

Version: V1.1

Level: Confidential

# Shenzhen Concox Information Technology Co., Ltd

GPS Tracker

Communication Protocol

(X1)

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## Document History

Version	Revision Date	Author	Detail
V1.1	May 10, 2017	Support16	Initial Version

CONCOX

# 1 GPRS Protocol

## 1.1 Protocol Packet Format

Filed	Size/Byte	Description
start-bit	2	Start of frame, 0x78, 0x78 for short package; 0x79, 0x79 for large package
package-len	1/2	Byte size of <u>&lt;protocol-type&gt;&lt;info-content&gt;&lt;serial-num&gt;&lt;error-chk&gt;</u> When <u>start-bit</u> is 0x78, 0x78, <u>package-len</u> occupies 1byte When <u>start-bit</u> is 0x79, 0x79, <u>package-len</u> occupies 2byte
protocol-type	1	Transmission packet type
info-content	N	The specific contents determined by <u>protocol-type</u> , which corresponds to different applications
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;package-len&gt;&lt;protocol-type&gt;&lt;info-content&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

### NOTE:

- ⊙ All fields are packed in binary data format
- ⊙ Without specification, multi-byte binary data uses Big Endian format

## 1.2 Login Package Format

### Description:

- ⊙ Login packet is the information packet connecting the terminal and platform. It can send terminal information to platform.
- ⊙ If a GPRS connection is established successfully, the terminal will send a first login message packet to the server and, within five seconds, if the terminal receives a data packet responded by the server, the connection is considered to be a normal connection; if not, the terminal will send login packet again.
- ⊙ If no packet returned by server within 5 seconds, then the response of login packet is timeout.
- ⊙ Terminal reboot automatically after 3 timeouts

### 1.2.1 Login package sent by terminal

Filed	Size/Byte	Description
start-bit	2	Start of frame, fixed value 0x78, 0x78
package-len	1	Byte size of: <u>&lt;protocol-type&gt;&lt;terminal-id&gt;&lt;identify-code&gt;&lt;tzone-lang&gt;&lt;serial-num&gt;&lt;error-chk&gt;</u>
protocol-type	1	0x01
terminal-id	8	Binary format of IMEI, right align. For example, when IMEI is "861694033130384",

		<i>terminal-id</i> is 0x08, 0x61, 0x69, 0x40, 0x33, 0x13, 0x03, 0x84
identify-code	2	Identification code of terminal. For X1, its code is 0xA0, 0x01
tzone-lang	2	Time zone and language description, refer to the below table for detail
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <i>&lt;package-len&gt;&lt;protocol-type&gt;&lt;terminal-id&gt;&lt;identify-code&gt;&lt;tzone-lang&gt;&lt;serial-num&gt;</i>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

*tzone-lang* Field Description:

Bit	Description
Bit[15:4]	Time-zone (in hour) plus 100, for example For GMT+8, Bit[15:4] is 0x0320 (8*100, and then convert to HEX data)
Bit[3]	0 - Eastern time-zone 1 - Western time-zone
Bit[2]	Reserved, set to 0
Bit[1:0]	Language selection bits, set to '00'

### 1.2.2 Response to Login Package

Response to login package is sent from server, format as below:

Filed	Size/Byte	Description
start-bit	2	Start of frame, fixed value 0x78, 0x78
package-len	1	Byte size of: <i>&lt;protocol-type&gt;&lt;serial-num&gt;&lt;error-chk&gt;</i>
protocol-type	1	0x01
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <i>&lt;package-len&gt;&lt;protocol-type&gt;&lt;serial-num&gt;</i>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

### 1.3 GPRS Protocol Format

Field	Size/Byte	Description				
start-bit	2	Start of frame, fixed value 0x78, 0x78				
package-len	1	Unit Byte, Length of <i>&lt;protocol-type&gt;&lt;data-alarm&gt;&lt;date-time&gt;&lt;qps-quantity&gt;&lt;latitude&gt;&lt;lonqitude&gt;&lt;speed&gt;&lt;course-st&gt;&lt;terminal-info&gt;&lt;MCC&gt;&lt;MNC&gt;&lt;LAC&gt;&lt;Cell-ID&gt;&lt;RFID-data&gt;&lt;ext-voltage&gt;&lt;bat-voltage&gt;&lt;port-info&gt;&lt;input-st&gt;&lt;output-st&gt;&lt;ad-data&gt;&lt;sensor-data&gt;&lt;serial-num&gt;&lt;error-chk&gt;</i>				
protocol-type	1	Fix value 0x34				
data-alarm	4	Data/Alarm type, refer to chapter-1.3				
date-time	6	BYTE[6], as below: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>BYTE</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>BYTE[0]</td> <td>Year, value: current year plus 2000</td> </tr> </tbody> </table>	BYTE	Description	BYTE[0]	Year, value: current year plus 2000
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		<table border="1"> <tr> <td>BYTE[1]</td> <td>Month, value 1~12</td> </tr> <tr> <td>BYTE[2]</td> <td>Day, value 1~31</td> </tr> <tr> <td>BYTE[3]</td> <td>Hour, value 0~23</td> </tr> <tr> <td>BYTE[4]</td> <td>Minute, value 0~59</td> </tr> <tr> <td>BYTE[5]</td> <td>Second, value 0~59</td> </tr> </table>	BYTE[1]	Month, value 1~12	BYTE[2]	Day, value 1~31	BYTE[3]	Hour, value 0~23	BYTE[4]	Minute, value 0~59	BYTE[5]	Second, value 0~59						
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gps-quantity	1	Bit described as below: <table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[7:4]</td> <td>Reserved, set value "0000"</td> </tr> <tr> <td>Bit[3:0]</td> <td>Satellites number; when GPS not fixed, set to 0</td> </tr> </tbody> </table>	Bit	Description	Bit[7:4]	Reserved, set value "0000"	Bit[3:0]	Satellites number; when GPS not fixed, set to 0										
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Bit[7:4]	Reserved, set value "0000"																	
Bit[3:0]	Satellites number; when GPS not fixed, set to 0																	
latitude	4	Convert to a decimal and divide by 1800000																
longitude	4	Convert to a decimal and divide by 1800000																
speed	1	Current GPS speed, unit km/h																
course-st	2	Bit[15:0], Bit described as below: <table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[15:14]</td> <td>Reserved, set value "00"</td> </tr> <tr> <td>Bit[13]</td> <td>0~Real time GPS 1~Differential position</td> </tr> <tr> <td>Bit[12]</td> <td>0~GPS not fixed 1~GPS fixed</td> </tr> <tr> <td>Bit[11]</td> <td>0~East longitude 1~West longitude</td> </tr> <tr> <td>Bit[10]</td> <td>0~South latitude 1~North latitude</td> </tr> <tr> <td>Bit[9:0]</td> <td>Running direction, unit degree, clockwise angle</td> </tr> </tbody> </table>	Bit	Description	Bit[15:14]	Reserved, set value "00"	Bit[13]	0~Real time GPS 1~Differential position	Bit[12]	0~GPS not fixed 1~GPS fixed	Bit[11]	0~East longitude 1~West longitude	Bit[10]	0~South latitude 1~North latitude	Bit[9:0]	Running direction, unit degree, clockwise angle		
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Bit[9:0]	Running direction, unit degree, clockwise angle																	
terminal-info	2	Record terminal and vehicle status, Bit[15:0]; Bit described as below: <table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[15:8]</td> <td>Reserved, set value "00000000"</td> </tr> <tr> <td>Bit[7]</td> <td>GPS antenna cut flag; Clear when antenna re-connect</td> </tr> <tr> <td>Bit[6]</td> <td>Ext-power lost; Clear when ext-power re-connect</td> </tr> <tr> <td>Bit[5]</td> <td>Ext-power low voltage; Clear when voltage normal</td> </tr> <tr> <td>Bit[4]</td> <td>Fatigue Driving; Clear when fatigue relieve</td> </tr> <tr> <td>Bit[3]</td> <td>Idling Running; Clear when auto starts running or ACC OFF</td> </tr> <tr> <td>Bit[2:0]</td> <td>Reserved, set value "000"</td> </tr> </tbody> </table>	Bit	Description	Bit[15:8]	Reserved, set value "00000000"	Bit[7]	GPS antenna cut flag; Clear when antenna re-connect	Bit[6]	Ext-power lost; Clear when ext-power re-connect	Bit[5]	Ext-power low voltage; Clear when voltage normal	Bit[4]	Fatigue Driving; Clear when fatigue relieve	Bit[3]	Idling Running; Clear when auto starts running or ACC OFF	Bit[2:0]	Reserved, set value "000"
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odometer	4	Odometer, unit m																
MCC	2	Mobile Country Code																
MNC	1	Mobile Network Code																
LAC	2	Location Area Code																
Cell-ID	4	Cell Tower ID																
RFID-data	4	RFID/iButton tag ID; If <i>RFID-data</i> ==0, Empty RFID/iButton data																
ext-voltage	2	Voltage of ext-power supply, unit 0.01V																
bat-voltage	2	Voltage of internal battery, unit 0.01V																
port-info	4	Input/output/AD/External sensor information, Bit[31:0], Bit described as below:																

Bit	Defined Field	Description
Bit[31:28]	input-num	INPUT number supported by terminal
Bit[27:24]	output-num	OUTPUT number supported by terminal
Bit[23:20]	ad-num	AD number supported by terminal
Bit[19:16]	sensor-type	Sensor type connected to terminal
Bit[15:12]	sensor-num	Sensor number connected to terminal

*sensor-type* as below

sensor-type	Description
0	No sensor connected
1	Temperature sensor, data unit 0.01℃
2~255	Reserved

input-st	1	Status of digital INPUT, Bit[7:0], Bit described as below:																		
		<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[7]</td> <td>IN8 status</td> </tr> <tr> <td>Bit[6]</td> <td>IN7 status</td> </tr> <tr> <td>Bit[5]</td> <td>IN6 status</td> </tr> <tr> <td>Bit[4]</td> <td>IN5 status</td> </tr> <tr> <td>Bit[3]</td> <td>IN4 status</td> </tr> <tr> <td>Bit[2]</td> <td>IN3 status</td> </tr> <tr> <td>Bit[1]</td> <td>ACC status</td> </tr> <tr> <td>Bit[0]</td> <td>SOS status</td> </tr> </tbody> </table> <p>Maximally, terminal supports 8 digital INPUT (including SOS and ACC); The valid bits of <i>input-st</i> field is defined by <i>port-info.input-num</i>; For example, when terminal support SOS, ACC, IN3, IN4, then <i>port-info.input-num==4</i></p>	Bit	Description	Bit[7]	IN8 status	Bit[6]	IN7 status	Bit[5]	IN6 status	Bit[4]	IN5 status	Bit[3]	IN4 status	Bit[2]	IN3 status	Bit[1]	ACC status	Bit[0]	SOS status
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Bit[2]	IN3 status																			
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Bit[0]	SOS status																			

output-st	1	Status of digital OUTPUT, Bit[7:0]; Bit described as below:																		
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Bit	Description																			
Bit[7]	OUTPUT8 status																			
Bit[6]	OUTPUT7 status																			
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Bit[4]	OUTPUT5 status																			
Bit[3]	OUTPUT4 status																			
Bit[2]	OUTPUT3 status																			
Bit[1]	OUTPUT2 status																			
Bit[0]	OUTPUT1 status																			

ad-data	2* <i>port-info.ad-num</i>	AD data, 2 bytes for each channel, which means the voltage of AD input, unit 0.01V; if <i>port-info.ad-num</i> ==0, the length of <i>ad-data</i> field is 0
sensor-data	2* <i>port-info.sensor-num</i>	External sensor data which connected to terminal, 2bytes for each sensor; Refer to <i>port-info.sensor-type</i> for sensor type and data unit; Complemental code for negative sensor data
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF

error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;package-len&gt;&lt;protocol-type&gt;&lt;data-alarm&gt;&lt;date-time&gt;&lt;gps-quantity&gt;&lt;latitude&gt;&lt;longitude&gt;&lt;speed&gt;&lt;course-st&gt;&lt;terminal-info&gt;&lt;MCC&gt;&lt;MNC&gt;&lt;LAC&gt;&lt;Cell-ID&gt;&lt;RFID-data&gt;&lt;ext-voltage&gt;&lt;bat-voltage&gt;&lt;port-info&gt;&lt;input-st&gt;&lt;output-st&gt;&lt;ad-data&gt;&lt;sensor-data&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

## 1.4 data-alarm Field Description

data-alarm field describes data type of GPRS package: normal position data or alarm data; For GPRS alarm package, it contains alarm parameter; data-alarm is Bit[31:0] format, bit describes as below:

Bit	Sub-field	Description
Bit[31:24]	data-type	Data/Alarm type
Bit[23:0]	alarm-para	Alarm Parameter

The following table describes the relationship of data-type and alarm-para:

data-type	alarm-para	Description						
0x00	NULL	Normal position package						
0x01	NULL	SOS alarm						
0x02	NULL	Ext-power cut alarm						
0x03	NULL	Vibration alarm						
0x04	NULL	Enter geo-fence						
0x05	NULL	Exit geo-fence						
0x06	NULL	Speeding						
0x0E	NULL	Internal battery low voltage						
0x30	NULL	ACC ON						
0x31	NULL	ACC OFF						
0x32	NULL	IN3 active						
0x33	NULL	IN3 release						
0x34	NULL	IN4 active						
0x35	NULL	IN4 release						
0x36	NULL	Fatigue driving						
0x37	NULL	Fatigue relieve						
0x38	NULL	Idling						
0x39	NULL	Login						
0x3A	NULL	Log out						
0x3B	<u>alarm-para</u> description as below	High temperature alarm						
	<table border="1"> <thead> <tr> <th>alarm-para</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[22:8]</td> <td>Reserved, set all to 0</td> </tr> <tr> <td>Bit[7:0]</td> <td>Temperature sensor number</td> </tr> </tbody> </table>	alarm-para	Description	Bit[22:8]	Reserved, set all to 0	Bit[7:0]	Temperature sensor number	
alarm-para	Description							
Bit[22:8]	Reserved, set all to 0							
Bit[7:0]	Temperature sensor number							
0x3C	The same as 0x3B	Low temperature alarm						
0x3D	NULL	COM port communication ERROR						
0x3E	NULL	Harsh Accelerate						



0x3F	NULL	Harsh Braking
0x40	NULL	Enter Sleep
0x41	NULL	Wake Up
0x42	NULL	GPS Jamming
0x43	NULL	GSM Jamming
0x44	NULL	GPS Antenna Cut

## 2 GPRS Protocol for Camera Function

Terminal takes photo using three methods:

- ⊙ Command
- ⊙ Timing
- ⊙ Alarm trigger

After photographing triggered, terminal takes a photo, and uploads 0x35 package, which indicates photo information, to notify server to retrieve data; Server retrieves photo data using 0x36 package

### 2.1 Photo Information Package - 0x35

After photographing finished, terminal uploads 0x35 package to server, which include photo's information such as photo size, format, and etc.; And then, server can sends 0x36 to retrieve data according to information form 0x35

Field	Size/Byte	Description														
start-bit	2	Start of Package, fixed value 0x78, 0x78														
pack-len	1	Unit byte, the length of <i>&lt;protocol-type&gt;&lt;date-time&gt;&lt;fix-st&gt;&lt;lat&gt;&lt;lon&gt;&lt;cam-id&gt;&lt;pho-src&gt;&lt;pic-format&gt;&lt;pic-size&gt;&lt;pic-id&gt;&lt;serial-num&gt;&lt;error-chk&gt;</i>														
protocol-type	1	0x35														
date-time	6	BYTE[6], date&time when photographing: <table border="1"> <thead> <tr> <th>BYTE</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>BYTE[0]</td> <td>Year, value: current year plus 2000</td> </tr> <tr> <td>BYTE[1]</td> <td>Month, value 1~12</td> </tr> <tr> <td>BYTE[2]</td> <td>Day, value 1~31</td> </tr> <tr> <td>BYTE[3]</td> <td>Hour, value 0~23</td> </tr> <tr> <td>BYTE[4]</td> <td>Minute, value 0~59</td> </tr> <tr> <td>BYTE[5]</td> <td>Second, value 0~59</td> </tr> </tbody> </table>	BYTE	Description	BYTE[0]	Year, value: current year plus 2000	BYTE[1]	Month, value 1~12	BYTE[2]	Day, value 1~31	BYTE[3]	Hour, value 0~23	BYTE[4]	Minute, value 0~59	BYTE[5]	Second, value 0~59
BYTE	Description															
BYTE[0]	Year, value: current year plus 2000															
BYTE[1]	Month, value 1~12															
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BYTE[3]	Hour, value 0~23															
BYTE[4]	Minute, value 0~59															
BYTE[5]	Second, value 0~59															
fix-st	1	Bit[7:0], bit described as below: <table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[7:3]</td> <td>Reserved, set to "00000"</td> </tr> <tr> <td>Bit[2]</td> <td>0~GPS not fixed 1~GPS fixed</td> </tr> <tr> <td>Bit[1]</td> <td>0~East Longitude 1~West Longitude</td> </tr> </tbody> </table>	Bit	Description	Bit[7:3]	Reserved, set to "00000"	Bit[2]	0~GPS not fixed 1~GPS fixed	Bit[1]	0~East Longitude 1~West Longitude						
Bit	Description															
Bit[7:3]	Reserved, set to "00000"															
Bit[2]	0~GPS not fixed 1~GPS fixed															
Bit[1]	0~East Longitude 1~West Longitude															

		Bit[0]	0~South Latitude 1~North Latitude
lat	4	Latitude	
lon	4	Longitude	
cam-id	1	Camera ID, fixed value 0x01	
pho-src	1	Event source of taking photograph, refer to chapter-2.2	
pic-format	1	Photo format: 1: JPG/JPEG 2: BMP 3: PNG	
pic-size	4	Photo size, unit byte	
pic-id	4	Photo ID, the only identifier to photo, server can use <i>pic-id</i> to fetch or re-fetch photo's data	
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF	
error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;pack-len&gt;&lt;protocol-type&gt;&lt;date-time&gt;&lt;fix-st&gt;&lt;lat&gt;&lt;lon&gt;&lt;cam-id&gt;&lt;pho-src&gt;&lt;pic-format&gt;&lt;pic-size&gt;&lt;pic-id&gt;&lt;serial-num&gt;</u>	
Stop-bit	2	End of package, fixed value 0x0D, 0x0A	

## 2.2 pho-src Field Description

data-type	alarm-para
0x00	Photographing by command
0x01	SOS Alarm
0x02	Photographing when ext-power cut off
0x03	Photographing when Vibration alarm
0x04	Photographing when enter geo-fence
0x05	Photographing when exit geo-fence
0x06	Photographing when speeding
0x0E	Photographing when internal battery low voltage
0x30	Photographing when ACC ON
0x31	Photographing when ACC OFF
0x32	Photographing when IN3 active
0x33	Photographing when IN3 release
0x34	Photographing when IN4 active
0x35	Photographing when IN4 release
0x36	Photographing when fatigue driving
0x37	Photographing when fatigue relieve
0x38	Photographing when idling
0x39	Photographing when login
0x3A	Photographing when logout
0x3B	Photographing when high temperature alarm
0x3C	Photographing when low temperature alarm
0x3D	Photographing when COM port communication error
0x3E	Photographing when Harsh Accelerate

0x3F	Photographing when Harsh Braking
0x40	Photographing when Enter Sleep
0x41	Photographing when Wake Up
0x42	Photographing when GPS Jamming
0x43	Photographing when GSM Jamming
0x44	Photographing when GPS Antenna Cut
0xFF	Timing photographing

### 2.3 Retrieve Photo Data - 0x36

The GPRS command is sent by server, to retrieve photo data

Field	Size/Byte	Description
start-bit	2	Start of package, fixed value 0x78, 0x78
pack-len	1	Unit byte, the length of <u>&lt;protocol-type&gt;&lt;pic-id&gt;&lt;offset&gt;&lt;size&gt;&lt;serial-num&gt;&lt;error-chk&gt;</u>
protocol-type	1	0x36
pic-id	4	Photo ID, refer to <u>pic-id</u> field in 0x35 package
offset	4	Photo data offset, rage [0,pic-size)
size	2	Data size to be retrieved, unit byte, range(0,1024]
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;pack-len&gt;&lt;protocol-type&gt;&lt;pic-id&gt;&lt;offset&gt;&lt;size&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

### 2.4 Upload Photo Data - 0x36

The GPRS package is uploaded by terminal to server, which is the reply to 0x36 command package:

Field	Size/byte	Description
start-bit	2	Start of package, fixed value 0x79, 0x79
pack-len	2	Unit byte, the length of <u>&lt;protocol-type&gt;&lt;pic-id&gt;&lt;offset&gt;&lt;size&gt;&lt;pic-data&gt;&lt;serial-num&gt;&lt;error-chk&gt;</u>
protocol-type	1	0x36
pic-id	4	Photo ID, refer to <u>pic-id</u> field in 0x36 command package from server
offset	4	Photo data offset. It is the same as <u>offset</u> from server's 0x36 package.
size	2	The size of <u>pic-data</u> , unit byte
pic-data	<size>	Photo data
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;pack-len&gt;&lt;protocol-type&gt;&lt;pic-id&gt;&lt;offset&gt;&lt;size&gt;&lt;pic-data&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

## 3 Heartbeat

Heartbeat packet is a data packet to maintain the connection between terminal and server.

### 3.1 Heartbeat Package Format

Heartbeat package is sent by terminal

Field	Size/byte	Description														
start-bit	2	Start of package, fixed value 0x78, 0x78														
pack-len	1	Unit byte, the length of <i>&lt;protocol-type&gt;&lt;terminal-info&gt;&lt;pwr-level&gt;&lt;gsm-level&gt;&lt;lang&gt;&lt;serial-num&gt;&lt;error-chk&gt;</i>														
protocol-type	1	0x13														
terminal-info	1	<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bit[7]</td> <td>1: Oil and electricity disconnected; 0: Oil and electricity connected</td> </tr> <tr> <td>Bit[6]</td> <td>1: GPS tracking is on 0: GPS tracking is off</td> </tr> <tr> <td>Bit[5:3]</td> <td>Reserved, set to "000"</td> </tr> <tr> <td>Bit[2]</td> <td>1: Charging on 0: Charging off</td> </tr> <tr> <td>Bit[1]</td> <td>1: ACC ON 0: ACC OFF</td> </tr> <tr> <td>Bit[0]</td> <td>1: Defense active 0: Defense deactivate</td> </tr> </tbody> </table>	Bit	Description	Bit[7]	1: Oil and electricity disconnected; 0: Oil and electricity connected	Bit[6]	1: GPS tracking is on 0: GPS tracking is off	Bit[5:3]	Reserved, set to "000"	Bit[2]	1: Charging on 0: Charging off	Bit[1]	1: ACC ON 0: ACC OFF	Bit[0]	1: Defense active 0: Defense deactivate
		Bit	Description													
		Bit[7]	1: Oil and electricity disconnected; 0: Oil and electricity connected													
		Bit[6]	1: GPS tracking is on 0: GPS tracking is off													
		Bit[5:3]	Reserved, set to "000"													
		Bit[2]	1: Charging on 0: Charging off													
		Bit[1]	1: ACC ON 0: ACC OFF													
Bit[0]	1: Defense active 0: Defense deactivate															
pwr-level	1	0x00: No power, ext-power is shut down 0x01: ext-power extremely low 0x02: ext-power very low 0x03: ext-power low, but it can be used normally 0x04: Medium ext-power voltage 0x05: High ext-power voltage 0x06: Full ext-power														
gsm-level	1	GSM signal level 0x00: No signal 0x01: Extremely weak GSM signal 0x02: Weak GSM signal 0x03: Good GSM signal 0x04: Strong GSM signal														
lang	2	0x00, 0x01: Chinese 0x00, 0x02: English														
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF														

error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;pack-len&gt;&lt;protocol-type&gt;&lt;terminal-info&gt;&lt;pwr-level&gt;&lt;qsm-level&gt;&lt;lang&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

### 3.2 Response to Heartbeat

Heartbeat response is sent by server

Field	Size/byte	Description
start-bit	2	Start of package, fixed value 0x78, 0x78
pack-len	1	Unit byte, the length of <u>&lt;protocol-type&gt;&lt;serial-num&gt;&lt;error-chk&gt;</u>
protocol-type	1	0x13
serial-num	2	Serial number for package, cyclic accumulation from 1 to 0xFFFF
error-chk	2	CRC-ITU checksum data, calculation range: <u>&lt;pack-len&gt;&lt;protocol-type&gt;&lt;serial-num&gt;</u>
stop-bit	2	End of package, fixed value 0x0D, 0x0A

## Appendix A Code Fragment of CRC-ITU Algorithm in C

```

static const unsigned short crctab16[] =
{
    0X0000, 0X1189, 0X2312, 0X329B, 0X4624, 0X57AD, 0X6536, 0X74BF,
    0X8C48, 0X9DC1, 0XAF5A, 0XBED3, 0XCA6C, 0XDBE5, 0XE97E, 0XF8F7,
    0X1081, 0X0108, 0X3393, 0X221A, 0X56A5, 0X472C, 0X75B7, 0X643E,
    0X9CC9, 0X8D40, 0XBFDB, 0XAE52, 0XDAED, 0XCB64, 0XF9FF, 0XE876,
    0X2102, 0X308B, 0X0210, 0X1399, 0X6726, 0X76AF, 0X4434, 0X55BD,
    0XAD4A, 0XBCC3, 0X8E58, 0X9FD1, 0XEB6E, 0XFAE7, 0XC87C, 0XD9F5,
    0X3183, 0X200A, 0X1291, 0X0318, 0X77A7, 0X662E, 0X54B5, 0X453C,
    0XBDCB, 0XAC42, 0X9ED9, 0X8F50, 0XFBF7, 0XEA66, 0XD8FD, 0XC974,
    0X4204, 0X538D, 0X6116, 0X709F, 0X0420, 0X15A9, 0X2732, 0X36BB,
    0XCE4C, 0XD5C5, 0XED5E, 0XFC77, 0X8868, 0X99E1, 0XAB7A, 0XBAF3,
    0X5285, 0X430C, 0X7197, 0X601E, 0X14A1, 0X0528, 0X37B3, 0X263A,
    0XDECD, 0XCF44, 0XDFDF, 0XEC56, 0X98E9, 0X8960, 0XBBFB, 0XAA72,
    0X6306, 0X728F, 0X4014, 0X519D, 0X2522, 0X34AB, 0X0630, 0X17B9,
    0XEF4E, 0XFEC7, 0XCC5C, 0XDD55, 0XA96A, 0XB8E3, 0X8A78, 0X9BF1,
    0X7387, 0X620E, 0X5095, 0X411C, 0X35A3, 0X242A, 0X16B1, 0X0738,
    0XFFCF, 0XEE46, 0XDCDD, 0XCD54, 0XB9EB, 0XA862, 0X9AF9, 0X8B70,
    0X8408, 0X9581, 0XA71A, 0XB693, 0XC22C, 0XD3A5, 0XE13E, 0XF0B7,
    0X0840, 0X19C9, 0X2B52, 0X3ADB, 0X4E64, 0X5FED, 0X6D76, 0X7CFF,
    0X9489, 0X8500, 0XB79B, 0XA612, 0XD2AD, 0XC324, 0XF1BF, 0XE036,
    0X18C1, 0X0948, 0X3BD3, 0X2A5A, 0X5EE5, 0X4F6C, 0X7DF7, 0X6C7E,
    0XA50A, 0XB483, 0X8618, 0X9791, 0XE32E, 0XF2A7, 0XC03C, 0XD1B5,
    0X2942, 0X38CB, 0X0A50, 0X1BD9, 0X6F66, 0X7EEF, 0X4C74, 0X5DFD,
    0XB58B, 0XA402, 0X9699, 0X8710, 0XF3AF, 0XE226, 0XD0BD, 0XC134,
    0X39C3, 0X284A, 0X1AD1, 0X0B58, 0X7FE7, 0X6E6E, 0X5CF5, 0X4D7C,
    0XC60C, 0XD785, 0XE51E, 0XF497, 0X8028, 0X91A1, 0XA33A, 0XB2B3,
    0X4A44, 0X5BCD, 0X6956, 0X78DF, 0X0C60, 0X1DE9, 0X2F72, 0X3EFB,
    0XD68D, 0XC704, 0XF59F, 0XE416, 0X90A9, 0X8120, 0XB3BB, 0XA232,
    0X5AC5, 0X4B4C, 0X79D7, 0X685E, 0X1CE1, 0X0D68, 0X3FF3, 0X2E7A,
    0XE70E, 0XF687, 0XC41C, 0XD595, 0XA12A, 0XB0A3, 0X8238, 0X93B1,
    0X6B46, 0X7ACF, 0X4854, 0X59DD, 0X2D62, 0X3CEB, 0X0E70, 0X1FF9,
    0XF78F, 0XE606, 0XD49D, 0XC514, 0XB1AB, 0XA022, 0X92B9, 0X8330,
    0X7BC7, 0X6A4E, 0X58D5, 0X495C, 0X3DE3, 0X2C6A, 0X1EF1, 0X0F78,
};

unsigned short get_crc16(const unsigned char* pData, int nLength)
{
    unsigned short fcs = 0xffff;
    while(nLength>0)

```

```
{  
    fcs = (fcs >> 8) ^ crctab16[(fcs ^ *pData) & 0xff];  
    nLength--;  
    pData++;  
}  
return ~fcs;  
}
```

CONCOX