MTK A-GPS 6575
Customer Support Document

Version: 1.0
Release date: 2011-04-14

Document Revision History

Revision	Date	Author	Description
1.0	2011-04-14	Baochu Wang	MTK A-GPS 6573 customer support document

Table of Contents

List of Figures

1 Introduction

1.1 GPS (Global Positioning System)

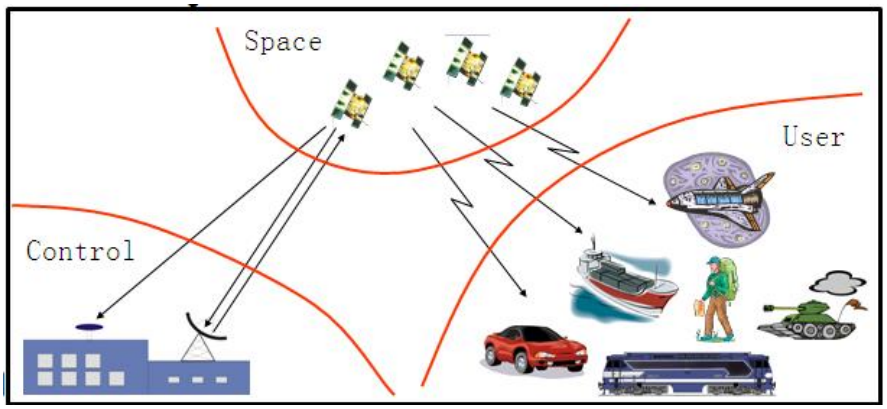


Figure 1-1. Segments of a GPS system

The Global Positioning System (GPS) is a worldwide radio-navigation system formed from a constellation of 24 satellites and their control stations. GPS uses these "man-made stars" as reference points to calculate positions accurate to a matter of meters. In a sense, it is similar to giving every square meter on the planet a unique address.

There are five control stations in the world, which are in Hawaii, Ascension Island, Diego Garcia, Kwajalein and Colorado Springs. They monitor the GPS satellites, checking both their operational health and the exact positions in space. The master ground station transmits corrections for the satellite's ephemeris constants and clock offsets back to the satellites themselves. The satellites can then incorporate these updates in the signals they send to GPS receivers.

GPS space constellation, the most important and complicated segment, is composed of 24 satellites which are located in 6 orbital planes. Each plane has a 55 degrees inclination angle with respect to the equator. Such overall arrangement makes every square meter on the planet observed by more than 4 satellites. In other words, GPS covers the planet seamlessly. 24 satellites are placed into the orbit by the U.S. Department of Defense. GPS was originally intended to design for military applications, but in the 1980s, the government made the system available for civilian use.

GPS user receivers have been miniaturized to just a few integrated circuits and so are becoming very economical, which makes the technology virtually accessible to everyone. These days GPS is finding its way into cars, boats, planes, construction equipment, movie-making gear, farm machinery and even laptop computers. GPS indeed has become a basic utility in smart telephones.

1.2 A-GPS (Assisted GPS)

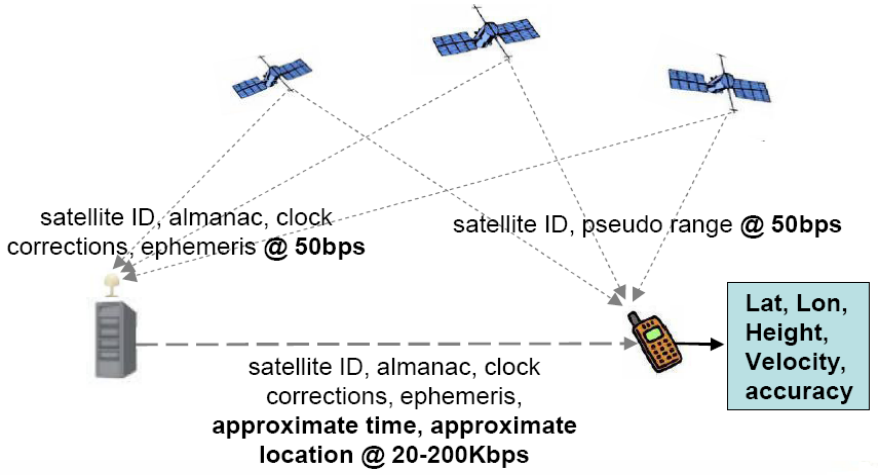


Figure 1-2. A-GPS topological model

A-GPS stands for Assisted-GPS. This method uses GPS satellites to determine the position of a UE. It is termed as Assisted-GPS because the method varies from the original GPS in the way that the UE uses satellite information provided by reference GPS receiver located at the base station of the cellular networks.

- Helps calculating positions but cannot position itself alone
- Receives transparent mobile/communication network signals, even indoors or no open sky
- Via base stations which have gathered/computed assistance data ephemeris, almanac, etc. from satellites.
- Originally designed for emergency rescue of mobile communication

A-GPS data paths

1. Control plane:
   This approach sends data for A-GPS on the standard defined signaling control channel (thus termed as "control plane"), which are an inherent part of a network operator's mobile call distribution system. The goal of the control plane is to provide high-accuracy, high-availability location response to emergency service providers. The positioning capability has to handle location requests that can come at any time from any environment, and no prior events can be assumed.

2. User plane:
   The user plane is generally TCP/IP based to support location services. The user plane is designed to provide enhanced handiness, e.g. speed, accuracy, ease of entry to location information in non-emergency use, for users. The solution is called a "user plane" due to the location-related signaling, both at the service level and the positioning level, appears simply as the user data to the wireless network. In general, the traffic is all carried over IP bearers.

A-GPS working modes

1. UE-assisted:
   The UE assists the network in calculating its location and provides the network with the necessary location information it possesses.
   - UE requires assistance data for each positioning session.
   - UE takes raw measurements of GPS signals from all visible satellites and provides them back to the network (SMLC).
   - SMLC computes location of the UE-based on GPS signal measurements
   - Typically used for emergency-type services

2. UE-based:
   The UE obtains the data for calculating the location from the network and calculates its location on its own.
   - UE requires periodic assistance data from the network (SMLC).
   - UE contains ability to compute its own location and may report back to the network in certain modes.
   - Typically used for commercial services

Types of location requests

- Network Induced Location Request (NI-LR): A typical location request used in an emergency call
- Mobile Terminated Location Request (MT-LR): A location request used by the network for supplementary services
- Mobile Originated Location Request (MO-LR): A location request initiated by the mobile for identifying its own location and may be obtained location-based services or navigation information

Specifications to refer to for A-GPS related information

- 3GPP_34.171
- 3GPP_34.123
- 3GPP_25.331
- 3GPP_51.010
- 3GPP_44.031
- OMA_AD_SUPL_V1.0
- OMA_TS_ULP_V1.0
- OMA_RD_SUPL_V1.0
- OMA_ETS_SUPL_V1.0

Download link for 3GPP: http://pda.etsi.org/pda/queryform.asp
Download link for OMA SUPL: http://openmobilealliance.org/Technical/current_releases.aspx

We currently support both 2G/3G CP and SUPL V1.0.

2 Environment

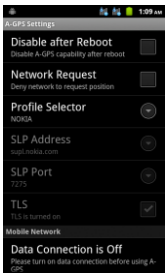
This document not only applies to Android OS 2.3 with MTK's hardware MT6573 but is also backward compatible to Android OS 2.2 with MTK's hardware MT6516.

However, please note that there are some differences between MT6573 and MT6516:

- MT6573 supports both the user plane (SUPL) and control plane.
- MT6516 only supports the user plane (SUPL).

3 A-GPS MMI Setting

3.1 Menu Layout (User Mode)

UM menu	Location & security	(1) Use GPS satellites	
 		(2) A-GPS	
		(3) A-GPS settings	(4) Disable after Reboot
			(5) Network Request
			(6) A-GPS profile
			Profile name
			Address
			Port
			TLS
			(7) Mobile data connection

(1) Use GPS satellites

A-GPS is used to speed up the GPS positioning, so it depends on “Use GPS satellites”. Only when “Use GPS satellites” is enabled can A-GPS be enabled.

(2) A-GPS

To enable or disable the A-GPS module. The “Data Connection” (Wi-Fi/GPRS/EDGE/3G) has to be turned on if you would like to enable A-GPS.

(3) A-GPS settings

When “A-GPS” is enabled, you can enter the A-GPS setup menus through this item.

(4) Disable after Reboot

When it is set to be “true”, the device reboot A-GPS will be disabled.

(5) Network Request

When it is set to be “false”, the requests for initiating network locations will be rejected.

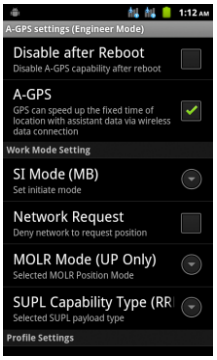
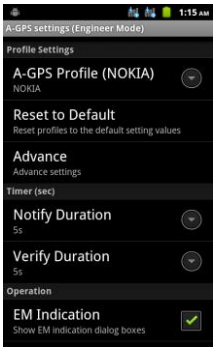
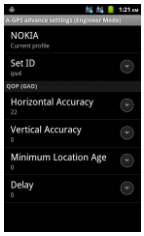
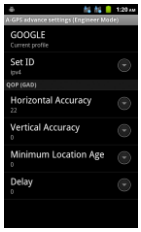
(6) A-GPS Profile

In the user plane, the A-PGS client needs to retrieve assistance data from the SLP server via an IP capable network. The profile contains detailed information on the SLP server. We currently support Google, Nokia, China Mobile (CMCC) and Chunghwa Tel (CHT). CMCC and CHT are displayed on the menu list only when the current SIM operator is CMCC or CHT and the data connection is active; otherwise they will not be displayed.

(7) Data Connection

Display the status of current data connection.

3.2 Layout of Menus (Engineer Mode)

EM menu	AGPS			
		(1) Disable after Reboot		
		(2) A-GPS		
		(3) SI Mode	SI Setting	
			SI-MA	
			SI-MB	
		(4) Network Request		
		(5) MOLR Mode	MOLR Position Mode	
			CP Only	
			UP Only	
		(6) SUPL Capability Type	SUPL Capability Type	
			RRLP	
			RRC	
			RRLP+RRC	
		**(7)** A-GPS Profile	A-GPS Profile	
			CUSTOM	
			NOKIA	Profile name
				NOKIA Address supl.nokia.com Port 7275 TLS On
			GOOGLE	Profile name
				GOOGLE Address supl.google.com Port 7275 TLS On
		(8) Reset to Default		
		(9) Advance	Set ID	Set ID
				IMSI
				IPV4
			Horizontal Accuracy	
			Vertical Accuracy	
			Minimum Location Age	
			Delay	

	*(10)* Notification Duration (11) Verification Duration (12) EM Indication (13) Log SUPL to File (14) Mobile Data Connection	

(1) Disable after Reboot

If it is set to be “true”, the device reboot A-GPS will be disabled no matter what its status is before the reboot.

(2) A-GPS

Enable or disable the A-GPS module. The “Data Connection” (Wi-Fi/GPRS/EDGE/3G) has to be on if you would like to enable A-GPS.

(3) SI Mode

Set up the work mode to “Mobile Assisted” or “Mobile Based”. (Default: MB)

(4) Network Request

If it is set to be “false”, the requests for initiating network locations will be rejected.

(5) MOLR Mode

Choose the work mode for MOLR (Mobile Originated Location Request). When it is set to be “UP”, MOLR will be processed with the SUPL protocol.

(6) SUPL Capability

- RRLP: UE will send messages to LCSP indicating that only RRLP payload is supported.
- RRC: UE will send messages to LCSP indicating that only RRC payload is supported.
- RRLP+RRC: UE will send messages to LCSP indicating that only RRLP payload is supported.

(7) A-GPS Profile

In the user plane, the A-PGS client needs to retrieve assistance data from the SLP server via an IP capable network. The profile is the configuration of the SLP server address, and with different profiles, the A-GPS client can access different servers. We currently support Google, Nokia, China Mobile (CMCC) and Chunghwa Tel (CHT). CMCC and CHT are displayed in the menu list only when the current SIM operator is CMCC or CHT and the data connection is active; otherwise they will not be displayed. In addition, we also provide a custom profile where you can input a known SLP server address. Other features include:

(8) Reset to Default

To reset all the profiles, e.g. Google, Nokia, CMCC and CHT, to default values.

(9) Advance

Click this item to enter the advanced setup screen for A-GPS. “Set ID” is the device identification that can be set to “IPv4” or “IMSI”. There are four configuration parameters of A-GPS quality of position (QOP):

- Horizontal accuracy: Horizontal parameter of QOP
- Vertical accuracy: Vertical parameter of QOP
- Minimum location age: Period of validity that allows the last position result to be used as the current location
- Delay: Values as defined element response

(10) Notification Duration

In MTLR (Mobile Terminated Location Request), a verified dialog will pop up to give you indications. This item value means the duration the dialog will be displayed and disappear.

(11) Verification Duration

In MTLR (Mobile Terminated Location Request), a verified dialog will pop up for your verification (i.e. accept or deny). This item value means the duration the dialog will be timed out and disappear if you do not respond.

(12) EM Indication

When this item is set to be “true” in the engineer mode, some indication dialog boxes will pop up for debugging.

(13) Log SUPL to File

To log out the SUPL critical log sentences to a file during SUPL processing.

(14) Data Connection

Display the status of current data connection.

3.3 AGPS Enable Sequence

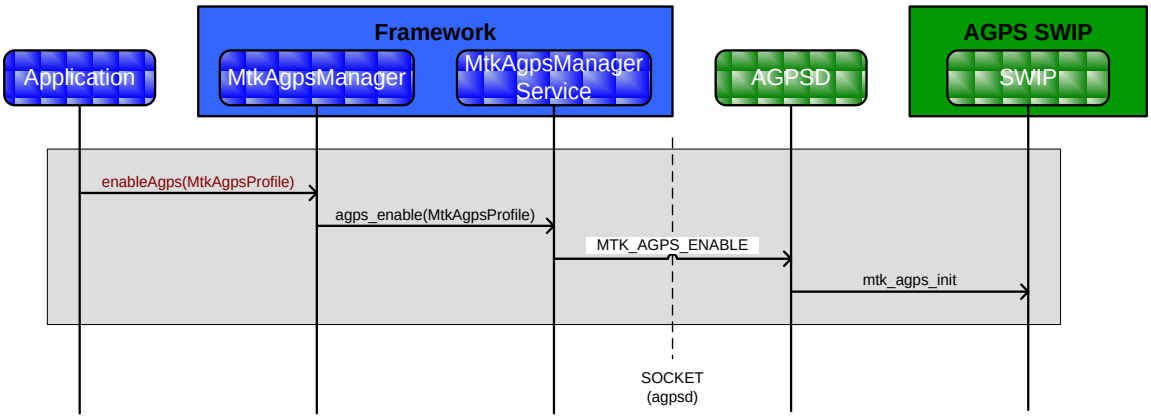


Figure 3-1. A GPS enable sequence

3.4 AGPS Disable Sequence

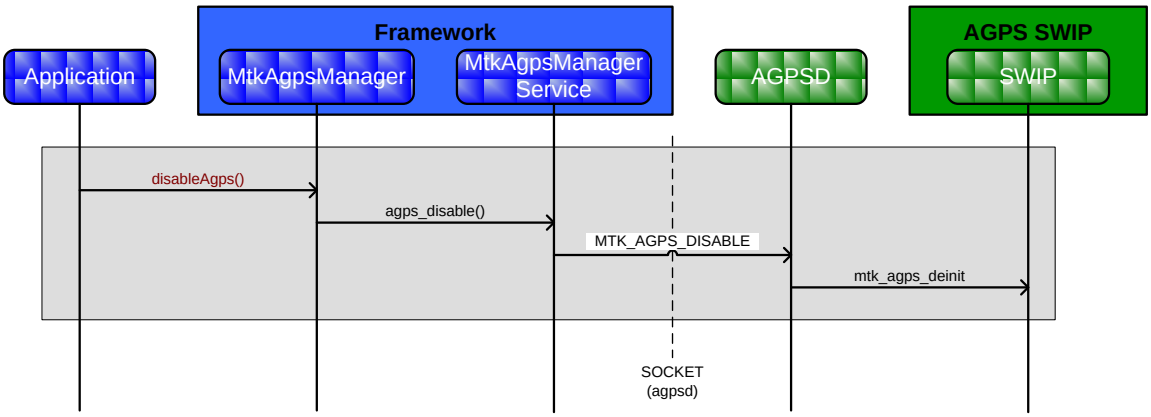


Figure 3-2. A-GPS disable sequence

3.5 AGPS Configuration Sequence

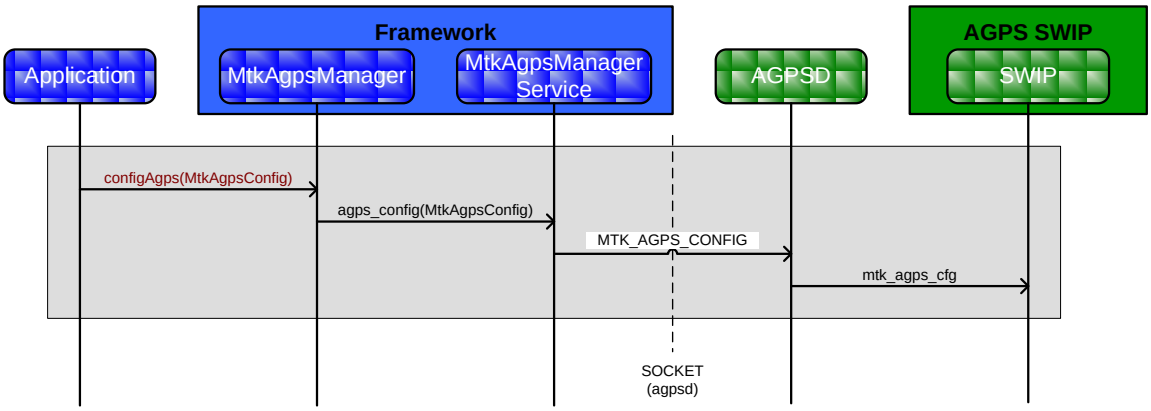


Figure 3-3. A-GPS configuration sequence

3.6 AGPS Response Sequence

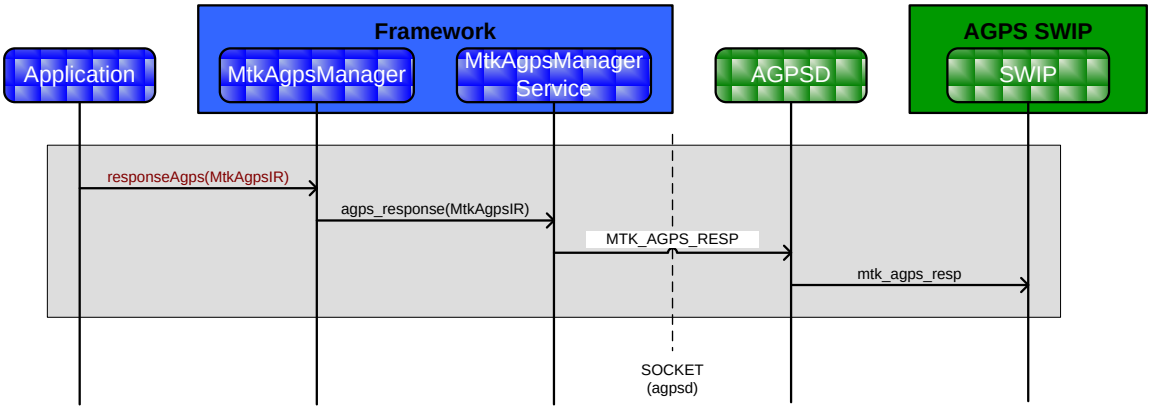


Figure 3-4. A-GPS response sequence

4 Build

4.1 How to Switch On/Off A-GPS Features

In order to dynamically switch on/off A-GPS, the Android build system provides optional tags of configuration (MTK_GPS_SUPPORT, MTK_AGPS_APP) for you to customize the features. “Switch off” means A-GPS MMI menus will not appear in the menu list of the user mode and engineer mode. Related modules mtk_agps.bin, libagpssupl.so and libssadp.so will not be generated or included into system.img. (If the modules already exist, use only the remake command to build the project.)

Due to the reason that A-GPS cannot work without GPS, we set up dependency of AGPS and GSP for your convenience to switch A-GPS.

- If you set MTK_GPS_SUPPORT = no, MTK_AGPS_APP also has to be set to "no". Otherwise, the project building will stop to show error messages indicating that AGPS cannot switch without the GPS support, and only setting up MTK_AGPS_APP to “no” can the building be passed without errors.
- If you set MTK_GPS_SUPPORT = yes, MTK_AGPS_APP can be set to "yes" or "no".

All the dependency functions above are integrated into the Android building system. See the instructions below for how to switch on/off A-GPS.

- Switch on A-GPS
  Set MTK_GPS_SUPPORT = yes and MTK_AGPS_APP = yes in ProjectConfig.mk
- Switch off A-GPS
  Set MTK_AGPS_APP = no in ProjectConfig.mk

4.2 A-GPS Configuration Files

For customers to configure the A-GPS default parameters, we add a configuration file named “agps_profiles_conf.xml” in alps/vendor/mediate/project-name/etc. In this file, you can add, remove and modify the related parameters to customize A-GPS.

Profile configuration

```
<!--CUSTOM Profile-->
        <agps_profile code="CUSTOM"/>
<!--NOKIA Profile -->
        <agps_profile code="NOKIA"/>
<!--GOOGLE  Profile-->
        <agps_profile code="GOOGLE"/>
<!--CMCC1  Profile-->
        <agps_profile code="46000"/>
<!--CMCC2  Profile-->
        <agps_profile code="46002"/>
```

```
<!--CMCC TD-->
        <agps_profile code="46007"/>
<!--CHUANG HWA Profile-->
        <agps_profile code="46692"/>
```

Parameter values configuration

```
<agps_conf_para
        default_profile="GOOGLE"
         disable_after_reboot="no"
         ni_request="no"
         agps_enable="yes"
         log_file_max_num="10"
 />
```

- default_profile:
  The default profile at the device's first boot-up
  Available value: NOKIA, GOOGLE
  - disable_after_reboot:

  Whether or not to enable A-GPS at the device's second boot-up
  Available value: yes, no
  - ni_request:

  Whether or not to enable the network to request the user's position
  Available value: yes, no
  - agps_enable:

  Whether or not to permit the enabling of A-GPS at the first boot-up
  Available value: yes, no
  - log_file_max_num:

  The max number of log files can be saved in /data/agps_supl/log/…
  Available value: 1 ~ 100

5 Debugging

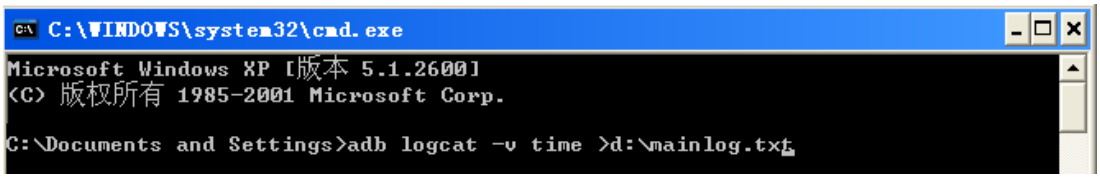
5.1 How to Record Debugging Messages

There are two types of log messages that can be recorded by different methods.

5.1.1 Log-cat

You can use the Android logging system tool “log-cat” to record the A-GPS debugging messages in the command line:

Example: Record the main log to mainlog.txt
adb logcat -v time >d:\mainlog.txt



5.1.2 Log SUPL to Files

In the engineer mode menu of A-GPS, we provide the item “Log SUPL to File” for you to log out the critical log sentences to a file (/data/agps_supl/log/…) during the SUPL processing, and it is only applicable to the user plane. From this log file we can find out the main procedure of the SUPL session. If you would like to obtain detailed log information, choose log-cat instead.

5.1.3 Standard Operation

Operators need to deploy the MLC (Mobile Location Center) and upgrade the wireless network infrastructure to support the control plane. The added cost and complexity of the control encourage operators to deploy the user plane solution instead.

The user plane enjoys quick time to the market and less deployment costs. By reusing the control plane protocols and IP-based transports, functionally equivalent network elements for the positioning server and the gateway server can be easily leveraged.

Most of the operators around the world (except for North America) do not support CP, most of the time users can only use UP though our platform has both CP and UP. See the figure below for a standard operation of demonstrating how to send UP (SUPL) SI requests on our platform.

If the operator supports CP, you can use it by switching the MOLR mode to ‘CP Only’. You can also switch the MOLR Position Method to ‘Location Estimate’ or ‘Assistance Data’ inside the CP Settings. Note that MT-LR and MO-LR work after you enable AGPS, but NI-LR works automatically after you dial an emergency call even if the AGPS is disabled

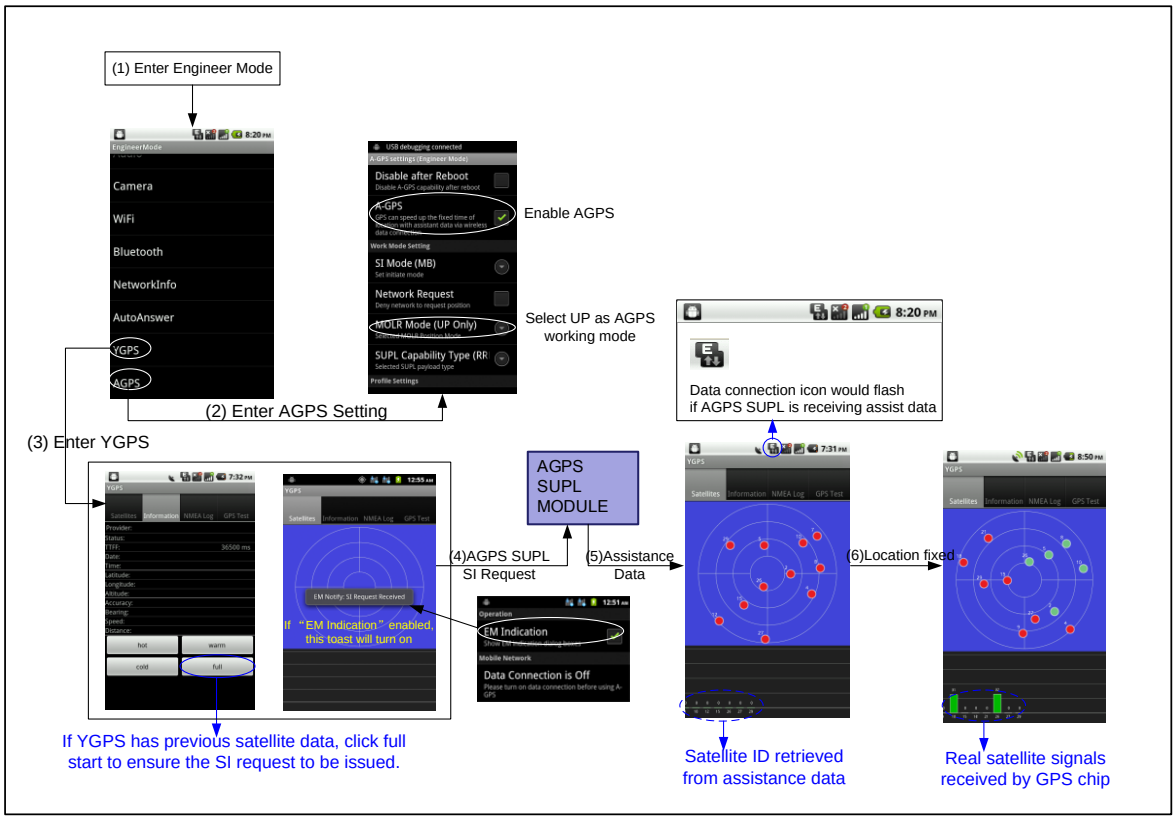


Figure 5-1. Standard operation of AGPS SUPL-SI