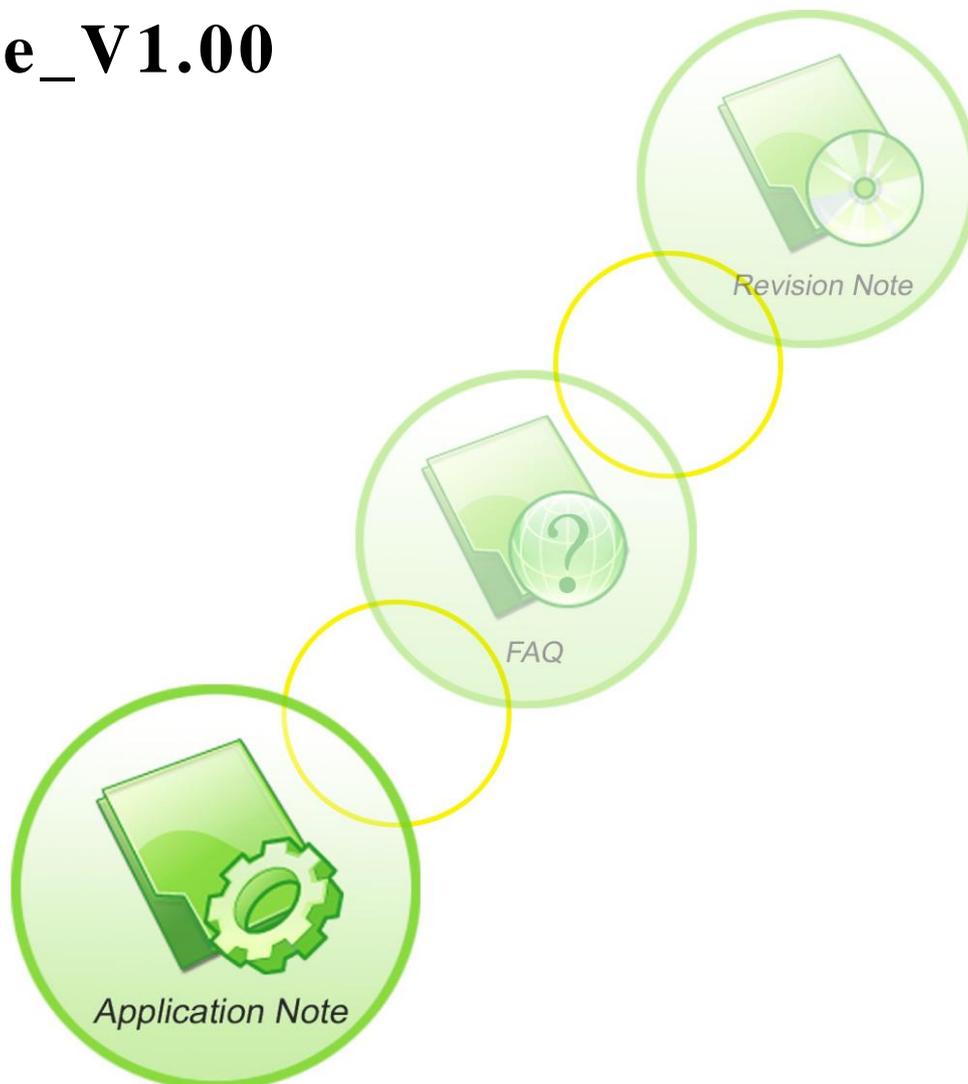




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# **SIM7X00 Series\_GPS\_Application**

## **Note\_V1.00**



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## Version History

Date	Version	What is new	Author
2016-07-07	1.00	New version	Dongshan.liu

## Scope

This document presents the AT command of GPS operation and application examples. This document can apply to SIM7X00 series modules, including SIM7600C, SIM7600CE and SIM7500JE.

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## 1. Introduction

### 1.1. Overview

Customer can get useful information about SIM7X00 GPS/A-GPS functions quickly through this document.

GPS function could be easily realized by AT command interface provided in SIM7X00 module via USB interface.

#### **SIM7X00 GPS features:**

- Support S-GPS and A-GPS function.
- Support GLONASS function.
- Support standalone mode, MS-based mode and MS-assisted mode
- Support cold start and hot start.
- Support a subset of the NMEA-0183 standard.
- Support NMEA sentences output in NMEA port port.
- A-GPS supports UP (user plane) and CP (control plane) method.
- MS-assisted mode supports single fixed; MS-based mode supports seriate fixed.
- Support certificate if necessary.

Supporting GPS starts automatically when module powers on, it supports standalone mode only.

### 1.2. GPS Mode Introduction

In MS-assisted mode, when a request for position location is issued, available network information is provided to the location server and assistance is requested from the location server. The location server sends the assistance information to the handset. The handset/mobile unit measures the GPS observables and provides the GPS measurements along with available network data (that is appropriate for the given air interface technology) to the location server. The location server then calculates the position location and returns results to the requesting entity.

In MS-based mode, the assistant data provided by the location server encompasses not only the information required to assist the handset in measuring the satellite signals, but also the information required to calculate the handset's position. Therefore, rather than providing the GPS measurements and available network data back to the location server, the mobile calculates the location on the handset and passes the result to the requesting entity.

In standalone mode, the handset demodulates the data directly from the GPS and GLONASS satellites. This mode has some reduced cold-start sensitivity, and a longer time to first fix as compared to the assisted modes. However, it requires no server interaction and works out of network coverage. GPS is preferred than GLONASS, so if GPS has fixed the position, the GNSS engine will close GLONASS, in order to save the power. If customer wants GPS and GLONASS hybrid, he can first change the mode with AT Command

**Table 1 GPS mode of operation**

<b>MS-assisted</b>	<b>Server</b>	<b>Module</b>
Location server sends aiding data that is valid for the current fix	Send aiding data	
Module sends code phases		Code phases
Server calculates position	Calculate position	
<b>MS-based</b>	<b>Server</b>	<b>Module</b>
Location server sends aiding data that is valid for the current fix	Send aiding data	
Module calculates position		Calculate position
<b>Standalone</b>	<b>Server</b>	<b>Module</b>
Module demodulates data from GPS satellite		Demodulates GPS and GLONASS satellite data
Module calculates position		Calculate position

### 1.3. gpsoneXTRA Introduction

#### 1.3.1 gpsOneXTRA assistance

It provides enhanced standalone performance, and eliminates the need to demodulate the GPS signal for ephemeris, almanac, iono, UTC, or health.

Normally requires -144 dBm or stronger for all SVs in view

TTF can be reduced by 18 to 30 sec (or more in harsh signal environments)

#### 1.3.2 gpsOneXTRA assistance data file content

Current assistance data (ephemeris, almanac, iono, UTC, health)

Predict satellite coordinates and clock biases valid for up to 7 days

#### 1.3.3 gpsOneXTRA assistance data delivery

Propriety binary file (approximately 40 kB, depending on number of active satellites)

File transfer via HTTP

Time assistance via SNTP/HTP

### 1.3.4 gpsOneXTRA assistance file source and policy

Qualcomm generated the assistance file and Qualcomm partner hosted.

## 1.4 References

The present document is based on the following documents:

SIM7X00 Series\_AT Command Manual\_V1.00

## 1.5 Terms and Abbreviations

For the purposes of the present document, the following abbreviations apply:

- AT Attention; the two-character abbreviation is used to start a command line to be sent from TE/DTE to TA/DCE
- A-GPS Assisted Global positioning system
- GPS Global positioning system
- S-GPS Simultaneous Global positioning system

## 2. A-GPS Quick Start – Setting

The purpose of this section is to help to get start with A-GPS setting.

### 2.1. Set A-GPS Server Address

UP method is through PS region, so customer must set A-GPS server and PDP context profile. The server address is provided by local carrier.

- ◆ Set the PDP context profile method:

```
AT+CGSOCKCONT=1,"IP","myAPN"
```

The first parameter is the profile number of CGSOCKCONT, and “IP” is the protocol stack type that MMS will use. “myAPN” is the ASN that will be used for PDP activation, this parameter should be set to the real APN string set by the carrier. Following is the PDP context profile and server URL setting example:

- ◆ Set the A-GPS server method:

```
AT+CGPSURL="111.222.333.444:8888"
```

### 2.2. Set Certificate

If the GPS server requires certificate, customer must select security mode, and input the certificate. The certificate must be imported into EFS by PC tool.

- ◆ Select the transport security:

```
AT+CGPSSSL=1
```

The certificate is provided by local carrier.

### 3. Start GPS

#### 3.1. Start GPS Standalone Mode

Three methods can start GPS standalone mode:

1. AT+CGPS=1,1 (or AT+CGPS=1)
2. AT+CGPSCOLD
3. AT+CGPSHOT

These commands must be executed after GPS engine switched off.

#### 3.2. Start A-GPS Mode

When using MS-based mode, mode will transform to standalone mode automatically after getting the ephemeris information from the server. MS-assisted mode is single fixed; MS-based mode is seriate fixed.

##### 1. AGPS server which does not support certificate:

MS-assisted mode	no certificate
Set APN	AT+CGSOCKCONT=1,"IP","myAPN"
Set server address (not support certificate )	AT+CGPSURL="111.222.333.444:8888"
Set security mode	AT+CGPSSSL=0
Start GPS	AT+CGPS=1,3
AT port response (URC)	+CAGPSINFO:3122256517,12135328531,135,15052009,012749.0
NMEA port response	\$GPGSV,3,1,10,02,22,135,26,08,11,045,23,09,11,180,22,10,33,056,22*71 \$GPGSV,3,2,10,15,78,281,44,21,22,315,41,24,67,315,47,26,45,225,30*78 \$GPGSV,3,3,10,27,33,157,,29,22,247,46*76 .....
<b>MS-based mode</b>	no certificate
Set APN	AT+CGSOCKCONT=1,"IP","myAPN"
Set server address (not support certificate )	AT+CGPSURL="111.222.333.444:8888"
Set security mode	AT+CGPSSSL=0
Start GPS	AT+CGPS=1,2
AT command (get fixed position)	AT+CGPSINFO
AT port response	+CGPSINFO: 3113.393766,N,12121.176625,E,061108,075358.0,19.5,0

NMEA port response	\$GPGSV,3,1,11,02,19,142,20,08,16,045,21,09,19,180,22,10,41,063,29*7B \$GPGSV,3,2,11,15,77,317,46,18,09,286,31,21,28,315,43,24,73,310,47*7F \$GPGSV,3,3,11,26,53,241,31,27,39,158,20,29,30,250,41*45 \$GPGGA,013925.0,3113.340070,N,12121.176208,E,1,08,2.9,164.0,M,,,*08 \$GPRMC,013925.0,A,3113.340070,N,12121.176208,E,,,150509,,,A*61 \$GPGSA,A,3,08,10,15,18,21,24,26,29,,,,,4.4,2.9,3.3*37 \$GPVTG,T,,M,0.0,N,0.0,K*4E .....
--------------------	---

## 2. AGPS server which supports certificate:

<b>MS-assisted mode</b>	use certificate
Import certificate	By PC tool
Set APN	AT+CGSOCKCONT=1,"IP", "myAPN"
Set server address (support certificate )	AT+CGPSURL="111.222.333.444:8888"
Set security mode	AT+CGPSSSL=1
Start GPS	AT+CGPS=1,3
AT port response (URC)	+CAGPSINFO:3122256517,12135328531,135,15052009,012749.0
NMEA port response	\$GPGSV,3,1,10,02,22,135,26,08,11,045,23,09,11,180,22,10,33,056,22*71 \$GPGSV,3,2,10,15,78,281,44,21,22,315,41,24,67,315,47,26,45,225,30*78 \$GPGSV,3,3,10,27,33,157,,29,22,247,46*76 .....
<b>MS-based mode</b>	use certificate
Import certificate	By PC tool
Set APN	AT+CGSOCKCONT=1,"IP", "myAPN"
Set server address (support certificate )	AT+CGPSURL="111.222.333.444:8888"
Set security mode	AT+CGPSSSL=1
Start GPS	AT+CGPS=1,2
AT command (get fixed position)	AT+CGPSINFO
AT port response	+CGPSINFO: 3113.393766,N,12121.176625,E,061108,075358.0,19.5,0
NMEA port response	\$GPGSV,3,1,11,02,19,142,20,08,16,045,21,09,19,180,22,10,41,063,29*7B \$GPGSV,3,2,11,15,77,317,46,18,09,286,31,21,28,315,43,24,73,310,47*7F \$GPGSV,3,3,11,26,53,241,31,27,39,158,20,29,30,250,41*45 \$GPGGA,013925.0,3113.340070,N,12121.176208,E,1,08,2.9,164.0,M,,,*08

	<pre>\$GPRMC,013925.0,A,3113.340070,N,12121.176208,E,,150509,,A*61 \$GPGSA,A,3,08,10,15,18,21,24,26,29,,,,4.4,2.9,3.3*37 \$GPVTG,T,,M,0.0,N,0.0,K*4E .....</pre>
--	--

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## 4. Get GPS Position Information

### 4.1. Standalone Mode

Command AT+CGPSINFO will return fixed position; also it can report GPS position string automatically by configured with AT command.

The report format:

```
+CGPSINFO: 3113.393766,N,12121.176625,E,061108,075358.0,19.5,0
```

### 4.2. A-GPS Mode

If MS-based mode is enabled, fixed position information is like standalone mode.

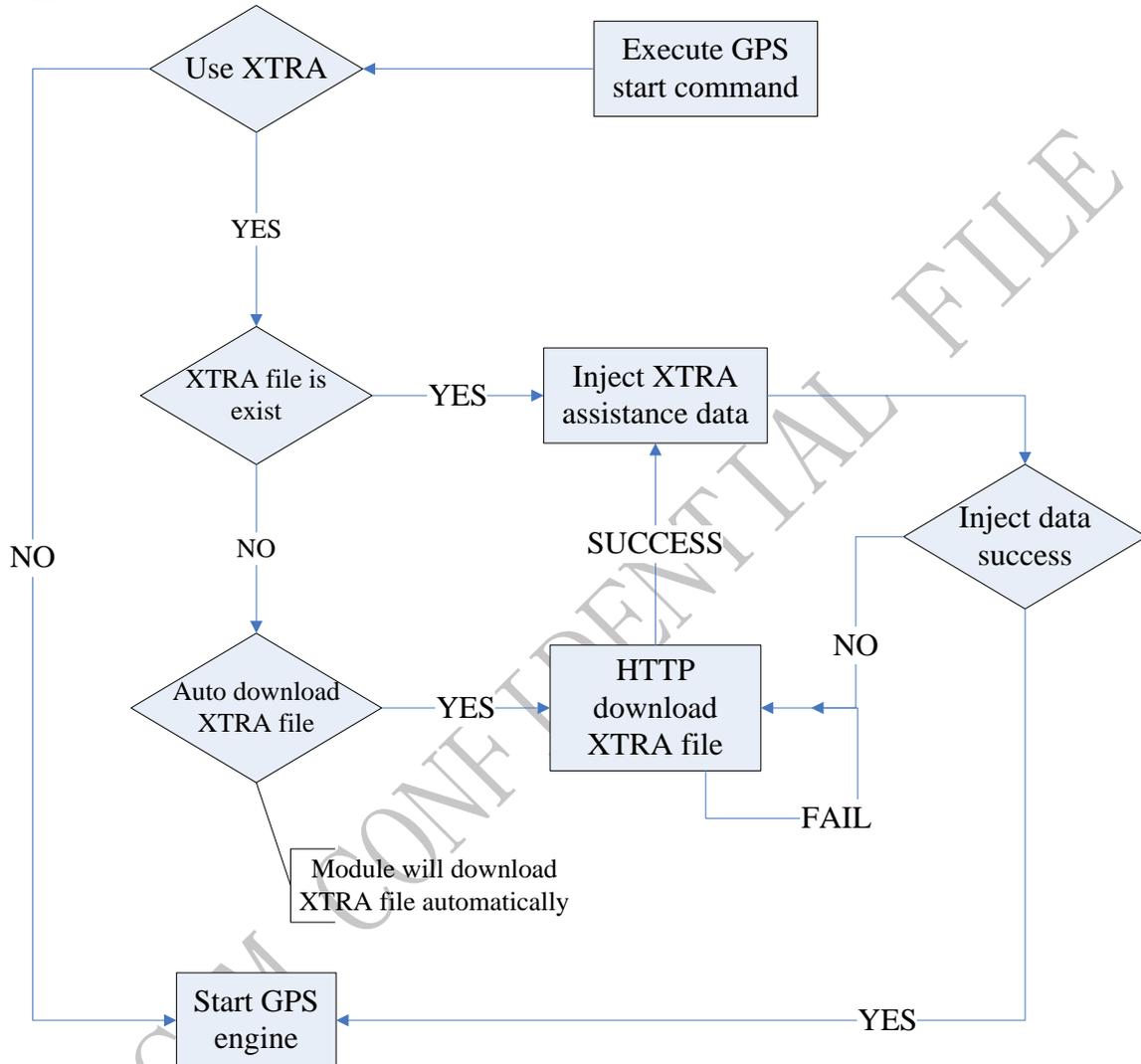
If MS-assisted mode is enabled, GPS position string will report automatically.

The report format is as following:

```
+CAGPSINFO:3122256517,12135328531,135,15052009,012749.0
```

## 5. Qualcomm gpstoneXTRA Mode

### 5.1. gpstoneXTRA Execute Flow



### 5.2. gpstoneXTRA Setting

- 1) Make sure the APN is correct (AT+CGSOCKCONT), gpstoneXTRA downloads the assistance file from server by HTTP protocol.
- 2) Module time (AT+CCLK) must be synchronized by HTP protocol, and local time zone must be set.
- 3) Enable the XTRA function (AT+CGPSXE=1)

### 5.3. gpstoneXTRA AT Flow

- 1) Enable the gpstoneXTRA function. Execute AT+CGPSXE=1, then restart the module. (This function will take effect after module restart).
- 2) Setting APN. Execute AT+CGSOCKCONT=1,"IP","myAPN".

- 3) Download the XTRA assistance file form HTTP server. Execute AT+CGPSXD=0. Module will report +CGPSXD: 0 if download successfully.
- 4) Set HTP server AT+CHTTPSERV="ADD","www.google.com",80,1
- 5) Set local time zone by AT+CCLK="11/09/27,09:27:31+32" (This time is maybe imprecise, but time zone must set local value. +32 is the Beijing time zone)
- 6) Synchronize time by command AT+CHTTPUPDATE
- 7) Start GPS AT+CGPSCOLD

#### 5.4. Vendor Propositional XTRA Execute Flow

- 1) Time synchronizes: Consumer must synchronize the module time before using XTRA. Time zone must be set by AT+CCLK. If consumers do not want to use HTP to synchronize the time, time also can be set by AT+CCLK. But the time must be accurate.
- 2) Download the XTRA file by AT command (AT+CGPSXD). The XTRA assistance file can be used for about 7 days. But suggest customer updates this file daily.
- 3) Start the GPS.

## 6. Q&A

Some answers to frequently asked questions may be helpful for using GPS.

### ***Why GPS does not start?***

Please execute AT+CGPSCOLD, AT+CGPSHOT or AT+CGPS=1 to start GPS. If customers want to start GPS automatically when powered on the module, they can set AT+CGPSAUTO=1.

### ***Why can we not get NMEA sentence?***

1. Make sure GPS is running.
2. Check current opened port is NMEA port.

### ***Why A-GPS does not get the fixed position?***

1. Make sure all the setting is correct. Re. A-GPS quick start setting.
2. Make sure AGPS server address is available.
3. Is module camp on WCDMA or GSM network?

### ***Why standalone mode cannot fix?***

1. Is GPS antenna connected normally?
2. Is there existing GPS signal? If indoor or no GPS signal, standalone mode cannot fix.

### ***How to get fixed position information?***

1. AT+CGPSINFO command should get position information after fixed. It is URC information.
2. Parse NMEA sentence \$GPGGA or \$GPRMC.
3. If use MS-assisted, fixed position information will report automatically after it is fixed.

### ***Why module cannot download XTRA file by HTTP?***

1. Make sure the APN setting correct.
2. Make sure the module camp on the PS, i.e. AT+CGREG? Return 0,1

### ***How to disable or enable the XTRA function?***

1. Setting by AT+CGPSXE=<on/off>, the parameter 0 means disable and 1 means enable. Module must be restarted after setting.

### ***Can XTRA enhance the TTF?***

1. Yes, TTF can be reduced by 18 to 30 sec (or more in harsh signal environments) for standalone cold start.

### ***Which setting is necessary for XTRA?***

1. Time synchronization.
2. Download XTRA file by HTTP.

*If http is used for XTRA download, can it be used for another http connection?*

1. No, HTTP is only allowed for one connection.

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