

# Communication Protocol for TK102

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## Version History

No.	Description of change	Author	Date	Ver.	Approved by
1	Release the first version	Victor	2013/03/06	V1.0	

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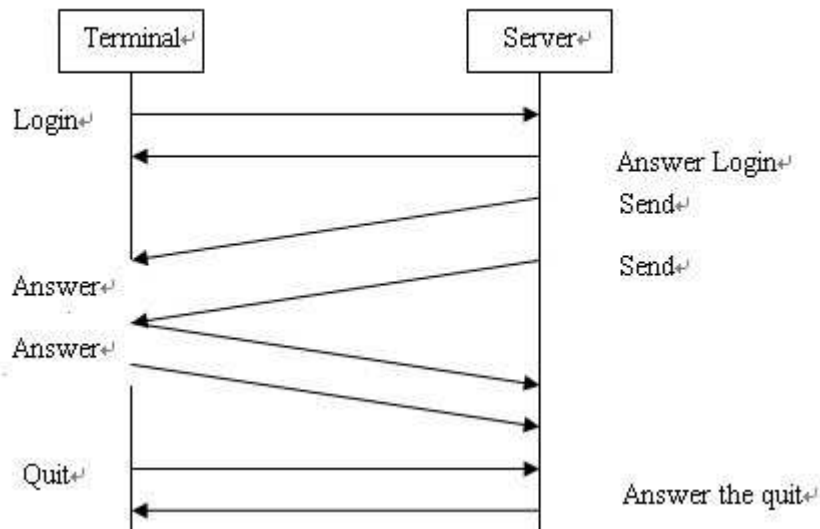
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# 1 Introduction about the protocol

## 1.1 The procedure

GPRS takes TCP as its communication method. To establish a link, the following steps is needed:



## 1.2 Data type definition

Data type	Description
CHAR	A single ASCII character
C_STRING	ASCII string. Except for special instructions, it is fixed length, if less than the length, supplements 0(30H) from the right
N_STRING	Numeric string containing 0 .. 9. Except for special instructions, it is fixed length, if less than the length, supplements ASCII code 0 (30H) from the left
HEX_STRING	Hexadecimal representation of the string, Except for special instructions, it is fixed length, if less than the length, supplements ASCII code 0 (30H) from the right
STRING	String, and may contain any type of data format
BIN	Binary
BYTE	8-bit unsigned integer, 0-255
WORD	16-bit unsigned integer, 0-147 483 647
DWORD	32-bit unsigned integer, 0-4294967295
UNICODE	Unicode
UNICODE_HEX_STRING	Unicode hexadecimal representation of a string
BCD	BCD code

## 1.3 TCP packet common format

### Packet format

Start identifier	Packet type	The serial number of the packet	The length of the packet	The contents of the packet	End identifier
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### Packet field description

Packet field	Type	Length (Byte)	Description
Start identifier	CHAR	1	Together with end identifier defines a single message integrity. Using '[' represent it. Due to the presence of binary data, to determine the integrity of the data packets should not only depend on start identifier and end identifier, but also to be judged according to the length of the packet content or number of the contents of the packet
Packet type	BYTE	1	Packet type
The serial number of the packet	N_STRING	10	The unique identification number of the packet, specific definition of the packet sequence number, please refer to the following description
The length of the packet	BYTE	1	The length of the packet. The Maximum length is 255.
The contents of the packet	STRING	Determined by the length of the packet content	Packet content, special characters need to be escaped, see [convention]
The end identifier	CHAR	1	Together with the start identifier defines a single packet integrity. Using '[' represents it.

### Description of the serial number of the packet

Filed	type	length	Description
Center number	N_STIRNG	2	
Seat No.	N_STRING	3	
Serial number	N_STRING	5	Starts from 0, each packet increase 1. After increased to 99999, then start from 0

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## 1.4 Convention

- 1) The convention of communication method and packet type selection

When the work mode of the terminal is short message, selects short message as the communication method, when the work mode of it is TCP, selects TCP as it.

- 2) Convention of the communication method between the server and the terminal

If the terminal has two communication options, give priority to TCP mode. When the GPRS network service is unavailable, selects short message.

- 3) Convention of the TCP packet

If the message contains 5BH ("["), 5CH ("\"), 5DH ("]"), the sender need to escape, the recipient need counter-escaping.

- ◆ Escaping rule: XOR with 50H, and add 5CH in front of it.
- ◆ Counter-escaping: When there is a 5CH,make the following character XOR with 50H,then remove the 5CH
- ◆ Escaping character: 5CH

## 1.5 Packet type

Type	Value	
Login request	21H	!
Answer login request	22H	”
Quit request	23H	#
Answer quit request	24H	\$
Link detection request	25H	%
Answer link detection request	26H	&
Query request	3AH	:
Answer query request	3BH	;
Answer update address of the alternate server	41H	A
Cell information request	4AH	J
GSM positioning switch request	4BH	K
Alarm	5EH	^
Answer alarm	5FH	-
Hotspot information query	7AH	z
Regional alarm information	7DH	}

## 1.6 The specification of the packet

The design of the TCP packet is encapsulated basically a short message, that the content of the packet is the contents of the entire short message.

## 1.7 Establish/keep/quit the link

### ◆ Establish the link

When using TCP protocol transfer the data, we need to establish a link with the sever and keep it.

The steps as following:

- 1) Take terminal as the client, sever as the sever
- 2) Terminal connect to the sever

- 
- 3) terminal request to login the server
  - 4) Sever answer the request within 10s
  - 5) Terminal exchange information with the server
  - 6) When the terminal is idle, every 3 -10 minutes,it send link detection information to the sever, after the server receive it, server answer the terminal, verify that the network connection is normal.
  - 7) terminal can take the initiative to make quit request, and disconnect

◆ **The reason for keep the link**

Because GPRS need to occupy the channel resources, under normal circumstances, the mobile network will real-time monitor the occupied channel, if within a certain period of time there is no data transmission, in order to improve utilization, the network will take the initiative to recover the channel and provide it to other users. So it is necessary to keep the channel real-time online through the link detection.

◆ **The ruler to determine whether the terminal online**

- 1) When the terminal is idle, every 3-10 minutes, it send the link detect packet to the server, after receives the packet, the server answer the link detect packet. According this to judge the network connection between the terminal and the server is normal or not. If more than 10 minutes, the server does not receive any data from the terminal, it determines the connection with the terminal was interrupted, and will close and delete the end-to-end network connection.
- 2) The terminal initiative to send the quit request packet, after receives it, the server will answer the request, and then close the connection.
- 3) The terminal did not send quit request packet, but close the connection with the sever directly.After realize the operation, the server determines that the terminal has quit.

## **1.8 Identification of the terminal**

After receives login information from the terminal, the server will get the identity flag code of the terminal.

## **2 Content of the SMS and TCP packet**

### **2.1 Login**

First do identification, and then enter the online mode.

After login in, server synchronizes the time zone according to the time zone which included in login information.

After get the time zone which included in login information, server updates the time zone of the web accoding to it. The default time zone of the terminal is 0.

The terminal must be synchronized to the local time after time zone transform is completed.



## 2.1.1 Login request

### TCP packet

Packet field	Value	Type	Length	Decription
Start identifier	[			
Packet type	21H			
The serial number of the packet		N_STRING	10	
The length of the packet		BYTE	1	
The content of the packet	Please refer to the following description			
End identifier	]			

### The content of the packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	(	BYTE	1	
	IMEI	N_STRING	14	Terminal ID
	,	CHAR	1	Delimiter
	VERSION	N_STRING	unsure	Ver. Of the software
	,	CHAR	1	Delimiter
	MCC	N_STRING	3	The country code of the SIM card
	,	CHAR	1	Delimiter
	MNC	N_STRING	3	The network code of the SIM card
	,	CHAR	1	Delimiter
	MCC of Roaming	N_STRING	3	Country code of registered network
	,	CHAR	1	Delimiter
	MNC of Roaming	N_STRING	3	Network code of the registered network. If the length is less then 3, supplements 0 from the front
	,	CHAR	1	Delimiter
	ROAM	BYTE	1	Whether roaming
	,	CHAR	1	Whether roaming
	Battery Level	BYTE	1	Battery Level
	,	CHAR	1	Delimiter
	CSQ	BYTE	1	CSQ
	,	CHAR	1	Delimiter
	Charger Status	BYTE	1	Charger Status
	,	CHAR	1	Delimiter
	APN	N_STRING	unsure	APN

,	CHAR	1	Delimiter
User_Name	N_STRING	unsure	The user name for the APN
,	CHAR	1	Delimiter
PWD	N_STRING	unsure	The password for the APN
,	CHAR	1	Delimiter
Number	N_STRING	unsure	Corresponding with SMS_Change_Number_Id
,	CHAR	1	Delimiter
Reset_Server_Flag	BYTE	1	A flag whether it should delete the parameter settings of the sever
,	CHAR	1	Delimiter
SMS_Change_Number_Id	BYTE	1	The index of authorized number which will be changed: 0 - SOS; 1 - SOS1; 2 - SOS2; 3 - SOS3; 4 - Service center; 5 - Message Center; 0xFF -No change
,	CHAR	1	Delimiter
is_sms_full	BYTE	1	The flag whether SMS of the SIM card is full 1 – full
,	CHAR	1	Delimiter
pwr_mode	BYTE	unsure	Connection mode  <ul style="list-style-type: none"> <li>● 0:Normal start</li> <li>● 1:Reconnect, after change IP1 by SMS</li> <li>● 2:GITV reconect</li> <li>● 3:Reconnect, after off the network</li> <li>● 4:Reconnect, after link detection</li> </ul>

				<p>socket</p> <ul style="list-style-type: none"> <li>● 9:Reconnect,after restore the factory settings</li> <li>● 10:Reconnect,after domain name resolution succeed</li> <li>● 11:Hot start, after worked for 24 hours</li> <li>● 12:Hot start, after sever send the start interval</li> <li>● 13:Hot start at once, after sever send the start message</li> <li>● 14:Hot start, after re-read SIM card</li> <li>● 15:Hot start, after received SMS of ZDRESET,RESTART</li> <li>● 16:Reconnect, after low voltage alarm</li> <li>● 17:Reconnect, after SOS alarm</li> <li>● 18:Reconnect, after Goe-fence alarm</li> <li>● 19:Reconnect, after query the location</li> <li>● 20:Hot start, after off the network for 30 Mins</li> <li>● 21:Hot start, after fail to connect to server</li> <li>● 22:Reconnect in 60s, after fail to connect to server</li> <li>● 23:Reconnect in 30s, after fail to connect to server</li> <li>● 24:Reconnect, after the SMS of delete the account</li> <li>● 25:Reconnet,after the vibration alarm</li> <li>● 26:The terminal is on monitor mode</li> <li>● 27:Reconnet, after change the G-Sensor switch by SMS</li> </ul> <p>If terminal restart, the</p>
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				value should add 100 Corresponding
	,	CHAR	1	Delimiter
	uart_flag	CHAR	1	The flag whether the URT has output: 1 - with 0 -without
	,	CHAR	1	Delimiter
	Work_mode	CHAR	2	Work mode 00:Cellphone mode 10:Short connection mode of sever 11:Long connection mode of sever
	,	CHAR	1	Delimiter
	Time_zone	CHAR	1	Time zone.The default value is 0. Eastern time zone use 2 bit, western time zone use 3 bit,and the first bit means -
End identifier	)	BYTE	1	

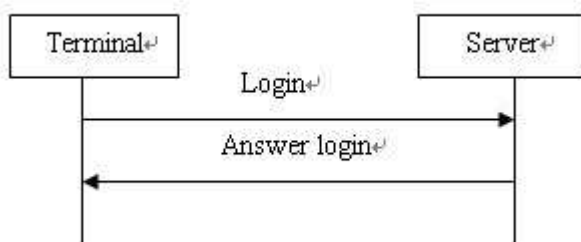
### 2.1.2 Answer login request

Under SMS mode, there is no need to answer login request.

#### The format of answer login request

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	22H			
The serial number of the packet		N_STRING	10	
The length of the packet	The same as the login packet to be answered			
The content of the packet				
End identifier	]			

### 2.1.3 Login process



Under SMS mode, terminal doesn't need to login.

◆ The login steps for TCP:

- 1) Terminal establishes a TCP connection with the server, after GPRS is connected.
- 2) Terminal sends login request to the server
- 3) After verification, server answers login request of the terminal
- 4) Terminal receives the answer, and logs in successfully

◆ Abnormal:

- 1) Terminal failed to establish GPRS connection.

## 2.2 Quit

Quit the on-line mode.

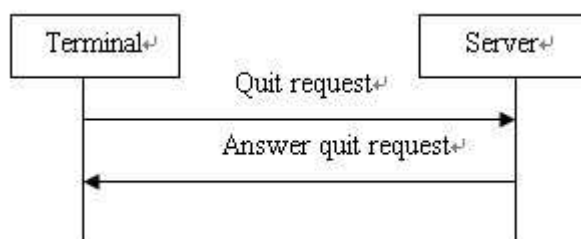
### 2.2.1 Quit request

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	23H			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	Terminal ID	N_STRING	Uncertain	Terminal ID
End identifier	]			

### 2.2.2 Answer quit request

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	24H			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	Terminal ID	N_STRING	Uncertain	Terminal ID
End identifier	]			

### 2.2.3 Quit process



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**The steps:**

- 1) Terminal send quit request to the server
- 2) Sever answer quit request
- 3) Terminal receive the answer, and quit on-line mode

**2.3 Link detection**

To keep the link, detect once every three minutes.

If the terminal doesn't receive the answer, try to establish GPRS connection again after three minutes.

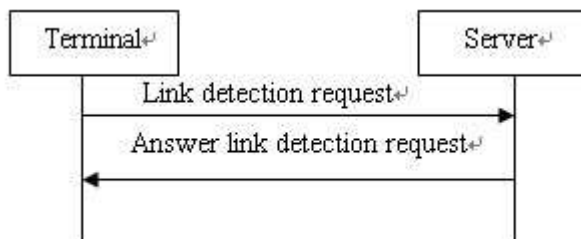
**2.3.1 Link detection request**

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	25H			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	Please refer to Appendix B			
End identifier	]			

**2.3.2 Answer Link detection request**

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	26H			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	Please refer to Appendix B			
End identifier	]			

**2.3.3 Link detection process**



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**Steps:**

- 1) In idle, terminal issue link detection request every 3 minutes
- 2) Server receive the link detection request, and answer it
- 3) If the terminal doesn't receive the answer, try to establish GPRS connection again after three minutes

**◆ Abnormal:**

Link detection can not be sent due to network reasons, the terminal according to the situation, re-launch detection.

**◆ Supplement:**

The interval to send the link detection is three minutes.

## 2.4 Query

Server uses this command to query the location and work status of the terminal.

### 2.4.1 Query request–GPS positioning is successful

**TCP packet**

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	3BH			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	Please refer to the following description			
End identifier	]			

**The content of the packet**

Packet field	Value	Type	Length(Byte)	Description
Start identifier	(			
Type	ONE			
The content	Location information, please refer to Appendix A			
	Terminal status, please refer to Appendix B			
End identifier	)			

### 2.4.2 Query request–GPS positioning fails, GSM positioning

**TCP packet**

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	4AH			
The serial number of the		N_STRING	10	

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packet				
The length of the packet		BYTE	1	
The content of the packet	Please refer to the following description			
End identifier	]			

### The content of the packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	(	BYTE	1	
	GSM	N_STRING	3	The flag of GSM positioning
	,	CHAR	1	Delimiter
	is_search	N_STRING	1	The flag of query. 1 - Query 0 - Timing of return
	,	CHAR	1	Delimiter
	is_gps_position_succ_flag	N_STRING	1	The flag of GPS positioning 1- GPS positioning success 0- GPS positioning time out
	,	CHAR	1	Delimiter
	gsm_cell_id_index	N_STRING	1	The index of cell information. 0 -The base station 1-7 -Near the index of the base station
	,	CHAR	1	Delimiter
	mcc	N_STRING	3	Mobile Country Code(mcc) included in cell information
	,	CHAR	1	Delimiter
	mnc	N_STRING	3	Mobile Network Code(mnc) included in cell information
	,	CHAR	1	Delimiter
	cell_id	N_STRING	uncertain	Cell Identity(cid) included in cell information



	,	CHAR	1	Delimiter
	lac	N_STRING	uncertain	Location Area Code(lac) included in cell information
	,	CHAR	1	Delimiter
	cell_id_rxlev	N_STRING	uncertain	Received Signal Level(rxl) included in cell information
	,	CHAR	1	Delimiter
	terminal_status	N_STRING	8	The status of terminal,please refer to Appendix C
	,	CHAR	1	Delimiter
	gps_info	N_STRING	uncertain	Need server translate it into latitude and longitude
	,	CHAR	1	Delimiter
	Reserved1	N_STRING	uncertain	Reserved character 1
	,	CHAR	1	Delimiter
	Reserved2	N_STRING	uncertain	Reserved character 2
End identifier	)	BYTE	1	

### 2.4.3 Answer Query request

The packet that server returns, please refer to the reply for hotspot information query.

## 2.5 Hotspot information query

With it, user can get the location of the terminal through SMS.

### 2.5.1 Answer hotspot information query

#### TCP packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	7AH			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	(	BYTE	1	Start identifier of the content
	CMD	N_STRING	3	Constant string
	,	BYTE	1	
	HOT	N_STRING	3	

	,	BYTE	1	
	UnicodeFlag	BYTE	1	The flag of the coding method 0 – Non UNICODE 1 – UNICODE
	,	BYTE	1	
	Description of the hotspot	UNICODE_HEX_STRING	uncertain	When UnicodeFlag=1, The hotspot information is UNICODE encoded hexadecimal string, its length must be integer multiple of 4, the maximum length is 240 characters
	)	BYTE	1	End identifier of the content
End identifier	]			

## 2.6 Server set kinds of alarm

After detect the alarm, terminal send the alarm information by TCP:

- 1) Terminal detects the battery is low;
- 2) Terminal detects user long press SOS key.

### 2.6.1 Server set kinds of alarm request

#### TCP packet

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	2AH			
The serial number of the packet		N_STRING	10	
The length of the packet		BYTE	1	
The content of the packet	(CMD,ALERT, alert_event_type, flag)  alert_event_type is the type of the alarm: 0: Vibration alarm 1: Low battery alarm 2:SOS alarm 3:In or out the concentric circle alarm 4:Over speed alarm 5:In or out the geo-fence alarm  Flag is a switch: <b>1: open</b> –Reserved, does not work <b>0: close</b> –Don't need server to control vibration alarm in recent.			
End identifier	]			

### 2.6.2 Answer server set kinds of alarm request

#### TCP packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	2BH			
The serial number of the packet		N_STRING	10	
The length of the packet		BYTE	1	
The content of the packet	(FNS, ALERT, alert_event_type, flag)			
End identifier	]			

## 2.7 Set work mode of the terminal

Through the terminal work mode setting command, server set the interval of the terminal to connect and exchange information with it.

- 1) Terminal work on real-time track mode when the interval value is 0. The connection between terminal and server is maintained
- 2) Terminal work on historical track record mode when the interval value is greater than 0 (not equal to 10). Terminal establish network connection with server according to the interval, after the connection is successful, it login/exchange information with server/quit
- 3) When the interval value is 10, in TCP mode, after send alarm to the server, terminal will break the link.
- 4) When the interval value is -1, it means tranfer of the packet that server send to the terminal is completed. After received the packet, terminal keep or break the link according to its work mode

### 2.7.1 Set GPRS timer request

#### TCP packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	7BH			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	(	BYTE	1	Start identifier of the content
	CMD	N_STRING	3	Constant string
	,	BYTE	1	Delimiter
	GITV	N_STRING	4	Const char
	,	BYTE	1	Delimiter
	Interval for positioning	N_STRING	uncertain	Interval for positioning, unit is

	)	BYTE	1	second End identifier of the content
End identifier	]			

## 2.7.2 Answer setting GPRS timer request

### TCP packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	7CH			
The serial number of the packet				
The length of the packet		BYTE	1	
The content of the packet	(	BYTE	1	Start identifier of the content
	FNS	N_STRING	3	Constant string
	,	BYTE	1	Delimiter
	GITV	N_STRING	4	Const char
	,	BYTE	1	Delimiter
	Interval for positioning	N_STRING	uncertain	Interval for positioning, unit is second
	)	BYTE	1	End identifier of the content
End identifier	]			

## 2.8 The GPS information saved in the T card send to the server

After the network connection is normal or GPRS establish connection successfully, sent the data saved in the T card when there is no network or GPRS failed to establish connection to the server.

### 2.8.1 Request of sending the GPS information which saved in the T card to the server

#### TCP packet

Packet field	Value	Type	Length(Byte)	Decription
Start identifier	[			
Packet type	30H			
The serial number of the packet		N_STRING	10	
The length of the packet		BYTE	1	
The content of the packet	(			
	LITV			
		Location information, please refer to Appendix A		
		Terminal status, please refer to Appendix B		
	)			
End identifier	]			

### 2.8.2 Answer the request of sending the GPS information saved in the T card to the server

Server receives the packet from the terminal, don't need to answer it.

## 2.9 The alarm information saved in the T card send to the server

### 2.9.1 Request of sending the alarm information which saved in the T card to the server

#### TCP packet

Packet field	Value	Type	Length(Byte)	Description
Start identifier	[			
Packet type	5CH			
The serial number of the packet		N_STRING	10	
The length of the packet		BYTE	1	
The content of the packet	Please refer to the following description			
End identifier	]			

#### The content of the packet

Packet field	Value	Type	Length(Byte)	Description
Start identifier	(			
Packet type	LALERT			
The content of the packet	alert_event_type	BYTE	1	Type of alarm, the default value is 0xFF 0: Vibration alarm 1: Low battery alarm 2: SOS alarm 3: In or out the concentric circle alarm 4: Over speed alarm 5: In or out the geo-fence alarm
	Location information, please refer to Appendix A			
	Date_time	N_STRING	12	Each is 2 bits for year, month, day, hour, minute, second
End identifier	)			

## 3 Appendix A: Location information

Packet field	Value	Type	Length(Byte)	Description
Location information	Hour	N_STRING	2	HH
	Minute	N_STRING	2	MM
	Second	N_STRING	2	SS
	The status of positioning	CHAR	1	="A": In positioning ="V": Not in positioning
	Latitude	N_STRING	2	Unit: degree

	Latitude	N_STRING	7	Unit: Point The format: bb.bbbb
	The flag of the latitude	CHAR	1	=“N”: Northern =“S”: Southern
	Longitude	N_STRING	3	Unit: degree
	Longitude	N_STRING	7	Unit: Point The format: dd.dddd
	The flag of the longitude	CHAR	1	=“E”: Eastern =“W”: Western
	Speed	N_STRING	5	Unit: nautical mile/H The format: vvv.v
	Direction	N_STRING	2	0 degree is the north. The resolution is 10 degree. Clockwise is positive
	日	N_STRING	2	DD
	月	N_STRING	2	MM
	年	N_STRING	2	YY

**Remark:**

- (I) The time included in the location information is the international standard time

#### 4 Appendix B: The status of the terminal

Packet field	Value	Type	Length(Byte)	Description
The content of the status	Battery Level	N_STRING	3	Remaining power, the maximum is 100;ie: 055 means the remaining power is 55%
	CSQ	N_STRING	3	CSQ of GSM:0—63
	Roaming Status	N_STRING	1	Roaming Status:0/1
	Charger Status	N_STRING	1	Charger Status:0/1

#### 5 Appendix C: Low battery alarm

When terminal detected the battery capacity is low, it sends the current location and status information to the server, then send out the alarm SMS. (The content of the alarm please refer to Appendix A and B)

◆ **Steps:**

- 1) Terminal detected the battery capacity is low
- 2) Terminal send the current location and status information to the server,
- 3) Terminal send the alarm SMS to the SOS number(Don't need to sent the SMS if the SOS number is NULL)

◆ **The content of the SMS:**

Less battery power, XXXXXXXXXXXXXXXX(IMEI)

#### 6 Appendix D: SOS alarm

When user long press SOS key, terminal will send alarm SMS to the SOS number. (The content of

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the alarm please refer to Appendix A and B)

◆ **Steps:**

- 1) User long press SOS key
- 2) Terminal sends current location to the server
- 3) Terminal will send alarm SMS to the SOS number. (Don't need to sent the SMS if the SOS number is NULL)

◆ **The content of the SMS:**

SOS,XXXXXXXXXXXXXXXX(IMEI)