GPIO Controller command protocol

Content

General:

Send command: packet head length ID command parameter parity, ID usually used for RS485, only use command+parameter in network status

packet head(2)	length(1)	ID(1)	Command (1)	Parameter (n)	parity(1)
0x55 0xaa	n+2, length without itself	id	C	xxxxxx	Length (including) start to the end of parameters, accumulation and parity
	<mark>parity including area</mark>				

Respond command: packet head length ID command parameter parity, ID usually used for RS485, only use command+parameter in network status

packet head(2)	length(1)	ID(1)	Command (1)	Parameter (n)	parity(1)
0xaa 0x55 Note: respond packet is different from sending packet	n+2, length without itself	id	C+0x80	xxxxxx	Length (including) start to the end of parameters, accumulation and parity
	<mark>parity including area</mark>				

1. If it is very stable when used for network communication or serial port communication, can use [command parameter] to simplify communication. But this may cause miscalculation as will not know parameters.
2. The respond data, can almost judge the condition of send data according to the respond content.   And update the display of control interface, without record the control command it send, this also means that the module can be active to response data.
3. Assume that, all IO ports from 1 to N channel, N channel in total, if there is a leap, blank area fill 0.
4. No need all the products support all protocols, different product implement different protocol
5. General commands: 0xff+cmd. If module does not support present command, it will respond 0xff+cmd

Description of continuous values to show IO, with 12 relay as example

Byte data	Byte1								Byte2			
channel	1	2	3	4	5	6	7	8	9	10	11	12
data	Bit 0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit0	Bit1	Bit2	Bit3
example	1	0	0	0	1	1	1	1	1	1	0	0
	0xF1								0x03, blank area fill 0			

Form1: continuous IO instructions (pls refer to this form for following description of BBBB)

There are two ways to send commands to the hardware devices:
1. As TCP client connect device TCP server directlyl, port 8899, hardware IP address through search protocol to search it.
2. When send instructions to cloud server, it is need corresponding user name, passport and MAC address, pls see detial for realted file.

Notice: Local to control device, after build TCP connect, it need send passport +0x0D+0x0A, system respond OK or NO, that's mean passport right or wrong, when passport is right, then it can go on work.

Below is only for [command, parameter]

When single-microcontroller receive command data, if the system is busy, it will return 0x7F 0x7F, other causes for treating failure will return 0x00 0x00

In commands, N represent a byte, usually selector channel. D represents a byte, means value. BBBB represents variable length and connected multiple bits. H is high, L is low

1. Output command

1. 0x01 N clear(close) single IO

Return: 0x81 N 0

Example: send 0x01 0x01 return 0x81 0x01 0x00 means clear the first channel IO, the scope of N is 1-255

2. 0x02 N set(open) single IO

Return: 0x82 N 1

3. 0x03 N invert single IO

Return: 0x83 N 1/0

4. 0x04 no parameter clear all output IO

Return: 0x84 0

5. 0x05 no parameter set all output IO

Return: 0x85 1

6. 0x06 no parameter invert all output IO

Return: 0x86 BBBB，BBBB means all IO current status

BBBB refer to form1 continuous IO instructions

7. 0x07 BBBB select multiple channel clear

Return: 0x87 BBBB

BBBB means the relay be selected to clear

8. 0x08 BBBB select multiple channel set

Return: 0x88 BBBB

BBBB means the relay be selected to set

9. 0x09 BBBB select multiple channel invert

Refund: 0x89 BBBB

BBBB means all IO current status

10. 0x0a no parameter reading all output IO status, no perform action

Return: 0x8a BBBB

BBBB means all output IO current status

11. 0x0b BBBB set all output IO status

Return: 0x8b BBBB
BBBB means all output IO status after the command execution

2. Input IO command

IO type and default output setting command

1. 0x10 BBBB set multiple IO as input type
Return: 0x90 BBBB current IO status
Save IO type at the means time, effect immediately

2. 0x11 BBBB set multiple IO as output type
Return: 0x91 BBBB current IO status
Save IO type at the means time, effect immediately

3. 0x12 BBBB set multiple output IO default value
Return: 0x92 BBBB current IO status
Save IO default value, effect when power on again

4. 0x14 no parameter read all input poet IO status, no perform action
Return: 0x94 BBBB
BBBB means all input IO current status

Note: Input and output IO universal command

1. 0x13 N read IO port current status
Return: 0x93 N 1/0
Special: Device can initiatively send this command to notify application, the current status has changed, this change is likely to be caused by external input, also may be caused by the program automatic control logic.

3. PWM port and frequency command

Note: PWM output without unit, can be 0-100 percent, also can be 0-255 RGB represent three-primary colors

1. 0x20 read all PWM status
Return: 0xa0 DDDD current PWM value, each byte represent duty ratio of one channel

Such as: return 0xA0 0x01 0x30 means the first channel duty ratio is 1, the second channel duty ratio is 48

2. 0x21 DDDD set all PWM value
Return: 0xa1 DDDD current PWM value, each byte represent duty ratio of one channel
Such as: send 0x21 0x01 0x30 means set the first channel duty ratio is 1, set the second channel duty ratio is 48

3. 0x22 N D set specified channel duty ratio output

N means operating channel, D is actual value
Return 0xa2 N D, example: send 0x22 0x01 0x10 means set the first channel duty ratio 16

4. 0x23 N read specified channel duty ratio output
N means operating channel
Return 0xa3 N D, for example send 0x23 0x01, return 0xa3 0x01 0x10, means read and get the first channel duty ratio is 16
5. 0x24N read all PWM duty ratio and frequency status
Return 0xa4 DD DH DL…
6.0x25 DD DH DL… Set all PWM duty ratio and frequency status
Return 0xa5 DD DH DL…
Each channel PWM have 1pcs bite duty ratio, 2pcs bite frequency, and several channel in turn arrangement,

4. Frequency operating command

Frequency operating command is in common with PWM operation command, but frequency parameter has two bytes, high in front and low behind

1. 0x30 read all frequency status
Return: 0xb0 DHDL DHDL current frequency value, every two bytes represent one channel frequency value
Example: return 0xB0 0x00 0x30 0x10 0x00 means the first channel frequency is 0*256+48=48, the second channel frequency is 16*256+0=256

2. 0x31 DHDL set all frequency value

Return: 0xb1 DHDL DHDL current frequency value, each two bytes represent one channel frequency value
Example: 0x31 0x01 0x30 0x00 0x20 means set the first channel frequency 1*256+48=304, set the second channel frequency 0+32=32

3. 0x32 N D set specified channel frequency value

N means operating channel, DHDL means actual value
Return: 0xb2 N DH DL, for example send 0x22 0x01 0x10 0x02 means set the first channel frequency 16*256+2=4098

4. 0x33 N read specified channel frequency value

N represent the operating channel
Return: 0xb3 N DH DL, for example, send 0x23 0x01, return 0xb3 0x01 0x10 0x02 means read and get the first channel frequency is16*256+2=4098

5. Register command

Each register data 2 bytes, showing the AD analog input and all the sensor data, top digit represent positive and negative, =1 means negative,=0 means positive, data part divided by 10 means, range from -3276.7 to +3276.7, example:

Receive 0x80 0x10 means: -1.6
Receive 0x01 0xaa means: +42.6

1. 0x40 read all register data
Return: 0xC0 DDDD ... Return all register data in turn

2. 0x41 N read single register data
Return: 0xC1 N DH DL single register data

3. 0x42 S N read specific register section data
Return: 0xC2 S N DH DL DH DL ... the specific register section data

4. 0x43N clear single register data
Back: 0XC3N clear register channel

5. 0x44 clear all register data
Back: 0xC4 0

Description: S one byte, means register initial address (0-255)
          N one byte, means register quantity (1-255)

6. Timing work command

The system defines a storage range of 55 byte, used to storage the 5 timing commands of 0~4, location and sequence fixed【5 points at present, based on system processing ability, can be more】

Note: You should use 0x70 commands to check if this function is available

Class	Task ID	type|enable type	time	cmd	Week enable
Number of bytes	1	1	4	4	1
instructions	Start from1, 1~5 max 5	The highest means enable or not, 1 is enable, default enable when add. Low order means cyclical patterns, see note	Unix time stamps, high order in front	Carry out the commands in this list, usually means out put control command, the lacked bytes use 0	Bit 0~6 stand for Sun. to Sat. 1 allow action, 0 not allow, highest bit pls fill 0
example	0x01	0x80	0x51C8E925	0x05 00 00 00	0x7F
meaning	Timing task 1	enable|single task	2013-06-25-08:49:41	Output all open	Allow action everyday

Note:

Cyclical type instructions: 0 single time, 1 minute circulate, 2 hour circulate, 3 day circulate, 4 month circulate. The system will adjust the timing time to the next time you need to perform according to cyclical patterns, after finish the timing task. Civil usage APP only think about single time and day circulate (choose which day to perform by week enable) is ok.

Unix timestamp: The seconds from Jan.1st, 1970(UTC/GMT midnight), not including leap seconds. Example: 0x51C8E925=1372121381=Jun25, 2013 08:49:41
Pls refer to http://shijianchuo.911cha.com/

1. 0x50 N read timing task list
Parameters: N: used to indicate reading N channel IO timing task, when N is 0, it means read all timing task, when N is not 0, it means read the timing task list for N channel IO. N from 0~255
Return: 0xD0 +the number of qualified task {less than or equal to 5, 0 is no list}+task list, followed by arrangement, format as the table above.

2. 0x51 add timing task
Parameters: Type Time CMD Week as the above table
Return: 0xD1 ID Type Time CMD Wee, ID means the location number after storage, FF means storage is full, storage failure.

3. 0x52 M N single timing task enable disable delete
Parameters: M means the task number to operate 1~5M
N means operation type   1 enable 2 disable 3 delete
Return: 0xD2 M N

4. 0x53 read system time
Parameters: no
Return: 0xD3 Time Time is Unix time stamp

5. 0x54 set system time
Parameters: Time
Return: 0xD4 Result Time

Result 1 means succeed, 0 means fail {it may not support or fail to set time because of hardware} Time is time stamp

7. Automatic control rules

This chapter is not completed

Class	ID	Enable	Source type	Source location	comparison operators ASCCII character	comparison value	executive command
Number of bytes	1	1	1	1	1	2	4
Instruction	1Beginning, 1~5, Max5 pcs	Use the least significant, 1 enable, 0 disable other for spare	0-3 output, 1 input, other in turn	Which channel source, 1~255	operational character ＜＞=! Means Less than, greater than ,equal to, un equal to; Special use for IO input and output follow, ~ negation & in-phase follow	0~65535, IO figure and storage figure for general use	To perform this agreement in the table command, Usually refers to the output control instruction, lack of bytes 0
Example							

Rule type: 0 reserve, 1 carry out when a input IO is low, 2 carry out when a input IO is high, 3 carry out when input IO vary(including the 1 and 2 function), 4 carry out when a register value greater than a value, 5 carry out when a register less than a value

1. 0x5F N Read automatic control rule list
Parameter: N read assign storage location automatic control rule, equal to next command ID, N is O read all data
Back: 0xDF+N+ suitable for conditions task number(≤5pcs, 0 is no list) +task list in turn, format is same with up chart.
2. 0x5E, add automatic control rule
Parameter: Enable type position compare value command, same with up chart
Back: 0XDE ID Enable type position compare value command, ID show location number, FF show full storage, fail storage
3. 0x5D M N single automatic control rule start stop delete
Parameter: M means operation mission number1~5
      N show operate type   1: start   2. Stop   3. Delete
Back: 0XDD M N

8. Resource command

For the convenience of use, each device can name each resource independently, device name storage in hardware for customers app read. The name space of each channel is14 bytes, the first byte is used to identify the real properties of the channel (see table), the second byte standby. The 12 bytes in behind means name, use Unicode-8 code storage, letters up to 12 bytes, Chinese characters max 4, if the name is less than 12 bytes, with 0 as the end. In case of all zero or all F, the APP should display as unnamed, on hardware resources can be offered a default name according to its circumstance. In actual operation, the 0 and 1 byte, can temporarily left blank, write 0.

1. 0x60 N M DDDDDDDDDDDDDD set single resource single channel name
N means resource type, (1-3, 0 means output, 1 means input, and 7E command represent XYZK), M means channel(1-255); D 14 byte means this channel name
Return: 0xE0 N M DDDDDDDDDDDDDD

2. 0x61 N M read single resource single channel name
Return: 0xE1 N M DDDDDDDDDDDDDD
N means resource number (0-3), M means channel number (1-255) signal channel name

3. 0x62 DDDDDDDDDDDDDD ... set all resource all channels name
Return: 0xE2 DDDDDDDDDDDDDD ... arrange in order

4. 0x63 read all resource all channels name
Return: 0xE3 DDDDDDDDDDDDDD ... all resource all channels name, arrange in order

5. 0x64 N DDDD… set one kind of resource all name
N means sources number (0-3)
Return: 0xE4 N DDDD…

6. 0x 65 N read one kind of resource all name
Return: 0xE5 N DDDD… all resource name, arrange in order

The content of the resource name of the first byte value as below table, the APP corresponding icon is displayed according to this value:

0	1	2	3	4	5	6	7	8	9
Reserved default	bulb	socket	switch	TV	air condition	refrigerator	water heater	temperature	humidity

10	11								
CO alarm apparatus	PM								

9. Special command

1. 0x7E no parameter read board source situation

Return 0xFE x y z

X Y Z respectively represent the numbers of output port, input port and PWM port

Add: 0x72   x y z set board source situation
Return 0xF2   x y z

Following command 2.3.4 is for temporal power supply

2. 0x7D no parameter read current voltage

Return 0xFD H L
H and L means high and low voltage

3. 0x7C no parameter perform Normal start command

When receive command, immediately return 0xFC 0x00 means start perform command
After the implementation, return 0xFC 0x01 means finish performance

4. 0x7B no parameter perform Normal close command

When receive command, immediately return 0xFB 0x00 means start perform command
After the implementation, return 0xFB 0x01 means finish performance

0x78   X Y Z   PWM switch to IO mode

Return 0xF8
PWM switch to IO mode send command 0x78 X Y Z, X Y Z respectively represent output
port, input port and PWM port, the module return 0xF8 X Y Z. For example, switch four channel
PWM to IO mode is0x78 8 0 0; switch seven channel PWM to IO mode is 0x78 7 0 1

0x79 A B C D   modify device ID

Return: 0xF9 A B C D
Specific commands as follows: 0x79+AddressH+AddressL+AddressH radix minus one
complement+AddressL radix minus one complement, device return
0xF9+AddressH+AddressL+AddressH radix minus one complement+AddressL radix minus one
complement, device return 0xF9+

0x7A save current settings

Return 0xFA
After send command, save all IO on-off status, all PWM frequency and duty ratio, set IO and
PWM as saved configurations after rebooting
Specific command is0x7A, the module return 0xFA (that is 0x7A+0x80)

0x70 read device version information

return 0xF0 device function byte (2 bytes) hardware version (2 bytes) software version (2 bytes)

The 8 bit function of the 1 byte in 设备功能字 as follows, 1 support, 0 not support

bit	0	1	2	3	4	5	6	7
function	Can be configurated by webpage	Resource numbers configurable	WIFI	Wired network	GPRS	Smart-link	Support timing task or not	Reserved

Bit5 Smart-link bit, if 0, correspond with the protocol of USR-WIFI232-A/B, if 1, correspond with the protocol of USR-WIFI232-G

The second byte represent device model number, different devices.
Current devices: IOT1 1, WIFI IO MINI 2, GPRS RTU 3
            WIFI-IO-83 4, IOT2 5

Hardware and software version represented with 2 bytes, high byte means large version, low byte means minor version, assembled to be VH.L

0x73 DDDDDD DDDDDD modify the device password
Parameters: 1 modify succeed, 0 old password incorrect, fail to modify
Return 0xF3 1/0

0x74 DDDDDDDDDDDDDDDD modify device name
Return 0xF2 DDDDDDDDDDDDDDDD parameter is device name, 16 bytes

0x75 get device name
Parameters: no
Return 0xF5 DDDDDDDDDDDDDDDD parameter is device name, length is 16 byte

0x76 Port N DDDDDDDD send data to specific serial port
Parameters: Port COM number (0~2) N the length of data section, DDDDDDDD the serial data to send
Return 0xF6
  Todo: data response commands undetermined

Enclose: search protocol

Search protocol use for E45 basic, use UDP Radio, port 1901

Search send:
Ff01 01 02

Search back:

Bite	Name	Example	Explain
0	TAG_STATUS	FF	Enable
1	Packet_length	24	Bag total length(all data length, enable 0x24)
2	CMD_DISCOVER_TARGET	01	command word, enable
3	Board_type	01	Equipment type（1 is IOT, 2 is WIFI io mini, 3 is GPRS rtu）
4	Board_ID	4B	Equipment function word(detail in GPIO protocol, 0x70 command word
5~8	Client_IP_address	C0	Euipment IP（High byte in the former）
9~14	MAC_address	D8 B0 4C 00 01 64	Euipment MAC（High byte in the former）
15~18	Firmware_version	DA 07 01 00	DA 07：software version（Low byte in former 2010） 01 00: is hardware version（low bite in the former），from 1 beginning，but cannot 0x0000
19~34	Application_title	55 53 52 2D 49 4F 54 31 00 00 00 00 00 00 00 00	Equipment name
35	checksum	85	Check byte base is 0, from 0 byte（contain）begin minus, before minus to check byte, Results keep low byte.

For example-USR-WP3:

Send command close first channel IO					
Send code	55 AA	00 03	00	01 01	05
Explain	packet header	Packet length 3 byte	ID acquiesce 0	Order and parameter Command number 01(clear command) Parameter 01	Check: 00+03+00+01+01=05
Response	AA 55	00 04	00	81 01 00	86

code					check
Explain	packet header	Packet length 4 byte	ID acquiesce 0	Order and parameter Command number 01(clear command) First channel 01 clear	check

TCP send: 55 AA 00 03 00 02 01 06
TCP accept: AA 55 00 04 00 82 01 01 88

Send command open first channel IO					
Send code	55 AA	00 03	00	02 01	06
Explain	packet header	Packet length 3 byte	ID acquiesce 0	Order and parameter Command number 02(clear command) Parameter 01	Check: 00+03+00+02+01=06
Response code	AA 55	00 04	00	82 01 00	88
Explain	packet header	Packet length 4 byte	ID acquiesce 0	Order and parameter Command number 02(clear command) First channel 01	check