NMEA Command Reference

AT100 GPS-GPRS Telematics Module

This document describes the NMEA protocol commands and messages supported by the AT100 module.

Issue 3.0

October 2009

Astra Telematics Limited

1. GENERAL

The AT100 produces and interprets messages in accordance with the NMEA standard. Complete NMEA specification is available in "NMEA 0183, version 3.0". Standard is published by National Marine Electronics association,

http://www.nmea.org/0183.

This document describes the subsets of the standard which are supported by the AT100.

1.1 General Message Format

All NMEA message and command data consist of ASCII characters (from 20 – 127 decimal or from HEX 14 to HEX 7E). For further information see Section 6.1 (Table 3.) in NMEA 3.0.

1.2 Command syntax

The AT100 accepts a set of NMEA commands consisting of fields as follows:

$PARM,<command>,<parameter>,<parameter> .. ,<parameter>

The command line starts with field “$PARM”, followed by the command identifier and possible parameters separated by commas. Parameters may occasionally be omitted (NULL). In such case, these parameters are still separated with commas but contain no characters. No checksum is applied to commands. The command is acknowledged, by outputting the received command together with a checksum. All commands are described in more detail in chapter 2. Note that all commands are in capital letters.

Example:

$PARM,IGNM,0

Will be acknowledged by the AT100 with:

$PARM,IGNM,0*57

TIP: when entering NMEA commands, it is useful to stop the NMEA output (which otherwise will appear every second). Use the `$PARM,STOP` command and when finished, use the `$PARM,START` command to restart GPS navigation and NMEA output.

1.3 Message syntax

The AT100 NMEA messages consists of fields as follows:

```
$GP<message id>,<data field>,<data field>,,,
      ..*<checksum><CR><LF>
```

Message starts with field “$GP” followed by a message identifier field. Message data fields are separated by commas, and the message ends after the checksum field and carriage return <CR> and line feed <LF> control characters. An asterisk delimiter ‘*’ precedes the checksum field. Notice that data fields may be omitted (NULL). Such data fields contain no characters but are still separated by commas, for example:

```
$GPGGA,134158.48,6016.3072,N,02458.3788,E,1,08,1.2,,,,,,0000*1E
```

The above message contains 5 NULL data fields.

Data fields for AT100 supported messages are presented in section 3 of this document.

For further information, please see section 5.2 in NMEA 3.0 specification.

1.4 Message sequence

The figure below is an NMEA output example containing a start command, NMEA output messages and a stop command. Notice that in this example the synchronous output mode is disabled.

The first NMEA messages after the start command contain the information from the “last known good” fix. The last known good fix is stored to the flash memory of AT100 each time a “stop” command is given. Notice that if AT100’s power is switched off without giving a stop command, the last known good isn’t stored to flash memory and thus the position outputted at the first message may be empty or older than expected at the next start

The AT100 starts outputting a sequence of one or more GSV messages as soon as a GPS signals have been found. These sequences are sent at interval of approximately one second. Notice that at this stage the GSV messages contain only signal strength information, not yet azimuth or elevation. If synchronous output mode were enabled, a full NMEA message set would be output every second with coordinates of the last known good fix.

	$PARM,START,0*61
"Last known good". Note: ZDA outputs the current time	$GPZDA,085725.80,17012002,00,00*64 $GPGGA,085717.28,6016.3103,N,02458.3768,E,0,06,1.2,32.2,M,18.6,M,,*53 $GPGLL,6016.3103,N,02458.3768,E,085717.28,V,N*76 $GPVTG,346.22,T,,,0.12,N,0.2,K,N*4F $GPRMC,085717.287,V,6016.3103,N,02458.3768,E,0.12,346.22,170102,,,N*71 $GPGSA,A,1,04,07,09,11,21,26,1.7,1.2,1.2*3B $PARM,FOM,2*67
When a GPS signal is found, the GSV message sequences are sent once per second.	$GPGSV,3,1,09,04,00,000,41,05,00,000,46,07,00,000,48,09,00,000,47*75 $GPGSV,3,2,09,11,00,000,40,18,00,000,39,21,00,000,42,26,00,000,42*71 $GPGSV,3,3,09,28,00,000,41*4F $GPGSV,3,1,09,04,00,000,41,05,00,000,47,07,00,000,49,09,00,000,47*75 $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,43,26,00,000,43*7D $GPGSV,3,3,09,28,00,000,43*4D $GPGSV,3,1,09,04,00,000,41,05,00,000,47,07,00,000,49,09,00,000,48*7A $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,44,26,00,000,44*7D $GPGSV,3,3,09,28,00,000,44*4A $GPGSV,3,1,09,04,00,000,42,05,00,000,47,07,00,000,49,09,00,000,48*79 $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,43,26,00,000,44*7A $GPGSV,3,3,09,28,00,000,44*4A $GPGSV,3,1,09,04,00,000,41,05,00,000,47,07,00,000,49,09,00,000,48*7A $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,44,26,00,000,44*7D $GPGSV,3,3,09,28,00,000,45*4B $GPGSV,3,1,09,04,00,000,42,05,00,000,47,07,00,000,49,09,00,000,48*79 $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,44,26,00,000,44*7D $GPGSV,3,3,09,28,00,000,45*4B
1st fix.	$GPGSV,3,1,09,04,00,000,41,05,00,000,47,07,00,000,49,09,00,000,48*7A $GPGSV,3,2,09,11,00,000,42,18,00,000,40,21,00,000,43,26,00,000,44*7A $GPGSV,3,3,09,28,00,000,45*4B $GPZDA,085732.80,17012002,00,00*64 $GPGGA,085732.34,6016.3072,N,02458.3772,E,1,06,1.3,80.3,M,18.6,M,,*5D $GPGLL,6016.3072,N,02458.3772,E,085732.34,A,A*68 $GPVTG,337.34,T,,,0.27,N,0.5,K,A*40 $GPRMC,085732.348,A,6016.3072,N,02458.3772,E,0.27,337.34,170102,,,A*67 $GPGSA,A,3,05,07,18,21,26,28,2.2,1.3,1.7*30
2nd fix.	$PARM,FOM,13*57 $GPGSV,3,1,09,04,05,120,41,05,36,247,47,07,51,084,48,09,71,248,48*79 $GPGSV,3,2,09,11,10,018,42,18,03,261,39,21,13,296,43,26,18,192,44*76 $GPGSV,3,3,09,28,12,076,46*4A $GPZDA,085733.80,17012002,00,00*64 $GPGGA,085733.34,6016.3100,N,02458.3769,E,1,08,1.0,29.7,M,18.6,M,,*58 $GPGLL,6016.3100,N,02458.3769,E,085733.34,A,A*67 $GPVTG,333.87,T,,,0.50,N,0.9,K,A*40 $GPRMC,085733.348,A,6016.3100,N,02458.3769,E,0.50,333.87,170102,,,A*64 $GPGSA,A,3,04,05,07,09,11,21,26,28,1.6,1.0,1.2*35
3rd fix. Note! STOP command!	$PARM,FOM,3*66 $GPGSV,3,1,09,04,05,120,40,05,36,247,47,07,51,084,49,09,71,247,48*76 $GPGSV,3,2,09,11,10,018,42,18,03,261,39,21,13,296,44,26,18,192,44*71 $GPGSV,3,3,09,28,12,076,46*4A $GPZDA,085736.80,17012002,00,00*64 $GPGGA,085736.34,6016.3085,N,02458.3786,E,1,07,1.2,34.0,M,18.6,M,,*56 $GPGLL,6016.3085,N,02458.3786,E,085736.34,A,A*6F $GPVTG,303.58,T,,,0.22,N,0.4,K,A*49 $GPRMC,085736.348,A,6016.3085,N,02458.3786,E,0.22,303.58,170102,,,A*68

When a fix is available, the AT100 sends a sequence of all enabled NMEA messages at an interval of approx. one second. A sequence of NMEA messages related to a single fix always starts with a GSV message (if that message is enabled) and the order of messages stays the same (with masked messages skipped). See chapter 2.2.4 for guidance on how NMEA messages are enabled and disabled.

1.5 Serial port performance considerations

The absolute character throughput of a serial port is limited by the serial speed. Temporary overload of sentences can be buffered but continuous overload eventually causes full NMEA sentences to be dropped. As most NMEA sentences are outputted once every fix, the *X* in following equation shouldn't exceed value of 1.

*X = (F * L) / T*

where

F *number of fixes in one second,*

L *combined length of all enabled messages (chars),*

T *throughput of the serial port (chars/s).*

Please refer to the tables below when deciding which NMEA messages to output and which to mask out with the given serial port speed.

Baud rate	Character Throughput (chars/s)
300	30
1200	120
2400	240
4800 **(default)**	480
9600	960
19200	1920
57600	5760
115200	11520

NMEA sentence	maximum possible length (chars incl. CRLF)
GLL	51
GGA	82
VTG	40
RMC	75
GSA	67
GSV	60 (per single line!)
ZDA	34
PVTK,FOM	19
PVTK,PPS	35

2. NMEA COMMANDS

This chapter describes the supported NMEA commands. Section 3.1 describes the NMEA commands which are used to configure the AT100 telematics application. The following section describes a lower level set of NMEA commands which can be used to control the iTrax03 GPS receiver. This second set of command should be used with caution, as they can sometimes override the telematics application. If in doubt, it is advisable to seek advice from Astra Telematics before using the commands in section 3.2.

2.1 Telematics NMEA Commands

2.1.1 DIST – Distance Report Interval

Defines how far the vehicle must travel (since the last report) to trigger a new position report. A value of zero will disable distance based reporting.

$PARM,DIST,<distance>

<distance>	Distance traveled (in metres) between reports

Examples:

$PARM,DIST<CR><LF>

Returns current setting

$PARM,DIST,1000<CR><LF>

Report every 1000m traveled.

$PARM,DIST,2500<CR><LF>

Set reporting distance to 2.5km.

Factory default is DIST = 2000m (2km).

2.1.2 HEAD – Heading Report Threshold

Defines the vehicle heading change (since the last report) required to trigger a new position report. A value of zero will disable heading based reporting.

$PARM,HEAD,<degrees>

<degrees>	Heading change (in degrees) to trigger an new report

Examples:

$PARM,HEAD<CR><LF>

Returns current setting

$PARM,HEAD,45<CR><LF>

Trigger new report when vehicle heading changes by 45 degrees.

$PARM,HEAD,30<CR><LF>

Set heading change to 30 degrees.

Factory default is HEAD = 45 degrees.

2.1.3 STIM – Stationary Timed Reporting Interval

Defines the reporting time interval for a stationary vehicle. A value of zero will disable time based reporting whilst stationary.

$PARM,STIM,<minutes>

<minutes>	Minutes between stationary timed reports

Examples:

$PARM,STIM<CR><LF>

Returns current setting

$PARM,STIM,1440<CR><LF>

Report every day when stationary.

$PARM,STIM,120<CR><LF>

Set stationary timed reporting interval to 2 hours.

Factory default is STIM = 60 minutes (1 hour).

2.1.4 JTIM – Journey Timed Reporting Interval

Defines the reporting time interval to be used during a journey. A value of zero will disable time based reporting whilst in a journey.

$PARM,JTIM,<minutes>

<minutes>	Minutes between journey timed reports

Examples:

$PARM,JTIM<CR><LF>

Returns current setting

$PARM,JTIM,5<CR><LF>

Report every 5 minutes whilst in a journey.

$PARM,JTIM,2<CR><LF>

Set timed reporting interval to 2 minutes.

Factory default is JTIM = 0 minutes (journey timed reports disabled).

2.1.5 IDLE – Idle Time Start Threshold

Defines the stationary time (with ignition on) to elapse before the vehicle is considered to be idling.

$PARM,IDLE,<minutes>

<seconds>	Stationary time to elapse before idle mode is initiated

Examples:

$PARM,IDLE<CR><LF>

Returns current setting

$PARM,IDLE,180<CR><LF>

Initiate idle mode after 3 minutes stationary time with ignition on.

$PARM,IDLE,120<CR><LF>

Initiate idle mode after 2 minutes.

Factory default is IDLE = 180 seconds

2.1.6 ITIM – Idle Mode Timed Reporting Interval

Defines the reporting time interval for an idling vehicle. A value of zero will disable time based reporting whilst idling.

$PARM,ITIM,<minutes>

<minutes>	Minutes between idling timed reports

Examples:

$PARM,ITIM<CR><LF>

Returns current setting

$PARM,ITIM,5<CR><LF>

Report every 5 minutes when stationary.

$PARM,ITIM,1<CR><LF>

Set idle mode timed reporting interval to 1 minute.

Factory default is ITIM = 0 minutes (disabled).

2.1.7 OSST – Overspeed Threshold

The AT100 can be configured to report over-speed events, which are defined as exceeding a given speed for a given amount of time. The OSST parameter defines the overspeed threshold in kmh. In order to trigger an overspeed event, the vehicle must travel in excess of OSST kmh for a period of OSHT seconds (see below). Further overspeed events cannot be triggered until OSIT seconds have elapsed and vehicle speed has fallen below the OSST threshold. A value of zero for OSST will disable overspeed events/reports.

$PARM,OSST,<kmh>

<kmh>	Overspeed Limit in kmh

Examples:

$PARM,OSST<CR><LF>

Returns current setting

$PARM,OSST,120<CR><LF>

Overspeed threshold set to 120kmh

$PARM,OSST,80<CR><LF>

Set overspeed threshold to 80kmh

Factory default is OSST = 0 kmh (disabled).

2.1.8 OSHT – Overspeed Hold Time

Defines the time that a vehicle must travel in excess of the overspeed threshold (OSST) in order to trigger an overspeed event.

$PARM,OSHT,<seconds>

<seconds>	Overspeed Hold Time in seconds

Examples:

$PARM,OSHT<CR><LF>

Returns current setting

$PARM,OSHT,20<CR><LF>

Overspeed hold time set to 20 seconds

$PARM,OSHT,10<CR><LF>

Set overspeed hold time to 10 seconds

Factory default is OSHT = 0

2.1.9 OSIT – Overspeed Inhibit Time

Defines the minimum time between overspeed events. Once an overspeed event has occurred, further overspeed events cannot be triggered until OSIT seconds have elapsed.

$PARM,OSIT,<seconds>

<seconds>	Overspeed Inhibit Time in seconds

Examples:

$PARM,OSIT<CR><LF>

Returns current setting

$PARM,OSIT,120<CR><LF>

Overspeed inhibit time set to 120 seconds

$PARM,OSIT,300<CR><LF>

Set overspeed hold time to 5 minutes

Factory default is OSIT = 0

2.1.10 GPSM – GPS Maximum Figure of Merit

Defines maximum acceptable figure of merit for GPS fixes. The GPS figure of merit is an indicator of the uncertainty for each fix, in metres. In ideal reception conditions,

$PARM,GPSM,<metres * 1000>

<metres * 1000>	Minimum acceptable GPS figure of merit

Examples:

$PARM,GPSM<CR><LF>

Returns current setting

$PARM,GPSM,10000<CR><LF>

Accept GPS fixes with a figure of merit of 10000 or less.

$PARM,GPSM,5000<CR><LF>

Set GPS figure of merit to 5000.

Factory default is GPSM = 5000

2.1.11 GPST – GPS Timeout

When a GPS fix is not available for the defined timeout period (seconds), the AT100 enters GPS timeout mode. In GPS timeout mode, a report is sent to the host server with the last known position and the GPS timeout flag set. In low power operating modes, the AT100 may power down after a GPS timeout (and wake to retry later).

$PARM,GPST,<seconds>

<seconds>	GPS timeout period

Examples:

$PARM,GPST<CR><LF>

Returns current setting

$PARM,GPST,300<CR><LF>

When GPS fix is unavailable, wait 5 minutes before entering timeout mode.

$PARM,GPST,900<CR><LF>

Set GPS figure of merit to 15 minutes.

Factory default is GPST = 300 seconds (5 minutes).

2.1.12 GPSL – GPS Maximum Location Error (from firmware 1.60 / 2.30)

Defines the maximum permissible estimated location error for an acceptable GPS fix. Please refer to the GPS Quality application note for further details.

$PARM,GPSL,<metres * 1000>

<metres * 1000>	Minimum acceptable GPS location error

Examples:

$PARM,GPSL<CR><LF>

Returns current setting

$PARM,GPSL,10000<CR><LF>

Accept GPS fixes with an estimated location error of 10000 or less.

$PARM,GPSL,5000<CR><LF>

Set GPSL to 5000.

Factory default is GPSM = 3000

2.1.13 GPSS – GPS Maximum Speed Error (from firmware 1.60 / 2.30)

Defines the maximum permissible estimated speed error for an acceptable GPS fix. Please refer to the GPS Quality application note for further details.

$PARM,GPSS,<value>

<value>	Minimum acceptable GPS speed error

Examples:

$PARM,GPSS<CR><LF>

Returns current setting

$PARM,GPSS,1000<CR><LF>

Accept GPS fixes with an estimated speed error of 1000 or less.

$PARM,GPSS,1500<CR><LF>

Set GPSL to 1500.

Factory default is GPSM = 1500

2.1.14 SERV – Host Server GSM Number

Defines the destination GSM number for reporting by SMS. Setting SERV to “NONE” will disable SMS based position reports.

$PARM,SERV,<GSM_number>

<GSM_number>	Destination number for SMS reports

Examples:

$PARM,SERV<CR><LF>

Returns current setting

$PARM,SERV,+44123456789<CR><LF>

Send SMS reports to +44123456789.

$PARM,SERV,+31987654321<CR><LF>

Set GSM Host Server number to +33987654321.

Factory default is SERV = NONE (SMS reporting disabled)

2.1.15 SMSC – SMS Service Centre Number

Defines the GSM SMS Service Centre number for the specific home network being used. The SMSC number is normally read from the GSM SIM card. This parameter is only required if the SMSC is not stored on the SIM card being used.

Setting ALRM to "NONE" will force the AT100 to use the SMSC number stored on the SIM card.

$PARM,SMSC,<SMSC_number>

<SMSC_number>	SMSC number for GSM network being used

Examples:

$PARM,SMSC<CR><LF>

Returns current setting

$PARM,SMSC,+447973100973<CR><LF>

SMSC number is +447973100973

$PARM,SMSC,+33987654321<CR><LF>

Set SMSC number to +33987654321.

Factory default is SMSC = NONE

2.1.16 ALRM – Alarm Message GSM Number

Defines the destination GSM number for Alarm Text Messaging. This feature can be disabled by setting ALRM to "NONE".

$PARM,ALRM,<alarm_number>

<alarm_number>	Destination number for SMS alarm messages

Examples:

$PARM,ALRM<CR><LF>

Returns current setting

$PARM,ALRM,+44123456789<CR><LF>

Send SMS alarms to +44123456789.

$PARM,ALRM,+31987654321<CR><LF>

Set GSM Alarm Message number to +31987654321.

Factory default is ALRM = NONE

2.1.17 IPAD – IP Address for Host TCP Server

Defines the destination IP address for sending position reports in GPRS mode, as TCP packets. Only the IP address part should be entered. The port number is defined using the PORT command.

$PARM,IPAD,<ip-address>

< ip-address >	Destination IP Address for TCP packets

Examples:

$PARM,IPAD<CR><LF>

Returns current setting

$PARM,IPAD,123.456.789.101<CR><LF>

Send TCP packets to 123.456.789.101/6001

$PARM,IPAD,001.002.003.004<CR><LF>

Set TCP Host Server address to 001.002.003.004/6001

Factory default is IPAD = 195.11.204.73 (SCES FMS)

2.1.18 PORT – Port Number for Host TCP Server

Defines the destination Port Number for sending position reports in GPRS mode, as TCP packets.

$PARM,PORT,<port_num>

< port_num>	Destination Port Number for TCP packets

Examples:

$PARM,PORT<CR><LF>

Returns current setting

$PARM,PORT,6001<CR><LF>

Send TCP packets to port number 6001

$PARM,PORT,5155<CR><LF>

Set TCP port number to 5155

Factory default is PORT = 90 (SCES Fleet Management System)

2.1.19 IPA2 – IP Address for Alternative Host TCP Server

In the case of repeated errors when trying to connect to the primary host IP address, the AT100 will attempt to try a second host address. The alternative host is disabled by setting IPA2 to “NONE”

$PARM,IPA2,<ip-address>

< ip-address >	Destination IP Address for TCP packets

Examples:

$PARM,IPA2<CR><LF>

Returns current setting

$PARM,IPA2,123.456.789.101<CR><LF>

Send TCP packets to 123.456.789.101/6001

$PARM,IPA2,001.002.003.004<CR><LF>

Set TCP Host Server address to 001.002.003.004/6001

Factory default is IPA2 = NONE

2.1.20 PRT2 – Port Number for Alternative Host TCP Server

Used in conjunction with IPA2 as an alternative TCP host, to be used in the event of repeated failures to deliver data to the primary host. The alternative host is disabled by setting PRT2 to zero.

$PARM,PORT,<port_num>

< port_num>	Destination Port Number for TCP packets

Examples:

$PARM,PORT<CR><LF>

Returns current setting

$PARM,PORT,6001<CR><LF>

Send TCP packets to port number 6001

$PARM,PORT,5155<CR><LF>

Set TCP port number to 5155

Factory default is PORT = 0 (feature disabled)

2.1.21 TCPT – TCP Acknowledgment Timeout

The AT100 requires an acknowledgment from the TCP host server for each report delivered. If an acknowledgment is not received within a given period, the report is retransmitted at a later time. The default timeout period is 10 seconds, but the value can be modified using the TCPT command. The maximum value is 60 seconds. A value of zero will disable the acknowledgement feature (this is not recommended).

$PARM,TCPT,<seconds>

<seconds>	TCP ACK timeout period in seconds

Examples:

$PARM,TCPT<CR><LF>

Returns current setting

$PARM,TCPT,10<CR><LF>

Wait a maximum of 10 seconds for the TCP packet acknowledgement

$PARM,TCPT,20<CR><LF>

Set TCP ACK timeout to 20 seconds.

Factory default is TCPT = 30 seconds.

2.1.22 TCPM – TCP Socket Mode

Defines whether to close the TCP socket after each transaction of keep open indefititely.

$PARM,TCPM,<mode>

<mode>	0: Leave TCP socket open 1: Close TCP socket after each transaction

Examples:

$PARM,TCPM<CR><LF>

Returns current setting

$PARM,TCPM,0<CR><LF>

Leave TCP socket open

$PARM,TCPM,1<CR><LF>

close the TCP socket after each transaction.

Factory default is TCPM = 1.

2.1.23 APAD – GPRS Access Point Address

Defines the address for access to the GPRS network. Please refer to the AT100 Integration Guide for a list of Access Point addresses for most GSM networks around the word.

$PARM,APAD,<address>

<address>	Access Point address for specific network used

Examples:

$PARM,APAD<CR><LF>

Returns current setting

$PARM,APAD,orangeinternet<CR><LF>

Access point username “orangeinternet”.

$PARM,APAD,web<CR><LF>

Set GPRS Access Point Address to “web”.

Factory default is APAD = orangeinternet (Orange UK)

2.1.24 APUN – GPRS Access Point Username

Defines the username for access to the GPRS network. Please refer to the AT100 Integration Guide for a list of Access Point usernames for most GSM networks around the word.

$PARM,APUN,<username>

<username>	Access Point username for specific network used

Examples:

$PARM,APUN<CR><LF>

Returns current setting

$PARM,APUN,orangeinternet<CR><LF>

Access point username “orangeinternet”.

$PARM,APUN,web<CR><LF>

Set GPRS Access Point Username to “web”.

Factory default is APUN = “” (i.e. none, Orange UK)

2.1.25 APPW – GPRS Access Point Password

Defines the password for access to the GPRS network. Please refer to the AT100 Integration Guide for a list of Access Point passwords for most GSM networks around the word.

$PARM,APPW,<password>

<password>	Access Point password for specific network used

Examples:

$PARM,APPW<CR><LF>

Returns current setting

$PARM,APPW,password<CR><LF>

Access point username “password”.

$PARM,APPW,secret<CR><LF>

Set GPRS Access Point Password to “secret”.

Factory default is APPW = “” (i.e. none, Orange UK)

2.1.26 MODE – GSM Communication Mode

The MODE command is used to select the primary mode of GSM communication with the host server.

$PARM,MODE,<gsm-mode>

<gsm-mode>	GSM communication mode, may be one of the following: 1 = LOG TO MEMORY ONLY 2 = SMS TEXT 3 = SMS PDU (“C” Protocol) 4 = GPRS TCP MODE (“C” PROTOCOL) 5 = GPRS UDP MODE (RESERVED)

Examples:

$PARM,MODE<CR><LF>

Returns current setting

$PARM,MODE,4<CR><LF>

GSM Communication mode = 4 (GPRS TCPMODE – "C" PROTOCOL).

$PARM,MODE,1<CR><LF>

Set GSM Communication mode to Logging only

Factory default is MODE = 4.

2.1.27 ROAM – GSM Network Roaming Control

The ROAM command is used to enable or disable GSM network roaming, as a means of controlling costs. A non-zero value will enable reporting when registered on a roaming network. A value higher than 1 will enabled reporting at a reduced rate when roaming.

$PARM,ROAM,<roaming-mode>

<roaming-mode>	GSM roaming mode, may be one of the following: 0 = Roaming disabled 1 = Roaming enabled at normal reporting rate 2 = Roaming enabled at half reporting rate 4 = Roming enabled at quarter reporting rate

Examples:

$PARM,ROAM<CR><LF>

Returns current setting

$PARM,ROAM,1<CR><LF>

GSM Roaming is currently enabled

$PARM,ROAM,0<CR><LF>

Disable GSM roaming

Factory default is ROAM = 1. (roaming enabled)

2.1.28 IGNM – Ignition Power Down Mode

The IGNM parameter determined whether the operating mode of the AT100 is controlled from the IGNITION input. When IGNM is set to 1, it will cause the AT100 to go into a low power sleep mode shortly after

the ignition is turned off (LOW input). There will be a delay of approx 5 minutes to ensure that stop reports are delivered before powering down. When ignition is turned back on (HIGH input), the AT100 will immediately wake up.

$PARM,IGNM,<ign-mode>

<ign-mode>	Ignition mode, may be one of the following: 0 = START/STOP reports based on GPS No power down when IGN off 1 = Send START/STOP reports based on IGN input No power down when IGN off 2 = Send START/STOP reports based on IGN input Power down when IGN if off.

Examples:

$PARM,IGNM<CR><LF>

Returns current setting

$PARM,IGNM,0<CR><LF>

Ignition Power Down mode is currently disabled.

Start and Stop reports are based on GPS.

$PARM,IGNM,1<CR><LF>

Enable Start and Stop reports based on the IGN input, but no power down when IGN is off.

Factory default is IGNM = 0.

2.1.29 IBTN

Enable Driver ID using iButton mode. Please refer to the application note for details

$PARM,IBTN,<debugmode>

<debugmode>	0: disable iButton mode 1: enable iButton mode

Examples:

$PARM,IBTN<CR><LF>

Returns current setting

$PARM,IBTN,0<CR><LF>

iButton mode disabled.

$PARM,DBUG,1<CR><LF>

iButton mode disabled.

Factory default is IBTN = 0

2.1.30 CLID – GSM Cell ID Reporting

The AT100 is able to report GSM cell ID information in the optional data section of the reports. This feature is enabled with the CLID parameter, as described below.

$PARM,CLID,<cell-id-mode>

<cell-id-mode>	Cell ID mode, may be one of the following: 0 = Never send GSM Cell-ID information 1 = Send GSM Cell-ID data only when no GPS fix 2 = Send GSM Cell-ID data always

Examples:

$PARM,CLID<CR><LF>

Returns current setting

$PARM,CLID,0<CR><LF>

GSM Cell ID data is currently disabled.

$PARM,CLID,1<CR><LF>

Enable GSM Cell ID content in reports only when there is no GPS fix available.

Factory default is CLID = 0.

2.1.31 STPD – STOP Report Delay

When IGNM is set to zero (see above), the AT100 will determine journey START and STOP events from GPS. A STOP event will occur after the vehicle has remained stationary for a pre-determined time. The length of stationary time necessary to trigger a STOP report is dictated by the STPD parameter.

$PARM,STPD,<seconds>

<seconds>	STOP Report Delay period

Examples:

$PARM,STPD<CR><LF>

Returns current setting

$PARM,STPD,300<CR><LF>

Send a STOP report after vehicle has been stationary for 5 minutes.

$PARM,STPD,180<CR><LF>

Set STOP Report delay to 3 minutes.

Factory default is STPD = 180 seconds (3 minutes).

2.1.32 LSOD – Load Switch Output Default States

Defines the power on default states for the two load switches. The argument is a bitfield, with the least significant bit defining the state of load switch 1 and bit 2 defining load switch 2.

$PARM,LSOD,<bitfield>

<bitfield>	First 2 bits defining states of load switches 1 and 2

Examples:

$PARM,LSOD,2<CR><LF>

Set load switch number 2 power on default to HIGH.

Factory default for all digital output power on defaults is LOW.

2.1.33 TEMP – Temperature Recorder Interface Mode

The AT100 is capable of reading temperature data from an external temperature recorder, over the NMEA serial port. Currently, two types of temperature recorder are supported, the DataCOLD DC500 and the Transcan 2. Please refer to the appropriate application notes for details of how to configure these applications.

$PARM,TEMP,<temp-mode>

<temp-mode>	Temperature Recorder Interface mode, may be one of the following: 0 = Temperature Recorder Mode Disabled 1 = Transcan 2 mode 2 = DataCOLD 500 mode

	3 = Carrier direct refrigerator mode

Examples:

$PARM,TEMP<CR><LF>

Returns current setting

$PARM,MODE,0<CR><LF>

Temperature Recorder mode is currently disabled.

$PARM,TEMP,2<CR><LF>

Enables the interface to a DataCOLD500 temperature recorder.

Factory default is TEMP = 0.

2.1.34 POLL – Request a Position Update Report

This command will force a position report to be immediately sent to the host server (in the selected GSM mode).

$PARM,POLL

Examples:

$PARM,POLL<CR><LF>

Force a position update report.

2.1.35 SHOW – Show Settings for all Telematics Parameters

This command responds with current settings of all Telematics parameters.

$PARM,SHOW

Examples:

$PARM,SHOW<CR><LF>

```
Version: 2.21 19/02/08
* APPLICATION PARAMETERS *
IMEI: 359449009001898
SERV: NONE
SMSC: NONE
IPAD: 193.108.82.111
PORT: 90
APAD: orangeinternet
APUN: NONE
APPW: NONE
MODE: 7
GPST: 300
GPSM: 5000
```

```
GPSD: 25000
GPSA: 0
DIST: 3000
HEAD: 45
STPD: 180
STIM: 60
JTIM: 5
IGNM: 1
DBUG: 4
ROAM: 1
REPL: 5
TCPT: 30
SMSL: 20
**********************
```

Display all Telematics parameters.

2.1.36 DBUG

Select level of debug output on NMEA port.

$PARM,DBUG,<debugmode>

<debugmode>	0: Only NMEA output on serial port 1 1: Display errors only 2: Display standard diagnostic information 3: Display extended diagnostic information 4: Display all debug information

Examples:

$PARM,DBUG<CR><LF>

Returns current setting

$PARM,DBUG,0<CR><LF>

Debug output is currently disabled on serial port 1. Only NMEA fix results will be displayed.

$PARM,DBUG,1<CR><LF>

Select error messages (in addition to NMEA fix results) on serial port 1.

Factory default is DBUG = 2.

2.1.37 FACT – Restore Factory Settings

Restores all configuration parameters to the factory default settings.

$PARM,FACT

Example:

$PARM,FACT<CR><LF>

2.1.38 SAVE – Save Telematics Settings

All telematics parameters are stored in volatile memory, which will resort to their original settings if power is removed from the AT100. The Save command is used to store all the previous Telematics parameters into non-volatile (flash) memory, so that they are preserved after power is removed from the AT100. Note that the process of writing the data to flash memory takes approx. 5 seconds. If power is removed from the AT100 during this time, the parameters may not be properly saved.

$PARM,SAVE

Examples:

$PARM,SAVE<CR><LF>

Save all Telematics parameters to flash memory.

2.1.39 ELOG – Erase Logged Reports from Flash Memory

Unsent position reports are stored in non-volatile (flash) memory, until network coverage allows them to be sent or in log-only mode, until they are requested. Reports are saved in a circular buffer, the latest overwriting the oldest reports once the capacity is full. These reports are preserved after power is removed from the AT100. The reports can be erased without sending by using the ELOG command.

$PARM,ELOG,<num_reports>

<num_reports>	No argument	erase all stored reports
	100	erase oldest 100 reports
	2000	erase oldest 2000 reports
	n	erase oldest n reports

$PARM,ELOG

Examples:

$PARM,ELOG<CR><LF>

Erase all saved position reports from flash memory.

2.1.40 PASS

Set PASS code for over-the-air (OTA) commands. This can be used to prevent unauthorised reconfiguration of device settings OTA. When PASS is non-zero, only commands with the correct PASS specified (must be first command) will be accepted. Only commands which modify parameters are affected by the PASS code. Commands which simply request information or actions do not require a PASS code at

any time. The PASS code is disabled if set to zero. PASS can only be set via NMEA command and cannot be set OTA.

The value of PASS can be set to any integer between zero and 65535.

$PARM,PASS,<pass_code>

<pass_code>	0: 1 - 65535:	OTA PASS code disabled user-specified OTA PASS code

Examples:

$PARM,PASS<CR><LF>

Returns current setting

$PARM,PASS,0<CR><LF>

Auto-answer mode is currently disabled.

$PARM,PASS,12345<CR><LF>

Set OTA PASS code to 12345.

Factory default is PASS = 0.

2.2 General NMEA commands

The following sections introduce general-purpose commands used for controlling the basic iTrax02 operations.

2.2.1 START – Start Navigation

Commands iTrax02 to start navigation. The command has no effect if called while iTrax02 is already navigating. After the start command has been given, it takes some time for the iTrax02 to acquire satellites, acquire required navigation data from the signal and calculate a first fix. By default, the iTrax02 automatically starts navigation after power on.

$PARM,START,<startmode>

<startmode>	Navigation start mode, may be one of the following: 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 GPS 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 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 $PARM,INITAID command. Valid ephemeris data is available if module has been navigating within past two hours and the navigation has been stopped properly by giving the $PARM,STOP command.

Examples:

$PARM,START<CR><LF>

Starts navigation using the fastest possible start mode.

$PARM,START,2<CR><LF>

Starts navigation using warm start mode if possible.

2.2.2 STOP – Stop Navigation

Commands AT100 to stop navigation and enter idle state. In idle state, the AT100 doesn't navigate but still accepts commands. Idle state consumes less power than navigation state, but considerably more than in the power-down mode. This command also stores the "LastKnownGood" fix, ephemeris and almanac data acquired during navigation to flash memory.

$PARM,STOP,<1|0>

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

Examples:

$PARM,STOP<CR><LF>

Stops navigation and saves "LastKnownGood" to flash memory.

$PARM,STOP,0<CR><LF>

Stops navigation. Doesn't save "LastKnownGood" to flash memory.

2.2.3 ATSW – Astra Telematics software revision

Shows the firmware revision of the Astra Telematics Telematics application.

$PARM,VTSW,<version>

<version>	Software version number

Example:

$PARM,ATSW

$PARM,ATSW,1.28*0C

The module has Astra Telematics application version 1.5.

2.2.4 NMEA – NMEA Serial Communication

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

$PARM,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 plain ",," used 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 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>

Examples:

$PARM,NMEA,7003

Enable GLL,GGA,VTG,GSA and GSV messages at serial port speed of 4800.

$PARM,NMEA,,19200

Keep the current message mask but change speed to 19200.

NOTE: using message mask FFFF (command $PARM,NMEA,FFFF) is not recommended. Although it may be used to turn on all messages, the side effect of this would be that also all new messages in future AT100 versions will be turned on. The following messages are enabled by default: GGA, RMC, GSA, GSV.

NOTE2: Other NMEA Serial port setting 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: In order to preserve this setting after reset or power-up, the new setting has to be stored to flash memory by using the $PARM,STORE command.

Factory default is FIXRATE = 1.

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 $PARM,STORE command (only AT100/8 modules).

3. NMEA MESSAGES

This chapter describes the supported NMEA output messages.

3.1 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).

Example:

$GPGGA,111200.02,6016.3092,N,02458.3841,E,1,09,0.8,30.6,M,18.1,M,,*5D

3.2 GLL – Geographic Position – Latitude/Longitude

Latitude and Longitude, UTC time of fix and status.

**$GPGLL,xxmm.dddd,<N|S>,
yyymm.dddd,<E|W>,hhmmss.dd,S,M*hh<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
hhmmss.dd	UTC time hh = hours mm = minutes ss = seconds dd = decimal part of seconds
S	Status indicator A = valid V = invalid
M	Mode indicator A=autonomous N=data not valid

Example:

$GPGLL,6016.3073,N,02458.3791,E,134157.48,A,A*26

3.3 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,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

Example:

$GPGSA,A,3,03,15,17,18,22,23,,,,,,,4.7,3.7,2.9*37

3.4 GSV – Satellites in view

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

Before a position fix is acquired the information contains only the SNR (signal to noise ratio) value. After a fix is acquired, also the elevation and azimuth angles are added. Note that there can be also “theoretical” satellites in the GSV message. These are satellites of which the angles (elevation, azimuth) are known but for some reason, e.g. due to an obstruction, have not been found by AT100. The SNR value for these satellites is set to zero.

Please notice that as all the satellites that in the view are reported, the amount of satellites may occasionally be more than the number of receiver tracking channels, 12.

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

n	Total number of messages, 1 to 9
m	Message number, 1 to 9
ss	Total number of satellites in view
Xx	Satellite ID (PRN) number
Ee	Satellite elevation, degrees 90 max
Aaa	Satellite azimuth, degrees True, 000 to 359
cn	SNR (C/No) 00-99 dB-Hz. zero when not tracking

Example:

$GPGSV,4,1,14,03,66,207,50,08,09,322,44,11,01,266,42,14,00,155,00*79

$GPGSV,4,2,14,15,41,088,48,17,21,083,44,18,57,087,51,21,57,173,50*78

$GPGSV,4,3,14,22,05,203,00,23,52,074,49,26,17,028,44,27,00,300,00*79

$GPGSV,4,4,14,28,32,243,00,31,48,286,00*70

3.5 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.dddd	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

Example:

```
$GPRMC,134829.486,A,1126.6639,S,11133.3299,W,58.31,309.62,110200,,,A*14
```

3.6 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

Example:

$GPVTG,202.60,T,,,0.38,N,0.7,K,A*0D

3.7 ZDA – Time and Date

Outputs the current UTC time and date. Unlike other messages, the time outputted by this message is bound to AT100's internal real-time 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>,<xx>,<yy>*hh

<hhmmss.dd>	UTC time in hours, minutes, seconds and fractions of a second.
<ddmmyyyy>	UTC data in day-month-year format
<xx>	Local zone hours. Not implemented, 00 outputted always.
<yy>	Local zone minutes. Not implemented, 00 outputted always.

Example:

$GPZDA,132358.14,04122002,00,00*6A

Corresponds to the UTC time 13:23:58.14 on 04-Dec-2002.

NOTES:

- The time outputted in ZDA message slightly differs from the time outputted by other messages because the time reference of the ZDA message is real-time clock (RTC) at the very instant of formatting the message, whereas the time outputted on other messages is the moment of the navigation fix.

- As the ZDA time is read from the RTC just upon formatting the message, this time is closer to the real time and may be used as a somewhat accurate time reference if the latency of the system-specific serial port transmission is compensated (usually about deterministic). Time precision of approx. 1/100th of a second can be achieved by this method.

3.8 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 "–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 (see chapter **Error! Reference source not found.**) when a fix has been calculated using three satellites.

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

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

Example:

$PARM,FOM,3*66

3.9 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.

$PARM,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.

Example:

$PARM,PPS,1161,309566,9,495*67

4. APPENDIX A: CHECKSUM CALCULATION EXAMPLE

Checksum is calculated by taking a logical exclusive-OR operation of the 8-bit message characters. Checksum excludes the leading '$', checksum delimiter '*' and the checksum itself.

The following C-language routine calculates the checksum. Parameters are:

char* sz pointer to the string containing the message (excluding checksum).

int nCount number of characters in message (including leading '$')

```
unsigned char Calc_checksum(char* sz, int nCount)
{

     unsigned char cs;      // Checksum

     //Omit the $-character
     for (i=1; i<Count; i++)
     {
          cs = cs ^((unsigned char)sz[i]);
     }

     return cs;

}
```

Notice that leading "$" is not included when calculating the checksum.

Receiving application should calculate the checksum of the message and compare it to the received checksum.

5. APPENDIX B: DATUM IDS

Table below has all coordinate system datum IDs supported by AT100:

datum id	name	description
-1	WGS84	Global WGS84 coordinate system
000	ADI-M	Mean Solution (Ethiopian and Sudan)
001	ADI-E	Burkina Faso
002	ADI-F	Cameroon
003	ADI-A	Ethiopia
004	ADI-C	Mali
005	ADI-D	Senegal
006	ADI-B	Sudan
007	AFG	Somalia
008	ARF-A	Botswana
009	ARF-H	Burundi
010	ARF-B	Lesotho
011	ARF-C	Malawi
012	ARF-D	Swaziland
013	ARF-E	Zaire
014	ARF-F	Zambia
015	ARF-G	Zimbabwe
016	ARS-M	Mean Solution (Kenya and Tanzania)
017	ARS-A	Kenya
018	ARS-B	Tanzania
019	PHA	Djibouti
020	BID	Guinea-Bissau
021	CAP	South Africa
022	CGE	Tunisia
023	DAL	Guinea
024	EUR-F	Egypt
025	EUR-T	Tunisia
026	LEH	Ghana
027	LIB	Liberia
028	MAS	Eritrea
029	MER	Morocco
030	MIN-A	Cameroon
031	MIN-B	Nigeria
032	MPO	Gabon
033	NSD	Algeria
034	OEG	Old Egypt
035	PTB	Mean Solution (Burkina Faso and Niger)
036	PTN	Congo
037	SCK	Namibia
038	SRL	Sierra Leone

datum id	name	description
039	VOR	Algeria
040	AIN-A	Bahrain Island
041	AIN-B	Saudi Arabia
042	BAT	Sumatra (Indonesia)
043	EUR-H	Iran
044	HKD	Hong Kong
045	HTN	Taiwan
046	IND-B	Bangladesh
047	IND-I	India and Nepal
048	INF-A	Thailand
049	ING-A	Vietnam (near 16deg N)
050	ING-B	Con Son Island (Vietnam)
051	INH-A1	Thailand (1997)
052	IDN	Indonesia
053	KAN	Sri Lanka
054	KEA	West Malaysia and Singapore
055	KGS	Korean Geodetic System
056	NAH-A	Masirah Island (Oman)
057	NAH-B	United Arab Emirates
058	NAH-C	Saudi Arabia
059	FAH	Oman
060	QAT	Qatar
061	SOA	Singapore
062	TIL	Brunei and East Malaysia (Sarawak and Sabah)
063	TOY-M	Mean Solution (Japan, Okinawa and South Korea)
064	TOY-A	Japan
065	TOY-C	Okinawa
066	TOY-B	South Korea
067	AUA	Australia and Tasmania (Australian geodetic 1966)
068	AUG	Australia and Tasmania (Australian geodetic 1984)
069	EST	Estonia
070	EUR-M	Mean Solution (Europe 1950)
071	EUR-A	Western Europe (1950)
072	EUR-E	cyprus
073	EUR-G	England, Channel Islands, Scotland and Shetland Islands
074	EUR-K	England, Ireland, Scotland and Shetland Islands
075	EUR-B	Greece
076	EUR-I	Italy (Sardinia)
077	EUR-J	Italy (Sicily)
078	EUR-L	Malta
079	EUR-C	Finland and Norway
080	EUR-D	Portugal and Spain
081	EUS	Mean Solution (European 1979)
082	HJO	Iceland
083	IRL	Ireland

datum id	name	description
084	OGB-M	Mean Solution (England, Isle of Man, Scotland, Shetland Islands and Wales)
085	OGB-A	England
086	OGB-B	England, Isle of Man and Wales
087	OGB-C	Scotland and Shetland Islands
088	OGB-D	Wales
089	MOD	Sardinia
090	SPK-A	Hungary
091	SPK-B	Poland
092	SPK-C	Czechoslovakia
093	SPK-D	Latvia
094	SPK-E	Kazakhstan
095	SPK-F	Albania
096	SPK-G	Romania
097	CCD	Czechoslovakia
098	CAC	Mean Solution (Florida and Bahamas)
099	NAS-C	Mean Solution (CONUS)
100	NAS-B	Western USA
101	NAS-A	Eastern USA
102	NAS-D	Alaska (excluding Aleutian Islands)
103	NAS-V	Aleutian Islands (East of 180deg W)
104	NAS-W	Aleutian Islands (West of 180deg W)
105	NAS-Q	Bahamas (exluding San Salvador Island)
106	NAS-R	San Salvador Island
107	NAS-E	Canada Mean Solution (including Newfoundland)
108	NAS-F	Alberta and British Columbia
109	NAS-G	Eastern Canada
110	NAS-H	Manitoba and Ontario
111	NAS-I	NW Territories and Saskatchewan
112	NAS-J	Yukon
113	NAS-O	Canal Zone
114	NAS-P	Caribbean
115	NAS-N	Central America
116	NAS-T	Cuba
117	NAS-U	Greenland (Hayes Peninsula)
118	NAS-L	Mexico
119	NAR-A	Alaska (excluding Aleutian Islands)
120	NAR-E	Aleutian Islands
121	NAR-B	Canada
122	NAR-C	CONUS
123	NAR-H	Hawaii
124	NAR-D	Mexico and Central America
125	BOO	Colombia
126	CAI	Argentina
127	CHU	Paraguay

datum id	name	description
128	COA	Brazil
129	PRP-M	Mean Solution (Bolivia, Chile, Colombia, Ecuador, Guyana, Peru and Venezuela)
130	PRP-A	Bolivia
131	PRP-B	Northern Chile (near 19deg S)
132	PRP-C	Southern Chile (near 43deg S)
133	PRP-D	Colombia
134	PRP-E	Ecuador
135	PRP-F	Guyana
136	PRP-G	Peru
137	PRP-H	Venezuela
138	HIT	Southern Chile (near 53deg S)
139	SAN-M	Mean Solution
140	SAN-A	Argentina
141	SAN-B	Bolivia
142	SAN-C	Brazil
143	SAN-D	Chile
144	SAN-E	Colombia
145	SAN-F	Ecuador (excluding Galapagos Islands)
146	SAN-J	Baltra, Galapagos Islands
147	SAN-G	Guyana
148	SAN-H	Paraguay
149	SAN-I	Peru
150	SAN-K	Trinidad and Tobago
151	SAN-L	Venezuela
152	ZAN	Suriname
153	AIA	Antigua, Leeward Islands
154	ASC	Ascencion Island
155	SHB	St. Helena Island
156	BER	Bermuda Islands
157	DID	Deception Island, Antarctica
158	FOT	Nevis, St. Kitts, Leeward Islands
159	GRA	Faial, Graciosa, Pico, Sao Jorge and Terceira Islands (Azores)
160	ISG	South Georgia Island
161	LCF	Cayman Brac Island
162	ASM	Montserrat, Leeward Islands
163	NAP	Trinidad and Tobago
164	FLO	Corvo and Flores Islands (Azores)
165	PLN	Canary Islands
166	POS	Porto Santo and Madeira Islands
167	PUR	Puerto Rico and Virgin Islands
168	QUO	South Greenland
169	SAO	Sao Miguel, Santa Maria Islands (Azores)
170	SAP	East Falkland Island
171	SGM	Salvage Islands

datum id	name	description
172	TDC	Tristan da Cunha
173	ANO	Cocos Islands
174	GAA	Republic of Maldives
175	IST	Diego Garcia
176	KEG	Kerguelen Island
177	MIK	Mahe Island
178	REU	Mascarene Islands
179	AMA	American Samoa Islands
180	ATF	Iwo Jima
181	TRN	Tern Island
182	ASQ	Marcus Island
183	IBE	Efate and Erromango Islands
184	CAO	Phoenix Islands
185	CHI	Chatham Island (New Zealand)
186	GIZ	Gizo Island (New Georgia Islands)
187	EAS	Easter Island
188	GEO	New Zealand
189	GUA	Guam
190	DOB	Guadalcanal Island
191	JOH	Johnston Island
192	KUS	Caroline Islands, Fed. States of Micronesia
193	LUZ-A	Philippines (excluding Mindanao Island)
194	LUZ-B	Mindanao Island
195	MID	Midway Islands
196	OHA-M	Mean Solution (old Hawaiian)
197	OHA-A	Hawaii
198	OHA-B	Kauai
199	OHA-C	Maui
200	OHA-D	Oahu
201	PIT	Pitcairn Island
202	SAE	Espirito Santo Island
203	MVS	Viti Levu Island (Fiji Islands)
204	ENW	Marshall Islands
205	WAK	Wake Atoll
206	BUR	Bankga and Belitung Islands (Indonesia)
207	CAZ	Camp McMurdo Area, Antarctica
208	EUR-S	Iraq, Israel, Jordan, Lebanon, S. Arabia and Syria
209	GSE	Kalimantan (Indonesia)
210	HEN	Afghanistan
211	HER	former Yugoslavia
212	IND-P	Pakistan
213	PUK	Russia
214	TAN	Madagascar
215	VOI	Tunisia/Algeria
216	VOI-2	Tunisia/Algeria

datum id	name	description
217	YAC	Uruguay
218	RT90	Sweden
300	KKJ	Kartta Koordinaatisto Järjestelmä, Finland