

# **JPEG Color Camera**

## **Serial UART Interface**

**(Version A1.4)**

## **ZMID Protocol**

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## Read Before

1. This protocol applies to all QQZM Serial (RS485,RS232,TTL) Camera Series, including 0.3 Mega Pixels, 1.0 Mega Pixels, 1.3 Mega Pixels, 2.0 Mega Pixels Camera (can take 3.0 Mega Pixels Picture);
2. The camera ID NO. is always "0" for RS232 and TTL camera. For the RS485 camera, the default camera ID NO. is "0". RS485 Camera specific ID NO. can be set by command Specifier "D";
3. The "Package Data" use big endian while other data use little endian in hexadecimal notation

## 1. Frame Type and Structure

There are 3 types of frame for data transmitting between camera and host. They are:

### 1.1 Command Frame:

**Description:** It is used to set work status of serial camera or have the camera capturing.

Data Header	Command Specifier	Camera ID NO.	Command Content	End Mark
"U"	See details below	0x00-0xFF 0xFF: all Device	It depends by command codes	"#"
1 Byte	1 Byte	1 Byte	0-n Bytes	1 Byte

### 1.2 ACK & NAK Frame

**Description:** An ACK will be sent out by receiver after receiving correct command. A NAK may be sent out by receiver after receiving wrong command or failing to execute command.

Data Header	Received Command Specifier	Camera ID NO.	End Mark	Description
"U"	Return the sending CMD Specifier	0x00-0x33	"#"	ACK
"U"	"?"	0x00-0x33	"#"	NAK
1 Byte	1 Byte	1 Byte	1 Byte	

### 1.3 Data Frame

**Description:** It is used to transmit the picture data.

Data Header	Command Specifier	Camera ID NO.	Data (Max. 1028 Bytes)			Checksum
			Package NO.	Package Size	Package Data	
"U"	"F"	0x00-0xFF	0xXX 0xXX	0xXX 0xXX	0xXX...0xXX	
1 Byte	1 Byte	1 Byte	2 Bytes	2 Bytes	Max. 1024 Bytes	2 Byte

## 2. Command Specifier Instruction

### 2.1 Command Specifier: "H": Capture a specified resolution picture

1. **Description:** Request camera to snapshot a specific size picture & divide picture data into packages with specific package size. (Notice: Package Size means the size of picture data in each data package)

Data Header	Command Specifier	Camera ID NO.	Command Content			End Mark
			Image Resolution	Description	Package Size	
"U" (0x55)	"H" (0x48)	0x00-0xFF 0xFF: all Device	"1" (0x31)	160×120	0xXX 0xXX	"#"
			"2" (0x32)	320×240		
			"3" (0x33)	640×480		
			"4" (0x34)	1280X720		
				1280X1024		
"5" (0x35)	2048 X 1536					
1 Byte	1 Byte	1 Byte	1 Byte		2 Byte	1 Byte

**2. Example:**

Action	Hexadecimal Notation	Description
Send	55 48 01 32 00 02 23	Host Device ask NO. 1 camera to snapshots a 320 X 240 picture and divide each picture packets into 512 bytes
ACK	55 48 01 23	The camera snapshots and packets data

**2.2 Command Specifier: "R": Report Picture Size & NO.of Package**

**1. Description:** Camera report picture size & number of packages of the snapshot to host deice

Data Header	Command Specifier	Camera ID NO.	Command Content		End Mark
			Picture Size	Packages amount	
"U" (0x55)	"R" (0x52)	0x00-0xFF	0xXX 0xXX 0xXX 0xXX	0xXX 0xXX	"#" (0x23)
1 Byte	1 Byte	1 Byte	4 Byte	2 Byte	1 Byte

**2. Example:**

Action	Hexadecimal Notation	Description
Send	55 52 01 00 5C 00 00 2E 00 23	NO. 1 camera reports the picture size is 23K and number of data packages is 46 to the host device.

**2.3 Command Specifier: "E": Get Specified Package**

**1. Description:** Host device sends this command to get the specified data package.

Data Header	Command Specifier	Camera ID NO.	Command Content	End Mark
			Package NO.	
"U" (0x55)	"E" (0x45)	0x00-0xFF	0xXX 0xXX	"#" (0x23)
1 Byte	1 Byte	1 Byte	2 Byte	1 Byte

**2. Example:**

Action	Hexadecimal Notation	Description
Send	55 45 01 2E 00 23	Host asks NO. 1 camera to send back NO. 46 package.
ACK	55 45 01 23	NO.1 camera receives cmd & begins to send NO. 46 package

**2.4 Command Specifier: "F": Send Specified Data Package**

**1. Description:** Camera transmits the specified data package to host device.

Data Header	Command Specifier	Camera ID NO.	Data (Max. 1028 Bytes)			Checksum
			Package NO.	Package Size	Package Data	
"U" (0x55)	"F" (0x46)	0x00-0xFF	0xXX 0xXX	0xXX 0xXX	0xXX...0xXX	0xXX 0xXX
1 Byte	1 Byte	1 Byte	2 Bytes	2 Bytes	Max. 1024 Bytes	2 Byte

**2. Remark:**

- (1) The data package size has been set by snapshot command except the last package data.
- (2) Checksum = Data Header + cmd specifier + Camera ID + Package NO. + Package Length + Picture Data. And get the last 2 bytes;

**3. Example**

Action	Hexadecimal Notation	Description
Send	55 46 01 2E 00 00 02 ...Package Data ... 1E 13	No.1 camera transmits package NO. 46 data. The package size is 512 bytes and checksum is 1E 13.

## 2.5 Command Specifier: "D": Change to Specific ID NO.

1. **Description:** The host sends this command to change the camera ID NO..

Data Header	Command Specifier	Camera ID NO.	Command Content	End Mark
			New Camera ID. NO.	
"U" (0x55)	"D" (0x44)	0x00-0xFF	0x00-0xFF	"#" (0x23)
1 Byte	1 Byte	1 Byte	1 Bytes	1 Byte

2. **Example:**

Action	Hexadecimal Notation	Description
Send	55 44 01 02 23	Change the ID No. of camera from 1 to 2
	55 44 FF 02 23	Change all the cameras ID NO. to be 2

## 2.6 Command Specifier: "Q": Change Picture Compression Rate

1. **Description:** The host sends this to set new picture compression rate to adjust picture quality.

Data Header	Command Specifier	Camera ID NO.	Command Content			End Mark
			Compression Rate Value	Picture Quality Level	Description	
"U" (0x55)	"Q" (0x51)	0x00-0xFF	0-40	High	When setting a value for 0.3MP, 1.0MP WDR Camera, it will auto select a relative level rate	"#" (0x23)
			41-100	Medium		
			101-200	Common (Default)		
			201-250	Low		
			1-99/100 (0x01-0x63/64)	[1:99] for 960P Camera; [1:100] for 1.3, 2.0MP Camera. Large value means better picture quality.		
1 Byte	1 Byte	1 Byte	1 Byte			

2. **Example:**

Action	Hexadecimal Notation	Description
Send	55 51 01 30 23	Change NO.1 compression rate to 0X30 ( 48)
ACK	55 51 01 23	The compression rate is set successfully

## 2.7 Command Specifier: "I": Change to Specified Baud Rate

1. **Description:** Setting Baud Rate of Camera

Data Header	Command Specifier	Camera ID NO.	Command Content			End Mark
			Baud Rate	Description		
"U" (0x55)	"I" (0x49)	0x00-0xFF 0xFF: all Device	"0" (0x30)	9600bps	9600bps	"#" (0x23)
			"1" (0x31)	19200bps	14400bps	
			"2" (0x32)	38400bps	19200bps	
			"3" (0x33)	57600bps	38400bps	
			"4" (0x34)	115200bps	57600bps	
			"5" (0x35)	2400bps	115200bps	
			"6" (0x36)	14400bps (Only for 0.3MP)		
1 Byte	1 Byte	1 Byte	1 Bytes	0.3MP / WDR /960P	1.3MP	1 Byte

2. **Example:**

Action	Hexadecimal Notation	Description
Send	55 49 01 <b>33</b> 23	Change NO.I Camera baud rate to 38400
ACK	55 49 01 23	The baud rate has been changed
NAK	55 3F 01 23	

### 3.Rule of Receiving Data

**1. "R" data frame:**

10 bytes= 1 Byte ('U') +1 Byte ('R') +1 Byte(Camera ID No.) +4 Bytes (Picture Size) +2 Bytes(Package Amount) +1Byte('#');

**2. "E" command frame:**

6 bytes= 1 Byte ('U') +1 Byte ('E') +1 Byte (Camera ID No.) +2 Bytes (Package ID) + 1byte ('#');

**3. "F" command frame:**

9+N Bytes= 1 Byte ('U') +1 Byte('F') +1 Byte(Camera ID No.) + 2bytes (package ID NO.) + 2 bytes (package Size)+ N Bytes(content of picture data of this package) + 2bytes (checksum)

### 4.Communication Process Between Camera and Host

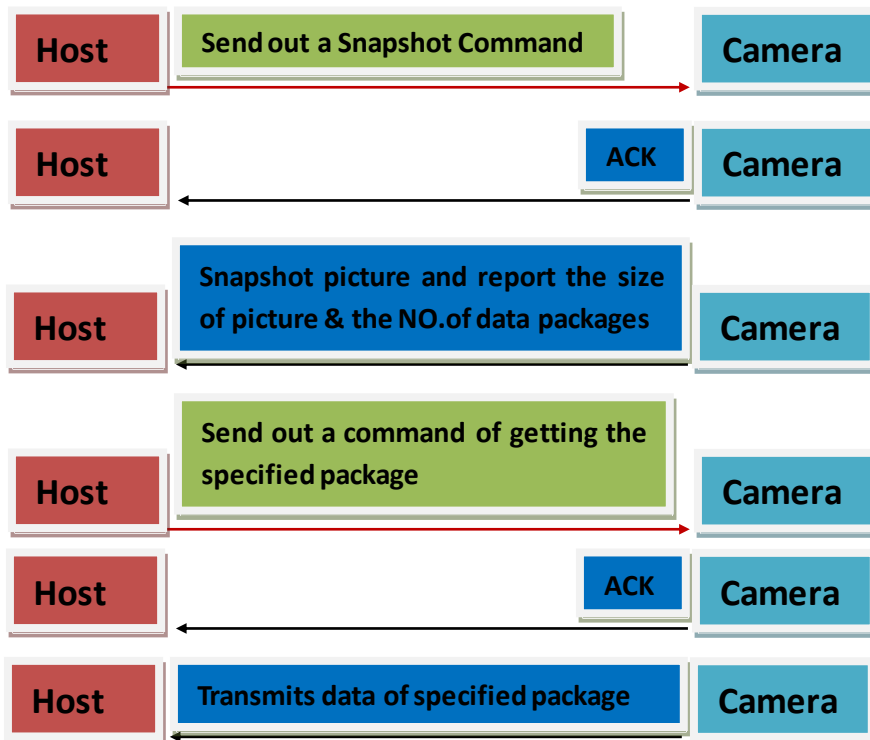
**Notice for communication of 0.3 Mega pixels Camera:**

- 1). The camera should be initialized after powering on, and it takes about 2S.
- 2). The consumed time of snapshot: it takes  $T_p$  to capture a picture after camera receiving the snapshot command. The min. of  $T_p$  is 200ms is that when takes a white-black picture.

**Notice for communication of 1.3/2.0/5.0 Mega pixels Camera:**

- 1). The camera should be initialized after powering on. It takes about 15S-30S.
- 2). The consumed time of snapshot: it takes  $T_p$  to capture a picture after camera receiving the snapshot command. The min.  $T_p$  is 150ms, if the current picture size is not the expected one which will be captured, the configuration of camera should be reset, and the  $T_p$  is about 3s.

**Snapshot a single picture (snapshot a picture of specified size)**



**E.g. Host requests to snapshot a picture with size 160x128 from no.1 Camera:**

(1) Host sends out snapshot command as follows: 55 48 01 32 00 02 23 //take an image with size 160X120, divide it into 512bytes per package.

(2) ACK from camera: 55 48 01 23

(3) Camera reports picture info.: 55 52 01 74 0A 00 00 06 00 23 // Size is 2676bytes, 6 packages.

(4) Host sends command of getting 1st package: 55 45 01 01 00 23

(5) ACK from camera: 55 45 01 23

(6) Camera transmits the data of first package as follows: //UF the first package 521bytes

```
55460101000002FFD8FFE000114A464946000102030405060708090AFFDB004300100C0C0E0C0A100E
0E0E1212101418281A181616183224261E283A343E3C3A34383840485C4E404458463838506E525860
626868683E4E727A7064785C666864FFDB004301121212161616301A1A3064423842646464646464
646464646464646464646464646464646464646464646464646464646464646464646464646464
6464FFC4001F0000010501010101010100000000000000000102030405060708090A0BFFC400B510000
2010303020403050504040000017D01020300041105122131410613516107227114328191A1082342B
1C11552D1F02433627282090A161718191A25262728292A3435363738393A434445464748494A53545
5565758595A636465666768696A737475767778797A838485868788898A92939495969798999AA2A3A
4A5A6A7A8A9AAB2B3B4B5B6B7B8B9BAC2C3C4C5C6C7C8C9CAD2D3D4D5D6D7D8D9DAE1E2E3E4E5E
6E7E8E9EAF1F2F3F4F5F6F7F8F9FAFFC4001F0100030101010101010101010000000000001020304050
60708090A0BFFC400B51100020102040403040705040400010277000102031104052131061241510761
711322328108144291A1B1C109233352F0156272D10A162434E125F11718191A262728292A35363738
393A434445464748494A535455565758595A6364650006 //check sum
```

(8) Host sends command of getting 2nd package: 55 45 01 02 00 23

(9) ACK from camera: 55 45 01 23

(10) Camera transmits the data of first package as follows: //UF the second package 521bytes

```
554601020000027475767778797A82838485868788898A92939495969798999AA2A3A4A5A6A7A8A9A
AB2B3B4B5B6B7B8B9BAC2C3C4C5C6C7C8C9CAD2D3D4D5D6D7D8D9DAE2E3E4E5E6E7E8E9EAF2F3F4
F5F6F7F8F9FAFFC0001108008000A003012200021101031101FFDA000C03010002110311003F00E934E
9231690CED1992793BE31C67078FA7F2AD6B70CB028906D6F4CD430C969112B16010013807BF23F9D
5A2096539E9DBD686F4B19A168A28A4329EA881EC1FD8823F3AE4EE5765C230E3A1CFE35D8DE2EEB4
917D4572B78A08FC3FAD6B4C3A0CD5154EB12EC5DB8C2E07183B40FE75DA57157EE1AF9A41DC293F5
DA33FAD749A35CACFA7A26ECBC636B0F41938FD289AD0465B851E32DCD8C6E03F1F2C549E27404DA
7FC0FF00F65A86E7E5F150247FCB58C7FE3AB56BC46326D7FE05FD28EA85D6E6ED1451591414514500
1451450067EB480E9539F61FCC566D94132F877308CB3B17EA38C1F7FA569EB4C0695367BE00FCC553
824F2BC2523E718864C7D7271557B442C72167034BA836D1911C65DBD8703FA8A76A134912208DB05
B3938AB5A3286BAB894A6E0A00FBD8EA7FF00AD5775482D255791A3C4D818393FFEAAABDF40EA58D
375059ED0DC344864023DC79F9B8C7D076ED5D4D725E1CB6173A7C60270010ED9E9F313FD2BAC1850
173CE2A256B21585A28A2A464738DD0B0AE4EEFA0FF76BB0EA2B9900F4 //check sum
```

(11) Host sends out command of getting the six(last) package: 55 45 01 06 00 23

(12) ACK from camera: 55 45 01 23

(13) Camera transmits the data of the sixth package: //UF the sixth package 117bytes

```
55460106001801693484D20026909A696A4C93484422A1B9E262C380DC8A941A528B201B8E00AAB83
42DC6A97B79FEBEE1DC7A741F9557DCCDD4D5B48ADD4648DC7D2A749E341F2C23FEFAA134B615994
52091FEAA1356134D9DFAA85AB1F6C973F290A3D00A63CAF21CBB1345C761DFD98B1F32CC00F4C54A
21B28C6465CFD0D57CD2E695D8EC59F3D02E16203F1A8CCAC7BFE951668CD21D87E68CD33346EA007
E69334C2D49BA8B8126EA6934DC93463345C2C05A93934E0B4F0940116DA50952EDC518A0928034A0
D301A5069B192034A0D301A5CD202406941A8F751BA8192E6973516EA50690C97349BA9A3EB4A0501
617752649A705A784A03423C5382D481453B02815C88253C2629F8A3140AE3714B4B8A5E2810DC518
A7710188 //Check Sum
```

Remark: All data is transmitted to host according to the above way.