

# **EELINK Terminal Communication Protocol Second Edition**

V1.9.0

SHENZHEN EELINK COMMUNICATION TECHNOLOGY CO.LTD

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## Revision History

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EELINK	2013-6-26	1.8.1			1.Add GEO-fence 2.Add displacement alarm 3.Add collision / fall alarm
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# CONTENTS

EELINK Terminal Communication Protocol Second Edition.....	1
Revision History.....	2
CONTENTS.....	3
1 COMMUNICATION PROTOCOL.....	6
1.1 Introduction.....	6
1.2 Compatibility.....	6
2 TERMS & DEFINITIONS.....	6
2.1 Terms and Abbreviations.....	6
2.2 General Definition.....	7
2.2.1 Endianness.....	7
2.2.2 Time Field Of Message Content.....	7
2.2.3 Packet Size.....	7
2.2.4 Domain Using Rules.....	7
3 BASIC RULE.....	7
4 DATA PACKET FORMAT.....	8
4.1 Format Description.....	8
4.1.1 Header.....	8
4.1.2 Protocol Number.....	8
4.1.3 Packet Length.....	9
4.1.4 Serial Number.....	9
4.2 Login Packet (0x01).....	9
4.2.1 Terminal ID (8 bytes).....	9
4.2.2 Terminal Language (1 byte).....	9
4.2.3 Time zone (1byte).....	9
4.2.4 Server Response.....	10
4.3 GPS Data Packet (0x02).....	10
4.3.1 Date Time.....	10
4.3.2 Latitude.....	10
4.3.3 Longitude.....	11
4.3.4 Speed.....	11
4.3.5 Course.....	11
4.3.6 Base Station.....	11
4.3.7 Position Status.....	11
4.3.8 Device Status.....	12
4.3.9 Battery Voltage.....	12
4.3.10 Signal Strength.....	12
4.3.11 Analog Input port 1.....	12
4.3.12 Analog Input port 2.....	12
4.3.13 Server Response.....	12

4.4	Heartbeat Packets (0x03).....	12
4.4.1	Status.....	13
4.4.2	Server Response.....	13
4.5	Alarm Data Packet (0x04).....	14
4.5.1	Date Time, Latitude, Longitude, Speed, Course, Base stations, Position Status..	14
4.5.2	Alarm Type.....	14
4.5.3	Server Response.....	14
4.6	Terminal State Data Packet (0x05).....	15
4.6.1	Date Time, Latitude, Longitude, Speed, Course, Base Station, Position Status...	15
4.6.2	Status Type.....	15
4.6.3	Device Status.....	15
4.6.4	Server Response.....	16
4.7	SMS Command Upload Data Packet(0x06).....	16
4.7.1	Date Time, Latitude, Longitude, Speed, Course, Base Stations, Position Status..	16
4.7.2	Phone Number.....	16
4.7.3	SMS Commands.....	16
4.7.4	SMS Commands Upload Rules.....	16
4.7.5	Server Response.....	17
4.8	Downlink Command/ Interactive Message Packet (0x80).....	17
4.8.1	Message Sign.....	17
4.8.2	Server Flag.....	17
4.8.3	Downlink Content.....	17
4.8.4	Terminal Response.....	17
4.9	Messages Downlink Data Packet (0x81) .....	18
4.9.1	Message Sign.....	18
4.9.2	Forward Message (0x01) Downlink Content Format.....	18
4.10	Photo information packet (0x0E).....	18
4.10.1	Data time/Latitude/Longitude/Speed/Course/Base/Position Status.....	18
4.10.2	Camera.....	19
4.10.3	Photo Format.....	19
4.10.4	Device Time.....	19
4.10.5	Photo Size.....	19
4.10.6	Server Response.....	19
4.11	Photo content data packet (0x0F) .....	20
4.11.1	Data time / Latitude / Longitude / Speed / Course / Base / Position Status...	20
4.11.2	Camera Value / Photo Format / Devices Time / Photo Size.....	20
4.11.3	Offset.....	20
4.11.4	Photo Data.....	20
4.11.5	Server Response.....	20
4.12	OBD Data Packet.....	21
4.12.1	Date & Time.....	21
4.12.2	OBD Data.....	21
4.12.3	Packet Sample.....	21
4.12.4	Server Response.....	22

4.13	OBD fault codes Packet (0x09).....	22
4.13.1	Device Time.....	24
4.13.2	OBD fault codes data.....	24
4.13.3	Server Response.....	24
5	DEVICE COMMAND.....	25
5.1	Tracker Command.....	25
5.2	OBD Command.....	30
5.2.1	Command Format.....	错误！未定义书签。
5.2.2	Return Message Format.....	错误！未定义书签。
5.2.3	Command Example.....	错误！未定义书签。
5.2.4	Return Message Example.....	错误！未定义书签。
5.3	OBD Monitoring Command.....	错误！未定义书签。
6	APPENDIX.....	36
6.1	OBD Vehicle List.....	36
6.2	OBD Extended Data Flow Algorithm.....	37
6.3	OBD Standard Data Flow Algorithm.....	38

# 1 COMMUNICATION PROTOCOL

## 1.1 Introduction

This document defines the positioning terminal and location-based services platform application interface protocols, and positioning commands supported by the terminal.

Interface protocol applies to the location service platform and positioning terminal's interaction through the GPRS communication; Command applies to users and terminal's interaction by SMS.

## 1.2 Compatibility

This Protocol is downward compatible with GOOME GT12 protocol.

# 2 TERMS & DEFINITIONS

## 2.1 Terms and Abbreviations

Terms, abbreviations	Full name
CMPP	China Mobile Peer to Peer
GPS	Global Positioning System
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
TCP	Transport Control Protocol
LBS	Location Based Services
IMEI	International Mobile Equipment Identity
MCC	Mobile Country Code
MNC	Mobile Network Code
LAC	Location Area Code
Cell ID	Cell Tower ID
UDP	User Datagram Protocol
SOS	Save Our Ship/Save Our Souls
CRC	Cyclic Redundancy Check
NITZ	Network Identity and Time Zone
GIS	Geographic Information System

## 2.2 General Definition

### 2.2.1 Endianness

Protocol related to multi-byte data field, Endianness correspond network byte order.

### 2.2.2 Time Field Of Message Content

The value of time field contained in message content is UTC seconds.

See also: <http://en.wikipedia.org/wiki/UTC>

### 2.2.3 Packet Size

A packet size cannot be more than 1024 bytes.

### 2.2.4 Domain Using Rules

IP obtained from DNS will be cached, if clients can not connect the IP in 5 minutes, DNS will restart to get new IP address.

Purpose:

- ① Cached IP connect to server faster( avoid DNS delay ), better user experience.
- ② Reduce the number of requests to DNS server (DNS server to the mobile device to avoid excessive pressure, causing false positives).
- ③ IP access is not affected by DNS server(server IP generally does not change)

Note: For connection times, overall principle is to establish a connection to server as soon as possible. Now some terminal establishes a connection in 20s to 60s, we suggest that the number of connections set at three times, each terminal choose the appropriate algorithm flexibility.

## 3 BASIC RULE

1. Equipment starts to send login information packet, the server returns a response packet to confirm. (The first packet must be login information packets after connection of device and server).
2. GPS data will be sent to server regularly after connection.

3. In order to ensure the validity of the connection, heartbeat packets will be sent at regular intervals to server, server returns a response packet. Protocol number and serial number inside the response packet is the same with the packets sent to server.

## 4 DATA PACKET FORMAT

### 4.1 Format Description

Total length of the packet has 7 + N bytes, uplink and downlink data packets use this packet structure.

Format	Header	Protocol number	Packet length	Serial Number	Content
Length(Byte)	2	1	2	2	N

#### 4.1.1 Header

2 bytes, fixed as 0x67 0x67

#### 4.1.2 Protocol Number

1 byte,relationship of protocol number and data packet,refer to the following table:

Protocol number	Packet description	Response
0x01	Login data packet	YES
0x02	GPS data packet	NO
0x03	Heartbeat data packet	YES
0x04	Alarm data packet	YES
0x05	Terminal state packet	YES
0x06	SMS commands upload data packet	YES
0x07	OBD data packet	YES
0x08	OBD vehicle status data packet	YES
0x09	OBD fault codes packet	YES
0x80	SMS commands / interactive message downlink data packet	YES
0x81	Ordinary messages data packets	NO
0x0E	Photo information data packet	YES
0x0F	Photo content data packet	YES



### 4.1.3 Packet Length

2 bytes, packet length is from "message serial number" to "content" including themselves.

### 4.1.4 Serial Number

The first GPRS data(GPS data packets,Heartbeat packet,Command packet) serial number sent by the rebooted devices is '1', serial number automatically increased by 1 after a data transmission. The serial number will be reset to 1 after reaching a maximum value of 65535 .

## 4.2 Login Packet (0x01)

Format	Content		
	Terminal ID	Terminal language	Time zone
Length (byte)	8	1	1

Login packet is used to verify that the server connection is established properly, submit the terminal ID to the server.

### 4.2.1 Terminal ID (8 bytes)

Terminal ID use the 15 IMEI number. Example: 123456789012345, the terminal ID is: 0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45

### 4.2.2 Terminal Language (1 byte)

This field indicates the terminal language.

Number	Languages
0x00	Simplified Chinese
0x01	English

Server will return some message with corresponding languages according to terminal language setting.

Terminal language is English, if SOS alarm occurs, the server returns the SOS alarm address in English SMS, such as:

Device SOS alarm! 3 Songpingshan Qimin Road, Nanshan, Shenzhen, Guangdong, China, 518057

### 4.2.3 Time zone (1byte)

1 byte, convert as follows:

Current time zone multiplied by 4 and convert to a hexadecimal number.

Example: East 8 time zones,  $8 * 4 = 32$ , convert it to hexadecimal 0x20.

## 4.2.4 Server Response

For example:

Terminal login information packet is sent to the server as follows (an example of a terminal ID: 123456789012345)

0x67 0x67	0x01	0x00 0x0C	0x00 0x01	0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45	0x01	0x20
<b>Header</b>	<b>Protocol number</b>	<b>Packet length</b>	<b>Serial Number</b>	<b>Terminal ID</b>	<b>Terminal Language (English)</b>	<b>Time zone (East 8)</b>

Server's response packet to the terminal (protocol number in the response packet is the same with protocol number in the terminal data packet)

0x67 0x67	0x01	0x00 0x02	0x00 0x01	0x53 0x20 0x3D 0x4A
<b>Header</b>	<b>Protocol number</b>	<b>Packet length</b>	<b>Serial Number</b>	<b>Server GMT Time</b>

## 4.3 GPS Data Packet (0x02)

Format	Content											
	Date Time	Latitude	Longitude	Speed	Course	Base	Position status	Device status	Battery voltage	Signal strength	Analog Input1	Analog Input2
<b>Length (byte)</b>	4	4	4	1	2	9	1	2	2	2	2	2

### 4.3.1 Date Time

4 bytes, the satellite time UTC seconds.

### 4.3.2 Latitude

4 bytes, latitude values of positioning data. Value range from -162000000 to 162000000, which means -90 degrees (South Latitude) to 90 degrees (North Latitude), unit: 1/500 second, value conversion is as follows:

Latitude value from GPS divided is converted to decimal that unit is minute, then put the decimal multiplied by 30,000 and converted into a hexadecimal number.

Such as:

North Latitude:  $22^{\circ} 32.7658'$   $(22 * 60 + 32.7658) * 30000 = 40582974$ , and convert it into a hexadecimal number: 0x02 0x6B 0x3F 0x3E

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South Latitude:  $-22^{\circ} 32.7658' - (22 * 60 + 32.7658) * 30000 = -40582974$ , and convert it into a hexadecimal number: 0xFD 0x94 0xC0 0xC2

### 4.3.3 Longitude

4 bytes, Longitude values of positioning data. Value range from -324000000 to 324000000, which means -180 degrees (West Longitude) to 180 degrees (East Longitude), unit: 1/500 second, value conversion is the same with 4.3.2

### 4.3.4 Speed

1 byte, speed from GPS, the value range is 0x00 ~ 0xFF, represents the range from 0 to 255 km / hour.

### 4.3.5 Course

2 bytes, means the direction of movement of GPS, the range from 0 to 360, unit: degree(north is 0 degrees, clockwise)

### 4.3.6 Base Station

9 bytes, if not long enough, left fill 0x00.

Format	MCC	MNC	LAC	CI
Length (byte)	2	2	2	3

A base station message of CHINA

0x01 0xCC	0x00 0x01	0x27 0x49	0x00 0x0C 0xEE
MCC	MNC	LAC	CI

### 4.3.7 Position Status

1 byte, represents the position status of the device. A byte consists of 8-bit, the lowest bit is 0, the highest bit is 7, priority transmit high bit, then low bit. as follows:

High							Low
7	6	5	4	3	2	1	0

Section 0 bit	0: GPS not positioned 1: GPS positioned
Section 1 bit	Reserved
Section 2 bit	Reserved
Section 3 bit	Reserved

Section 4 bit	Reserved
Section 5 bit	Reserved
Section 6 bit	Reserved
Section 7 bit	Reserved

### 4.3.8 Device Status

2 bytes, refer to **4.4 Heartbeat Packets (0x03)**

### 4.3.9 Battery Voltage

2 bytes, represents battery voltage, can be converted to remaining battery by voltage curve .

### 4.3.10 Signal Strength

2 bytes, 0 represents -110dB, 1 represents -109dB, and so on, Max

2 bytes, 0 represents -110dB, 1 represents -109dB, and so on. The maximum is 63, that is -47dB.

Convert decimal number to hexadecimal number.

For example: Current signal strength is -68dB, decimal is 42, convert it to hexadecimal is 2A.

### 4.3.11 Analog Input port 1

2 bytes, represents analog input port 1 voltage value, which used to connect oil and temperature sensor.

### 4.3.12 Analog Input port 2

2 bytes, represents analog input port 2 voltage value, which used to connect oil and temperature sensor.

### 4.3.13 Server Response

Does not need response.

## 4.4 Heartbeat Packets (0x03)

Format	Content
	status
Length (byte)	2

Confirm the connection of terminal and server is normal or not, send the data packet at a fixed frequency.

### 4.4.1 Status

One byte, represents the position status of the device. A byte consists of 8-bit, the lowest bit is 0, the highest bit is 7, priority transmit high bit, then low bit. as follows:

High							Low
15	14	...	...	...	...	1	0

Section 0 bit	0: GPS not positioned 1: GPS positioned
Section 1,2 bits	10: ACC OFF 11: ACC ON 00: None such status
Section 3,4 bits	10: Disarming 11: Fortification 00: None such status
Section 5,6 bits	10: Cut off oil and power 11: Restore oil and power 00: None such status
Section 7,8 bits	10: Charger not plugged 11: Charger plugged 00: None such status
Section 9 bit	Reserved
Section 10 bit	Reserved
Section 11 bit	Reserved
Section 12 bit	Digital input port 1, default is 0, change to 1 when receive a high level
Section 13 bit	Digital input port 2, default is 1, change to 0 when receive a low level
Section 14 bit	Digital input port 3, default is 0, change to 1 when receive a high level
Section 15 bit	Digital input port 4, default is 1, change to 0 when receive a low level

Example: 0x20BB is 0010 0000 1011 1011, Maximum four digits input ports are defaults, the other digits represent GPS positioned, ACC OFF, FORTIFY, cut oil, charger is not plugged.

### 4.4.2 Server Response

For example: Terminal send heartbeat packet to the server as follows:

0x67 0x67	0x03	0x00 0x04	0x00 0x1A	0x00 0x01
<b>Header</b>	<b>Protocol number</b>	<b>Packet length</b>	<b>Serial number</b>	<b>Status</b>

Server's response packet to the terminal (protocol number in the response packet is the same with protocol number in the terminal data packet)

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0x67 0x67	0x03	0x00 0x02	0x00 0x1A
<b>Header</b>	<b>Protocol number</b>	<b>Packet length</b>	<b>Serial number</b>

## 4.5 Alarm Data Packet (0x04)

Format	Content							
	Date time	Latitude	Longitude	Speed	Course	Base Station	Position Status	Alarm Type
<b>Length (byte)</b>	4	4	4	1	2	9	1	1

Upload the packet when occurs an alarm by terminal.

### 4.5.1 Date Time, Latitude, Longitude, Speed, Course, Base stations, Position Status

Please refer to 4.3 GPS data packet (0x02) .

### 4.5.2 Alarm Type

Value	Status
0x01	Power off alarm
0x02	SOS alarm
0x03	Low battery alarm
0x04	Vibration alarm (motion sensor required)
0x05	Displacement alarm
0x06	Enter blind area alarm (not implemented, reserved)
0x07	Left blind area alarm (not implemented, reserved)
0x08	GPS antenna open circuit alarm
0x09	GPS antenna short circuit alarm
0x81	Low speed alarm (Requires hardware's support)
0x82	High speed alarm (Requires hardware's support)
0x83	In geo fence alarm
0x84	Out geo fence alarm
0x85	Collision alarm (motion sensor required)
0x86	Drop alarm (motion sensor required)

### 4.5.3 Server Response

Format	Content
--------	---------

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	Alarm SMS
<b>Length (byte)</b>	N

Alarm message content use UTF-8 encoding. For example:

Device power off alarm! 3 Songpingshan Qimin Road, Nanshan, Shenzhen, Guangdong, China, 518057

Terminal send alarm SMS to Center number/ SOS number when receives the response. if the alarm message content is empty (0 byte), do not need to send SMS.

## 4.6 Terminal State Data Packet (0x05)

Format	Content								
	Date time	Latitude	Longitude	Speed	Course	Base Station	Position Status	Status type	Type value
<b>Length (byte)</b>	4	4	4	1	2	9	1	1	N

Upload the Packet when the terminal states change

### 4.6.1 Date Time, Latitude, Longitude, Speed, Course, Base Station, Position Status

Please refer to 4.3 GPS data packet (0x02) .

### 4.6.2 Status Type

Status Type Value	Status Type	Status Value
0x01	ACC ignition	Device time (4 bytes, UTC seconds)+Device status(2 bytes)
0x02	ACC flameout	Device time (4 bytes, UTC seconds)+Device status(2 bytes)
0x03	Digital input port status changed	Device time (4 bytes, UTC seconds)+Device status(2 bytes)

Terminal must sync device time and satellite time. Device time equals satellite time with device timezone.

### 4.6.3 Device Status

2 bytes, refer to 4.4 Heartbeat Packets (0x03)

## 4.6.4 Server Response

<b>Format</b>	Content
	(No content)
<b>Length (byte)</b>	0

## 4.7 SMS Command Upload Data Packet(0x06)

<b>Format</b>	Content								
	Date Time	Latitude	Longitude	Speed	Course	Base Station	Position Status	Phone number	SMS command
<b>Length (byte)</b>	4	4	4	1	2	9	1	21	N

When terminal receives SMS command, the SMS will be uploaded to the server.

Note: SMS command must obey the rule **4.7.4 SMS commands upload rules**

### 4.7.1 Date Time, Latitude, Longitude, Speed, Course, Base Stations, Position Status

Please refer to **4.3 GPS data packet (0x02)** .

### 4.7.2 Phone Number

If the phone number is not enough 21 bytes, right fill 0x00.(Using ASCII encoding)

### 4.7.3 SMS Commands

SMS commands sent to the device by cellphone (using UTF-8 encoding).

### 4.7.4 SMS Commands Upload Rules

(1) Some SMS commands need not be sent to the server, the terminal deal with itself, such as STATUS# . Some SMS commands need to be sent to the server , such as: position# and 123, they will be sent to the server to get the address.

(2) SMS commands without Chinese character that the length is more than 2 characters and less than 30 characters needs to be uploaded to the server.



## 4.7.5 Server Response

Format	Content	
	Phone number	Response
Length (byte)	21	N

Server response message encoded in UTF-8, the terminal send response content in a text SMS to the phone number in the packet. If server response content is empty (0 byte), it means do not need to send SMS to phones number .

## 4.8 Downlink Command/ Interactive Message Packet (0x80)

Format	Message Content		
	Message Sign	Server flag	Downlink content
Length(byte)	1	4	N

Server send downlink command/ interactive message to terminal

### 4.8.1 Message Sign

Message Sign value	Downlink message type
0x01	Command
0x02	Interactive news

### 4.8.2 Server Flag

For server identification, terminal will reply: return the packet as the receive binary data.

### 4.8.3 Downlink Content

Command / interactive message, using UTF-8 encoding.

### 4.8.4 Terminal Response

Format	Message Content		
	Message Sign	Server flag	Response content
Length(byte)	1	4	N

Terminal response content part adopts UTF-8 encoding.

## 4.9 Messages Downlink Data Packet (0x81)

Format	Message Content	
	Message Sign	Content
Length(byte)	1	N

Terminal get messages from server and display to the screen or forward messages according message type.

### 4.9.1 Message Sign

To identify the message type, different processing according different types of messages, refer to the following table.

Message Sign value	Message type	Function
0x01	Forward message	Forwards the message to the specified phone number

### 4.9.2 Forward Message (0x01) Downlink Content Format

Format	Phone number	Message
Length(byte)	21	N

Forwards the message to the specified phone number.

Note: If the phone number is all 0x00, then they would have to send the message to the terminal's center number / SOS number.

## 4.10 Photo information packet (0x0E)

Format	Content										
	Date Time	Latitude	Longitude	Speed	Course	Base	Position Status	Camera	Photo format	Device time	Photo size
Byte	4	4	4	1	2	9	1	1	1	4	4

After device receive the commands and complete the photograph, upload the data packet.

### 4.10.1 Data time/Latitude/Longitude/Speed/Course/Base/Position

#### Status

Refer to 4.3 GPS Data Packet (0x02)

## 4.10.2 Camera

1 byte, ranging from 0-3, representing Camera number, device supports up to 4 cameras.

## 4.10.3 Photo Format

1 byte.

BIT0-3: Represents photo format:

0: QQVGA (160x120) (General)

1: QQVGA (160x120) (Better)

2: QVGA (320x240) (General)

3: QVGA (320x240) (Best)

4: VGA (640x480) (General)

5: VGA (640x480) (Good)

BIT7: Represents camera trigger :

0: Device receives the photo command

1: Device detects digital input port 1 to high level or digital input 2 to low level, trigger photograph.

## 4.10.4 Device Time

Device time (4 bytes, UTC seconds), pay attention to the synchronization of device time and satellite time , device time equals satellite time plus time zone value.

## 4.10.5 Photo Size

4 Bytes, Size of photo taken by camera.

## 4.10.6 Server Response

For example: Uploaded photo information packet (0x0E) to server as follows:

```
67670E0025000B5260ED68026B6A5E0C3926D300000001CC00002495000EEF00010150E228020000C800
```

Response packet from server to device (response packet protocol number is the same with terminal packet protocol number)

```
67670E0002000B
```

Note: After receiving server response packet, device upload **Photo content data packet (0x0F)**

## 4.11 Photo content data packet (0x0F)

Format	Content												
	Date Time	Latitude	Longitude	Speed	Course	Base	Position Status	Camera	Photo format	Device time	Photo size	Offset	Photo Content
Byte	4	4	4	1	2	9	1	1	1	4	4	4	N

After receiving server response packet (0x0E), device upload **Photo content data packet (0x0F)**

### 4.11.1 Data time / Latitude / Longitude / Speed / Course / Base / Position Status

Refer to 4.3 GPS Data Packet (0x02)

### 4.11.2 Camera Value / Photo Format / Devices Time / Photo Size

Refer to 4.10 Photo information packet (0x0E)

### 4.11.3 Offset

4 bytes, represent transferred photo data offset in entire photo file.

### 4.11.4 Photo Data

Each packet maximum transfer 1K bytes photo data.

### 4.11.5 Server Response

For example: Uploaded photo content packet (0x0F) to server as follows:

```
67670F0429000A5260ED68026B6A5E0C3926D300000001CC00002495000EEF00010150E228
020000C8000000040001010400.....
```

Response packet from server to device (response packet protocol number is the same with terminal packet protocol number)

```
67670F0002000A
```

Note:Server respond device after all photo contents uploaded to server.

## 4.12 OBD Data Packet

Format	Message Content	
	Date Time	OBD data
Length(byte)	4	N

Terminal uplink data to meet the OBD conditions (ignition, flame, speed increases 20km / h, the speed reducing 20km / h, constant speed 2 minutes), the device sends an uplink data packet to the server OBD.

Device send an uplink OBD data packet to the server in OBD data uplink condintions including ignition, flame, speed increases 20km / h, speed reducing 20km / h, constant speed for 2 minutes.

### 4.12.1 Date & Time

This is device time (4 bytes, UTC seconds). Terminal must sync device time and satellite time. Device time equals satellite time with device timezone.

### 4.12.2 OBD Data

Every five bytes represents a PID data in OBD data, which the first byte represent PID number, the subsequent four bytes represent Data corresponding PID. For example: 00FFFFFFF indicates PID00 data is FFFFFFFF; 0233445566 indicates PID02 data is 33445566; and so on. Data algorithm corresponding to each PID . see **6.3 OBD standard data flow algorithms**.

Note: MONITOR command is sent to the device, tell device which part PIDs data need to be monitored and uplinked. see **5.3 OBD monitoring command**

### 4.12.3 Packet Sample

This is an actual uplink OBD packet :

```
6767070088001050E2281400FFFFFFFFF02334455660333445566043344556605AA00000007334
455660A334455660B334455660C4E2000000DAA0000000E334455660F3344556610AAAA000
011334455661C334455661F334455662133445566423344556646334455664D334455665C3344
55665E3344556688000000089000000008A00000008B00000000
```

In this packet, 6767 is the message header, 07 for the protocol No., 0088 for the packet length, 0010 is serial number information, 50E22814 is the current time;

```
00FFFFFFFFF02334455660333445566043344556605AA00000007334455660A334455660B3344
55660C4E2000000DAA0000000E334455660F3344556610AAAA000011334455661C33445566
1F334455662133445566423344556646334455664D334455665C334455665E334455668800000
0089000000008A00000008B00000000
```

is the OBD data.

TEL : 0755-86278376 FAX : 0755-86258387 ZIP : 518057 WEBSITE : www.eelink.com.cn  
 ADDRESS : South Block, 3 Floor, Yuyang Building, 2nd Road of Langshan, Science and Technology  
 Park, Nanshan District ,ShenZhen ,CHINA

## 4.12.4 Server Response

Format	Message Content
	(No content)
Byte	0

Example: OBD data packet by terminal is sent to the server as follows:

0x67 0x67	0x07	0x00 0x88	0x00 0x1A	.....
Header	Protocol No.	Packet length	Serial Number Information	Content

Server response packet is sent to the terminal( Protocol No. are the same in the response packet and terminal packet.

0x67 0x67	0x07	0x00 0x02	0x00 0x1A
Header	Protocol No.	Packet length	Serial Number Information

## 4.13 OBD Vehicle Status Data Packet (0x08)

Format	Message Content	
	Device Time	OBD Vehicle Status Data Packet
Length (byte)	4	N

OBD Vehicle Status Data Packet will be uploaded by Device.

### 4.13.1 Device Time

Device Time (4 Byte, UTC Seconds). Device will Synchronize Device time & Satellite time, Device time equal Satellite time plus time zone.

### 4.13.2 OBD Vehicle Status Data

There are 4 bytes in vehicle status data :

BYTE0: Gate Signal

BIT0: Left front door (0: Off 1: On)  
 BIT1: Right front door (0: Off 1: On)  
 BIT2: Left rear door (0: Off 1: On)  
 BIT3: Right rear door (0: Off 1: On)  
 BIT4: Trunk door (0: Off 1: On)

BYTE1: Gears Signal

0x00: Not supported  
 0x50: P  
 0x52: R  
 0x4E: N  
 0x44: E

**BYTE2: Lamp Signal**

BIT0: Engine Light	(0: Off	1: On)
BIT1: ABS Light	(0: Off	1: On)
BIT2: SRS Light	(0: Off	1: On)
BIT3: Brake Lights	(0: Normal / No brakes	1: Abnormal / brakes)
BIT4: Center Control Status	(0: unlocked	1: locked)

**BYTE3: Other**

BIT0: ACC	(0: Flame out	1: Ignition)
BIT1: TPMS tire pressure	(0: Normal	1: Abnormal)
BIT2, BIT3: Remote control signal	(00: No button pressed	01: Press unlock button

10: Press lock button)

Example: 1F001000

The first byte 1F indicates all doors are open, the second byte 00 indicates they did not support reading gear state, the third byte 10 indicates car is locked, the fourth byte 00 means flame-out, tire pressure normal, no remote control button be pressed.

### 4.13.3 Server Response

Format	Message Content
	(No Content)
Length (byte)	0

Example: OBD data packet is sent to the server as follows:

0x67 0x67	0x08	0x00 0x0A	0x00 0x2C	.....
Header	Protocol No.	Packet length	Serial Number Information	Content

Server response packet is sent to terminal( Protocol No. are the same in the response packet and terminal packet.

0x67 0x67	0x08	0x00 0x02	0x00 0x2C
Header	Protocol No.	Packet length	Serial Number Information

### 4.14 OBD fault codes Packet (0x09)

Format	Content	
	Device time	OBD fault codes data
Byte	4	N

Device upload OBD fault codes Packet.

### 4.14.1 Device Time

Device time (4 bytes, UTC seconds), pay attention to the synchronization of device time and satellite time , device time equals satellite time plus time zone value.

### 4.14.2 OBD fault codes data

First byte of OBD fault codes data is fault type, then every 3 bytes represent a fault code data.

Fault Code Type: Fixed to 00

Fault code data:

First 2 bytes are fault coding, third byte is the fault code status (01 represents there are fault codes, 02 represents there are pending fault codes)

Example: 00020502009302

00 is fault code type, 020502 & 009302 are fault codes data. P0205 & P0093 are pending fault codes.

Note: Pending codes refer to <http://www.obd2help.com/>

### 4.14.3 Server Response

Format	Content
	None
Byte	0

Example: Device sends packets OBD fault codes as follows:

0x67 0x67	0x09	0x00 0x0D	0x00 0x2C	00020502009302
Header	Protocol number	Packet length	Serial number	Contents

Response packet from server to device (response packet protocol number is the same with terminal packet protocol number)

0x67 0x67	0x09	0x00 0x02	0x00 0x2C
Header	Protocol number	Packet length	Serial number



# 5 DEVICE COMMAND

## 5.1 Setting Command

I Set Command			
Function	Format	Example	Note (Example)
APN setting	APN,Network name,[name,password] #	APN,CMNET#	If the setup is successful, terminal will reply: SET APN OK
APN setting inquiry	APN?	APN?	Terminal will reply: APN:cmnet
Server setting	SERVER,1,domain,port#	SERVER,1,www.sky200.com,32001#	If the setup is successful, terminal will reply: SET SERVER OK
	SERVER,0,IP,port#	SERVER,0,113.108.68.8,8821#	
Server setting inquiry	SERVER?	SERVER?	Terminal will reply: SERVER:www.sky200.com,32001
GPRS upload time interval	TIMER,Upload time interval[,Packet number]#	TIMER,10#	Upload interval: 0,10 ~ 18000s, 0 means prohibit uploading, default is 10s . Packet number:1-20,default is 1 If the setup is successful, terminal will reply: SET TIMER OK
GPRS upload time interval inquiry	TIMER?	TIMER?	Terminal will reply: TIMER:10
Time zone setting	GMT,Time zone orientation,Whole Time Zone,[Half Time Zone] #	GMT,9# GMT,9,30#	Range: E / W; 0 ~ 12; 0/15/30/45 If the setup is successful, terminal will reply: SET GMT OK
Time zone setting inquiry	GMT?	GMT?	Terminal will reply: GMT:E8.00
Language	LANG,1/0#	LANG,1#	1 represents Chinese

setting		LANG,0#	0 represents English  If the setup is successful, terminal will reply: SET LANG OK
Language setting inquiry	LANG?	LANG?	Terminal will reply: LANG:CN
Center number setting	CENTER,A,center number#	CENTER,A,13800138000#	Center number is used for cutting off power and oil.  If the setup is successful, terminal will reply: SET CENTER OK
Delete center number	CENTER, D#		Center number is used for cutting off power and oil by SMS.  If the deletion is successful, terminal will reply: DEL CENTER OK
Center number inquiry	CENTER?	CENTER?	Terminal will reply: CENTER:13800138000
Add SOS number	SOS,A,number one,number two,number three#		SOS,A,13800138000,13800138001,13800138002# means to set 3 numbers at a time . SOS,A,13800138000# means to set 1 <sup>st</sup> number. SOS,A,,13800138001# means to set 2 <sup>nd</sup> number. SOS,A,,,13800138002# means to set 3 <sup>rd</sup> number.  If the setup is successful, terminal will reply: SET SOS OK
Delete SOS number	SOS,D,number one, number two, number three# Or: SOS, D,1,2,3#		SOS,D,1# means to delete 1st number SOS,D,3# means to delete 3rd number SOS,D,1,3# means to delete 1st and 3rd number SOS,D,13800138000# means to

			directly delete the 13800138000  If the deletion is successful, terminal will reply: DEL SOS OK
SOS number inquiry	SOS?	SOS?	Terminal will reply: SOS:,,
Edit location query URL	EURL,website URL#	EURL,http://maps.google.com/maps?q=#	If the setup is successful, terminal will reply: SET EURL OK
Monitor delay time setting	DELAY,time#	DELAY,5#	Range: 5-60s, default is 10s.  If the setup is successful, terminal will reply: SET DELAY OK
Monitor delay time setting inquiry	DELAY?	DELAY?	Terminal will reply: DELAY:5
Heartbeat packet upload	HBT,time#	HBT,3#	Range: 1-60min, default 3min.  If the setup is successful, terminal will reply: SET HBT OK
Heartbeat packet upload inquiry	HBT?	HBT?	Terminal will reply:HBT:3
Motion setting	MOTION,sensitivity,timeout#	MOTION,2,5#	Sensitivity range: 0-9 Timeout range: 0-60  Sensitivity: 0: disable vibrating alarm  If the setup is successful, terminal will reply: SET MOTION OK
Motion setting inquiry	MOTION?	MOTION?	Terminal will reply: MOTION:2,5
Speed setting	SPEED,min speed,max speed#	SPEED,0,80#	Device will rise an alarm when speed is lower than min-speed or

			<p>higher than max-speed</p> <p>If set Min-speed to 0,disable low speed alarm;</p> <p>If set Max-speed to 0,disable high speed alarm;</p> <p>If the setup is successful, terminal will reply: SET SPEED OK</p>
Speed setting inquiry	SPEED?	SPEED?	Terminal will reply: SPEED:0,80
Geo fence setting	FENCE,fence number,fence marking,fence parameters 1,fence parameter 2,fence parameter 3,fence parameter 4#	FENCE,1,OR,,,500#	Set No.1 round fence, <b>OR</b> alarm type: out-fence alarm; current point as the center, radius 500m.
		FENCE,2,IR,,,500#	Set No.2 round fence, <b>IR</b> alarm type: in-fence alarm; current point as the center, radius 500m.
		FENCE,3,CR,,,500#	Set No.3 round fence, <b>CR</b> alarm type: across-fence alarm; current point as the center, radius 500m.
		FENCE,4,OR,113.5,22.5,500#	Set No.4 round fence, <b>OR</b> alarm type: out-fence alarm; Latitude and longitude (113.5,22.5) as the center, radius 500m.
		FENCE,5,IR,113.5,22.5,500#	Set No.5 round fence, <b>IR</b> alarm type: in-fence alarm; Latitude and longitude (113.5,22.5) as the center, radius 500 m.
		FENCE,6,CR,113.5,22.5,500#	Set No.6 round fence, <b>CR</b> alarm type: across-fence alarm; Latitude and longitude (113.5,22.5) as the center, radius 500 m.
		FENCE,1,OS,113.2,22.2, 113.8,22.8#	Set No.1 rectangular fence, <b>OS</b> alarm type: out-fence alarm; In longitude and latitude (113.5, 22.5), (113.8, 22.8) forming a rectangle.
		FENCE,2,IS,113.2,22.2,113.8,22.8#	Set No.2 rectangular fence, <b>IS</b> alarm type: in-fence alarm; In longitude and latitude (113.5, 22.5), (113.8, 22.8) forming a

			rectangle.
		FENCE,3,CS,113.2,22.2,113.8,22.8#	Set No.3 rectangular fence, CS alarm type: across-fence alarm; In longitude and latitude (113.5, 22.5), (113.8, 22.8) forming a rectangle.
Delete geo fence	FENCE,0#	FENCE,0#	Delete all fences
	FENCE,N#	FENCE,5#	Delete the 5th fence
Geo fence setting inquiry	FENCE,N?	FENCE,1?	Terminal will reply: FENCE1:IR,113.12340,22.12340,1000.00
Start Shift Alarm	SHIFT,shift range#	SHIFT,100#	Set 100 meters shift alarm range,when the ignition is turned off,Vehicle's 100 meters shift will trigger the alarm
Close Shift Alarm	SHIFT,0#		Close Shift alarm
Shift alarm Inquiry	SHIFT?	SHIFT?	Terminal will reply: SHIFT:100.00
Output port value setting	PORT,NNNN#	PORT,1000#	N's value is 0/1 Is the value of the output ports, represent 1/2/3/4 port  If the setup is successful, terminal will reply: PORT OK
Output port value setting inquiry	PORT?	PORT?	Terminal will reply: DIN:0100 DOUT:0000 AIN1:0 AIN2:0
Height & Weight Settings	BODY,Height,Weight#	BODY,170,60#	If there is a G-sensor in device for individual, device will calculate amount of exercise according to setting of height & weight; Height unit is cm, the weight unit is kg.  If the setup is successful, the terminal will reply: SET BODY OK
Height & Weight Inquiry	BODY?	BODY?	Terminal will reply: HEIGHT:170(cm) WEIGHT:60(kg)

## 5.2 Control Command

Function	Format	Example	Note
Cut off oil or power	RELAY,1#		If setup successful, Terminal will reply: Relay enable OK Otherwise, Command can not be executed and reply the reasons: Not center number, GPS not positioned or speed > 20KM / H
Restore oil or power	RELAY,0#		If setup successful, Terminal will reply: Relay disable OK
Oil or power status inquiry	RELAY?	RELAY?	Terminal will reply: RELAY:DISABLE
Camera photographing	CAMERA,N1,N2,N3,N4#	CAMERA,2,0,0,0#	Parameters N1-N4 are 1-4 camera's format, range from 0-6: 0: Do not shoot the camera 1: 160x120 Low quality 2: 160x120 High quality 3: 320x240 Low quality 4: 320x240 High quality 5: 640x480 Low quality 6: 640x480 High quality If setup is successful, terminal will reply: Camera OK
Camera photographing inquiry	CAMERA?	CAMERA?	3 status of Camera:NONE/IDLE/BUSY Terminal will reply: CAMERA1:IDLE CAMERA2:NONE CAMERA3:NONE CAMERA4:NONE
Restart terminal	RESET#		Terminal reply: Reset OK
Restore factory settings	FACTORY#		Terminal reply: Factory OK

Remote Upgrade	UPGRADE,upgrade package,domain /IP, port#	UPGRADE,C4_ext.exf,www.sky200.com,69#	Upgrade Package: C4_ext.exf Upgrade Domain: <a href="http://www.sky200.com">www.sky200.com</a> Upgrade Port: 69  If setup is successful, terminal will reply: Upgrade OK
----------------	---	---------------------------------------	---

### 5.3 Inquiry Command

Function	Format	Example
Version Inquiry	VERSION# <b>VERSION?</b>	IMEI:354188046912460 IMSI:9460025500276617 ICCID:898602A51314F1298017 SYSTEM:M6000_V1.8.6 VERSION:MXAPP_V1.9.3 BUILD:MAY 21 2015 11:08:43
Parameter Inquiry	PARAM# <b>PARAM?</b>	IMEI:123456789012345 APN:cmnet IP:Server:port TIMER:GPS Packet Interval CENTER:Center number SOS:Number1,Number2,Number3 LANG: (CN/EN) GMT: (E/W8.00) SAVING: Current Saving Mode
Latitude and Longitude Inquiry	WHERE# <b>WHERE?</b>	Lat:N23.111743 Lon:E114.409238 Course:0.00 Speed:0.17KM/H Date Time:2015-09-13 20:21:20
Status Inquiry	STATUS# <b>STATUS?</b>	BATTERY:100% Battery Status (Battery level) GPRS:SUCCESS GPRS Status(SUCCESS/FAILED/CLOSED) GSM:HIGH GSM Signal (HIGH/MED/LOW/NONE) GPS:FIXED,8 GPS Status (FIXED/UNFIXED/CLOSED) ACC:ON ACC Status (ON/OFF) RELAY:OFF Oil Circuits Status (ON/OFF) POWER:OK Power Supply Status (OK/NC) MS:LIS3DH G-Sensor Model
URL Inquiry	URL# <b>URL?</b>	<a href="http://maps.google.com/maps?q=22.555525,113.940147">http://maps.google.com/maps?q=22.555525,113.940147</a> <63.5km/h 322.5> <2013-11-18 18:41:04>

Address Inquiry	POSITION# <b>POSITION?</b> 123	3 Songpingshan Qimin Road, Nanshan, Shenzhen, Guangdong, China, 518057 Note: Reply position message's language is determined by device's language setting, if get position content failed, reply the device's Google Maps location link.
Pedometer Cleared	PDM#	Pedometer Statistics Cleared
Pedometer Inquiry	PDM?	STEPS:1283                      Cumulative steps TIME:15:20                      Cumulative exercise time DISTANCE:0.7(km)              Cumulative exercise distance ENERGY:375.1(kCal)        Cumulative energy consumption
SMS Forwarding	FW,tracking number,content#	Example: balance inquiries FW, 10086, CXYE # FW, 10010, YE # When terminal receives the message, put the query in a text message sent to the tracking number, and return the message to the sender with the content back from tracking number in 5 minutes. Can be used for inquiry calls, traffic, etc.

## 5.4 OBD Setting Command

**Note:** The PID mentioned in current chapter and next chapter , please refer to 6.2 OBD extended data flow algorithm and 6.3 OBD standard data flow algorithm

Function	Format	Example	Note
Monitor Command	MONITOR,PIDs#	MONITOR,0C0D898A8B#	This command is used for set: When vehicle ignition, flame out, speed accelerate more than 20km / h, speed decelerate more than 20km / h, constant speed more than 2 minutes, Device sends the number of PID data to the server.  NOTE: You can monitor up to 50 PIDs.  The PID in example command are: 0C 0D 89 8A 8B  If setup is successful, terminal will reply: SET MONITOR OK



## 5.5 OBD Control Command

Note 1: The command field between the English "," separated

Note 2: Server Command format refer to **4.8 issued commands / interactive message packet (0x80)**

### Command Format

OBD,<Command Code>, <Command Parameter>#

Explanation:

<b>Command Code</b>	01	Get Version
	02	Get Serial
	03	Get VIN
	08	Set car models
	10	Get PID device supports
	11	Get PID data
	12	Get PID in freeze frame
	13	Get PID data in freeze frame
	14	Get fault code data
	15	Clear fault codes
	18	<a href="#">Get vehicle status</a>
	19	<a href="#">Control vehicle</a>
<b>Command Parameter</b>	Some commands have parameters, see following <b>Command Example</b>	

### Return Message Format

OBD, <Command Code>, <Command Results>, <Return Message>

<b>Command Code</b>	Same as above	
<b>Command Results</b>	00	Success
	01	Timeout
	02	Command Code error
	03	Command Parameter error
	04	Communications failure
<b>Return Message</b>	Return Message meaning, see following <b>Command Example</b>	

### Command List

<b>Command</b>	Get Version
<b>Format</b>	OBD,01#
<b>Parameter</b>	

<b>Return Message</b>	OBD,01,00,5100003C0000
	OBD chip version : 5100003C0000

<b>Command</b>	Get serial number
<b>Format</b>	OBD,02#
<b>Parameter</b>	
<b>Return Message</b>	OBD,02,00,066CFF575454834987114547
	OBD chip version: 066CFF575454834987114547

<b>Command</b>	Get VIN
<b>Format</b>	OBD,03#
<b>Parameter</b>	
<b>Return Message</b>	OBD,03,00,3132333435363738394142434445464748
	VIN: 123456789ABCDEFGH

<b>Command</b>	Set car type
<b>Format</b>	OBD,08,0000#
<b>Parameter</b>	0000 is car type setting, see <b>6.1 OBD car list</b>
<b>Return Message</b>	OBD,08,00,0000
	0000 is car type setting, see <b>6.1 OBD car list</b>

<b>Command</b>	Get PID supported by device
<b>Format</b>	OBD,10#
<b>Parameter</b>	
<b>Return Message</b>	OBD,10,00,00FFFFFFFF20FFFFFFE000
	00FFFFFFFF: 4 bytes behind 00 is named ABCD, then A7-D0 represents PID 0x01-0x20 support or not. 20FFFFFFE000: 4 bytes behind 20 is named ABCD, then A7-D0 represents PID 0x21-0x40 support or not. And so on

<b>Command</b>	Read device data
<b>Format</b>	OBD,11,0020408A8B0C0D0E#
<b>Parameter</b>	Means get data from PID: 00 20 40 8A 8B 0C 0D 0E
<b>Return Message</b>	OBD,11,00,00FFFFFFFF20FFFFFFFF40FFFFFFFF8A000000008B000000 000C4E2000000DAA0000000E33445566
	Returned data can be divided into several parts, each first byte of part correspond to PID need to be fetched in command. 00FFFFFFFF: Four bytes behind 00 is the PID data of 00 ..... 0C4E200000: According 6.3 OBD standard data flow algorithm : We know 0C corresponds to engine speed, There are 2 bytes in returned result,

	Formula is $((A * 256) + B) / 4$ , and calculated as $((0x4E * 256) + 0x20) / 4 = 5000$ rpm; 0E33445566: Also get results according to 6.3 OBD standard data flow algorithm.
--	---

<b>Command</b>	Read PID supported by freeze frame
<b>Format</b>	OBD,12#
<b>Parameter</b>	
<b>Return Message</b>	OBD,12,00,004455667720445566774044556676
	0044556677: 4 bytes behind 00 is named ABCD, then A7-D0 represents PID 0x01-0x20 is involved in freeze frame or not; 2044556677: 4 bytes behind 20 is named ABCD, then A7-D0 represents PID 0x01-0x40 is involved in freeze frame or not; 4044556676: 4 bytes behind 40 is named ABCD, then A7-D0 represents PID 0x41-0x60 is involved in freeze frame or not; And so on.

<b>Command</b>	Read freeze frame data
<b>Format</b>	OBD,13,0C0E1C1E#
<b>Parameter</b>	Parameter indicates read 4 PID data :0C 0E 1C 1E
<b>Return Message</b>	OBD,13,00,0C445566770E445566771C445566771E44556677
	Returned data can be divided into several parts, each first byte of part correspond to PID need to be fetched in command. 0C44556677: 4 bytes behind 0C is the fetched PID data. 0E44556677: 4 bytes behind 0E is the fetched PID data. 1C 1E by the same rules.

<b>Command</b>	Get fault code data
<b>Format</b>	OBD,14#
<b>Parameter</b>	
<b>Return Message</b>	OBD,14,00,00
	00 Represents no fault
	OBD,14,00,00020502009302
	Means there is a fault, fault code is 00020502009302

<b>Command</b>	Clear fault code
<b>Format</b>	OBD,15#
<b>Parameter</b>	
<b>Return Message</b>	OBD,15,00,01
	Read returned data to see fault code is cleared or not (01: Success 00:Failure)

<b>Command</b>	Get vehicle status
<b>Format</b>	OBD,18#

<b>Parameter</b>	
<b>Return Message</b>	OBD,18,00,1F001000
	<p>First byte 1F indicates that all doors are open state, Second byte 00 indicates do not support reading gear state, Third byte 10 indicates car is locked, Fourth byte 00 indicates Flaming out, tire pressure normal, no remote control button be pressed.</p> <p>Return Data Format see <b>4.13.2 OBD vehicle status data</b></p>

<b>Command</b>	Control Vehicle
<b>Format</b>	OBD,19,0100#
<b>Parameter</b>	<p>BYTE1:</p> <p>0x01: Central Locking</p> <p>0x02: Speaker</p> <p>0x03: Hazard Lights</p> <p>0x04: Window</p> <p>BYTE2:</p> <p>0x00: OFF</p> <p>0x01: ON</p>
<b>Return Message</b>	OBD,19,00,01
	Returned data indicates Control Vehicle command is executed or not (01: Success 00:Failure)

## 6 APPENDIX

### 6.1 OBD Vehicle List

Code		Cars
01	00	Volkswagen
02	00	Universal
03	00	Ford
04	00	Toyota
05	00	Honda
06	00	Nissan
07	00	Kia
08	00	Hyundai
09	00	BMW
0A	00	Mercedes-Benz
0B	00	Subaru
0C	00	Mitsubishi

0D	00	Renault
0E	00	Peugeot
0F	00	Land Rover
10	00	Volvo
11	00	Ssangyong

Note: Car can be identified through the first byte , there are some cars may also have 2-3 kinds, through the second byte to identify.

## 6.2 OBD Extended Data Flow Algorithm

ID	Name	Algorithm	Unit	Note
88	One hour Fuel consumption	$Y=X$	L/H	$X=A\ll 24+B\ll 16+C\ll 8+D$ Meaning of “X” are the same in this table;
89	100KM Fuel consumption	$Y=X/10$	L/100KM	Show 100 km fuel consumption when the speed is greater than 5km ;
8A	Mileage	$Y=X$	KM	
8B	Remaining fuel	If $(X \geq 0x8000)$ { $Y=(X-0x8000)/10$ } else { $Y=X/10$ }	When $X > 0X8000$ remaining fuel expressed as a percentage; When $X < 0X8000$ remaining fuel by L units.	1, Buick \ Chevrolet \ Honda series remaining fuel is expressed as %; 2, Volkswagen \ Audi \ Skoda \ Toyota \ Ford \ Nissan Series of remaining fuel is represented by L; 3, To accurately read the remaining oil, automotive needs in a horizontal stationary state, otherwise, the read data will fluctuate;

## 6.3 OBD Standard Data Flow Algorithm

Mode hex	PID hex	Data bytes	Description	Min Value	Max Value	Units	Formula
01	00	4	PIDs supported[01-20]				Bit[A7..D0]== [PID 0x01..PID 0x20]
01	01	4	Monitor status since DTCs clear.(Includes malfunction indicator lamp MIL)status and number of DTCs.)				Bit encoded. See below.
01	02	2	Freeze DTC	00 00	FF FF		Hexadecimal
01	03	2	Fuel system status				Bit encoded. See below.
01	04	1	Calculated engine load value	0	100	%	A*100/255
01	05	1	Engine coolant temperature	-40	215	℃	A-40
01	06	1	Short term fuel % trim-Bank 1 Short term fuel % trim-Bank 3	-100 (Rich)	99.22 (lean)	%	(A-128) *100/128 (B-128) *100/128
01	07	1	Long term fuel % trim-Bank 1 Long term fuel % trim-Bank 3	-100 (Rich)	99.22 (lean)	%	(A-128) *100/128 (B-128) *100/128
01	08	1	Short term fuel % trim-Bank 2 Short term fuel % trim-Bank 4	-100 (Rich)	99.22 (lean)	%	(A-128) *100/128 (B-128) *100/128
01	09	1	Long term fuel % trim-Bank 2 Long term fuel % trim-Bank 4	-100 (Rich)	99.22 (lean)	%	(A-128) *100/128 (B-128) *100/128
01	0A	1	Fuel Pressure	0	765	kPa(gauge)	A*3
01	0B	1	Intake manifold absolute pressure	0	255	kPa(absolute)	A

01	0C	2	Engine RPM	0	16,383.75	rpm	$(A * 256) + B / 4$
01	0D	1	Vehicle speed	0	255	km/h	A
01	0E	1	Timing advance	-64	63.5	°	A/2-64
01	0F	1	Intake air temperature	-40	215	°C	A-40
01	10	2	MAF air flow rate	0	655.35	g/s	$(256 * A) + B / 100$
01	11	1	Throttle position	0	100	%	A*100/255
01	12	1	Commanded secondary air status				Bit encoded. See below
01	13	1	Oxygen sensors present				[A0..A3]==Bank 1, Sensors 1-4. [A4..A7]==Bank 2, Sensors
01	14	2	Bank 1, Sensor 1: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in trim calc)
01	15	2	Bank 1, Sensor 2: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in trim calc)
01	16	2	Bank 1, Sensor 3: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in trim calc)
01	17	2	Bank 1, Sensor 4: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in trim calc)
01	18	2	Bank 2, Sensor 1: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in trim calc)
01	19	2	Bank 2, Sensor 2: Oxygen sensor voltage,	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128) *100/128 (if B=0xFF, sensor is not used in

			Short term fuel trim				trim calc)
01	1A	2	Bank 2, Sensor 3: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128)*100/128 (if B=0xFF, sensor is not used in trim calc)
01	1B	2	Bank 2, Sensor 4: Oxygen sensor voltage, Short term fuel trim	0 -100 (Lean)	1.275 99.2 (Rich)	Volts %	A*0.005 (B-128)*100/128 (if B=0xFF, sensor is not used in trim calc)
01	1C	1	OBD standards this vehicle conforms to				Bit encoded. See below
01	1D	1	Oxygen sensors present				Similar to PID 13, but [A0..A7]==[B1S1, B1S2, B2S1, B2S2, B3S1, B3S2, B4S1, B4S2]
01	1E	1	Auxiliary input status				A0==Power Take off (PTO) status (1==active) [A1..A7] not used
01	1F	2	Run time since engine start	0	65, 535	seconds	(A*256)+B
01	20	4	PIDs supported 21-40				Bit encoded[A7..D0]==[PID 0x21..PID 0x40]
01	21	2	Distance traveled with malfunction indicator lamp (MIL) on	0	65, 535	km	(A*256)+B
01	22	2	Fuel Rail Pressure (relative to manifold vacuum)	0	5177.265	kPa	((A*256)+B)*0.079
01	23	2	Fuel Rail Pressure (diesel)	0	655350	kPa(gauge)	((A*256)+B)*10
01	24	4	02S1_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	((A*256)+B)*0.000305 ((C*256)+D)*0.000122
01	25	4	02S2_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	((A*256)+B)*0.000305 ((C*256)+D)*0.000122



01	26	4	02S3_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	27	4	02S4_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	28	4	02S5_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	29	4	02S6_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	2A	4	02S7_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	2B	4	02S8_WR_lambda (1): Equivalence Ratio Voltage	0 0	2 8	N/A V	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.000122
01	2C	1	Commander EGR	0	100	%	100*A/255
01	2D	1	EGR Error	-100	99.22	%	A*0.78125-100
01	2E	1	Commanded evaporative purge	0	100	%	100*A/255
01	2F	1	Fuel Level Input	0	100	%	100*A/255
01	30	1	# of warm-ups since codes cleared	0	255	N/A	A
01	31	2	Distance traveled since codes cleared	0	65, 535	km	(A*256) +B
01	32	2	Evap. System Vapor Pressure	-8, 192	8, 192	Pa	( (A*256) +B) /4-8, 192

01	33	1	Barometric pressure	0	255	kPa(absolute)	A
01	34	4	02S1_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	35	4	02S2_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	36	4	02S3_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	37	4	02S4_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	38	4	02S5_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	39	4	02S6_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	3A	4	02S6_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	3B	4	02S8_WR_lambda (1): Equivalence Ratio Current	0 -128	2 128	N/A mA	( (A*256) +B) *0.0000305 ( (C*256) +D) *0.00390625-128
01	3C	2	Catalyst Temperature	-40	6,513.5	°C	(A*256+B) /10-40

			Bank 1, Sensor 1				
01	3D	2	Catalyst Temperature Bank 2, Sensor 1	-40	6,513.5	°C	(A*256+B) /10-40
01	3E	2	Catalyst Temperature Bank 1, Sensor 2	-40	6,513.5	°C	(A*256+B) /10-40
01	3F	2	Catalyst Temperature Bank 2, Sensor 2	-40	6,513.5	°C	(A*256+B) /10-40
01	40	4	PIDs supported 41-60				Bit Encoded[A7..D0]==[PID 0x41..PID 0x60]
01	41	4	Monitor status this drive cycle				Bit encoded. See below.
01	42	2	Control module voltage	0	65.535	V	(A*256+B) /1000
01	43	2	Absolute load value	0	25,700	%	(A*256+B) *100/255
01	44	2	Command equivalence ratio	0	2	N/A	(A*256+B) *0.0000305
01	45	1	Relative throttle position	0	100	%	A*100/255
01	46	1	Ambient air temperature	-40	215	°C	A-40
01	47	1	Absolute throttle position B	0	100	%	A*100/255
01	47	1	Absolute throttle position C	0	100	%	A*100/255
01	49	1	Accelerator pedal position D	0	100	%	A*100/255
01	4A	1	Accelerator pedal position E	0	100	%	A*100/255
01	4B	1	Accelerator pedal position F	0	100	%	A*100/255
01	4C	1	Command throttle actuator	0	100	%	A*100/255
01	4D	2	Time run with MIL on	0	65,535	minutes	A*256+B
01	4E	2	Time since trouble codes cleared	0	65,535	minutes	A*256+B
01	51	1	Fuel Type				From fuel type table. See below.
01	52	1	Ethanol fuel %	0	100	%	A*100/255
01	53	2	Evap System Vapor Pressure	0	372.675	kPa	(A*256+B) *0.005

01	54	2	Evap System Vapor Pressure	-32768	32768	Pa	(A*256+B) -32768
01	55	2	Short Secondary 02 Fuel TrimB1 Short Secondary 02 Fuel TrimB3	-100	99.22	%	(A-128) *100/128 (B-128) *100/128
01	56	2	Short Secondary 02 Fuel TrimB1 Short Secondary 02 Fuel TrimB3	-100	99.22	%	(A-128) *100/128 (B-128) *100/128
01	57	2	Short Secondary 02 Fuel TrimB2 Short Secondary 02 Fuel TrimB4	-100	99.22	%	(A-128) *100/128 (B-128) *100/128
01	58	2	Short Secondary 02 Fuel TrimB2 Short Secondary 02 Fuel TrimB4	-100	99.22	%	(A-128) *100/128 (B-128) *100/128
01	59	2	Fuel Rail Pressure (absolute)	0	655350	kPa	A*10
01	5A	1	Accelerator Pedal Position	0	100	%	A*100/255
01	5B	1	Hybrid Battery Remaining Life	0	100	%	A*100/255
01	5C	1	Engine Oil Temperature	-40	215	°C	A-40
01	5D	2	Fuel Injection Timing	-210.00	301.992	°	(A*256+B-25880) /128
01	5E	2	Engine Fuel Rate	0	3296.75	L/h	(A*256+B) *0.05
01	5F	1	Emission requirements				Bit encoded. See below
01	60		PIDs supported 61-80				
01	61	1	Engine-Percent Torque	-125	130	%	A-125
01	62	1	Actual Engine-Percent Torque	-123	130	%	A-125
01	63	2	Engine-Percent Torque	0	65535	Nm	A*256+B
01	64	5	Engine Percent Torque Data: At Idle, Point 1 At Point 2 At Point 3 At Point 4 At Point 5	-125	130	%	A-125 B-125 C-125 D-125 E-125

01	65	2	Auxiliary Inputs / Outputs				Bit encoded. See below
01	66	5	MAF Sensor A,B supported	0	2047.96875	g/s	A0=SA supported, A1=SB supported. A2-A7 reserved. (B*256+C) *0.03125 (D*256+E) *0.03125
			Mass Air Flow Sensor A	0	2047.96875	g/s	
			Mass Air Flow Sensor B				