# Serial Camera Protocol

**Read Before**

1. The camera ID NO. is always “0”. If use RS485 communication Camera specific ID NO. can be set by command Specifier “D”;
2. The “**Package Data”** use big endian while other data use little endian in hexadecimal notation
3. 57600 baud rate by defaults

## Frame Type and Structure

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

### 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 |

### 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 |  |

### 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 |

## Command Specifier Instruction

## 2.1 Command Specifier: "L": List file in Folder

**1. Description:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Header** | **Command Specifier** | **Camera ID NO.** | **Command Content** | | | **End Mark** |
| **Date** | **HOUR** | **Package Size** |
|  |  |  | Y/M/D | H |  |  |
| **“U”**  **(0x55)** | **“L”**  **(0x4C)** | **0x00-0xFF**  **0xFF:** all  Device |  | **“#”** |
| 1 Byte | 1 Byte | 1 Byte | 3 Byte | 1 Byte | 2 Byte | 1. Byte |

**2. Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 4C 01 18 05 01 0A 00 00 23 | Host Device ask NO. 1 camera to list file in Folder “240501/Video/10” picture and divide each picture packets into 512 bytes |
| **ACK** | 55 4C 01  05  23 | The camera send Total File in Folder  05 Files |

## 2.2 Command Specifier: "N": Get next file by file

**1. Description:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Header** | **Command Specifier** | **Camera ID NO.** | **Command Content** | | | **End Mark** |
| **Date** | **TIME** | **Package Size Data** |  |
| **“U”**  **(0x55)** | **“N”**  **(0x4D)** | **0x00-0xFF**  **0xFF:** all  Device |  |  | 00: 512 Byte | **“#”** |
| Y/M/D | H\_M | 01: 1024Byte |
|  |  | 02: 2048Byte |
| 1 Byte | 1 Byte | 1 Byte | 3 Byte | 2 Byte | 1 Byte | 1. Byte |

**2. Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 4C 01 18 05 01 0A 05 01 23 | Host Device ask NO.1 camera prepare to send file(10\_06.jpeg) after this time: 10:05(10\_05.jpeg) in Folder “240501/Video/10” picture and divide each picture packets into 1024 bytes |
| **ACK** | 55 4C 01  40  23 | The camera send Total Package (64K ~ 64 package) of file (10\_06.jpeg) to host |

* 1. **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** | HH\_MM\_PK | **“#” (0x23)** |
| 1 Byte | 1 Byte | 1 Byte | 3 Byte | 1 Byte |

1. **Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 45 01 0A 06 03 23 | Host asks NO.1 camera to send back NO.03 package of file 10\_06.jpeg |
| **ACK** | 55 45 01 23 | NO.1 camera receives cmd & begins to send NO. 03 package |

* 1. **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 | HH\_MM\_PK | 0xXX | 0xXX…0xXX | 0xXX 0xXX |
| 1 Byte | 1 Byte | 1 Byte | 3 Bytes | 1 Bytes | Max. 1024 Bytes | 2 Byte |

1. **Remark:**
2. The data package size has been set by snapshot command except the last package data.
3. Checksum = Data Header + cmd specifier + Camera ID + Package NO. + Package Length + Picture Data. And get the last 2 bytes;
4. **Example**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 46 01 0A 06 03 01  ...Package Data … 1E 13 | No.1 camera transmits package NO.3 data file 10\_06.jpeg  The package size is 1024 bytes and checksum is 1E 13. |

* 1. **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** |
|  |  |  | **“0” (0x30)** | 9600bps |  |
|  |  |  | **“1” (0x31)** | 19200bps |  |
| **“U”**  **(0x55)** | **“I” (0x49)** | **0x00-0xFF**  **0xFF:** all Device | **“2” (0x32)** | 38400bps | **“#”**  **(0x23)** |
| **“3” (0x33)** | 57600bps |
| **“4” (0x34)** | 115200bps |
| 1 Byte | 1 Byte | 1 Byte | 1 Bytes |  | 1 Byte |

1. **Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 49 01 33 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 |  |

* 1. **Command Specifier: "O":** Change Text Overlay

1. **Description:** The host sends this to change Text Overlay on frame.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Data Header** | **Command Specifier** | **Camera ID NO.** | **Command content** | | | **End Mark** |
| **Position on frame** | **Text Lenght** | **Text Value** |
| “U” | “O” | 0x00-0xFF | “T” or “B” | 0xXX | 30A12345|NGUYEN VAN ANH|BLX123456|105.67895|20.12354|60km/h | “#” |
| (0x55) | (0x4F) |  | (0x54) or (0x42)  “T”: Top  “B”: Bottom |  | (0x23) |
| 1 Byte | 1 Byte | 1 Byte | 1 Byte | 1 Byte |  | 1 Byte |

1. **Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 4F 01 54 04 54 45 53 54 23 | Change TOP text overlay => “TEST” |
| **ACK** | 55 4F 01 23 | The text ovelay is set successfully |

* 1. **Command Specifier: "T":** Change Time (RTC Clock)

**1. Description:** The host sends this change time of cameras.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Header** | **Command Specifier** | **Camera ID NO.** | **Command content** | | **End Mark** |
| **Timestamp** | **Description** |
| “U” | “T” | 0x00-0xFF | 0xXX 0xXX 0xXX 0xXX | Unix time: measures time by the number of seconds that have elapsed since 00:00:00 UTC on 1 January 1970 | “#” |
| (0x55) | (0x54) |  |  | (0x23) |
| 1 Byte | 1 Byte | 1 Byte | 4 Byte |  | 1. Byte |

**2. Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 54 01 08 00 92 65 23 | |  | | --- | | Change time to: Mon Jan 01 2024 00:00:00 | |  | |
| **ACK** | 55 54 01 23 | Change time successfully |

f .**Command Specifier: "W":** Change to Wlan mode

1. **Description:** Setting wlan mode of camera

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Data Header** | **Command Specifier** | **Camera ID NO.** | **Command Content** | | | | | **End Mark** |
| **WLAN MODE** | ssid\_len | pass\_len | ssid | pass |
| **“U”**  **(0x55)** | **“W” (0x57)** | **0x00-0xFF**  **0xFF:** all Device | **“0” (0x30) sta mode** |  |  |  |  | **“#”**  **(0x23)** |
| **“1” (0x31) ap mode** |  | |  | |
| 1 Byte | 1 Byte | 1 Byte | 1 Bytes |  | | | | 1 Byte |

1. **Example:**

|  |  |  |
| --- | --- | --- |
| **Action** | **Hexadecimal Notation** | **Description** |
| **Send** | 55 49 01 33 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. Communication Process Between Camera and Host

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

**Camera**

|  |  |  |
| --- | --- | --- |
| **Host** |  | **Send out a Snapshot Command** |

**Camera**

**ACK**

**Host**

**Camera**

**Host**

**Snapshot picture and report the size of picture & the NO.of data packages**

**Camera**

**Host**

**Send out a command of getting the specified package**

**Camera**

**ACK**

**Host**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Host** |  | **Transmits data of specified package** |  | **Camera** |