ATrack

AK7
User Manual

Revision: 03
Revision Date: 2016/02/22

Table of Contents

1. Notification

1.1. Disclaimer

This document, and all other related products, including device, firmware, and software, are exclusively developed by ATrack Technology Inc. Due to the continuous developments and improvements of device functionalities, changes in the protocol, specification, and firmware functions are subjects to change without notice. ATrack Technology Inc. reserves the right to modify all documentations based on its own timelines. Document modification notices will be released to ATrack Technology Inc.'s customers upon completion.

ATrack Technology Inc. products are not intended to be used as life support or rescue equipments. ATrack Technology Inc. is not liable for any loss or injury caused by using or referencing to any of its products. Any possible means of using or integrating ATrack Technology Inc. products shall be avoided.

1.2. Copyright

ATrack Technology Inc. holds all parts of intellectual rights applicable in the copyright laws in all the countries. Any and all contents of this document shall not be exposed, delivered, and/or disclosed to non-authorized 3rd party without any form of approval and consent from ATrack Technology Inc. Any form of, including but not limited to, verbal, duplicate, or internet sharing, of releasing or exposing information to an unauthorized party shall be prohibited. ATrack Technology Inc. reserves the rights of litigation in the violation of copyright laws.

1.3. Warning

Connecting of the input wires can be hazardous to both the installer and your vehicle's electrical system if not done by an inexperienced installer. This document assumes you are aware of the inherent dangers of working in and around a vehicle and have qualified understanding of electrical behaviors.

2. Introduction

Congratulations on your purchase of the ATrack AK7 Vehicle Telematics device. The AK7 is equipped with state of the art Mobile and GPS technology, providing the most reliable up to date tracking information of your vehicle's current position or movement status. In addition to this, vehicle tracking can be combined with a variety of customized events based on your needs. For instance, you may configure driving behavior events such as harsh braking, sudden acceleration, speeding, and cornering in which the vehicle may be engaged. In this way, aggressive driving behavior can be easily highlighted and prevented from reoccurrence. Therefore, not only it reduces the risks of vehicle damage but also it drives down the cost of fuel that helps contribute to saving our environment. This user manual is intended to walk you through on the installation, configuration, and firmware upgrade process.

3. System Architecture

From the following diagram, the AK7 GPS receiver receives incoming signals from each orbiting satellite. These signals consist of information such as satellite's position and the time that the signal was transmitted by each satellite. The receiver analyzes these data in order to determine how far away each satellite is and it uses the triangulation method to calculate the vehicle's exact position. Once the positioning data along with other event data are gathered, they will be transmitted to the service center across a Mobile network (e.g. GPRS/CDMA/UMTS) or via SMS. The communication is bidirectional, which means you can control the AK7 remotely across a Mobile network or via SMS.
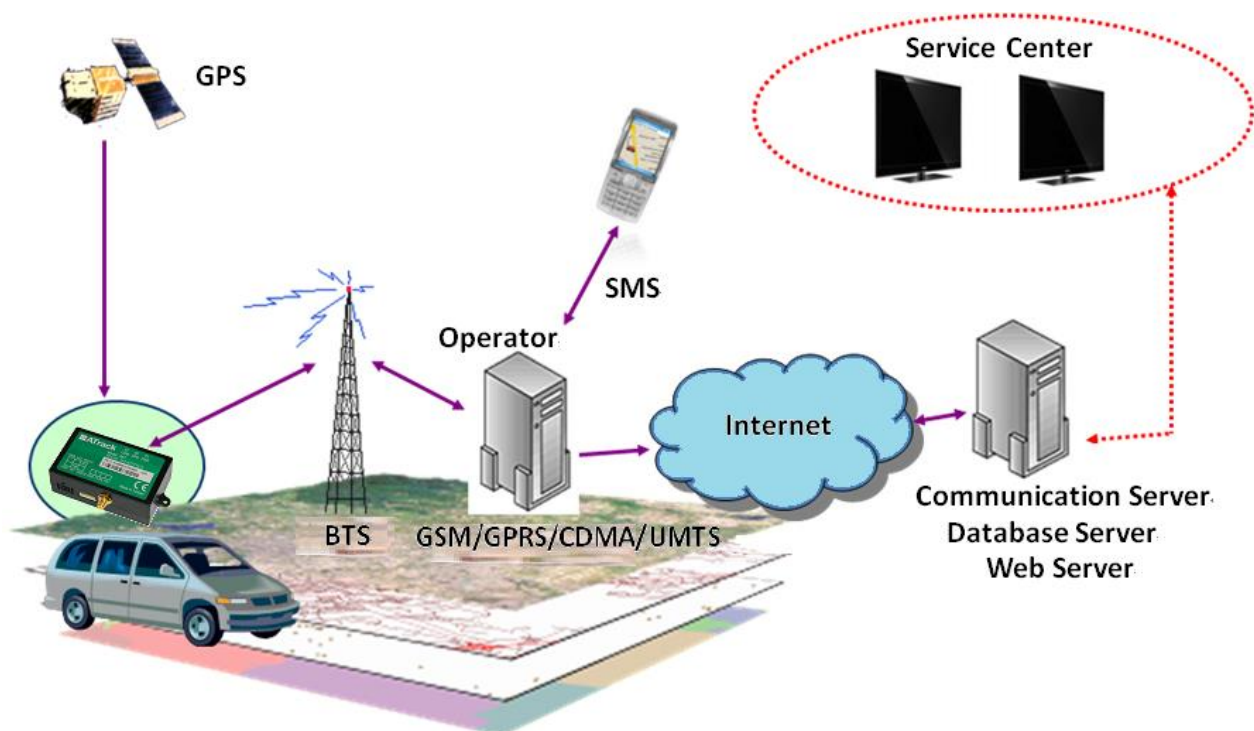
System Architecture

4. Installation

4.1. Package Content

When you open the package, please verify that you received the following device and accessories:

- AK7 Device * 1
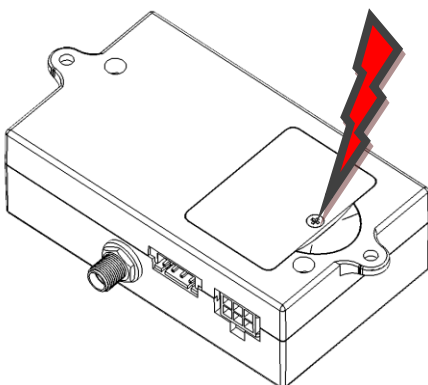- Power/IO Cable * 1

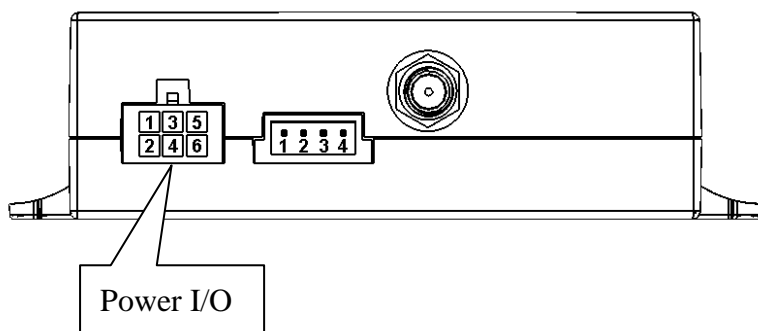- GPS Antenna * 1
- Serial Cable * 1

4.2. SIM Card Installation

The AK7 supports a SIM card with either of these two operating voltages: 1.8V (ISO/IEC 7816-3 class C) or 3V (ISO/IEC 7816-3 class B). To install a SIM card, please loosen the screw and remove the bottom SIM cover.

4.3. Power I/O Connector

The following figure shows the power I/O connector and its associated pin number.

Power I/O

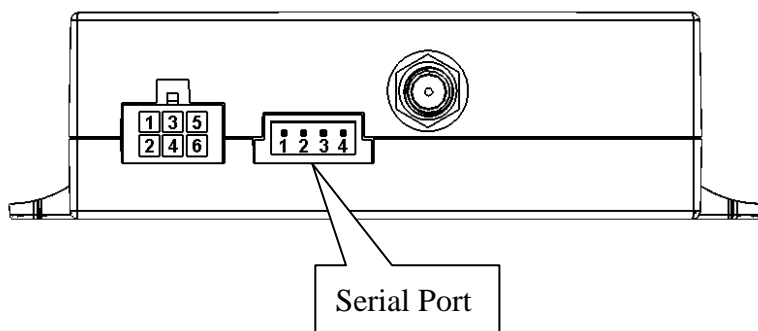The following table describes the function of each pin.

Power I/O Connector				
Pin#	**Function**	**Color**	**Designation**	**Note**
1	Main power input	Red	PWR	DC 9V~40V DC input
2	Power ground	Black	GND	
3	ACC Input	Yellow	ACC	Ignition status positive trigger input
4**	General Input1 (Default) 1-Wire Protocol Input *	Green	IN1/1W	Negative trigger input 1-Wire Data input
5**	General Input2 General Output1 (Default) Analog Input1	Brown	IN2/O1/AI	Positive trigger input Open collector output (Max.300mA) Analog input (DC0V~40V)
6**	General Input3 General Output2 (Default)	Gray	IN3/O2	Negative trigger input Open collector output (Max.300mA)

* The 1-Wire® Protocol supports up to three 1-Wire™ devices simultaneously, which means you can have one (iButton®, DS1990A) and two 1-Wire™ temperature sensor probes (DS18B20)

** You may configure the AT$IOCG command to change these specific I/O pins to any of those functions mentioned as above. **Note: Please do not connect a positive voltage to any output pin!!!**

4.4. Serial Port Connector

The following figure shows the serial port connector and its associated pin numbers.

Serial Port

The following table describes the function of each pin.

Serial Port Connector				
Pin#	Function	Color	Designation	Note
1	Power Ground	Black	GND	
2	RS232 Transmit data output	White	TX	
3	RS232 Receive data input	Green	RX	
4*	+5V Output for external accessories	Red	+5V	DC5V Max.300mA Output

* Note: The +5V output pin can not be connected to the other power source or short circuit to power ground.

The following figure shows the wire diagram of a RS-232 serial cable. *

JST XHP-4 Connector

DB9 Female Connector

* Note: The RS-232 serial cable is not included in the package.

4.5. GPS Antenna Installation

The AK7 determines its position by communicating with Global Positioning Satellites through an external GPS antenna. The location where the AK7 GPS antenna is installed will have great effect in the overall performance of the GPS receiving. Please note that the following interior conditions may cause bad GPS reception when a GPS antenna is installed inside interior of vehicle:

- Windows with metallic tint
- Windshield mounted radio antenna
- Windows with solar reflective covers
- The MP3 FM transmitter may interfere with GPS reception

4.6. Device Installation

When installing the AK7 onto a vehicle, please make sure that the XYZ-position of the device follows the exact same directions as shown below. The G-Sensor operates in such a way in order to detect harsh driving events. The forces in each axis are used to determine the status of harsh driving events. If the following installation is not practicable, it is advised to use the GPS for detecting harsh driving as an alternative.
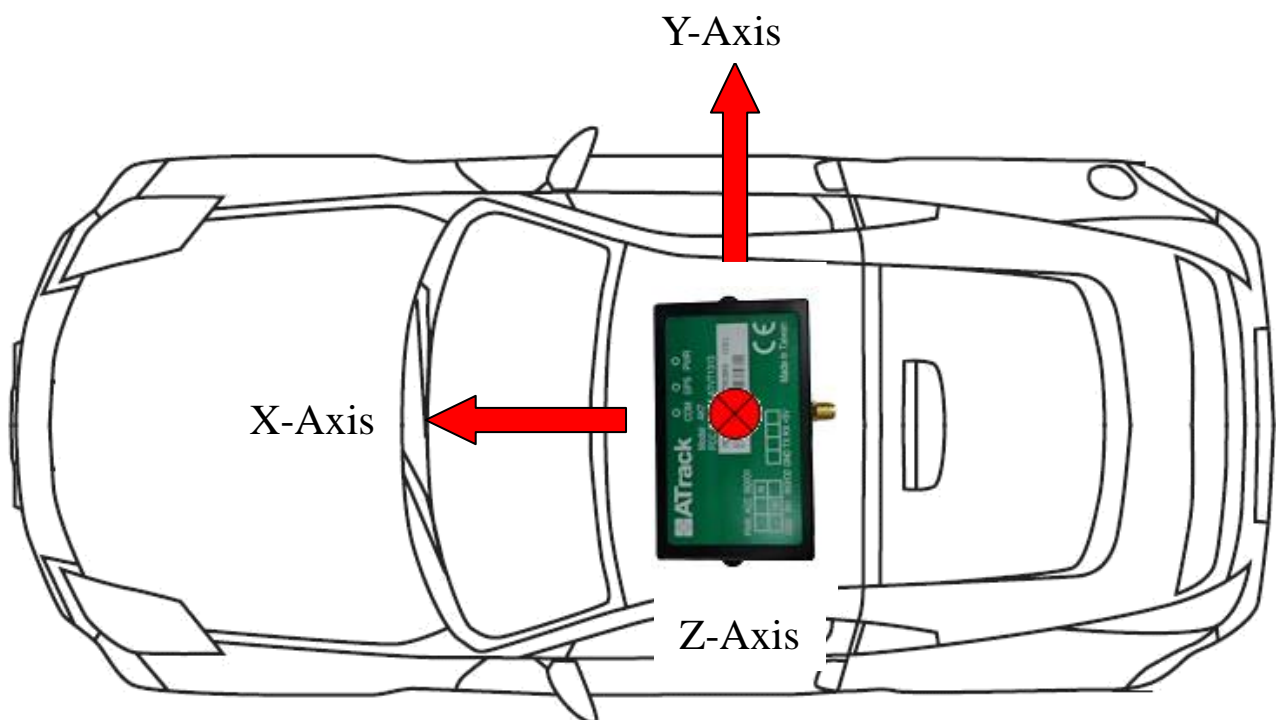
1.   Note: When installing the device, the vehicle should be parked on a horizontal place (not tilted). Then, the device should be installed parallel to the vehicle body and fixed with a mounting bracket or double-sided adhesive to ensure that the G-Sensor works properly.
2.   Note: It is strongly recommended that an automobile technician is required to be involved for the above installation.

4.7. LED Indicators

The following figure shows the location of the device LEDs.
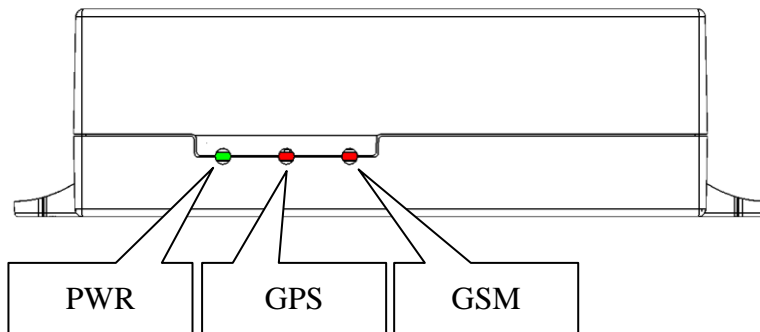
LED	Indication	Description
PWR (Green)	Solid On	In full operation mode
	1 blink (0.1 sec.) in every 10 sec.	In sleep mode
	1 sec. On, 1 sec. Off	GPS module off, External power lost, running on backup battery
GPS (Red)	0.7 sec. On, 0.7 sec. Off	Searching for GPS signal
	Solid On	Position get fixed
GSM (Red)	Off	GSM module off
	0.7 sec. On, 0.7 sec. Off	Searching for GSM signal
	0.2 sec. On, 2 sec. Off	Registered to GSM network
	2 blinks in every 2 sec.	Connected to GPRS network
	Continuous blinking	SIM PIN Error
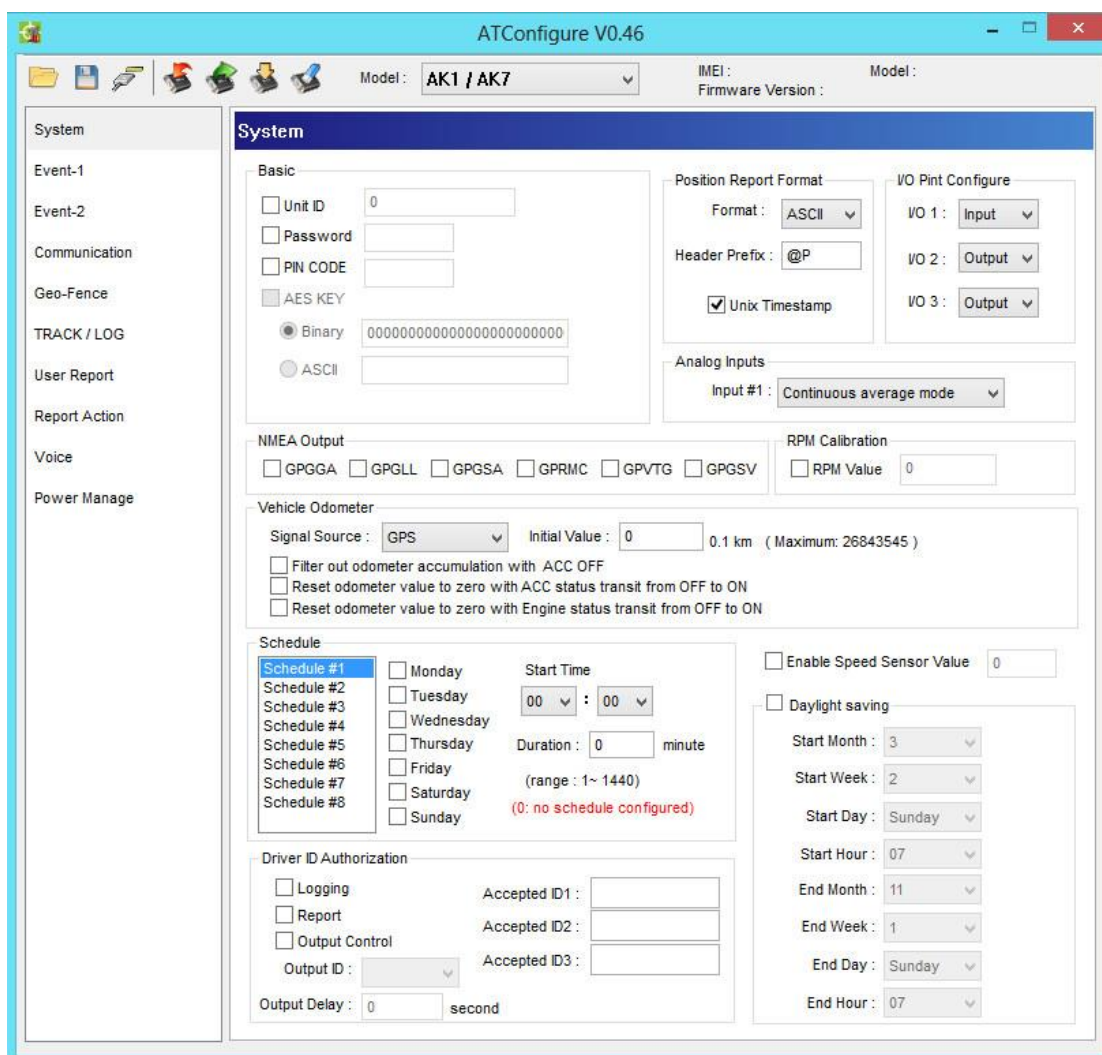
Note: In the case of SIM PIN Error, the device will check the AT$SPIN every 10 minutes and try to access the SIM again. The PIN will be validated 3 times and if it fails the last attempt, including the first inserting time, the SIM card will be locked. Once the SIM is locked, you need to contact your GSM carrier for the PUK in order to unlock the SIM card using your cell phone.

5. Configuration

You may explore great features on the AK1 either through AT commands or the AK Series Configure Tool. The commands can be sent to a device via RS232, SMS or Mobile network (e.g. GSM/GPRS).

5.1. Set up a Device Using the ATConfigure Tool

Before running the ATConfigure Tool, make sure your device is connected to a PC/laptop via RS232. The ATConfigure Tool provides a user-friendly intuitive interface that enables you to quickly and easily set up those basic parameters. Please refer to our ATConfigure Tool user manual for details.

5.2. Connect a Device Using HyperTerminal

The following example shows how to connect the AK7 through HyperTerminal. You may use other popular terminal emulators such as Putty or Tera Term Pro to establish a console session with the AK7.

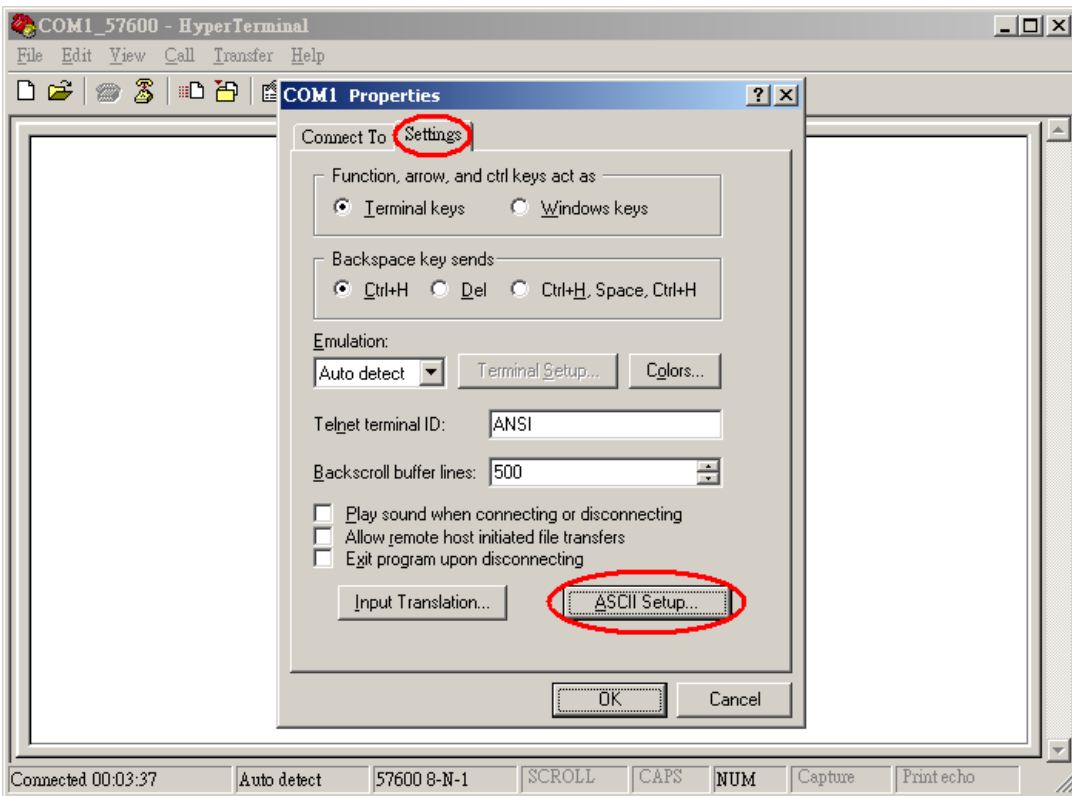(1) Run HyperTerminal and select the correct COM port and click on the **[Configure…]** button.
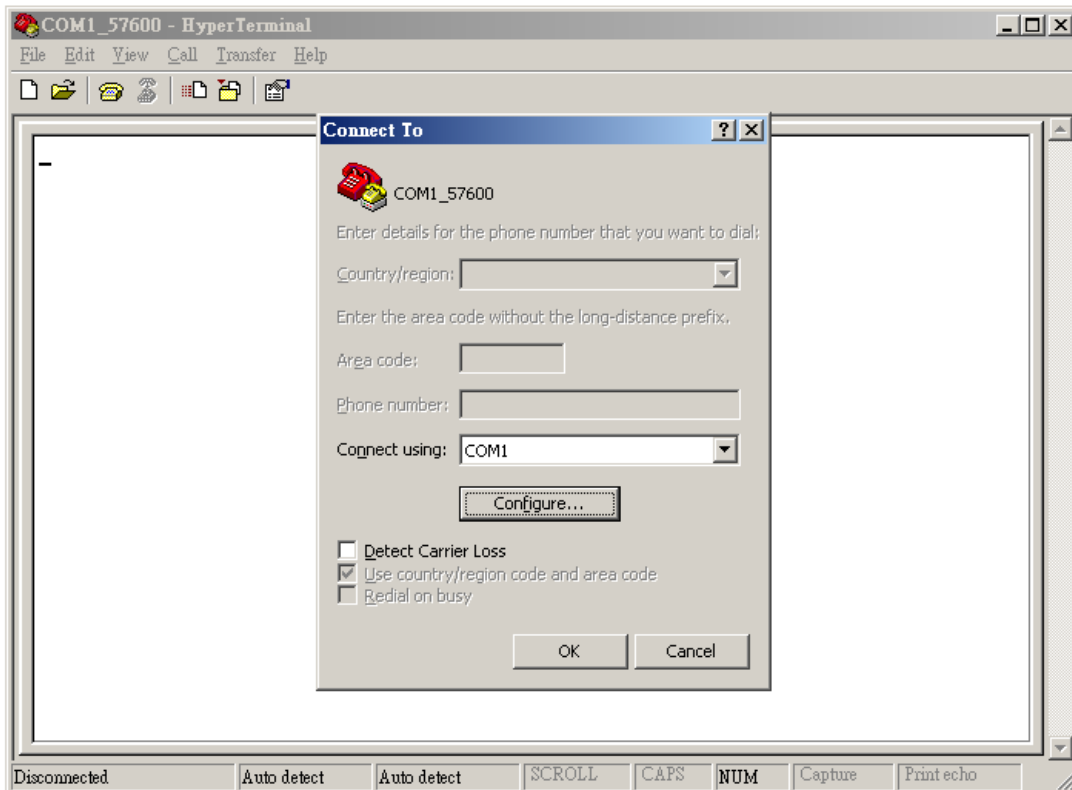
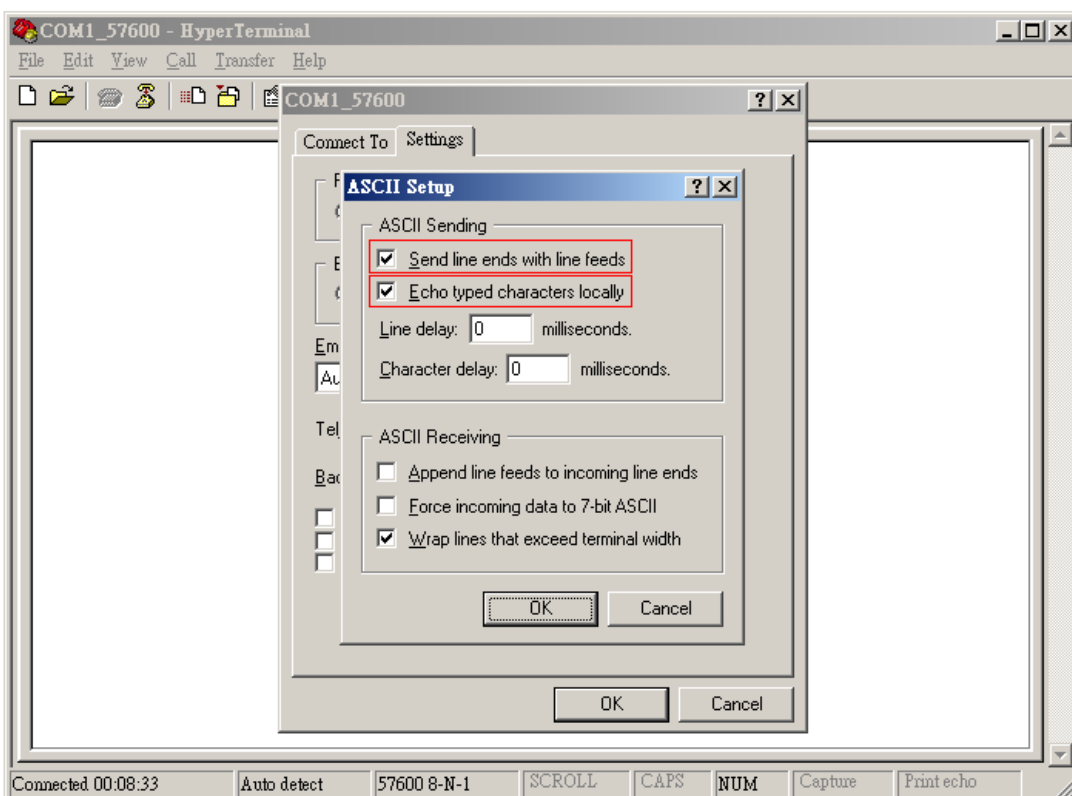(2) Port Settings should be as follows. Click on the **[OK]** button to close the Properties window.


Bits per second:	**57600**
Data Bits:	**8**
Parity:	**None**
Stop Bits:	**1**
Flow Control:	**None**
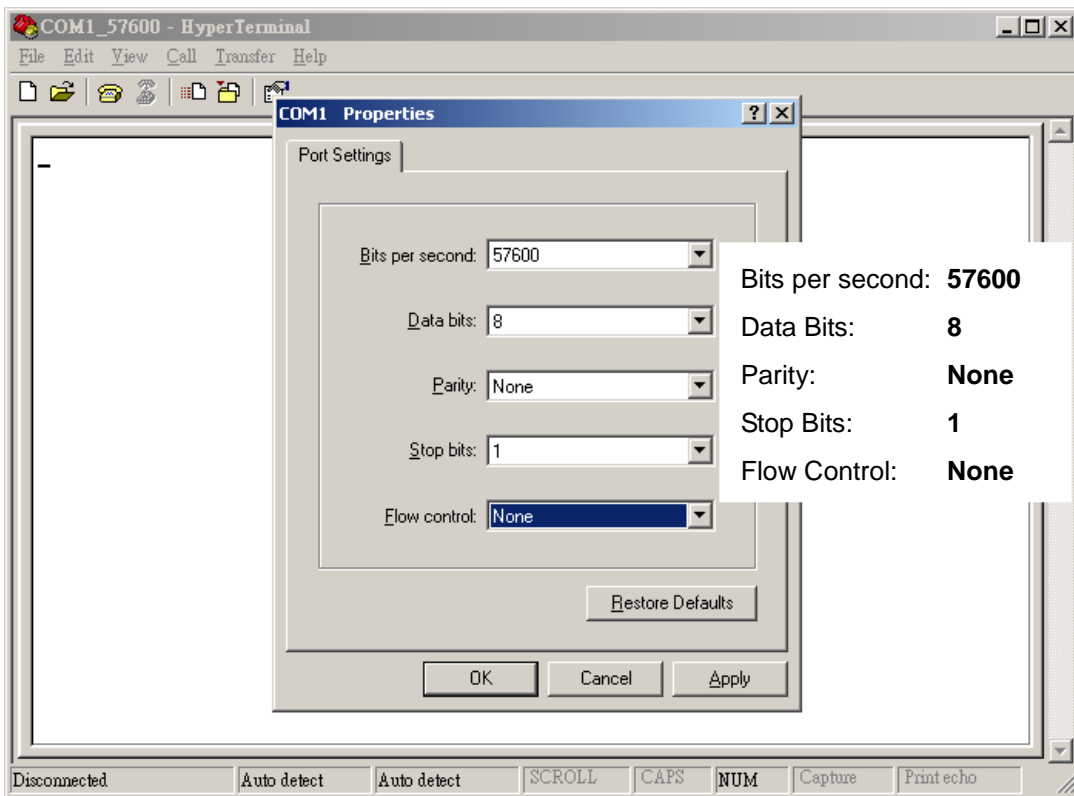
(3) Click on **[File]→[Properties]**
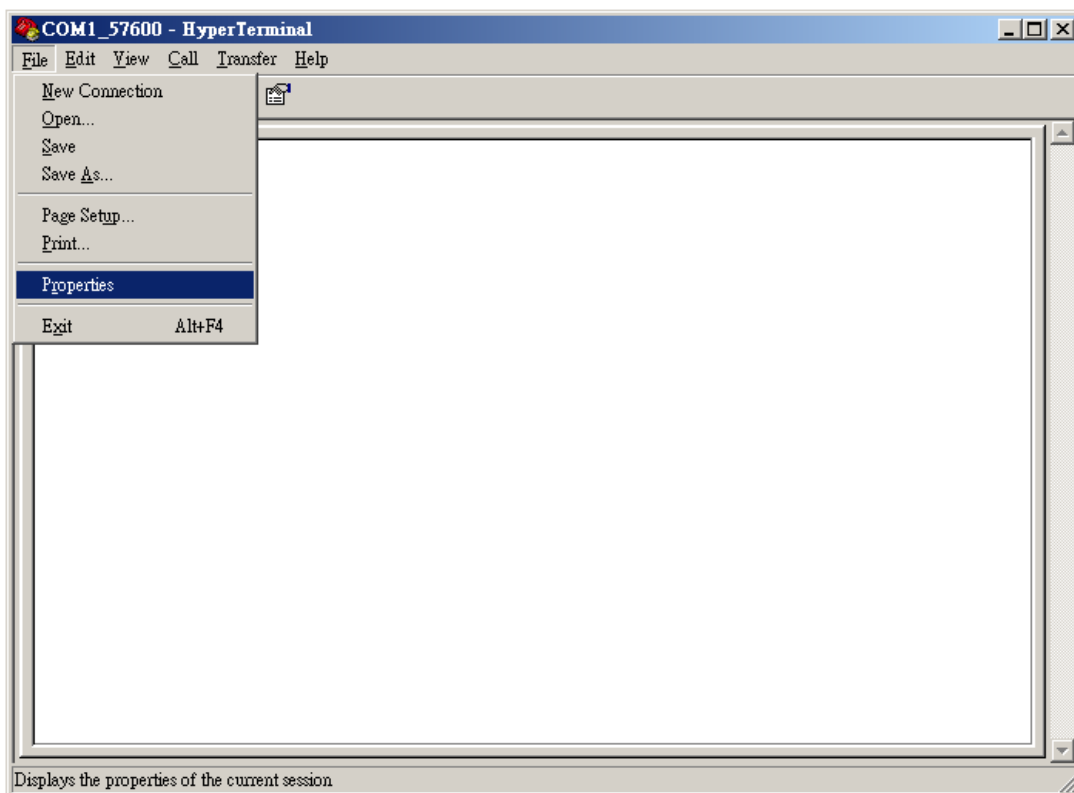
(4) Click on the **[Settings]** tab and click on the **[ASCII Setup…]** button.

(5) Check the following options and click on the **[OK]** button.
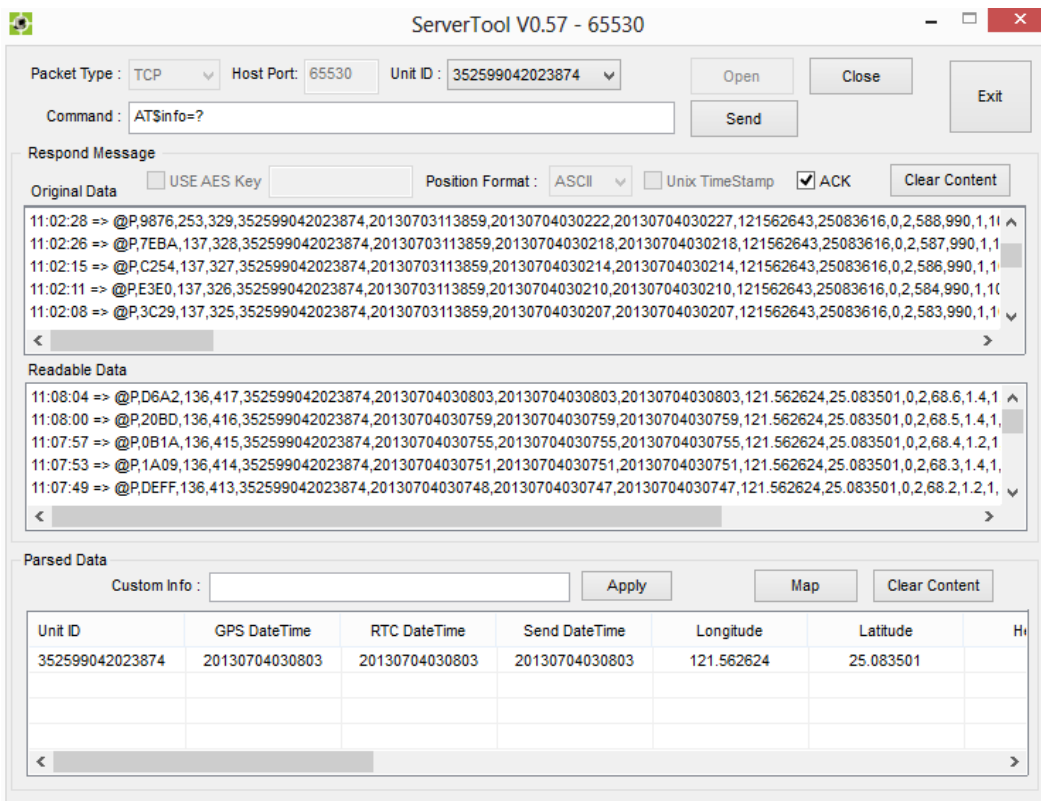
(6) Power ON the device and the startup message will be displayed on the screen. You may type some AT commands to query the device afterwards. Please refer to the ATrack Protocol Document for details.
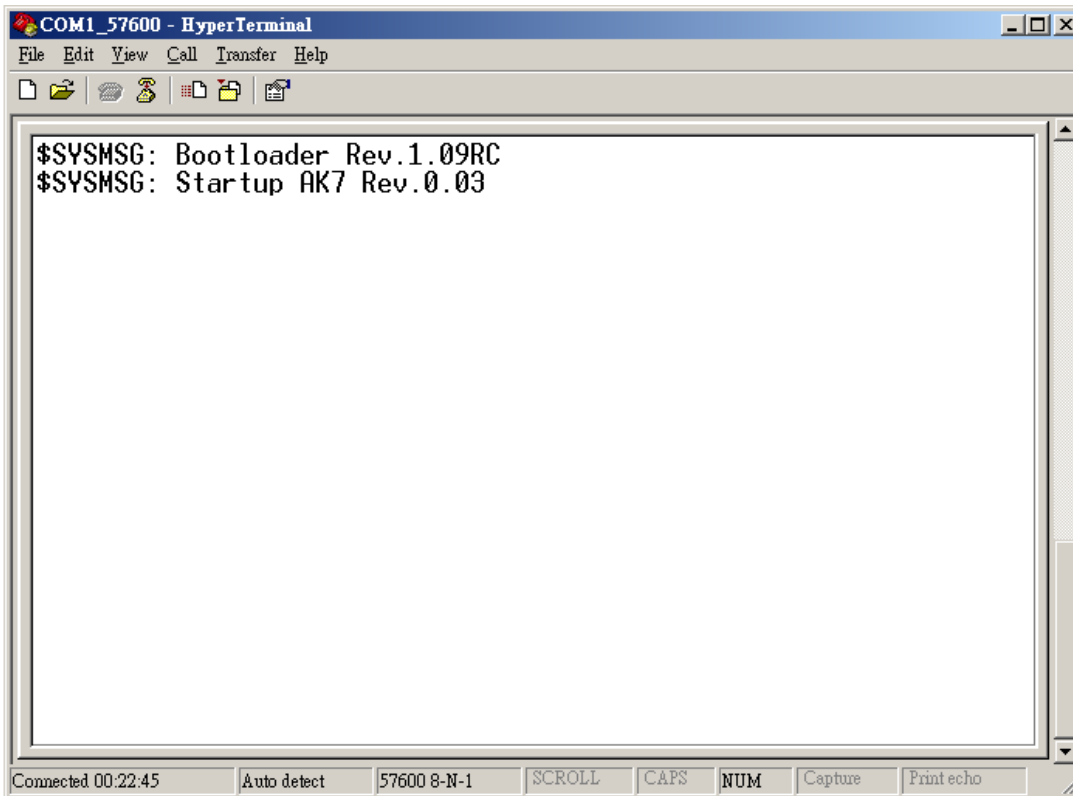
5.3. Connect a Device to a Remote Server

The GPRS or UMTS connection can either be enabled by typing the AT$GPRS command or thorough the AK Series Configure Tool. Once enabled, the ATrack ServerTool is then installed on a Windows PC in order to communicate with the AK7 remotely via a GPRS or UMTS network. The ServerTool is a remote server application, which is mainly used for parsing data by translating binary formats into readable formats or other testing purposes. Port forwarding is required if the PC is located behind a Broadband router or any other firewall device or if it has third-party firewall software installed. The communication is bidirectional, which means you can issue any AT command to the AK7 by clicking the Send button. Please refer to the following snapshot and the Port forwarding website: http://portforward.com/ for details.

6. AT$IOCG Command Reference

6.1. Configure or Query I/O Pin Characteristics

| Command Description				
This command is used to set or query the I/O port characteristics of the AK7. It is recommended to disconnect all I/O connections prior to changing the I/O characteristic in order to avoid damage to the I/O port.				
Syntax				
Write Command	AT$IOCG=<IO1>,<IO2>,<IO3>			
Response	$OK			
Read Command	AT$IOCG=?			
Response	$IOCG=<IO1>,<IO2>,<IO3>			
Parameter Description				
Parameters	Description		Data Type	Default
<IO1>	1: Input1 (VSS ,Pulse counter) 4: 1-Wire Protocol		U8	1
<IO2>	1: Input 2 2: Output 1 3: Analog Input		U8	2
<IO3>	1: Input 3 (RPM) 2: Output 2		U8	2
Example				
(1) Change all ports to inputs: AT$IOCG=1,1,1 (2) Change Input1 to 1-Wire Protocol AT$IOCG=4,2,2 (3) Change IO1 and IO3 to inputs, and IO2 to analog input: AT$IOCG=1,3,1				
Remark				
☒MEMO ☒SERIAL ☒SMS ☒GPRS				

7. Firmware Upgrade

The device firmware can be upgraded via RS232 or through the FTP protocol. Following is an example of firmware upgrade via RS232.
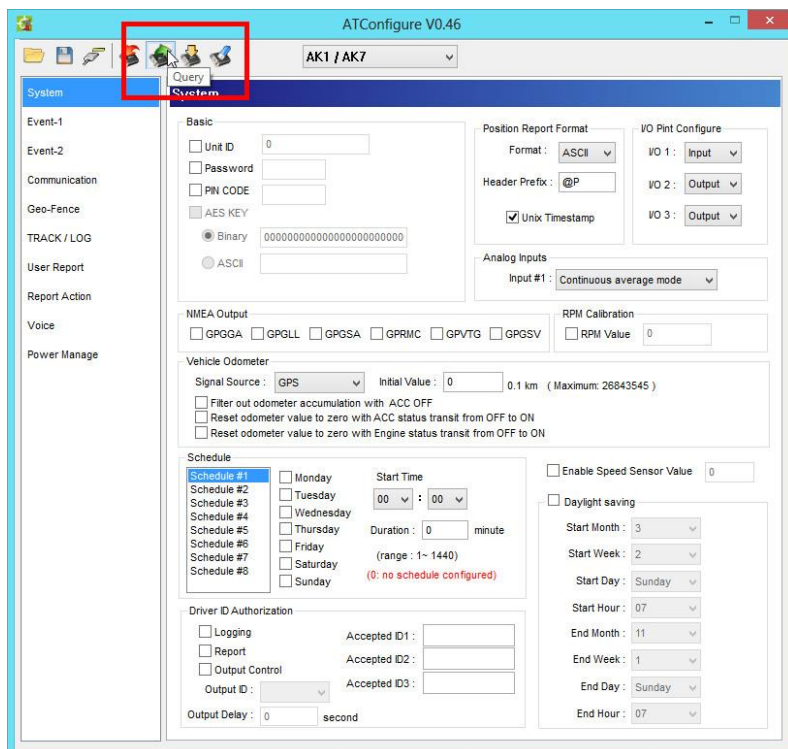
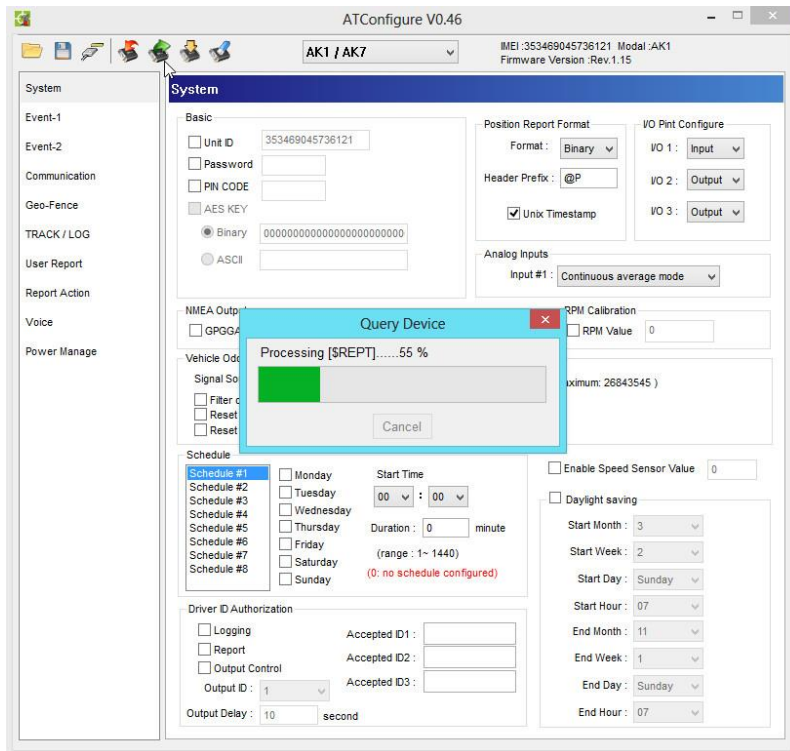(1) Run the ATConfigure Tool and click on the **[ComPort set]** button to establish connection.
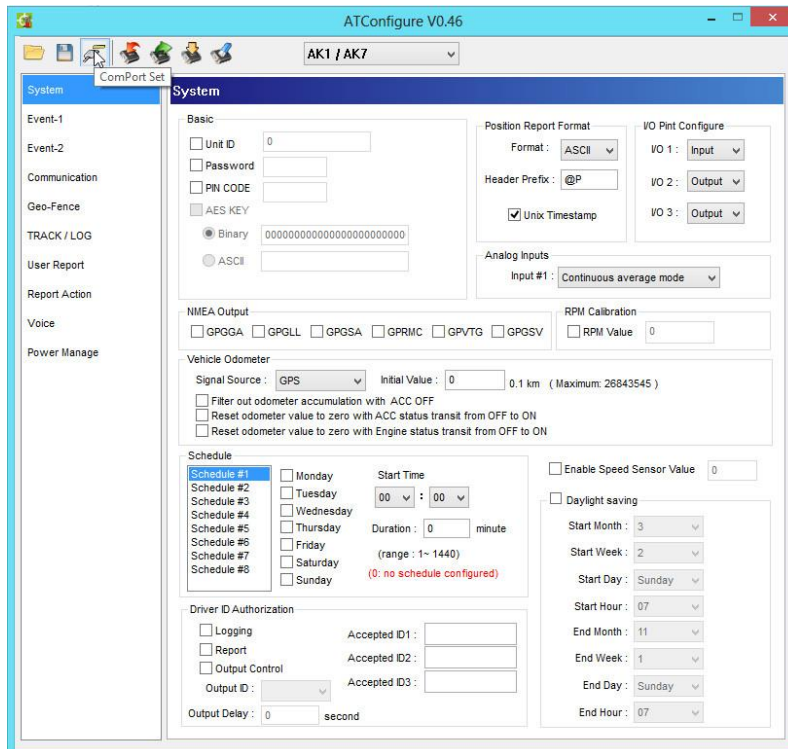
(2) Select the correct COM port and the Baud Rate (57600) from drop-down lists. Click on the **[Ok]** button to close Setting.
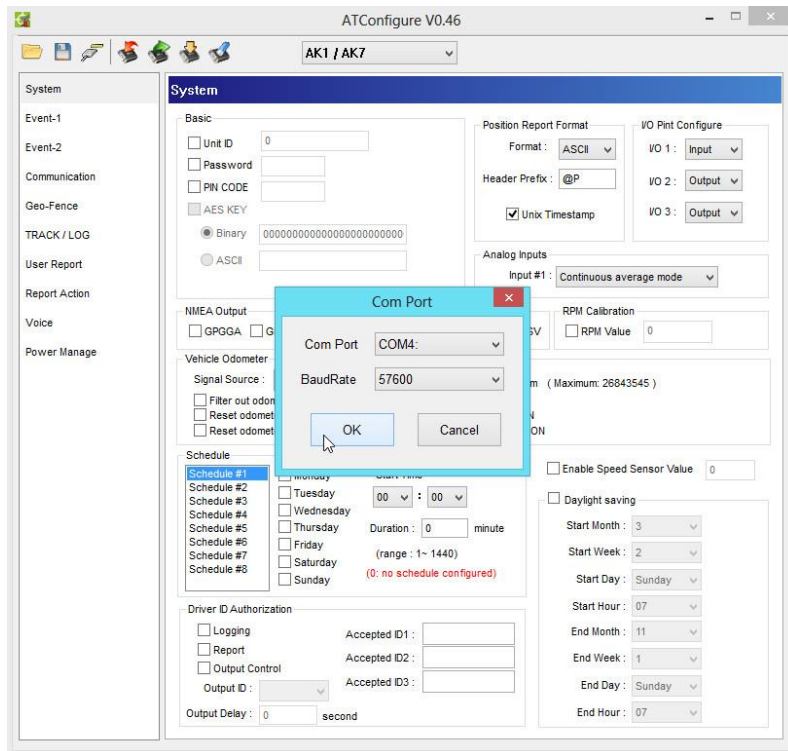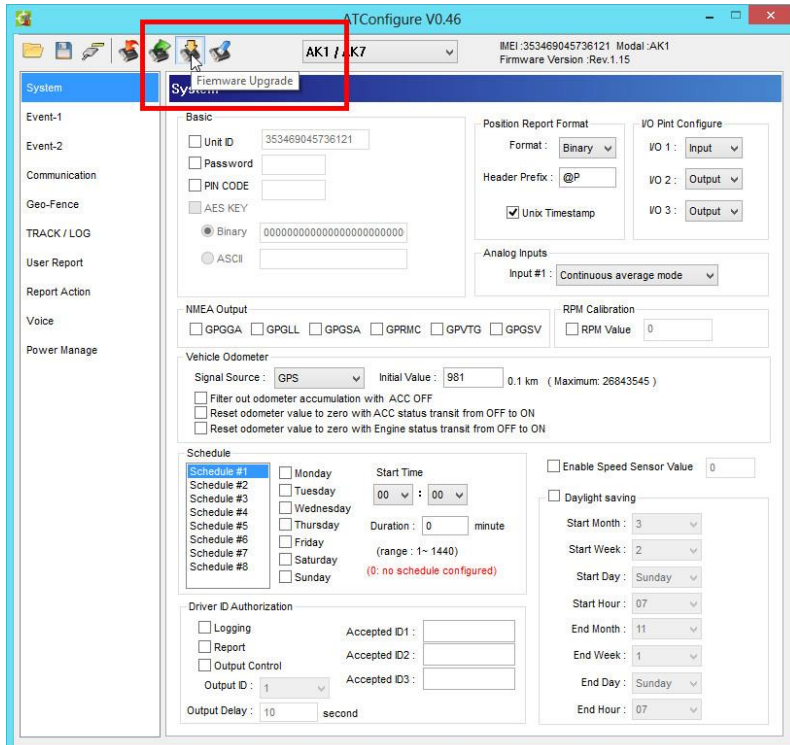
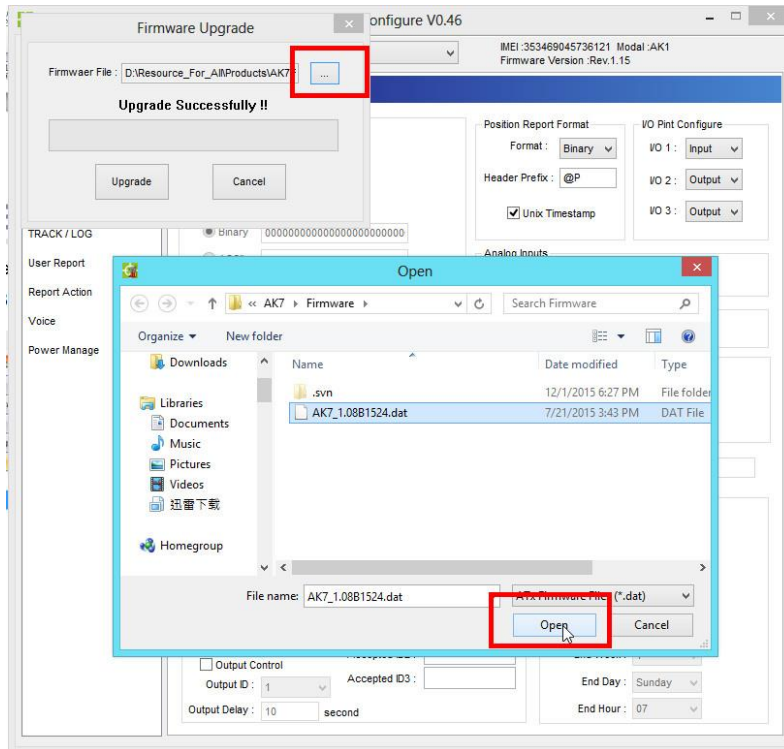(3) Click on the **[Query]** button to read out data from the device.

(4) From the following snapshot, the data is being read out.

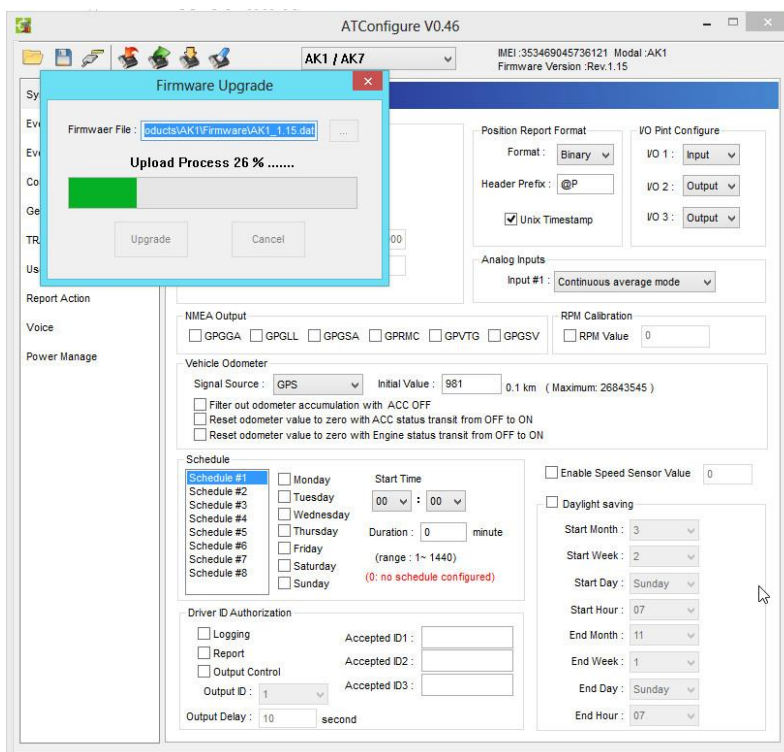

(5) Click on **[Firmware Upgrade]**

(6) Click on the **[Load…]** button to browse the firmware file where you saved. In the following example, **AK7_1.08B1524** is selected and click on the **[Open]** button to close the window.
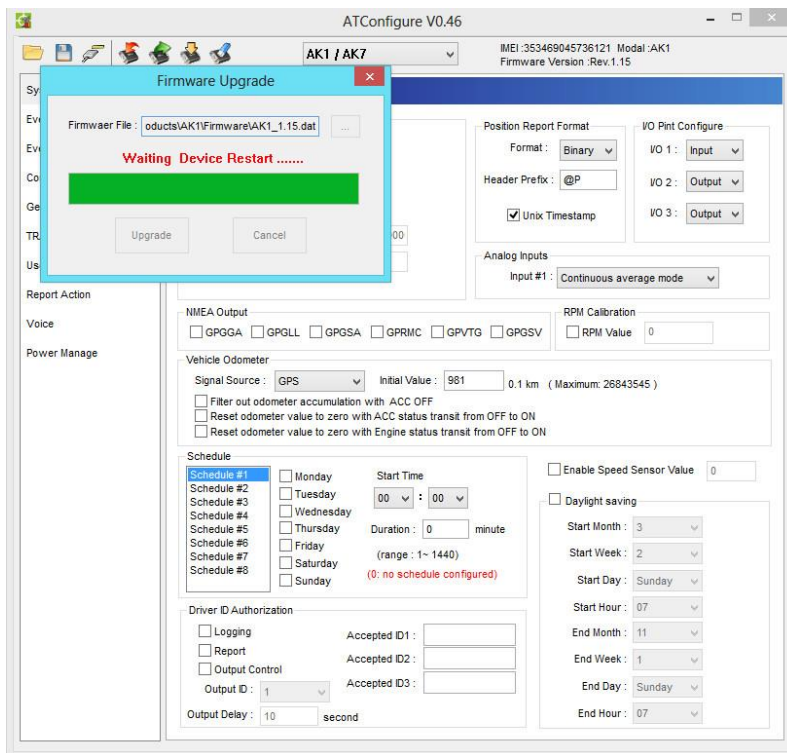

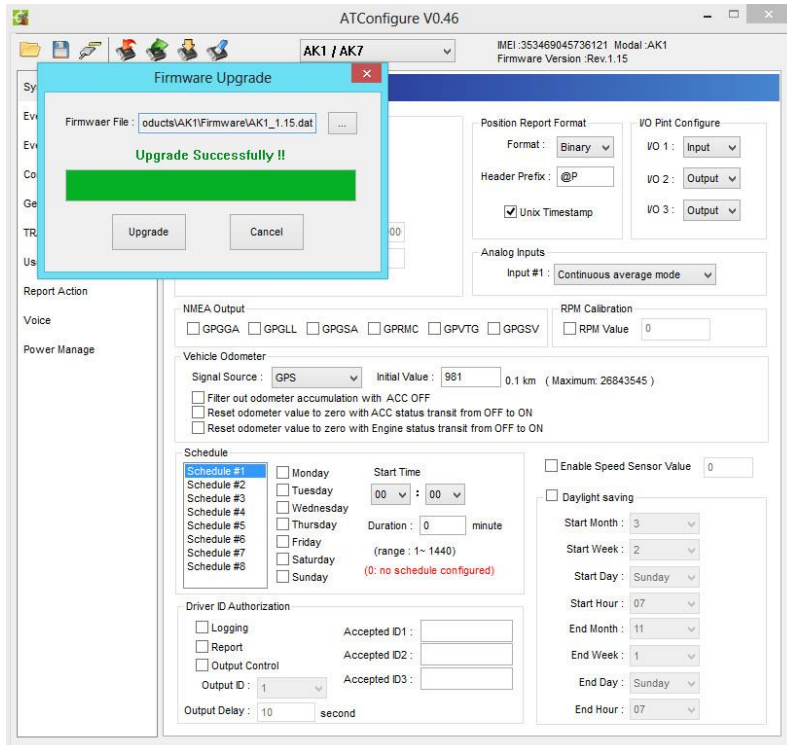(7) Click on the **[Update]** button to upgrade the firmware.

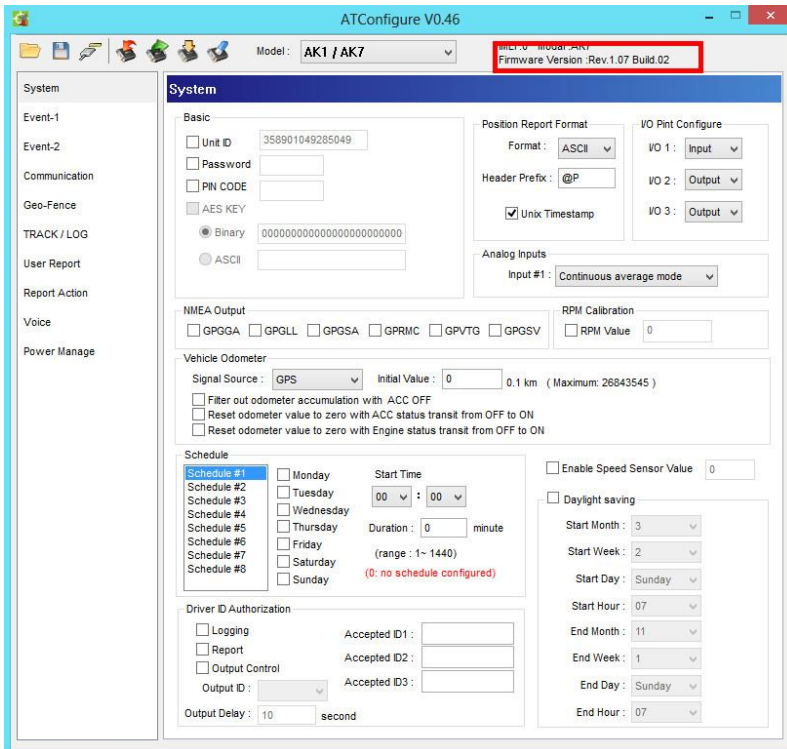(8) From the following snapshot, the firmware is being uploaded.

(9) From the following snapshot, the device is being rebooted.

(10) Click on the **[Cancel]** button to close the message box.

(11) Check the information on the upper-right is updated.

8. Appendix

8.1. Hardware Specification

Model Number	AK7(UA)	AK7(UE)	AK7(UG)	AK7(CV)	AK7(CS)
Dimensions (L x W x H)	80 x 48 x 26 mm				
Weight	63g				
Housing	PC+ABS (UL 94 V-0)				
Operating Temperature	-40℃ ~ +85℃				
Electrical Characteristics					
Power Supply	9V ~ 40V DC (±20%)				
Current Consumption	Operating : 70mA@12V average, Deep sleep mode 4mA@12V				
Cellular Network Communication					
Technology	UMTS/HSPA			CDMA2000 1xRTT	
Frequency(MHz)	850/1900	900/2100	800/850/900 1700/1900/2100	800/1900MHz	
Carrier Support	US AT&T	EU/APAC	World Wide	Verizon	Sprint
GPRS Support	Quad-band GPRS			N/A	
Cellular Antenna	Internal cellular antenna				
SIM Card	1.8V/3V Mini SIM(2FF)			N/A	
GPS					
Receiver	50 Channels, L1 Band, C/A Code, -159dBm				
Accuracy	2.5m CEP				
Data Acquisition Rate	1Hz				
GPS Antenna	External GPS active antenna				
GPS Antenna status	GPS antenna tampering detection				
GPS Data Buffer	2 MB				
Accelerometer					
3-Axis	Z,X,Y				
Resolution	±16g, 400Hz				
Interface/ Input /Output	*The specification shown the max. ports of the I/O configuration.				
ACC Input	1 Positive Triggered				
*Digital Input	1 Positive, 2 Negative Triggered				
*Digital Output	2 Open-Collect Output (Max. sink current 300mA)				
*Analog Input	1 Analog input (0~40VDC, 12bits resolution)				
*1-Wire®	Supported up to 1 iButton® and 2 temperature sensors				
RS-232	1 RS-232 interface (Configurable Baud Rate 1200bps~115200bps)				

8.2. FCC Regulations:

● This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

● This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment can generate, use and radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

▸ RF Exposure Information

This device meets the government's requirements for exposure to radio waves.
This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

● This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.