

2 Million Pixel Serial Camera Module



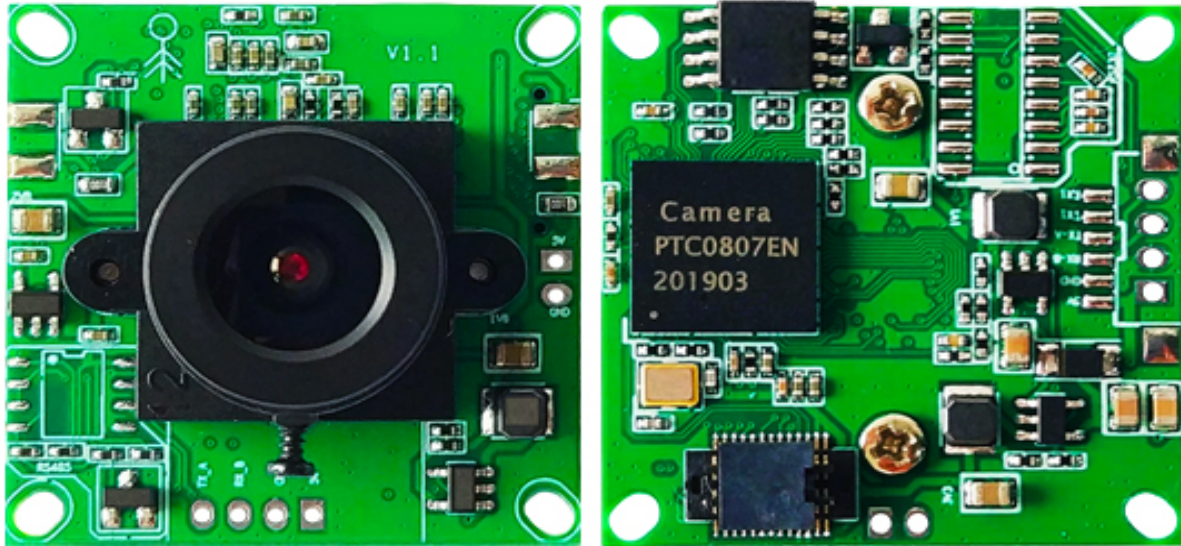
Description

This camera module is a new generation 2 million pixel serial JPEG camera module with a resolution of up to 1920x1080. Its serial port baud rate can be up to 921600bps.

This camera module support TTL and RS232 interface for this camera module to be connected with kinds of MCUs or computer conveniently.

The DSP of this camera module integrate new generation of ISP algorithm, which make the picture be more clear and less bitstream. This camera support continuous shooting and high speed serial communication.

Users can snapshot a full resolution single-frame picture through a snapshot command from the MCU, then the picture will be compressed by the JPEG engine and transferred to the MCU. So this module can be easily integrated into the some device, and let the equipment device has image snapshot function.



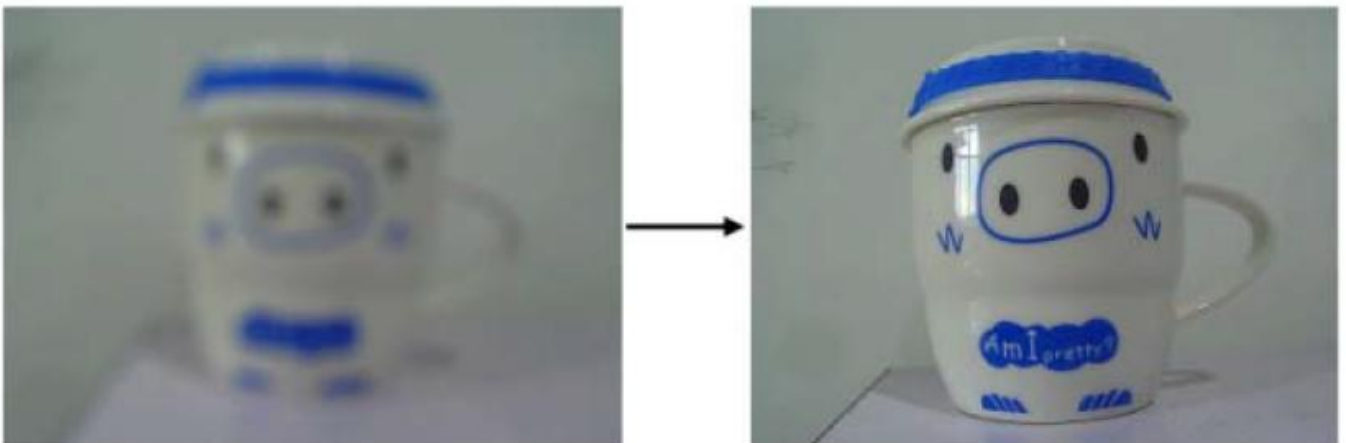
Characteristic

- 1、 Module Size: 32mm x 32mm
- 2、 Optical Format: CMOS 1/2.7 inches
- 3、 Image Pixels: 2 million
- 4、 Pixel Size: 3.30um
- 5、 White Balance: automatic
- 6、 Exposure: automatic
- 7、 Gain: automatic
- 8、 Shutter: electronic rotating shutter (ERS)
- 9、 Output Format: JPEG / M-JPEG
- 10、 Signal to Noise Ratio (SNR): 44DB
- 11、 Dynamic Range: 72DB
- 12、 Maximum Analog Gain: 16DB
- 13、 Scan Mode: progressive scan
- 14、 Viewing Angle: 90 degrees with 3.6mm Focal Length by default (Optional)
- 15、 Monitoring Distance: 0.01~5m (Adjustable)
- 16、 Image Size: 1080P(1920*1080)、720pHD(1280*720)、SD(1024*768)、VGA(640*480)
QVGA (320*240 default)、QQVGA (160*120)
- 17、 Analog video output frame rate: 1280*960 30fps
- 18、 White Lamp Fill Light: two interface reserved
- 19、 Infrared Lamp Fill Light: 2pin 5V output interface reserved
- 20、 Working Current: 160 mA
- 21、 Working Voltage: DC+5V
- 22、 Interfaces: RS232、 TTL
- 23、 Serial port Rate: 115200 by default (9600、 19200、 38400、 57600、 230400、 460800、 921600)
(TTL support maximum baud 921600bps and RS232 support maximum baud 230400bps)

Lens

Focal Length	Viewing Angle	Distance
1.6 mm	156°	0.01~3 m
2.1 mm	170°	0.01~3 m
2.8 mm	120°	0.01~4 m
3.6 mm	90°	0.01~5 m
6 mm	60°	0.01~10 m
12mm	30°	0.01~35m

Notice: If the lens is blurry and needs to be readjusted, please loosen the screw next to the camera, then rotate the lens left and right, and take a picture until you get a clear picture. Don't forget to tighten the screws again.



Electrical Specification

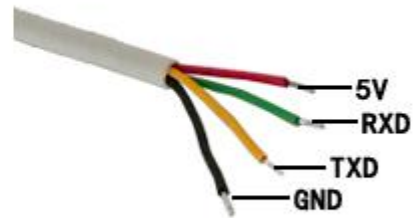
Parameter	Min	TVp	Max	Unit
DC Supply Voltage	3.5	5.0	5.5	V
Operation Current	110	120	130	mA
Operating Temperature Range	-20	20-	75	°C

Pin Description

Interface Type	Pin	Pin Definition
RS232	VCC	5V Power Supply Input
	GND	GND with 5Pin of DB9
	RX	RXD with 2Pin of DB9
TTL	TX	TXD with 3Pin of DB9
	VCC	5V Power Supply Input
	GND	GND
	RX-B	UART Receive Data
	TX-A	UART Send Data
Notice: RX and TX are 3.3V TTL Level		

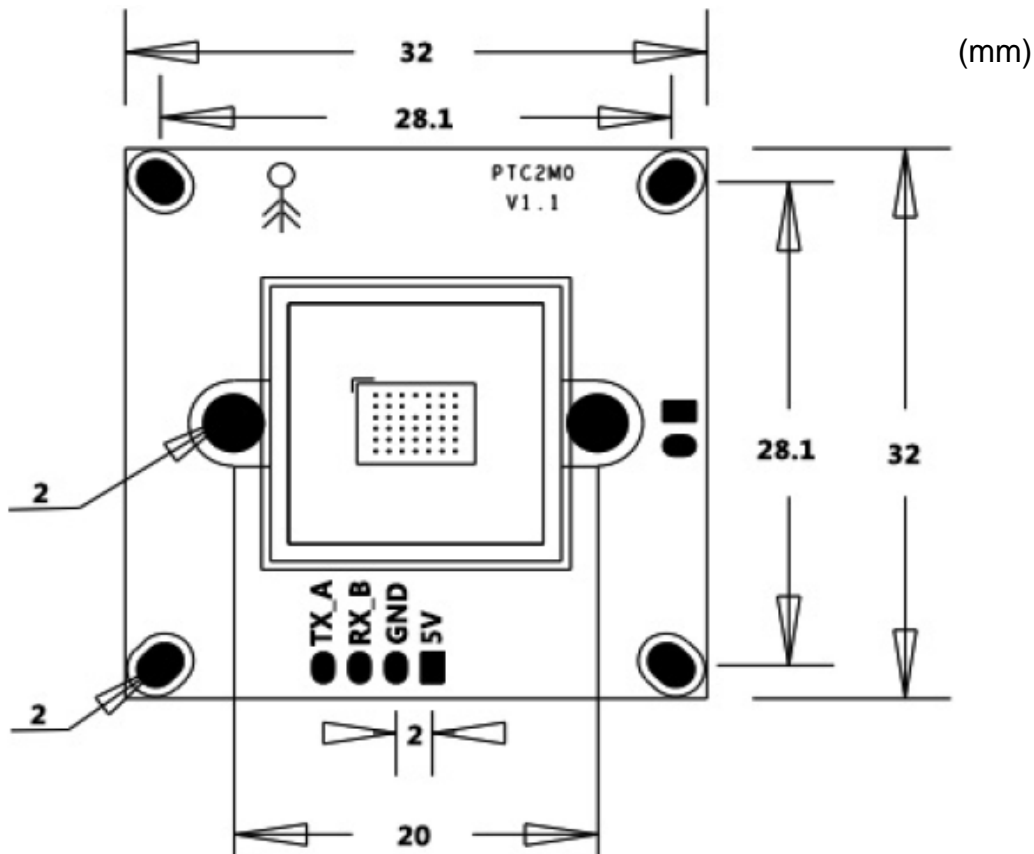


RS232 DB9 Interface



TTL Interface

Size



Application

- 1、 Security System
- 2、 Image Acquisition System
- 3、 Environmental Monitoring
- 4、 Industrial Field Process Control
- 5、 Medical Equipment
- 6、 Videophone
- 7、 Power Distribution Network Monitoring
- 8、 Hydrological Monitoring
- 9、 Oil Field Monitoring System
- 10、 Railway Monitoring
- 11、 Urban Bus and Vehicle Monitoring
- 12、 Highway Monitoring
- 13、 Mine Production Monitoring
- 14、 Forestry Protection Monitoring
- 15、 Surveying and Mapping Exploration Monitoring
- 16、 Intelligent Community Monitoring
- 17、 Logistics Management Monitoring
- 18、 Meteorological Monitoring
- 19、 Industrial Automation Monitoring

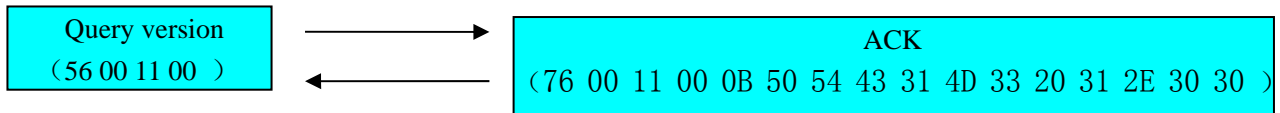
Command Protocol (hex format data)

When the module is powered on, the serial port outputs the following information, so that the picture can be taken normally.

Version:3 1.07(SC)
MEID_Num:00
ImageWidth:1280,ImageHeight:960
Init end

1 Query version: 56 00 11 00

RETURN: 76 00 11 00 0B 50 54 43 31 4D 33 20 31 2E 30 30



Example: 76 00 11 00 0B 50 54 43 31 4D 33 20 31 2E 30 30

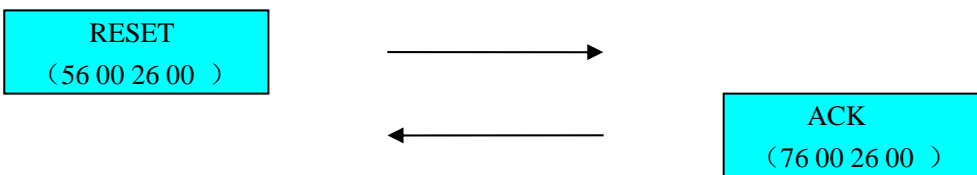
0B is the version string length 11

50 54 43 31 4D 33 20 31 2E 30 30 turn string means Version1.02

Model:Camera+ space + main version 1. Minor version number 00 (version number may change due to function optimization)

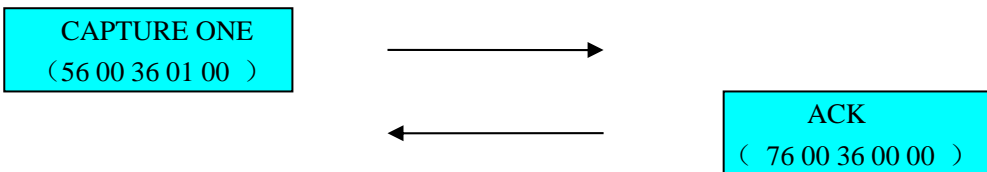
You can test the communication is ready by checking the version command

2 RESET: 56 00 26 00 RETURN: 76 00 26 00



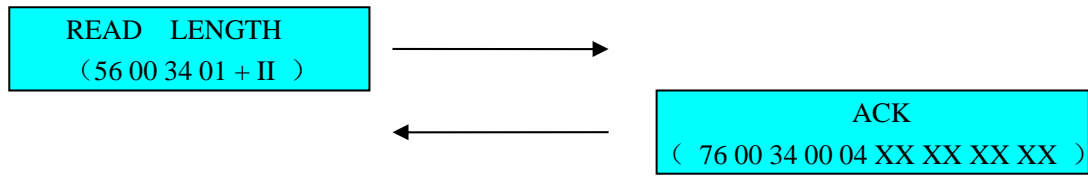
3 CAPTURE A IMAGE:

CAPTURE A IMAGE CAMMAND



4 READ IMAGE DATA LENGTH:

READ IMAGE DATA LENGTH



II ----- 1 byte mean reading different image caches about rang 0-5, in which the image cache no.0 is fixed as the image currently taken, and the Image cache space of no.1-5 is shared by the snap triggered by Motion detection and mulitiple snap commands.

XX XX XX XX ----- image length, 4 bytes

Example:

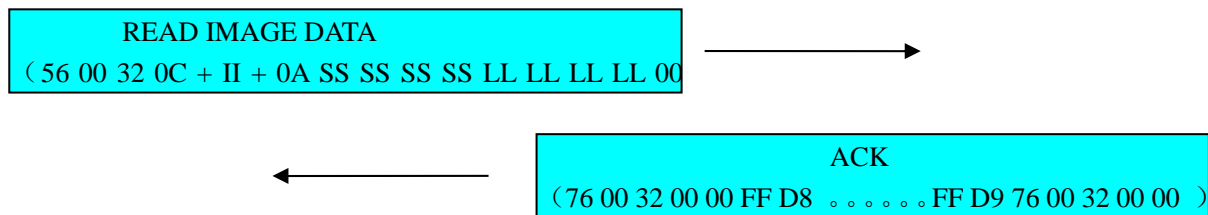
Send: 56 00 34 01 00

Ack: 76 00 34 00 04 00 01 4B C6

So the Image date length is 0x00014BC6

The hex value 0x00014BC6 convert to decimal system is 84934 bytes

5 READ IMAGE DATA:



II ----- 1 byte mean reading different image caches about rang 0-5, in which the image cache NO.0 is fixed as the image currently taken, and the Image cache space of NO.1-5 is shared by the snap triggered by Motion detection and mulitiple snap commands.

SS SS SS SS

---- start address 4 bytes (the address must be times of 8)

LL LL LL LL ----the length of image data length ,4 bytes

Notice:JPEG IMAGE DATA must be FF D8 in first, and FF D9 in end.

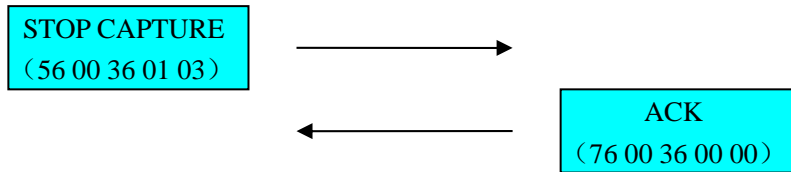
Example:

Send: 56 00 32 0C 00 0A 00 00 00 00 01 4B C6 00 FF

Ack: 76 00 32 00 00 FF D8 ... FF D9 76 00 32 00 00

The jpg data is Start from 0x00000000 and read the length of 0x00014BC6

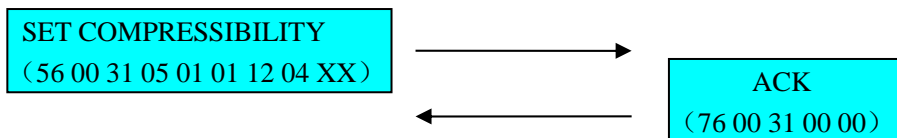
6 **STOP CAPTURE:** 56 00 36 01 03 **RETURN:** 76 00 36 00 00



7 **SETTING IMAGE COMPRESSIBILITY:** 56 00 31 05 01 01 12 04 XX

RETURN: 76 00 31 00 00

XX ----default value: 36 (range: 00 ----FF)



8 **SETTING IMAGE RESOLUTION:** (default: 1280 * 960)

56 00 31 05 04 01 00 19 11 (320*240) **RETURN:** 76 00 31 00 00

//The picture is about 11.2k bytes

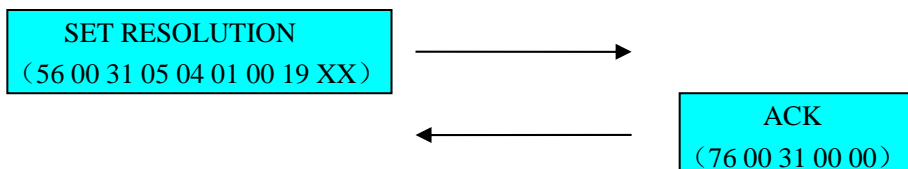
56 00 31 05 04 01 00 19 00 (640*480) //The picture is about 36k bytes

56 00 31 05 04 01 00 19 22 (160*120) //The picture is about 4.5k bytes

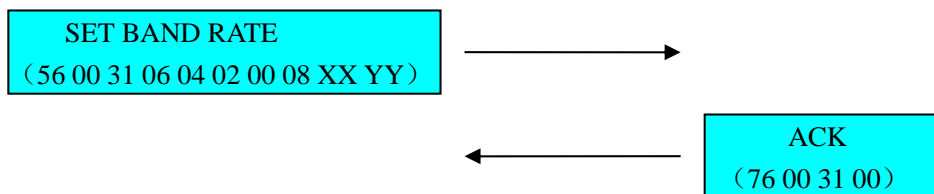
56 00 31 05 05 01 00 19 33 (1024*768) //The picture is about 80k bytes

56 00 31 05 05 01 00 19 44 (1280*720) //The picture is about 92k bytes

56 00 31 05 05 01 00 19 55 (1280*960) //The picture is about 136k bytes



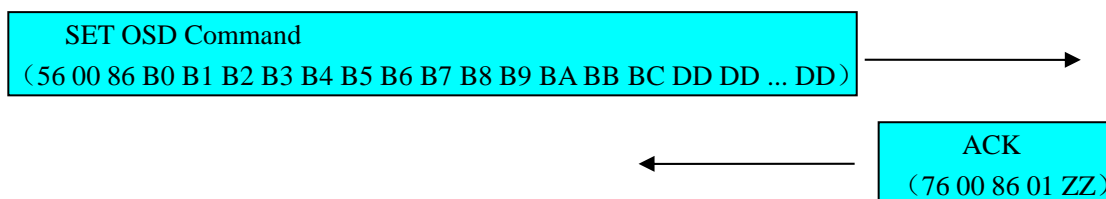
9 BAND RATE: (default: 115200bps)



XX	YY	BAND RATE
56 00 31 06	04	02 00 08 AE C8 9600
56 00 31 06	04	02 00 08 56 E4 19200
56 00 31 06	04	02 00 08 2A F2 38400
56 00 31 06	04	02 00 08 1C 4C 57600
56 00 31 06	04	02 00 08 0D A6 115200 (default)
56 00 31 06	05	02 00 08 EE A1 230400
56 00 31 06	05	02 00 08 EE A2 460800
56 00 31 06	05	02 00 08 EE A3 921600

Note: the high baud rate 230400–921600bps do not support 30,000 pixel all serial and 1.3/2.0 million-pixel camera RS485 interface series, please do not try, otherwise it will lead to a communication wrong, can only be returned to the factory processing. It can only use high baud rate 921600 BPS for TTL interface and RS232 interface to support high baud rate 230400 BPS, where the RS485 support high baud rate 115200 BPS. When modify the serial port after initial baud rate, no need to reset, return instruction is effective, set the value stored in the flash and electricity equally effective on the next time!

10 OSD char display



ZZ ----- the last byte is mean OSD lines, 4 lines total, about rang 0 - 3

Send field description:

56	1 byte frame head
00	1 byte serial number(0-255),default 0
86	1 byte OSD setting command
B0	1 byte command length,according to the text content dynamic changes,fixed 12 bytes + text content total length
B1	1 byte OSD display switch, 1: enabled, 0: disabled
B2	1 byte line N (0-3), up to 4 lines
B3	1 byte 0: font 16x16, 1: font 24x24, 2: font 32x32
B4B5	2 byte X coordinates, 200W(decimal 0-1279) coordinates even Numbers

B6B7 2byte Y coordinates, 200W(decimal 0-959) coordinates need even Numbers
B8B9 2byte font color RGB555 order
BABB 2byte background color RGB555 order
BC 1byte text length, the maximum limit of 160 characters, that is, 80 Chinese characters
DD...DD multi-Byte text content, support only GB2312 encoding Chinese characters and ASCII

Examples:

Send: 56 00 86 16 01 00 00 00 00 00 7C FF FF 0A 30 31 32 33 34 35 36 37 38 39

Ack: 76 00 86 01 00

Send field description:

0x56, // fixed frame header

0x00, // serial number

0x86, //OSD setting command

0x16, // command length, according to the text content dynamic changes, fixed 12 bytes + text content total length

0x01, //OSD display switch, 1: enable 0: disable

0x00, // line N,(0-3)

0x01, // size 0: font 16x16, 1: font 24x24, 2: font 32x32

0x00,0x00, //x coordinates 130W(decimal 0-1279), even coordinates required

0x00,0x00, //y coordinates 130W(decimal 0-959), even coordinates required

0x00,0x7C, // font color, blue RGB555 order

0xff,0xff, // background color, white

0x0A, // text length, the maximum limit is 160 characters, that is, 80 Chinese characters

0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 // ASCII text content "0123456789",

Note: if it is Chinese, it is encoded in GB2312, with one character accounting for 2 bytes

Ack field description:

0x76, // fixed return frame header

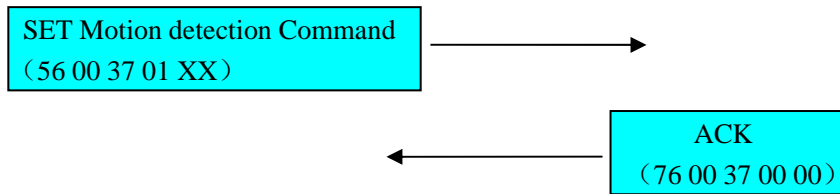
0 x00, // serial number

0x86, // orders

0x01, // fixed data length 1

0x00, // sets the number of rows 0-3

11 Motion detection function

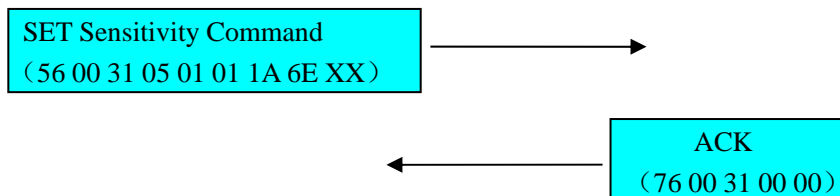


XX -- 0x00 disable the motion detection . Every power on motion detection is disable.
0x01, enable motion detection.

If the motion detection function is enable, within the camera Angle range, if the scene changes, the prompt message (76 00 39 00 00) will be output from the serial port to notify the external processor, realizing the alarm function!

When images have change is detected, the serial port will output: 76 00 39 00 00, external processor receives the string after the first closing motion detecting function (prevent while taking photo, detecting information interference image data), and then immediately take pictures, realize the capture function, processed can again open the motion detecting function, in order to capture next time.

12 Motion detection sensitivity setting command



Where: XX is the motion sensing sensitivity, ranging from 00 to FF.

00 - most sensitive, easy to trigger by mistake

FF - the dullest and most difficult to trigger

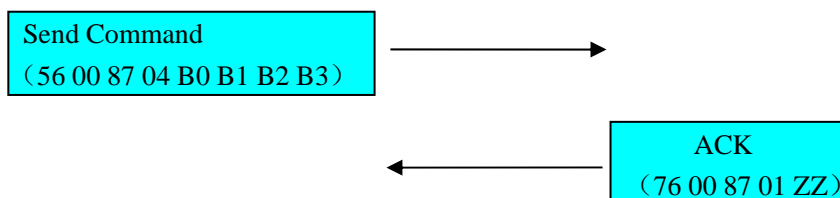
Recommended value: 0x03.

In practical application, to enable motion detection, it is recommended to execute the following two instructions in turn:

First : 56 00 31 05 01 01 1A 6E 03 -- set motion detection sensitivity to 03

second: 56 00 37 01 -- enable motion detection

13 Motion detection continuous shot command



B0 -- 1byte number of photos, ranging from 0 to 5

B1 -- 1byte next detection time, unit second, range 0-255

B2B3 -- 2byte continuous photo interval in milliseconds, ranging from 0 to 65535

ZZ 1byte indicates whether the set parameter is valid, 0x00 is valid, 0x01 is invalid, for example, the number of photos more than max size will return 0x01

Examples:

Send 56 00 87 04 03 0A 00 64

ACK 76 00 87 01 00

Send field description:

0x56 // fixed sending frame header

0x00 // serial number

0x87 // motion detection beat command

0x04 // data length fixed 4 bytes

0x03 // 3 consecutive pictures, valid range 0-5

0x0A // next detection time 10 seconds

0x00 0x64 // 2 bytes represent a continuous photo interval of 100 milliseconds, ranging from 0 to 65535

ACK field description:

0x76 // fixed return frame header

0x00 // serial number

0x87 // orders

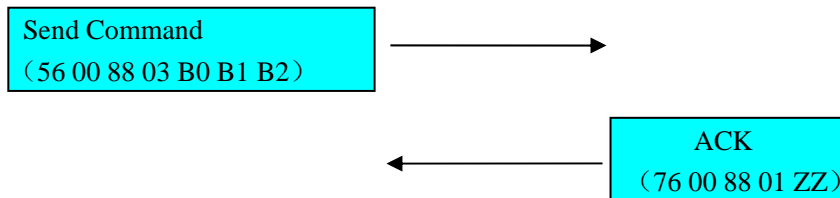
0x01 // fixed data length 1

0x00 // indicates successful parameter setting

Note:

1. The motion detection continuous beat command cannot take effect until the motion detection command is enable;
2. If we can only open the motion detecting, when detected moving reported 76 00 39 00 00, no cache images, the user will make their own pictures instructions executed snapping pictures, only set up a motion detecting after the shoot, when it detects moving automatically photographed and cached, the reported 76 00 39 00 + shoot the number of images, such as 76 00 39 00 05 said automatically detect moving even took 5 images;
3. Use the read image length command and read image data command to read out the 1-5 cached images;
4. If it is not read in time during the next detection time and the camera detects the movement again after the next detection time, the previously cached picture will be overwritten.

14 multiple pictures snapshot command



B0 -- 1byte number of photos, ranging from 0 to 5

B1B2 -- 2byte continuous photo interval in milliseconds, ranging from 0 to 65535

ZZ -- 1byte indicates whether the set parameter is valid, 0x00 is valid, 0x01 is invalid, for example, the number of photos more than max size will return 0x01

Examples:

Send 56 00 88 03 03 00 64

ACK 76 00 88 01 00

Send field description:

0x56 // fixed sending frame header

0x00 // serial number

0x88 // multiple pictures continuous snapshot command

0x03 // data length fixed 3 bytes

0x03 // three photos, valid range 0-5

0x00 0x64 // continuous photo interval 100 ms, range 0-10000,10 seconds

Return field description:

0x76 // fixed return frame header

0 x00 // serial number

0 x88 // command

0x01 // fixed data length 1

0x00 // indicates successful parameter setting

Note:

1. The function of multiple continuous shooting commands is similar to that of motion detection continuous shooting commands, which is an extension of single shooting commands, making it more free and convenient to use;

2. Multiple continuous shooting instructions and motion detection continuous shooting instructions share the 1-5 image cache, which cannot be used at the same time, otherwise the cached images will be overwritten, and the power will not be saved. The 1-5 image cache can be read out by using the read image length instruction and read image data instruction;

3. The return time of multiple continuous beat instructions is related to the interval time of continuous beat. The interval time of continuous beat should not be set too long, because the serial port is blocked during this period and cannot respond to other instructions.

4. The maximum support is to cache 6 pictures. First, execute multiple continuous shooting instructions, and then execute single photo instruction 56 00 36 01 00

15 command exception return

(65 72 72 6F 72)

It is the hexadecimal form of "error".

16 Initial operation process

- (1) power on
- (2) delay 3s
- (3) set image resolution command (optional)

Notice: Please choose the corresponding photo process

Get image operation process

- (1) capture a image command 56 00 36 01 00
- (2) read image data length command 56 00 34 01 00
- (3) read image data command 56 00 32 0C 00 0A SS SS SS SS LL LL LL LL 00 FF
- (4) stop capture command 56 00 36 01 03

Refer to the application process of motion detection and continuous shooting

- 1) first set the motion detection continuous shot command, such as 56 00 88 04 05 0A
00 64
- 2) set the motion detection sensitivity command again, such as 56 00 31 05 01 01 1A 6E
03
- 3) finally open the motion detection command, such as 56 00 37 01 01
- 4) when 76 00 39 01 05 is reported, motion detection occurs and 5 pictures are cached
- 5) close motion detection 76 00 37 01 00
- 6) use the read picture length instruction to read by 1-5, such as 56 00 34 01 01
- 7) finally, use the data instruction of reading the picture to read out the picture by 1-5, for
example
56 00 32 0C 01 0A + 4 bytes start address + 4 bytes length to read + 00 FF
- 8) after all pictures are read out, restart motion detection 76 00 37 01 01