

Query Device Unique UID	Command	0x04	0x00	Index_id	0xF8	UID_Type	CRC					
	Response	0x04+4/12	0x00	Index_id	0xF8	Operation_st	UID (multi-	CRC				
	Command Details	(1) Function: Query device unique UID (2) Input parameters: Index_id (device index ID), UID_Type (3) Return parameters: Operation_status, UID (4) Command code: 0xF8 Note 1: Operation_status - operation status 0: Operation failed 1: Operation succeeded Note 2: UID_Type - UID type 0: 4-byte UID 1: 12-byte UID										
Query Bootloader Version	Command	0x03	0x00	Index_id	0xF9	CRC						
	Response	0x04	0x00	Index_id	0xF9	Bootloader v	CRC					
	Command Details	(1) Function: Query bootloader version (2) Input parameter: Index_id (device index ID) (3) Return parameter: Bootloader_version (4) Command code: 0xF9										
Query Firmware Version	Command	0x03	0x00	Index_id	0xFA	CRC						
	Response	0x04	0x00	Index_id	0xFA		CRC					
	Command Details	(1) Function: Query device firmware version (2) Input parameter: Index_id (device index ID) (3) Return parameter: Firmware_version (4) Command code: 0xFA										
Query Device Type	Command	0x03	0x00	Index_id	0xFB	CRC						
	Response	0x05	0x00	Index_id	0xFB	Device type	Device type	CRC				
	Command Details	(1) Function: Query device type (2) Input parameter: Index_id (device index ID) (3) Return parameter: Device_type (4) Command code: 0xFB Note 1: Device_type = (uint16_t)((Device_type_high << 8) Device_type_low)										

Enumeration Request	Command	None											
	Response	0x03	0x00	Index_id	0xFC	CRC							
	Command Details	(1) Function: Enumeration request. Sent by the end device when the chain topology changes, and also sent on device power-up, to notify the host to update the chain device status. (2) Input parameter: none (3) Return parameter: none (4) Command code: 0xFC											
Heartbeat Packet	Command	0x03	0x00	0xFF	0xFD	CRC							
	Response	0x03	0x00	0xFF	0xFD	CRC							
	Command Details	(1) Function: Heartbeat packet. Periodic communication between chain devices, allowing self-discovery of whether a device is the end device. The host can also use heartbeat packets to determine if any chain devices are connected. (2) Input parameter: none (3) Return parameter: none (4) Command code: 0xFD											
Enumeration	Command	0x04	0x00	0xFF	0xFE	Send_num	CRC						
	Response	0x04	0x00	0xFF	0xFE	Receive_num	CRC						
	Command Details	(1) Function: User can obtain the number of devices in the chain through enumeration (2) Input parameter: Send_num (default: 0, used to count device number) (3) Return parameter: Receive_num (value represents the number of devices) (4) Command code: 0xFE											

Note 1: Maximum packet length is 256 bytes (UART serial)

Note 2: Data length counts from Index_id to CRC, including Index_id and CRC, but excluding the data length field itself

Note 3: When calculating CRC, exclude the packet header, packet footer, length field, and CRC field itself; only sum the remaining data

Note 4: Serial communication baud rate: 115200, 8 data bits, 1 stop bit, no parity

```
uint8_t calculateCRC(const uint8_t *buffer, uint16_t size)
{
    uint8_t crc8 = 0;
    for (uint8_t i = 4; i < (size - 3); i++) {
        crc8 += buffer[i];
    }
    return crc8;
}
```