Communication Protocol of LTS-5YS

Jan,2021

Content

One: Protocol data format

Data packet format

1.1.1 Data packet from server to device

Header	Storage Property	Response Property	Function Code	Function Keyword	Content	Tail

1.1.2 Data packet responded by device

Header	Response property	Device ID	‘,’	‘Y’	Function Code	Function Keyword	Content	Tail

1.1.3 Data packet from device to server

Header	Response property	Device ID	‘,’	Function Code	Function Keyword	Content	Tail

1.1.4 Data packet format responded by the server

Header	‘Y’	FunctionCode	Function Keyword	Tail

Explaination

1.1.1 Header is 5bytes, which is fixed as “*HQ20”； tail is 1byte,which is fixed as ’#’;

1.1.2 Storage property :1byte,0x31:represents data storage required； 0x30:represents data storage not required

1.1.3 Response property :1byte,0x31: represents response required； 0x30:represents response not required ； the response bytes is fixed to 0x30；

Data packet from server:

*HQ2011**AA**(1040218)(213888888888)#

Data packet response from device:

*HQ200999999,**YAA**&A1656512233362911356523660000230618&B0100060010&C00000<6<&F0000&R2405&V0109&W0000003E&K00100&T65#

Device upload data packet to server:

*HQ201999999,**BA**&A1656512233362911356523660000230618&B0100060010&C00000<6<&F0000&R2405&V0109&W0000003E&K00100&T65#

Data response from server:

*HQ20**YBA** #

1.1.4 Protocol function code and keyword are each 1 byte, which represents the command keywords

1.1.5 Protocol data and the data packet from device is composed by the additional data packets part 3

1.1.6 Device ID,4-15 digits, for example : 862003268000717

Two: Specific description of the protocol data packet

2.1 Data packet from server

2.1.S Configuration packet（Function code is A）

2.1.1.1 Set number—A

Function Keywords	Data packet
A	（VD0……Dn）……（VD0……Dn）
Description	Use ‘（’and‘）’to include all specific configuration items, each configuration command can set multiple items, the total bytes length are maximum 100 bytes V: is number keywords,‘D0……Dn’:is the specific number been set 1. V＝‘1’: Set the the 1st center No. 2. V＝‘2’: Set the 2nd center No
Examples	*HQ2011**AA**(1040218)(213888888888)# Represents the 1st center number is 040218,the 2nd center number is 13888888888 **Response from device:** *HQ20113800138000,YAA**&A**07321422335500114058290605201903 14**&B**0100000000**&C**00001234**&R**3109**&T**80 #

2.1.1.2 Other settings—H

Function keywords	Data packet
H	（VD0……Dn）……（VD0……Dn）
	Use ‘（’and‘）’to include the specific setting items, each command can include multiple items,but total bytes are limited

Description	to 100 V:Represents setting type keywords,'D0……Dn': Represents the specific setting data V＝'2': Set sleep mode after the device stops(Track mode of LTS-5YS_P30) D0D1D2D3:represents specific time value, 4 bytes,hex format,unit is seconds,for example "0121" represents the device will enter into sleep model after 300 seconds vehicle stopping V='K' :Set upload interval in sleep mode D0,D1,D2,D3: represents the specific time value,4 bytes,hex,unit is minutes, for example "012c"represents 300 minutes Value range:5-43200 mintues V='P' :Set upload interval in clock mode (Device wake up at certain time point) D1D2D3D4 the 1st upload time point,4 bytes BCD code,0830represents 08:30am Dn+1Dn+2Dn+3Dn+4 the nth upload time point,4 bytes BCDcode,2050represents 20:50 "0830120016301900" Represents upload 4 packets of data each day; the 1st upload time point is 08:30am； 12:00the second upload time point is 12:00,； the third upload time point is 4:30pm, the 4th upload time point is 7:00pm "090013301800" represents upload 3 packets of data each day; The 1st upload point is 09:00am； the 2nd upload point is 1:30pm； the 3rd upload time point is 6:00pm The device will execute the commands after receiving the commands and wake up accordingly. When parameter is empty, represents deleting multiple points upload parameters V='X' :Set timezone $D_0D_1D_2D_3$ 4 bytes, hex, unit is minutes,the highest bit is 1 represents westzone, while when it is 0, represents east zone "030C" represents 780 mintues, time zone is UTC+13:00 "82D0" represents -720 minutes,time zone is UTC-12:00

	V='&' OTA text command Eg : SMS command:LBS,0#, Corresponding text command:(&LBS,0) For more details, please refer to SMS command list
Examples	*HQ2011AH (K05A0)(&LBS,0)# Represents upload interval is 1440 minutes(24 hours),and OTA text command is LBS,0 Device respond *HQ20113800138000,YAH&A0732142233550011405829060520190314&B0100000000&C00001234&R3109&T80 #

2.1.1.3 Function On/Off—I

Function Keywords	**Data packet**
I	（VD）（VD）（VD）
Description	Use'（'and'）'to include the specific iterms, each command could include multiple setting items V: Represents setting keyworkds D='0':Represents function off D='1': Represents function on V='I': Position mode D=3 LBS +wifi is on priority,Only NT06_P30 support D=2 Unpostioned D=1 Only LBS D=0, GPS is on priority V= 'P': Removal alarm on/off D=1 Removal alarm off D=0 Removal alarm on ,track 60 mins after removal alarm , upload data each 60 seconds D=2 Removal alarm on ,track 15 mins after removal alarm ,upload data each 300 seconds D=3 Removal alarm on ,only alarm

2.1.2 Control command（Function Code is B）

2.1.2.1 Control working status of the device —A

Function Keywords	Data packet
A	V
Description	V＝‘0’:Mandatory restart the device V＝‘1’: Device restores to factory setting (Except APN, IP and port)
Example	*HQ2011BA0# Device restart after receiving this command Device respond *HQ20113800138000,YBA&A0732142233550011405829060520190314&B0100000000&C00001234&R3109&T80 #

2.1.2.2 Disarm device alarm—C

Function Keywords	Data packet
C	Null
Description	
Example	*HQ2011BC# Device respond *HQ20113800138000,YBC&A…&B……#

2.1.2.3 Roll call—E

Function Keywords	Data packet
E	Null
Description	

Examples	*HQ2001**BE**# Query the current location of the device, and the response propery should be '1'。 Device response *HQ20113800138000,YBE&A…&B……#

2.1.2.4 OTA—U

Function Keywords	**Data packet**
U	**F**IIIIIIII**YYYY****VV…V**
Description	Device connects to certain IP to remote upgrade firmware: **F**: Represents control options F＝'1'Represents start upgrade F＝'0' Represents stop upgrade,the rest parameters IIIIIIIIYYYY**VV…V** is invalid IIIIIIII represents server IP address YYYY represents **server port No** 119.145.40.64,7771 converted into **77912840**1E5B **VV…V**: represents firmware version,for example NT06-4.1 The terminal uses these three parameters to form the download link after receiving the instruction
Examples	*HQ2000BU**1**77912840**1E5B****NT06-4.1**#, connects to 119.145.40.64,7771,download firmware version :NT06-4.1 program file Download address:http:// 119.145.40.64:7771/MTKUpdate/NT06-4.1.bin The device will judge whether the firmware is compatiable with the current hardware version,if it is incompatiable or it is already loaded with the same version firmware, the upgrade will be rejected,it should show in the device response packet, please refer to 2.2.1.7

2.1.2.5 Track mode—X

Function	**Data packet**

Keywords	
X	<A>[,T1,T2]
Description	**A:** A=1, Tracking mode on A=0 exit tracking mode T1: Upload interval in tracking mode,unit :seconds, it is configurable, vale range:5-300 seconds T2: Track duration in tracking mode ,unit :minute, it is configurable,value range:5-57600 minutes
Example	*HQ2011BX**1,10,60**#, Tracking mode on, Upload interval is 10 seconds,enter into sleep mode after 60 minutes； Backend should pre-process and it should be sent to device immediately when it is online *HQ2011BX**0**# Exit tracking mode Device respond *HQ201113800138000,YBX&A…&B……#

2.1.3 Network parameter configuration command （Code D）

2.1.3.1 Set IP address and port number of the main server—A

Function Keywords	Data packet
A	IIIIIIIIBBBBYYYYT
Description	IIIIIIII Represents the IP address of the server LLLL Represents local port No, it can be empty, but the command should include this field RRRR represents the Port number of the server T: communication type T=T or T=1 mean TCP T=U or T=0 mean UDP Once the device receives command and respond to the server, it will immediately disconnect to current socket and connects to new server
Examples	*HQ2011DA1A2B3C4D04D222B1T# set IP as26.43.60.77,local Port No is 1234, Remote port No is 8881 Dervice respond *HQ20113800138000,YDA&A…&B……#

2.1.3.2 Set the IP address , port number of back up server—E

Function Keywords	Data Packet
E	IIIIIIIIBBBBYYYYT
Description	IIIIIIII represents the IP port of the server LLLL represents the local port No, it can be empty, but the command should include this field RRRR represents the server IP port

	T communication type T=T or T=1 represents TCP T=U or T=0 represents UDP Once the device receives command and respond to the server, it will immediately disconnect to current socket and connects to new server
Example	*HQ2011DE1A2B3C4D04D222B1T# set the IP as 26.43.60.77,port is 1234,remote port 8881 Device respond *HQ20113800138000,YDE&A…&B……#

2.1.3.3 Set the domain of the main server—G

Function Keywords	Data packet
G	KK…K,PPPP,T
Description	KK…K: represents backend domain, ASCII code, maxium 30 bytes。 PPPP port No. 0-65535 T Communication type T=T or T=1 represents TCP T=U or T=0 representsUDP
Examples	*HQ2011DGwww.abcde.com,8881,T#

2.1.3.4 Set domain of the backup server —I

Function Keywords	Data packet
G	KK…K,PPPP,T
Description	KK…K:represents back up domain, ASCII code,maximum 30 bytes PPPP Port No. is 0-65535 T Communication type T=T or T=1 representsTCP T=U or T=0 representsUDP

Examples	*HQ2011DIwww.bcdea.com,8881,U#

2.2 Data packet from device to server

2.2.1 Status upload （Code is A）

2.2.1.1 Alarm upload—A

Keywords	Data Packet
A	Additional data packet
Description	Send this message when each time the alarms are triggered
Example	*HQ201999999,AA&A16565122333629113565236600002306 18&B0100060010&C00000<6<&F0000&R2405 &V0109&W0000003E&K00100&T65&X(k89860045191536000374) #

2.2.1.2 Login message—B

Keywords	Data
B	N+ Additonal info
Description	“N”:fixed ‘1’ Every time the device is powered on or wake up should send this data packet
Examples	*HQ200999999,AB1&A16565122333629113565236600002306 18&B0100060010&C00000<6<&F0000&R2405&V0109& W0000003E &K00100&T65&X(k89860045191536000374) #

2.2.1.3 Respond to OTA command-W

Function	Data packet

Keywords	
W	R
Description	R represents respond result R='1' Correct version, allowed to upgrade R='2' Not allowed to upgrade, hardware is not compatiable R='3' No need to upgrade, already loaded with same firmware version, Other value is invalid
Examples	"*HQ20013800138000,AW1&A……&B……#" represents this version is compatible, can be upgraded, ready to download the program

2.2.2 Location upload （Code B）

2.2.2.1 Fixed upload—A

Keywords	Data packet
A	Additional
Description	Null
Example	*HQ201999999,**BA**&A1656512233362911356523660000230618&B0100060010&C00000<6<&F0000&R2405&V0109&W0000003E &K00100&T65&X(k89860045191536000374) #

2.2.3 Others

2.2.3.1 AY

*HQ200999999,AY# Heartbeat info to maintain connection between device and server

Three: Additional data packets

3.1 Location data(34 BYTES)

"&" is connector for additional data packets, It represents that the subsequent data is additional data, and the data length is not limited, it is specifically defined according to the data type.

&Ahhmmssaaaaaaaaooooooooo Fvvffddmmyy

"&A"GPS represents that the data after & a is GPS data.

"hhmmss" represents hour, minutes,seconds, eg 123112 represents 12:31:12

"aaaaaaaa" It is 8-bit latitude data, and the last 4 digits are fractional parts.

22321234 represents 22°32.1234' 1°=60'=3600"

"ooooooooo"is the 9-bit longitude data, the last 4 digits are the fractional part

113542345 represents 113°54.2345' 1°=60'=3600"

"F" The upper nibble is fixed at 3, and the lower nibble is the GPS flag. See below for details.

bit0: 1 1 represents unprecised positioning, 0 represents precise positioning

bit1: 1 represents north latitude, 0 represents south latitude

bit2: 1 represents north longitude, 0 represents south longitude

bit3: reserve

"vv"Represents GPS speed,unit is 2 nmi/h,23 represents 46 nmi/h,about 85km/h;

"ff" Represents the direction, the unit is 10 degrees, the right north is 0 degrees, clockwise, 30 means 300 degrees

"ddmmyy" represents day,month,year； 230414 represents 23/04/2014

3.2 Status and alarm code(10 BYTES):

&B$S_0S_1S_2S_3S_4A_0A_1A_2A_3A_4$

"&B" represents additional info is the device status code, the range of values for each byte is (0x30-0x3F)

S0:

BIT0=1:

BIT1=1: Reserved

BIT2=1:GPS module error

BIT3=1:Reserved

S1

BIT0=1:ACC On,fixed

BIT1=1:Reserved

BIT2=1:Reserved

BIT3=1: Reserved

S2:

Reserved

S3:

Reserved

S4:

Reserved

A0:

BIT0=1: Reserved

BIT1=1: Reserved

BIT2=1: Motion alarm

BIT3=1: Reserved

A1:

BIT0=1: Reserved
BIT1=1: Reserved
BIT2=1: Reserved
BIT3=1: Reserved

A2:

BIT0=1: Reserved
BIT1=1: Reserved
BIT2=1: Reserved
BIT3=1: Reserved

A3:

BIT0=1: Reserved
BIT1=1: Reserved
BIT2=1: Reserved

A4:

Reserved

3.3 Speed data（4 BYTES）

&F D0D1D2D3

F represents the additional data is speed data

D0D1D2D3: represents speed,0~9 ASCII code format,Unit is:0.1nmi/h。D0D1D2 Is an integer bit, D3 is a decimal bit

For example**&F**0458 represents the current speed is 45.8 nmi/h,that is 84.8 Km/h.

3.4 Signal strength（4 BYTES）

&RD0D1D2D3

F represents that the additional information is the celluar signal strength and the number of GPS satellites.

D0D1: represents celluar signal strength, ASCII code format from 0 to 9, ranging from 00-31
D2D3: represents the number of GPS satellites, ASCII format from 0 to 9.
For example, &R2510 represents that the signal strength is 25, and the GPS satellite number is 10

3.5 Extended device status（5 BYTES）

&KS0S1S2S3S4

K represents the additional data is the extended status info

S0S1S2S3S4: status code

S0:

BIT0=1: History data
BIT1=1: Reserved
BIT2=1: Removal satus
BIT3=1:RTC Error

S1

BIT0=1: Track mode
BIT1=1:**G-sensor** error
BIT2=1: Improper installation, anti-removal button or light sensor terminal installation error
BIT3=1: motion on NT06_P30 support

S2

Bit1 BIT0: 01-Power off restart(Power on reset)； 10-wake up from standby; 11-Software reset； 00- Other reset
Bit2=1: SpiFlash fault NT06_P30 support
BIT3=1: Reserved

S3:

BIT0=1: Jamming detected, NT06_P30 support
BIT1=1:Reserved
BIT2=1:Reserved
BIT3=1:WIFI module error, NT06_P30 support

S4:

BIT3=1: Reserved
BIT2=1: Reserved
BIT1=1: Reserved
BIT0=1:Reserved

3.6 LBS information of 2G network（18-78BYTES）

&INCCCMML0L0L0L0C0C0C0C0D0D0...LnLnLnLnCnCnCnCnDnDn
I Represents the additional data is multiple LBS information
N: Base number, range value 1-7
CCC:country code,460:China
MM:Mobile network code
00:China mobile,01:China mobile,
L0L0L0L0: Current base code,0~9 /A-Z ASCII code, Value range 0000-FFFF
C0C0C0C0: Current base cell code,0~9 /A-Z ASCII code, Value range 0000-FFFF
D0D0: Current base signal strength,0~9 ASCII code, value range is 0-62
Base signal range is （-113dbm,-51dbm）,after add 113,range is 0-62

LnLnLnLn: Near Nth base station location code (n=N-1), 0~9 /A-Z ASCII code format, value range 0000-FFFF
CnCnCnCn: the nth base station cell code (n=N-1), 0~9/A-Z ASCII code format, and the value range is 0000-FFFF
DnDn: signal strength of the nth base station nearby, ASCII code format of 0~9, ranging from 0-62
Base signal range is （-113dbm,-51dbm）,after add 113,range is 0-62

For example&I5460002 7A00FCB62 27A00FCA57 27A00E955 3 27A00E8B53 27A00F9748
Represents that the number of base stations is five, and the current operator is China Mobile.
The current service base station location code is 27A0, the cell code is 0FCB, and the signal strength is 62 (-51dbm).
The first base station location code is 27A0, the cell code is 0FCA, and the signal strength is 57 (-56dbm).
The second base station location code is 27A0, the cell code is 0E95, and the signal strength is 53 (-60dbm).
The third base station location code is 27A0, the cell code is 0E8B, and the signal strength is 53 (-60dbm).
The fourth base station location code is 27A0, the cell code is 0F97, and the signal strength is 48 (-65dbm).

3.7 History data type P（4 BYTES）

&PS0S1S2S3

P represents that the additional data is the history data

S0S1S2S3: History data status code

S0:
BIT0=1: Communication interupted
BIT1=1: No signal
S1:
Bit1=1: downloading AGPS data
Bit2=1:Reserved
Bit3=1:Reserved
S2:
BIT0=1: Reserved

Bit1=1: Module error,No response
Bit2=1: Sim card error, reading card error
BIT3=1: Device ID number error, no such ID or device number

S3:

BIT0=1: Network register failure
BIT1=1:PDP activation context failed
BIT2=1: IP error, not able to connect server
BIT3=1: Domain name error, unable to connect to the server

3.8 Device parameters X

&X（VD0…Dn）…（VD0…Dn）
X represents the additional info is device parameters,V:Setting type keywords,'D0……Dn':the specific setting data
V ='1' Positioning mode NT06_P30 support
D0=0 GPS >WIFI>LBS
D0=1 WIFI+LBS
D0=3 WIFI > GPS > LBS
V ='3' Upload interval in tracking mode
D0D1D2D3: Specific time value,4 bytes, hex,unit is seconds, for example eg"003c"represents 60 seconds。
V ='4' Tracking mode duration
D0D1D2D3: Specific time value,4 bytes,hex, unit is minutes, for example"012c" 300 mintues。
V ='5' Upload interval in sleep mode
D0D1D2D3: Specific time value,4 bytes, hex ,unit is minutes, for example eg"012c"represents 300 mintues
V ='A' Multiple points upload parameters
D1D2D3D4 1st upload time point,4 bytes BCD codes, ,0830 represents 08:30
Dn+1Dn+2Dn+3Dn+4 the nth upload time point,4 bytes BCD codes, 2050 represents 20:50

eg“0830120016301900”represents upload 4 points data each day

1st upload time point is 08:30am；the second upload point is 12:00；the 3rd upload point is 4:30pm； the 4th upload point is 7:00pm；

eg“090013301800” represents upload 3 points data each day；

the 1st upload time point is 09:00； the 2nd upload time point is 1:30pm；the 3rd upload point is 6:00pm；

V = ‘E’ Device remaining usage time

D0D1D2D3: is specific time value,4 bytes, hex, unit day

eg“012c”represents 300 days

V = ’J’ time area (JD0D1D2D3)

D0D1D2D3 4 Bytes, Hex, unit: minutes ,high bit means West Zone, 0 means East Zone

eg “030C” means 780 mins，Time zone is UTC+13:00

V = ‘L’ The device standby time based on one day one ping, unit: Year

(L3) 3 years battery life

(L5) 5 years battery life

V='N' Upload interval in storage mode

D0D1D2D3: Specific time value,4 bytes, hex ,unit is minutes, for example eg“0b40”represents 2880 mintues

V=':' Motion and static mode

D0D1D2D3: interval of motion mode, Specific time value,4 bytes, hex ,unit is minutes, for example eg“012c”represents 300mintues

D4D5D6D7: interval of static mode, Specific time value,4 bytes, hex ,unit is minutes, for example eg“0b40”represents 2880mintues

V = ’k’ ICCID of SIM card (k89860045191536000374)

&X(10)(A0900123015001930)

Represents postion mode is GPS postion, the upload point is 09:00 12:30 15:00 19:00；

&X(12)(505A0)(k89860045191536000374)

Represents the positon mode is LBS, upload data each 24 hours；ICCID is 89860045191536000374

3.9 Battery level status（2 BYTES）

&TD0D1

T represents that the additional information is the remaining battery capacity percentage.

D0D1: 0~9 ASCII format

For example, &T80 represents that the battery power remains 80%.

3.10 WIFI data Q

&QN0N1M00M01M02M03M04M05M06M07M08M09M0aM0bD00D01…Mn0Mn1Mn2Mn3Mn4Mn5Mn6Mn7Mn8Mn9MnaMnbDn0Dn1

N0N1: Number of WIFI, Axis format of 0~9 /A-Z

M00M01M02M03M04M05M06M07M08M09M0aM0b 0~9 /A-Z ASSII code format nth group wifi mac address

Dn0Dn1 0~9 /A-Z ASSII code format nth group wifi signal strength

3.11 LBS data of CAT-M & NBiot

&YNCCCMML0L0L0L0C0C0C0C0C0C0C0C0D0D0…LnLnLnLnCnCnCnCnCnCnCnCnDnDn

Y represents that the additional information is multi-base station information.

N: Number of base stations, ranging from 1 to 7.

CCC: Mobile Country Code, 3 digits, 460: China

MM: Mobile network code, 2-3 digits

00: China Mobile, 01: China Unicom, 02: China Mobile, 06: China Unicom (UMTS 2100), 07: China Mobile (TD-SCDMA), 20: China Railcom

L0L0L0L0: current service base station location code, 0~9 /A-Z ASCII code format, value range 0000-FFFF

C0C0C0C0C0C0C0C0: current serving base station cell code, 0~9 /A-Z ASCII code format, value range 0000-FFFFFFFF

D0D0: Current service base station signal strength, 0~9 ASCII code format, value range 0-62

The base station signal range is (-113dbm, -51dbm), and after adding 113, the range is 0-62.

.....

LnLnLnLn Near nth base station location code (n=N-1), 0~9 /A-Z ASCII code format, value range 0000-FFFF

CnCnCnCnCnCnCnCn: the nth base station cell code (n=N-1), 0~9/A-Z ASCII code format, and the value range is 0000-FFFFFFFF
DnDn:: signal strength of the nth base station nearby, ASCII code format of 0~9, ranging from 0-62
The base station signal range is (-113dbm, -51dbm), and after adding 113, the range is 0-62.

For example, &Y54600027A000000FCB6227A000000FCA5727A000000E955327A000000E8B5327A000000F9748
Represents that the number of base stations is five, and the current operator is China Mobile.
The current service base station location code is 27A0, the cell code is 0FCB, and the signal strength is 62 (-51dbm).
The first base station location code is 27A0, the cell code is 0FCA, and the signal strength is 57 (-56dbm).
The second base station location code is 27A0, the cell code is 0E95, and the signal strength is 53 (-60dbm).
The third base station location code is 27A0, the cell code is 0E8B, and the signal strength is 53 (-60dbm).
The fourth base station location code is 27A0, the cell code is 0F97, and the signal strength is 48 (-65dbm).

3.12 Network type N

&ND0D1
N represents that the additional data is network type
D0D1：
00：unknow
01：GSM
05：CAT-M1 (eMTC)
06：NBioT

3.13 Temperature data J（4 BYTES）

&JNSD0D1D2D3
J Represents the additional info is the current temperature info
N: Represents temperature channel，value from 0x30~0x33
S: Represents current status， high half bit is 3，low half bit definition is below：

bit0=1 Temperature is minus

bit1=1 High temperature alarm

bit2=1 Low temperature alarm

bit3=1 Sensor disconnected

D0D1D2D3:Current temperature info ， 0~9ASCII code，3 integer, 1 decimal, unit is centigrade, range -999.9~999.9

For example, &J010255 represents temperature of 1st chanel is—25.8 degree

----------——THE END—----------—