h 30min 15 sec or until GPIO 11 pin is toggled.

$PFST,PWRDOWN,0,0,30<CR><LF>

Sleep for 30 seconds or until GPIO 11 pin is toggled.

$PFST,PWRDOWN<CR><LF>

Sleep until GPIO 11 pin is toggled.

The following section introduces commands for providing the CT5510 receiver with additional data that will be helpful when starting navigation and during navigation.

INITAID – Initial position and time aiding

Gives the CT5510 module the current position and time information for aiding the navigation startup.

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 first two parameters. The altitude information is not critical and can be set to zero (i.e. mean sea level) if not known.

NOTE: Even after INITAID is issued, the CT5510 module continues to report the navigation data of the previous actual navigation fix until a new fix is acquired.

$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).

Examples:

$PFST,INITAID,131500.78,100102,6016.3075,N,2458.3817,E,40<CR><LF>

Sets the initial position and time as follows:

Time = 13:15:00.78 (UTC)

Date = 10 10-Jan Jan-2002

Latitude = N60 16.3075

Longitude = E24 58.3817

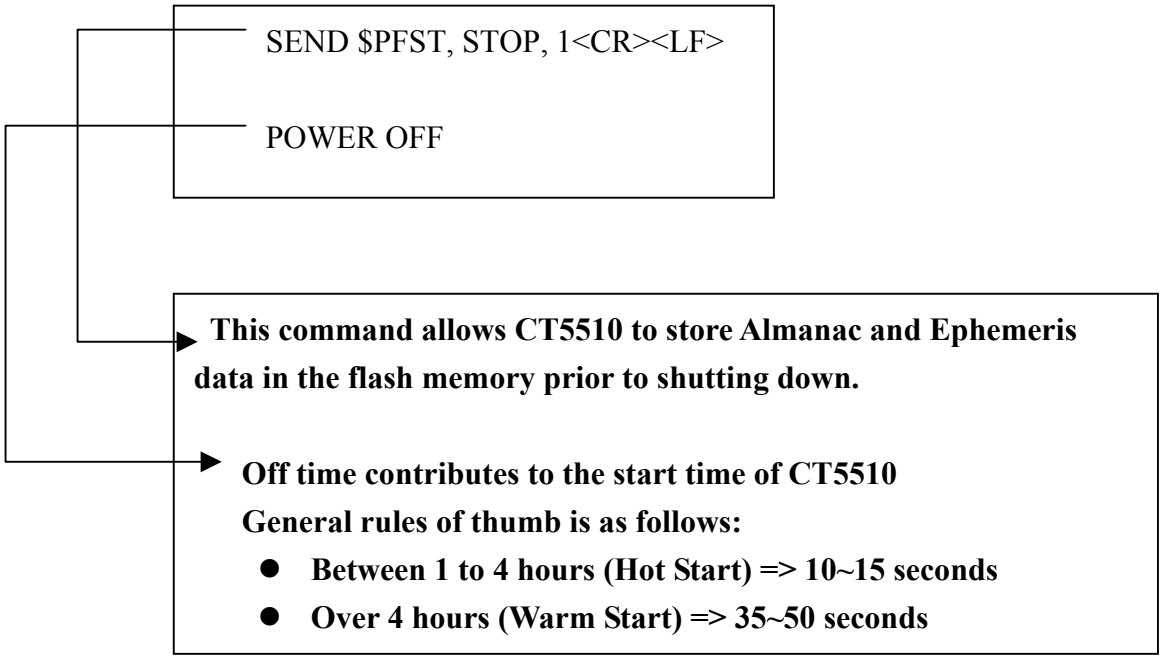
Altitude = 40 meters above the sea level

$PFST,INITAID,131500.78,100102<CR><LF>

Sets the initial time only.

NOTE: This command has to be given before starting navigating. If AUTOSTART is active, navigation has to be stopped after switching on the power, then issue the INITAID command and then START the navigation again. The AUTOSTART is always set in CT5510 so this procedure must always be followed after power-up with CT5510.

Sample procedure:



1. SEND $PFST,STOP, 0<CR><LF>
2. SEND $PFST,INITAID,<current time>,<current date><CR><LF>
3. SEND $PFST,START<CR><LF>

9.0 Overview

The core engine of PCM-3292 is CT5510.
The data logging capability of CT5510 enables the storage of time and location information in the built-in flash memory, while the module is navigating.

When logging, the receiver periodically stores new "log points", which consist of the current navigation information. There may be several different logs in the module's memory at the same time, so that different routes can be stored. The user may upload the logged data from the module to a PC or other host devices for observation and processing.

Users may choose how much information is stored along each point, affecting the number of log points stored in the available memory. Each log point may contain the following navigation information or a subset of them:

- Latitude+longitude coordinates with a resolution of 0.0000001 degrees (about 1 cm on earth surface).
- Altitude with a resolution of 1 meter.
- Time with a resolution of 1 second.
- Horizontal and vertical velocity with a resolution of 0.01 m/s, direction of movement with a resolution of 0.01 degrees.
- Fix quality information like the number of satellites used in a fix, 2D/3D fix indication, HDOP value with a resolution of 0.1 units.

User may also set various conditions for how often new data points are added to the log:

- Minimum and maximum time may elapse between logging points.
- Minimum and maximum distance the receiver may move between logging points.

Depending on the logging settings, between 14000 to 39000 log points can fit into the memory of a standard CT5510 module with 8Mbits of flash memory.

The logging capability is not available in CT5510 modules with 4Mbit flash memory.

10.0 QUICK START

This chapter describes the quick steps to start using the logging system.

During these steps, users may use either the NMEA protocol to communicate with the CT5510 module.

Step 1: Logging settings

The logging filter settings define how often new points are added to the log and how much information is saved at each log point.

The default settings are that a new point is added to the log if the receiver has moved at least 15 meters AND at least 5 seconds have elapsed since the previous point was added to the log. According to the default settings, CT5510 stores time and latitude & longitude coordinates at each point.

Step 2: Logging start mode

By default, logging is disabled.

To activate logging, set the logging start mode to "3". In this mode, a new log is created and logging is started each time when navigation is started. The old logs are stored in the memory.

Using NMEA protocol

The logging start mode is set to "3" with the following command:

$PFST,LOGMODE,3<CR><LF>

NOTES:

- When using NMEA, navigation has to be stopped before setting the logging start mode.
- In the logging start mode "3" , logging is started each time when navigation is started. To disable logging, the start mode has to be set to zero (see step 6 below)
- The logging settings are stored in flash memory and can thus persist resetting the module and switching off the power.

Step 3: Start navigation

When the logging settings have been configured as described in the previous sections, logging starts automatically as navigation is started.

Navigation is started by:

- Giving the NMEA command *$PFST,START<CR><LF>*
- Resetting the CT5510 module (assuming that the auto-start after power-up is enabled [on by default]).

Step 4: Downloading logged data

After the CT5510 has been navigating and logged, the logged data can be downloaded to PC in the following ways:

Using NMEA protocol

1. Stop navigation to finish the logging session.

2. Read the number of logs that are in CT5510's memory, as new logs are created each time when logging is started with the given settings. The number of logs can be displayed with the *$PFST,LOGNUM* command, e.g. *$PFST,LOGNUM<CR><LF>*
   The system responds with a message containing the number of logs,
   e.g. *$PFST,LOGNUM,1*32*
   This shows that there is one log currently in the memory.

3. The logged data can be outputted using the command "*$PFST,LOGGET,<N>*", where *<N>* is the log number of interest. This command outputs the logged data in standard NMEA format.

   For example, the following command will display all data in log 1:
   $PFST,LOGGET,1<CR><LF>

NOTE: If there are plenty of data in the log, it may take some time to output all the data as NMEA messages. To speed-up the operation, it is advised to increase the NMEA port speed or disable some of the NMEA messages.

Step 5: Erasing logs

CT5510's logging system doesn't automatically delete old log data but always creates new logs or appends data to the previous log. While it's often advantageous to have several logging sessions in memory at the same time, eventually the memory will be filled up if old log data isn't erased.

Using NMEA protocol

The log data is deleted with the following command:

$PFST,LOGCLEAR<CR><LF>

Step 6: Disable logging

When the logging system is configured as described above, a new log is created each time when navigation is started. To stop using the logging capability, the logging can be disabled by setting the start mode to zero.

Using NMEA protocol

The logging start mode is set to zero with the following command:

$PFST,LOGMODE,0<CR><LF>

Summary

This chapter describes the quick steps for using the CT5510 logging system.

1. [No action needed at first step if the default logging settings are ok.]

2. Set logging start mode to "3",
   NMEA : *$PFST,LOGMODE,3<CR><LF>*

3. Start navigation,
   $PFST,START<CR><LF>

4. Download logged data,
   NMEA : *$PFST,LOGGET,1<CR><LF>*

5. Erase log data,
   NMEA : *$PFST,LOGCLEAR<CR><LF>*

6. Disable logging,

NMEA : *$PFST,LOGMODE,0<CR><LF>*

11.0 LOGGING SETTINGS

This chapter describes the settings that affect the logging system. These settings can be configured by using the NMEA protocol.

The log settings are stored in flash memory and thus they will stay valid until the user reconfigures them.

Logging filters

Logging filters control how often and the amount of time that is stored into the log. Users may affect the amount of data, and span of time or distance that can fit into the available memory by using these settings.

Position and interval limits

Users may define the minimum and maximum time intervals, as well as the movement limits between the storing points:

Minimum interval time (seconds): A new point won't be added to a log if the time elapsed since the previous log point is less than the minimum interval time set. An exception is that if the maximum movement limit is exceeded, then a new point is logged.

Maximum interval time (seconds): If the time elapsed since the previous log point is longer than the maximum interval time set, a new point is then logged. The maximum limit is ignored if it's set to zero.

Minimum movement (meters): A new point won't be added to a log if the distance travelled 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.

Maximum movement (meters): If the distance travelled from the previous log point is equal to or more than the maximum value set, a new point is logged. If the maximum value is set to zero, the maximum limit isn't used.

In pseudo-code, the limit rules are evaluated as follows:

```
if ((time >= min_interval) and (distance >= min_move)) then
        log;
else if ((time >= max_interval) or (distance >= max_move))
then
        log;
else
        dont_log;
```

Default settings for the filter limit are as follows:

min.interval = 5
max.interval = 0 (max. limit not used)
min.move = 15
max.move = 0 (max. limit not used)

According to these default settings, a new point is logged when at least 5 seconds has elapsed from the previous point and the distance from the previous point is at least 15 meters.

Example:
Assume that the limit settings are defined as follows:

min.interval = 5
max.interval = 60
min.move = 15
max.move = 100

In this case a new point is logged when at least 5 seconds has elapsed from the previous point and the distance from the previous point is at least 15 meters. A new point is also logged when at least 60 seconds has elapsed since the previous point or the distance from the previous point is 100 meters or more.

Logging data level

Logging data level controls how much information is stored at each log point. The data level directly affects how much space each log point requires, and consequently how many log points can fit in memory.

Data-Level	Size per point (16-bit words)	Information stored per point
1	4	Latitude & Longitude coordinates
2	6	Lat&Lon + GPS Time
3	7	Lat&Lon + Time + Altitude
4	8	Lat&Lon + Time + Alt + Fix information (i.e. number of satellites used for fix, 2D/3D fix indicator, HDOP value)
5	10	Lat&Lon + Time + Alt + FixInfo +Horizontal Velocity + Direction of movement
6	11	Lat&Lon + Time + Alt + FixInfo + HVel +Dir + Vertical velocity

Configuring the filter settings

Using NMEA: Filter settings are configured with the command *$PFST,LOGSETTING.*

Start modes

Logging start mode controls if and how CT5510 should start logging when GPS navigation is started. Depending on the start mode, the system may create a new log each time when logging is started or continue using the old log so that new log points are appended after the old points.

The start mode also controls if logging starts only once, at the next time when navigation starts, or continuously so that logging always starts when navigation starts (until again disabled by user).

Available start modes are described in the following table:

Start Mode	Description
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 the consecutive navigation starts after that logging won't be used.
2	The previous log is continued once when navigation is started for the next time. On the consecutive navigation starts after that logging won't be used.
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.

Using NMEA, logging start mode is configured with the command *$PFST,LOGMODE.*

dLog name

The system stores a log name which has a user-given log name text string and the index number of the log. The default log name is “Log”.

Using NMEA, log names can be configured with the command *$PFST,LOGNAME.*

12.0 DOWNLOADING LOGGED DATA TO HOST

The logged data can be downloaded to the host device using one of these alternative approaches:

- Using the NMEA protocol. In this approach, the CT5510 outputs the logged data to the NMEA serial port as standard NMEA messages.
- Using the iTalk protocol. The binary iTalk protocol offers an efficient way for downloading the logged data to applications.

Downloading log-data using NMEA

CT5510 can output the log-data through the NMEA serial port in standard NMEA message format. The users may then capture and parse the outputted messages from the serial port by his/her own means.

Depending on the data level settings that were used when logging the data, it may be possible that, not all the data required for generating complete NMEA messages are available; in such case, the missing data fields are replaced with zeros.

The output is activated with the NMEA command *$PFST,LOGGET*

13.0 NMEA PROTOCOL SUPPORT

CT5510 has a set of NMEA commands that can be used to control the logging system. On the table below is a summary of the available NMEA logging commands.

Command	Description
LOGCLEAR	Erase log data from CT5510's memory
LOGFREE	Calculate how much space is left for log data
LOGGET	Output logged data as standard NMEA messages
LOGINFO	Show log information
LOGMODE	Set logging start mode
LOGNAME	Set log name
LOGNUM	Show how many logs are currently stored in the memory
LOGSETTING	Sets the logging settings
LOGSTOP	Stop logging without stopping navigation

14.0 USAGE CONSIDERATIONS

Sleep mode

Sleep mode (power-down mode) doesn't affect the logging system. If logging is active when going to sleep mode, logging is resumed as the module wakes up and first valid fixes are received.

Power-down

The CT5510's logging system can sustain sudden power losses without major affects; however, it's suggested to stop navigation properly prior to switching off the power or otherwise some of the most recently logged data may be lost and as CT5510's logging system performs automatic recovery checks due to the power loss, the next power-up time may be longer.

It's also possible that CT5510's logging system may occasionally unable to continue the previous log (logging start modes 2 and 4) after sudden power-losses. In such cases, the logging system creates a new log and continues using that one as usual.

Memory full

CT5510's logging system automatically ceases from logging shortly before the flash memory gets totally full. It's thus quite normal for the logging to stop while enough flash space for several dozen more logs seems to be available.

This early stopping is implemented to prevent problems with logging settings and book-keeping information due to the lack of available memory.