



AT5820 SOC HCI Protocol
Version 0.2

Catalog

1 Summary.....	1
2 Communication Protocol Definition.....	1
2.1 Control Frame Data Format.....	1
2.2 Reply Frame Data Format.....	2
3 Command Description.....	3
3.1 Basic Command.....	3
3.1.1 Set the Motion Sensing Distance.....	3
3.1.2 Obtain the Motion Sensing Distance.....	3
3.1.3 Setting the Lighting Time.....	3
3.1.4 Obtain the Lighting Time.....	4
3.1.5 Set the Photosensitive Threshold.....	4
3.1.6 Obtain the Photosensitive Threshold.....	4
3.1.7 Set the Motion Detection Data-Delta.....	4
3.1.8 Obtain the Motion Detection Data-Delta.....	5
3.1.9 Set the Breathing Detection Sensing Distance.....	5
3.1.10 Obtain the Breathing Detection Sensing Distance.....	5
3.1.11 Set the Sensing Distance of Micro-Motion Detection.....	5
3.1.12 Obtain the Sensing Distance of Micro-Motion Detection.....	6
3.1.13 Turn On/Off the Light.....	6
3.1.14 Set PWM Duty Cycle.....	6
3.1.15 Turn On/Off the Radar.....	6
3.1.16 Obtain the Radar Switch Status.....	7
3.1.17 Save the Radar Settings.....	7
3.1.18 Obtain the Radar Saving State.....	7
3.1.19 System Reset.....	8
3.2 Debug Commands.....	8
3.2.1 Register Write.....	8
3.2.2 Register Read.....	9
3.2.3 Memory Write.....	9
3.2.4 Memory Read.....	9
3.2.5 Memory Dump.....	9
3.2.6 Flash Write.....	10
4 Hardware Interface.....	10
4.1 Uart.....	10
5 Revision History.....	11

1 Summary

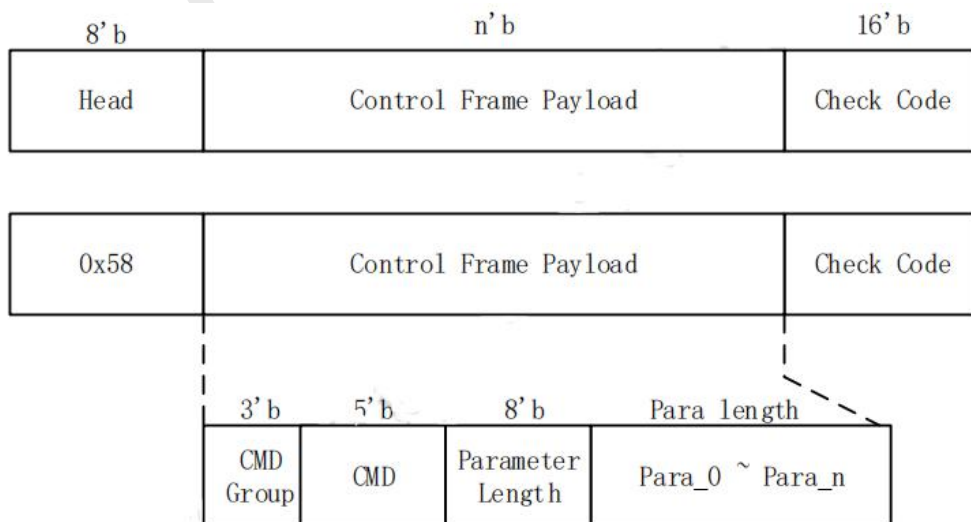
The AT5820 5.8GHz Radar SOC chip, developed independently by AirTouch, supports communication via the UART interface and host side, including program download, command control and debugging instructions. This article focuses on the communication protocol formats and individual command description of the AT5820.

2 Communication Protocol Definition

The frame data of the communication protocol is mainly divided into control frame data and Reply Frame data. The control frame is the frame data format that the upper computer sends the control command to the AT5820 SOC. The Reply Frame is the data format that AT5820 SOC replies to the upper computer after executing the command controlled by the upper computer. The detailed frame data format is described as follows.

2.1 Control Frame Data Format

The control frame is mainly the control frame data sent by the upper computer to the AT5820 chip through UART, and its format is defined as follows:



Description:

Head:control frame head,the value is 0x58;

Control Frame Payload:it divides into command grouping,control command,parameter length and parameter;

CMD Group:command grouping,3 effective bits,supporting up to 7 groups' command;

CMD:control command,5 effective bits,that a group supports up to 32 control command;

Parameter Length:the total length of the parameter (bytes);

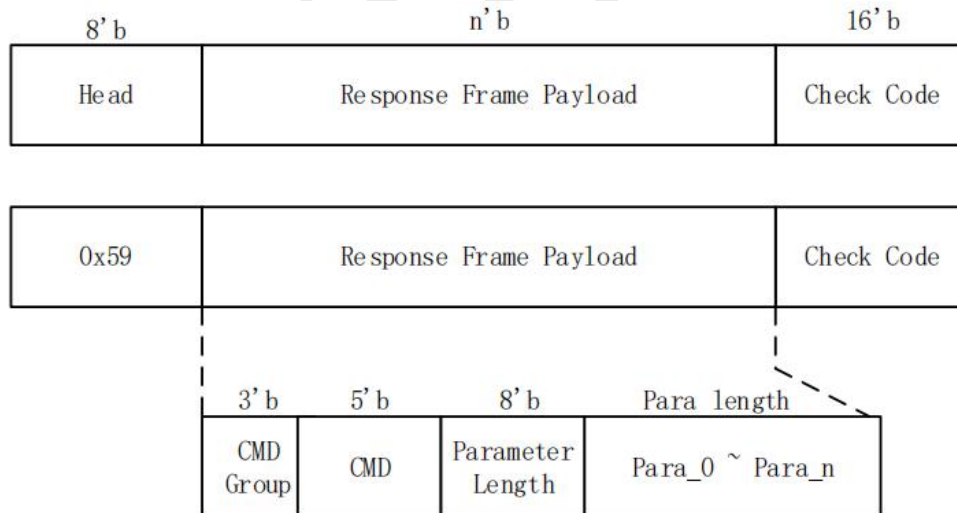
Para_0 ~ Para_n:parameter (the length is specified by Parameter Length);

Check Code: the value is the sum of the previous data:

$$\text{Check Code} = \text{Head} + \text{Payload}_0 + \dots + \text{Payload}_n$$

2.2 Reply Frame Data Format

The reply data that after executing the control command by SOC chip,it is defined as follows:



Description:

Head:Reply Frame's head,the value is 0x59;

Response Frame Payload:it divides into command group,control command,parameter length and parameter;

CMD Group:reply to the corresponding execution command group

CMD:Reply to the corresponding execution command;

Parameter Length:the total length of the reply parameter (bytes);

Para_0 ~ Para_n:Parameter (length is specified by Parameter Length)

Check Code:the value is the sum of the previous data:

$$\text{Check Code} = \text{Head} + \text{Payload}_0 + \dots + \text{Payload}_n$$

3 Command Description

3.1 Basic Command

3.1.1 Set the Motion Sensing Distance

Instruction Code:0x2

Parameters:para1: distance level 0 - 15

Sending Data Format(HEX): 58 02 01 xx xx xx

Reply Frame:refer to Reply Frame format

e.g., set distance level to 15

HEX is: 58 02 01 0F 6A 00

Resp: 59 02 01 00 5C 00 (success), Other: fail

3.1.2 Obtain the Motion Sensing Distance

Instruction Code: 0x3

Parameters: none

Sending Data Format(HEX): 58 03 00 5B 00

Reply Frame: 59 03 01 0F 6C 00 // e.g. get distance level: 15

3.1.3 Setting the Lighting Time

Instruction Code: 0x4

Parameters: para1: time(low byte), para2: time(high byte). In seconds.

Sending Data Format(HEX): 58 04 02 xx xx xx xx

Reply Frame: refer to Reply Frame format

e.g., set time to 1s

HEX is: 58 04 02 01 00 5F 00

Resp: 59 04 01 00 5E 00 (success), Other: fail

3.1.4 Obtain the Lighting Time

Instruction Code: 0x5

Parameters: none

Sending Data Format(HEX): 58 05 00 5D 00

Reply Frame: 59 05 02 01 00 61 00 // e.g. get lot: 0x0001 (1s)

3.1.5 Set the Photosensitive Threshold

Instruction Code: 0x6

Parameters: para1: lux(low byte), para2: lux(high byte).

Sending Data Format(HEX): 58 06 02 xx xx xx xx

Reply Frame: refer to Reply Frame format

e.g., set lux to 1000

HEX is: 58 06 02 E8 03 4B 01

Resp: 59 06 01 00 60 00 (success), Other: fail

3.1.6 Obtain the Photosensitive Threshold

Instruction Code: 0x7

Parameters: none

Sending Data Format(HEX): 58 07 00 5F 00

Reply Frame: 59 07 02 E8 03 4D 01 // e.g. get lux: 0x03E8

3.1.7 Set the Motion Detection Data-Delta

Instruction Code: 0xd3

Parameters: 16-bits, para1: delta(low byte), para2: delta(high byte).

Sending Data Format(HEX): 58 d2 02 xx xx xx xx

Reply Frame: refer to Reply Frame format

e.g., set delta to 300
 HEX is: 58 d2 02 2c 01 59 01
 Resp: 59 D2 01 00 2C 01

3.1.8 Obtain the Motion Detection Data-Delta

Instruction Code: 0xd4
 Parameters: none
 Sending Data Format(HEX): 58 d3 00 2b 01
 Reply Frame: 59 D3 02 2C 01 5B 01 // e.g. get delta, return value: 300

3.1.9 Set the Breathing Detection Sensing Distance

Instruction Code: 0xC
 Parameters: para1: distance level 0-32 // The smaller value, the more sensing sensitive.
 Sending Data Format(HEX): 58 0C 01 xx xx xx
 Reply Frame: refer to Reply Frame format
 e.g., set distance level to 15
 HEX is: 58 0C 01 0F 74 00
 Resp: 59 0C 01 00 66 00

3.1.10 Obtain the Breathing Detection Sensing Distance

Instruction Code: 0xD
 Parameters: none
 Sending Data Format (HEX): 58 0D 00 65 00
 Reply Frame: 59 0D 01 00 67 00 // e.g. get distance level: 0

3.1.11 Set the Sensing Distance of Micro-Motion Detection

Instruction Code: 0xE
 Parameters: 8-bits, para1: distance level 0-32 // The smaller value, the more sensing sensitive.
 Sending Data format (HEX): 58 0E 01 xx xx xx

Reply Frame: refer to Reply Frame format

e.g., set distance level to 15

HEX is: 58 0E 01 0F 76 00

Resp: 59 0E 01 00 68 00

3.1.12 Obtain the Sensing Distance of Micro-Motion Detection

Instruction Code: 0xF

Parameters: none

Sending Data Format (HEX): 58 0F 00 67 00

Reply Frame: 59 0F 01 0F 78 00 // e.g. get distance level: 15

3.1.13 Turn On/Off the Light

Instruction Code: 0xA

Parameters: para1: 0x1 (turn on the light), 0x0 (turn off the light)

Sending Data Format (HEX): 58 0A 01 01 64 00 (turn on the light)

58 0A 01 00 63 00 (Turn off the light)

Reply Frame: 59 0A 01 00 64 00 (success), Other: fail

3.1.14 Set PWM Duty Cycle

Instruction Code: 0xB

Parameters: para1: value of duty (low byte), para2: value of duty (high byte).

Unit 0.1%

Sending Data Format (HEX): 58 0B 02 xx xx xx xx

Reply Frame: refer to Reply Frame format

e.g., set duty to 50.0%

HEX is: 58 0B 02 F4 01 5A 01

Resp: 59 0B 01 00 65 00 (success) Other: fail

Note: Set the PWM duty cycle when turning on the light

3.1.15 Turn On/Off the Radar

Instruction Code: 0xD1

Parameters: para1: 0x1 (open the radar), 0x0 (close the radar)
 Sending Data Format (HEX): 58 D1 01 01 2B 01 (open the radar)
 58 D1 01 00 2A 01 (Turn off the radar)
 Reply Frame: 59 D1 01 00 2B 01 (success), Other: fail

3.1.16 Obtain the Radar Switch Status

Instruction Code: 0xD0
 Parameters: none
 Sending Data Format (HEX): 58 D0 00 28 01
 Reply Frame: 59 D0 01 01 2B 01 // e.g., radar is on
 59 D0 00 01 2A 01 // e.g., radar is off

3.1.17 Save the Radar Settings

Mainly save the set parameters (sensing distance, lighting time and photosensitive threshold) in the flash of the module, then restart and the machine will load the parameter which set last time.

Instruction Code: 0x8
 Parameters: para1: 0x1 (save), 0x0 (do not save)
 Sending Data Format (HEX): 58 08 01 01 62 00 (Save)
 58 08 01 00 61 00 (do not save)
 Reply Frame: 59 D8 01 00 62 00 (success) Other: fail

Note: If you need to save the parameters in the radar module, it is recommended to delay more than 1 second after sending the command before sending other commands.

3.1.18 Obtain the Radar Saving State

Instruction Code: 0x9
 Parameters: none
 Sending Data Format (HEX): 58 09 00 61 00
 Reply Frame: 59 09 01 01 64 00 // e.g., save is on
 59 09 01 00 63 00 // e.g., save is off

3.1.19 System Reset

Instruction Code: 0x13

Parameters: para1: reset mode (uint8)

Control Frame Format Definition:

```
boot_hci_ctrl_frm_t send_frm = {
    0x58,                // uint8 head
    BOOT_HCI_SYS_RESET&0x1f, // uint8 cmd: 5
    (BOOT_HCI_SYS_RESET>>5) &0x07, // uint8 cmd_grp: 3
    0x1,                // uint8 para_len
    NULL,               // uint8 *para
    0x0,                // uint16 check_code
};
```

Reply Frame: The data format is as follows:

e.g., sys_reset(0x1)

HEX is: 58 13 01 01 6d 00

3.2 Debug Commands

The debug commands are mainly used for AT5820 debugging.

3.2.1 Register Write

Instruction Code: 0x0

Parameters: para1: 32-bits register address, para2: 32-bits data to write

Return: 8-bits value, 0: success, other: fail.

Sending Data Format (HEX): 58 00 08 xx xx xx xx xx xx xx xx xx xx

Reply Frame: refer to Reply Frame format

e.g. reg_write(0x40003008, 0x0e810f3b)

HEX is: 58 00 08 08 30 00 40 3b 0f 81 0e b1 01

Resp: 59 00 01 00 5a 00

3.2.2 Register Read

Instruction Code: 0x1

Parameters: para1: 32-bits register address

Return: 32-bits register value

Sending Data Format (HEX): xx

Reply Frame: Refer to the Reply Frame format

e.g. reg_read(0x40003008)

HEX is: 58 01 04 08 30 00 40 D5 00

Resp: 59 01 04 xx xx xx xx xx xx

3.2.3 Memory Write

Instruction Code: 0x10

Parameters: para1: 32-bits memory address, para2: 32-bits data to write

Sending Data Format (HEX): xx

Reply Frame: The data format is as follows:

e.g. memory_write(0x20001000, 0xaabbccdd)

HEX is: 58 10 08 00 10 00 20 dd cc bb aa ae 03

Resp: 59 10 01 00 6A 00

3.2.4 Memory Read

Instruction Code: 0x11

Parameters: para1: 32-bits memory address

Sending Data Format (HEX): xx

Reply Frame: The data format is as follows:

e.g. memery_read(0x20001000)

HEX is: 58 11 04 00 10 00 20 9d 00

Resp: 59 11 04 xx xx xx xx xx xx

3.2.5 Memory Dump

Instruction Code: 0x12

Parameters: para1: 32-bits memory address, para2: dump size(uint16)

Sending Data Format (HEX): xx

Reply Frame: The data format is as follows:

e.g., memory_dump(0x20001000, 0x400)

HEX is: 58 12 06 00 10 00 20 00 04 a4 00

3.2.6 Flash Write

Instruction Code: 0x14

Parameters: para1: 32-bits memory address, para2: data size in byte, para3: buf to write.

Sending Data Format (HEX):

head	command	Para len	Addr(4 B) data(<=252 B)	Check code
0x58	0x14	Size	address and data	Check code

Reply Frame: 59 14 01 00 00 6E (OK), 59 14 01 01 00 6F (Fail)

e.g. flash_write(addr, size, buf) // addr=0x0a000000, size=8, buf[8] = {0x10, 0x11, 0x12, ...}

HEX is: 58 14 0c 04 00 00 0a 10 11 12 13 14 15 16 17 22 01

Resp: 59 14 01 00 6E 00 (OK), 59 14 01 01 6F 00 (Fail)

4 Hardware Interface

Currently, the AT5820 chip's module communication only supports Uart interface.

4.1 Uart

Uart communication is configured as follows:

Baudrate: 115200 bps (default)

Data Bits: 8 bits

Stop Bits: 1 bit

5 Revision History

Revision	Date	Description
0.1	2021-3-3	Initial Version.
0.2	2021-8-30	Adding the related instruction of breath detection and micro-movement detection.

Airtouch