HAF700II - Device Control Protocol Specification

Revision History

Revision	Date	Descriptions
0.2.1	2025/3/4	1. Add Cmd “set device sn”, “get Device sn“, “set color sku“, “get color sku“ and relative response 2. Change the type of Report ID 2(device-subcommand) from Set_Report (Feature) / Interrupt (Output) to Interrupt (Output) only.
0.2.0	2025/02/18	1. Remove Cmd “turn on/off offline mode", “set power suspend”, set power resume” and relateive response 2. Correct typo in Cmd “set suspend” and “delete suspend” 3. Modify JSON payload of response “read rotated angle”, “read brightness”, “read keep alive timer”, “read maximun number of suspend media” 4. Add High level device state machine to describe the detailed device behavior
0.1.3	2025/01/16	Modify command and response of `read rotated angle` , `read brightness` , `read keep alive timer` and `read maximun number of suspend media` Add new command `set power suspend` Add new command `set power resume`
0.1.2	2025/01/10	• Remove unused “Date“ tag from JSON commands. • Insert “`set powerup media`“ command and response. • Insert “`turn on/off offline mode`“ command and “`turn offline mode complete`“ respose. • Add 5 contents for `fileName` in “`set suspend`“ and “`suspend completed`“commands. • Insert “`delete suspend`“command and “`delete suspend completed`“ response. • Insert “`keep alive`“ command and response. • Insert “`read maximum number of suspend media`“ command and response. • Insert “`set keep alive timer`“ command and “`keep alive timer`“ response. • Insert “`read keep alive timer`“ command and response. • Change USB PID to 0x228 for AP, 0x229 for IAP
0.1.1	2024/12/27	• Insert description of “length“ and “checksum“ in `Command payload structure` , `File transfer payload structure` and `Respnse payload structure` sections.
0.1.0	2024/11/28	First draft.

Run-Time Mode Descriptor Set

Device Descriptor

Field	Description
bLength	`0x12`
bDescriptorType	`0x01`
bcdUSB	`0x0200`, v2.0
bDeviceClass	`0x00`
bDeviceSubClass	`0x00`
bDeviceProtocol	`0x00`
bMaxPacketSize0	`0x40`, 64 **TBD**
idVendor	`VID`, `0x2516`
idProduct	`PID`, `0x0228`
bcdDevice	`Firmware Version`, for example, version 2.1.9 is `0x0219`
iManufacturer	`0x01`
iProduct	`0x02`
iSerialNumber	`0x03` `0x00` - If the hardware ID data is not available on the flash storage. **NEED TO CHECK WITH VENDOR**
bNumConfigurations	`0x01`

Configuration Descriptor

Field	Description

bLength	`0x09`
bDescriptorType	`0x02`
wTotalLength	Total length of data returned for this configuration. Includes the combined length of all descriptors (configuration, interface, endpoint, and class- or vendor-specific) returned for this configuration.
bNumInterfaces	`0x01` TBC
bConfigurationValue	`0x01`
iConfiguration	`0x00`
bmAttributes	`0x80`
bMaxPower	`0xFA`

HID Interface Descriptor

Field	Description
bLength	`0x09`
bDescriptorType	`0x04`
bInterfaceNumber	`0x00`
bAlternateSetting	`0x00`
bNumEndpoints	`0x02` TBC
bInterfaceClass	`0x03`, HID
bInterfaceSubClass	`0x00`
bInterfaceProtocol	`0x00`
iInterface	`0x00` TBD

HID Class Descriptor

Field	Description
bLength	`0x09`
bDescriptorType	`0x21`, HID descriptor type
bcdHID	`0x0111`, v1.11
bCountryCode	`0x00`
bNumDescriptors	`0x01`
bDescriptorType	`0x22`, Report descriptor type
wDescriptorLength	Total length of the Report descriptor

HID Endpoint Descriptor

Field	Description
bLength	`0x07`
bDescriptorType	`0x05`
bEndpointAddress	`0x81`, IN Endpoint #1 TBC
bmAttributes	`0x03`, Interrupt
wMaxPacketSize	`0x0400`,1024 TBC
bInterval	`0x01`, 125us TBC

Field	Description
bLength	`0x07`
bDescriptorType	`0x05`
bEndpointAddress	`0x01`, OUT Endpoint #1 TBC
bmAttributes	`0x03`, Interrupt
wMaxPacketSize	`0x0400`, 1024 TBC
bInterval	`0x01`,125us TBC

String Descriptors

Index	Description
0x00	Supports English only, wLANGID[0] = `0x0409`
0x01	Manufacturer, `Cooler Master` **TBC**
0x02	Model Name, `HAF700 V2` **TBD**
0x03	Hardware ID, e.g., `1793a00d-6373-47a1-b017-80b7da3b5e89` **TBC**

HID Report Descriptor

```
0x06, 0xFF, 0xFF,          // Usage Page (generic)
0x09, 0x02,                // Usage (liquid-cooler)           ; liquid-cooler start
0xA1, 0x01,                // Collection (Application)

0x85, 0x01,                //   Report ID (1)
0x09, 0x40,                //   Usage (device-info)
0x75, 0x08,                //   Report Size (8)
0x95, 0x06,                //   Report Count (6)
0xB1, 0x03,                //   Feature (Const,Var,Abs)

0x85, 0x02,                //   Report ID (2)
0x09, 0x41,                //   Usage (device-subcommnad)
0x75, 0x08,                //   Report Size (8)
0x95, 0x01,                //   Report Count (1)
0x91, 0x02,                //   Output (Data,Var,Abs)

0x06, 0xFB, 0xFF,          //   Usage Page (display)
0x09, 0x01,                //   Usage (display-ctrl)        ; display-ctrl start
0xA1, 0x00,                //   Collection (Physical)

0x85, 0x14,                //     Report ID (20)
0x09, 0x20,                //     Usage (display-ctrl-capabilities)
0x75, 0x08,                //     Report Size (8)
0x95, 0x2F,                //     Report Count (47)
0xB1, 0x03,                //     Feature (Const,Var,Abs)

0x85, 0x1e,                //   Report ID (30)
0x09, 0x60,                //   Usage (display-ctrl-ssr-command)
0x75, 0x08,                //   Report Size (8)
0x96, 0xFF, 0x03           //   Report Count (1023)
0x91, 0x02,                //   Output (Data,Var,Abs)

0x85, 0x1f,                //   Report ID (31)
0x09, 0x61,                //   Usage (display-ctrl-ssr-file-transfer)
0x75, 0x08,                //   Report Size (8)
0x96, 0xFF, 0x03           //   Report Count (1023)
0x91, 0x02,                //   Output (Data,Var,Abs)

0x85, 0x20,                //   Report ID (32)
0x09, 0x62,                //   Usage (display-ctrl-ssr-response)
0x75, 0x08,                //   Report Size (8)
0x96, 0xFF, 0x03           //   Report Count (1023)
0x81, 0x02,                //   Iutput (Data,Var,Abs)

0xC0,                      //   End Collection              ; display-ctrl end

0xC0,                   // End Collection              ; liquid-cooler end
```

Device Control

Device Information (`device-info`)

Get_Report (Feature)

Byte	Description
0	`report-id`, 1
1 - 2	`hw-ver`, R/O,
3 - 6	`fw-ver`, R/O,

Hardware Version (`hw-ver`)

Byte	Description
0	`major`, [0-99], `0xFF` if the hardware version data is not available on the flash storage.
1	`minor`, [0-99], `0xFF` if the hardware version data is not available on the flash storage.

Firmware Version (`fw-ver`)

Byte	Description
0	`major`, [0-99]
1	`minor`, [0-9]
2	`revision`, [0-9]
3	`build`, [0-255]

Subcommand (`device-subcommnad`)

Interrupt (Output)

Byte	Description
0	`report-id`, **2**
1	`subcommand-id`, `0x01` - `reset`, perform a device factory default. `0x02` - `reboot`, ~~0x03 - keep alive,~~ TBC

Display Controller (`display-ctrl`)

Capabilities (`display-ctrl-capabilities`)

Get_Report (Feature)

Byte	Description
0	`report-id`, **20**
1 - 47	`0x01`, `0x02`, `0x00`, `0x01`, `0x02`, `0x01`, `0x01`, `0x03`, `0x02`, `0xE0`, `0x01`, `0x04`, `0x02`, `0xE0`, `0x01`, `0x05`, `0x01`, `0x03`, `0x06`, `0x01`, `0x1E`, `0x07, 0x01, 0x02, 0x08, 0x01, 0x02, 0x09, 0x04, 0x00, 0x00, 0x40, 0x01,0x0A, 0x02, 0xE8, 0x03, 0x0B, 0x02, 0x01, 0x03, 0x0C, 0x01, 0x01 0x0D, 0x01, 0x01` NEED TO UPDATE

Tag	Length	Value
`0x01` (`display-mode`)	`0x02`	`0x00` (`off`), `0x01` (`ssr`)
`0x02` (`ssr-vs-interface`)	`0x01`	`0x01` (Interface 1)
`0x03` (`ssr-vs-width`)	`0x02`	`0xE0`, `0x01` (480)
`0x04` (`ssr-vs-height`)	`0x02`	`0xE0`, `0x01` (480)
`0x05` (`ssr-vs-format`)	`0x01`	`0x03` (JPEG)
`0x06` (`ssr-vs-max-fps`)	`0x01`	`0x1E` (30 fps)
`0x07` (`ssr-vs-transfer-interface`)	`0x01`	`0x02` (USB-HID-HS)
`0x08` (`ssr-vs-fw-support-rotation`)	`0x01`	0x02 (FW-support-90-degree)
`0x09` (`ssr-vs-max-file-size`)	`0x04`	`0x00, 0x00, 0x40, 0x01` (20MB), TBC Maximum size of a single file. (must report this capability if hw decode supported
`0x0a` (`ssr-vs-max-frame-cnt`)	`0x02`	`0xE8, 0x03` (1000), TBD Maximum counnt of frames in gif or mp4 file. (must report this capability if using real-time streaming), for standby mode background only
`0x0b` (`ssr-vs-hw-decode-support`)	`0x02`	`0x01` (H.264), `0x03` (JPEG)
`0x0c` (`ssr-vs-hw-support-overlay`)	`0x01`	`0x01` (support)
`0x0d` (`ssr-vs-cmd-format`)	`0x01`	`0x01`(support JSON)

Software Screen Rendering-Command (`display-ctrl-ssr-command`)

Set_Report (Feature) / Interrupt (Output)

Byte	Description
0	`report-id`, **30**

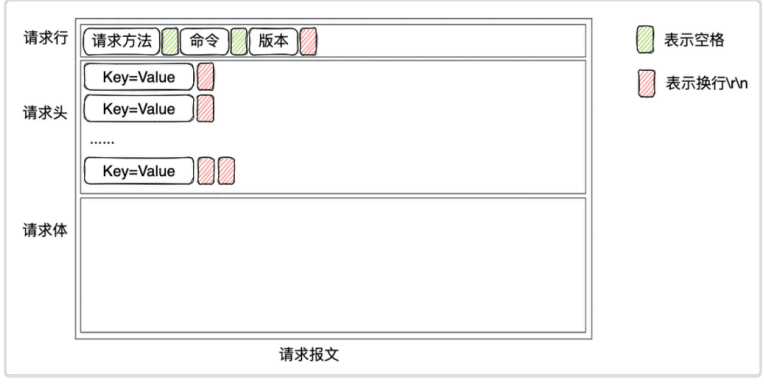
1~n	`Command payload`

Command payload structure

Byte	1	2~3	4~n	n+1 (Bytes)	end byte
	0x5a	length	JSON payload	checksum	0x5a

length: The length from the 1st “5a“ to the 2nd “5a“(Ex: length is 0x009A , the highbyte is 0x00 , lowbye is 0x9A). checksum: Do the sum of the content of “length“ and “JSON paylod“ and get the value of the lowest 8bits.

JSON payload(Sent from software tool)



Payload translation : It has to be translated as below If 0x5A or 0x5B is seen in `length` , `JSON payload` and `checksum` :

0x5A --> 0x5B 0x01

0x5B --> 0x5B 0x02

It also needs to make sure the completeness using `length` and `checksum` after reversing translation.

Request method: GET/STATE/POST/DELETE

Command: rotate/brightness/tranport/transported/realtimeDisplay

Version: 1

Key=Value

- SeqNumber : 0 ~ 0xFFFFFFFF
- ContentLength : Length of request content(Ex. length is 14 for `{"degree":180}`)
- ContentType : format of content(Ex. text/json/xml/png/jpg/gif/mp4/avi/pdf)
- FileName
- FileSize(unit is byte)
- Date: timestamp

Support command list: TBC

Command	Parameters	Jason Payload

`rotate`	`degree` = 0, 90, 180 or 270	`POST rotate 1`
		`ContentType=json`
		`ContentLength=14`
		
		`{"degree":180}`

`brightness`	`value` = 0~100	`POST brightness 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=12`
		
		`{"value":99}`

`firmware upgrade`	`type`:firmware
	`fileName`:update.zip
	`fileSize`
		`POST transport 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=61`
		
		`{"type":"firmware","fileName":"update.zip","fileSize":969373}`

`upgrade completed`
(Send completed command when response received from device afer tranfer done)
	`fileName`:update.zip
	`md5`
		`POST transported 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=39`
		
		`{"fileName":"update.zip","md5":1111111}`

`set OSD`
[NOTE]File format is .osd(i.e. Change file extension of .png to .osd)
	`type`:media
	`fileName`
	`fileSize`
		`POST transport 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=52`
		
		`{"type":"media","fileName":"1.osd","fileSize":14442}`

`OSD completed`
(Send completed command when response received from
	`fileName`
	`md5`
		`POST transported 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=34`

device afer tranfer done)		`{"fileName":"1.osd","md5":1111111}`

`set background`
[NOTE]File format is .jpg/.mp4
	`type`:media
	`fileName`
	`fileSize`
		`POST transport 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=52`
		
		`{"type":"media","fileName":"1.jpg","fileSize":14442}`

`background completed`
(Send completed command when response received from device afer tranfer done)
	`fileName`
	`md5`
		`POST transported 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=34`
		
		`{"fileName":"1.jpg","md5":1111111}`

`real-time display`
[NOTE]File format is .mp4
	`enable`	`POST realtimeDisplay 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=15`
		
		`{"enable":true}`
		
		When playing .mp4 is ended:
		
		`POST realtimeDisplay 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=16`
		
		`{"enable":false}`

`read rotated angle`	None	`POST param 1`
`read brightness`	None	`POST param 1`

`turn on/off LCD in sleep`
[NOTE]Use `set suspend` if assigning custom video file
	`enable`	`POST displayInSleep 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=15`
		
		`{"enable":true}`

`set suspend`
[NOTE]File format is .jpg/.mp4
	`type`:suspend
	`fileName`:suspend_0.mp4~suspend_4.mp4
	`fileSize`
		`POST transport 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=61`
		
		`{"type":"suspend","fileName":"suspend0.mp4","fileSize":14442}`

`suspend completed`
(Send completed command when response received from device afer tranfer done)
	`fileName`:suspend_0.mp4~suspend_4.mp4
	`md5`
		`POST transported 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=41`
		
		`{"fileName":"suspend0.mp4","md5":1111111}`

`delete suspend`	`type`:suspend
	`fileName`:suspend_0.mp4~suspend_4.mp4/all
		`POST delMedia 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=44`
		
		`{"type":"suspend","fileName":"suspend0.mp4"}`

`keep alive`	`timestamp`	`STATE timestamp 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=27`
		
		`{"timestamp":1705372154468}`

`set keep alive timer`	`value` = 0~65,535(second); assigning 0 will keep device alive forever	`POST timeout 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=12`
		
		`{"value":99}`

`read keep alive timer`	None	`POST param 1`
`read maximun number of suspend media`	None	`POST param 1`
`set powerup media`	`type`:logo `fileName`:logo	`POST transport 1` `SeqNumber=42`

[NOTE]File format is .mp4	_0.mp4	`ContentType=json`
		`ContentLength=56`
		
		`{"type":"logo","fileName":"logo_0.mp4","fileSize":14442}`

`powerup media completed`
 	
(Send completed command when response received from device afer tranfer done)
	`fileName`:logo_0.mp4
	`md5`
		`POST transported 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=39`
		
		`{"fileName":"logo_0.mp4","md5":1111111}`

set device sn	sn:xxxxx
	
	(32Byte)
		`POST setDeviceSN 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=41`
		`{"sn":"AB12345678901234567890123456 78CD"}`

get device sn	None	`POST getDeviceSN 1` `SeqNumber=42`

set color sku	color:0x1234
	
	(2 byte value but in string format)
		`POST setSKUColor 1`
		`SeqNumber=42`
		`ContentType=json`
		`ContentLength=41`
		`{"color":"0x1234"}`

set color sku	None	`POST getSKUColor 1` `SeqNumber=42`

Software Screen Rendering-File transfer (`display-ctrl-ssr-file-transfer`)

NEED A FLOW HERE

[NOTE]Use display-ctrl-ssr-file-transfer usage to transfer .JPG/.MP4/DFU data when the response of command(`firmware upgrade` / `set background` / `set OSD` / `real-time display`) is received from device

Interrupt (Output)

Byte	Description
0	`report-id`, **31**
1~n	`file transfer payload`

File transfer payload structure

Byte	1	2~3	4~23 (20 Bytes)	24~1023 (1000 Bytes)
	0x5c	length	meta data	payload

length: The length from the “5c“ to “payload“(Ex: length is 0x03FC , the highbyte is 0x03 , lowbye is 0xFC).

Meta data structure

Byte	4	5~6	7~8	9	10~23
	Id	Count	Index	Type	Reserved NEED CHECKSUM??

	description
Id	unique number, 0~59
Count	total block count (1~65535)
Index	current block index, 0~ (count -1)
Type	0 (don’t care), 1 (jpg), 2 (png)

Software Screen Rendering-Response (`display-ctrl-ssr-response`)

[NOTE]Device will send the response to the Host when receiving any command of `display-ctrl-ssr-command` or the file transfer process using `display-ctrl-ssr-file-transfer` is completed/failed

Interrupt (Input)

Byte	Description
0	`report-id`, **32**

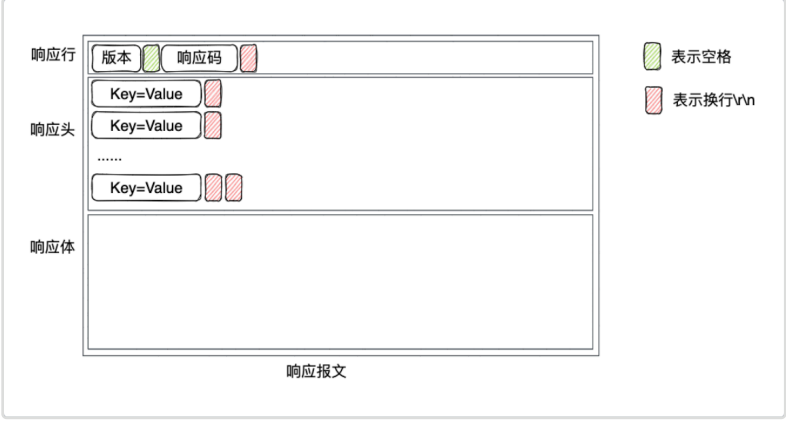
1~n	`Response payload`

Response payload structure

Byte	1	2~3	4~n	n+1 (Bytes)	end byte
	0x5a	length	JSON payload	checksum	0x5a

length: The length from the 1st “5a“ to the 2nd “5a“(Ex: length is 0x009A , the highbyte is 0x00 , lowbye is 0x9A). checksum: Do the sum of the content of “length“ and “JSON paylod“ and get the value of the lowest 8bits.

JSON payload(Replied from device)



Payload translation : It has to be translated as below If 0x5A or 0x5B is seen in `length`, `JSON payload` and `checksum`:

0x5A --> 0x5B 0x01

0x5B --> 0x5B 0x02

It also needs to make sure the completeness using `length` and `checksum` after reversing translation.

Version: 1

Response code:

- 1xx(100~199): Message
- 2xx(200~299): Success
- 4xx(400~499): Request Error on Host
- 5xx(500~599): Response Error on device

Key=Value

- AckNumber(=SeqNumber+1)
- ContentLength : Length of response content
- ContentType : format of content(Ex. text/json/xml/png/jpg/gif/mp4/avi/pdf)
- Date: timestamp

Command Response list: TBC

Target Command	Response Jason Payload
`rotate`	`1 200` `AckNumber=1`
`brightness`	`1 200` `AckNumber=43`

`firmware upgrade`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=39`
	
	`{"state":"success","blockMaxSize":1024}`

`upgrade completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

`set OSD`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=39`
	
	`{"state":"success","blockMaxSize":1024}`

`OSD completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

`set background`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=39`
	
	`{"state":"success","blockMaxSize":1024}`

`background completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

`real-time display`	`1 200` `AckNumber=43`

`read rotated angle`	`1 200`
	`AckNumber=1`
	`ContentType=json`
	`ContentLength=89`
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMedia`
	
	Parsing
	
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMediaCou nt":5,"displayInSleep":0,"suspendMediaActive":[1,0,0,1,1]}`
	
	and extract “degree“: 180

`read brightness`	`1 200`
	`AckNumber=1`
	`ContentType=json`
	`ContentLength=89`
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMedia`
	
	Parsing
	
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMediaCou nt":5,"displayInSleep":0,"suspendMediaActive":[1,0,0,1,1]}`
	
	and extract “brightness“: 99

`turn on/off LCD in sleep`	`1 200` `AckNumber=43`

`set suspend`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=39`
	
	`{"state":"success","blockMaxSize":1024}`

`suspend completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

`delete suspend completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

`keep alive`	`1 200` `AckNumber=43`
`keep alive timer`	`1 200` `AckNumber=43`

`read keep alive timer`	`1 200`
	`AckNumber=1`
	`ContentType=json`
	`ContentLength=89`
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMedia`
	
	Parsing
	
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMediaCou nt":5,"displayInSleep":0,"suspendMediaActive":[1,0,0,1,1]}`
	
	and extract “keepAliveTimeout“: 60

`read maximun number of suspend media`	`1 200`
	`AckNumber=1`
	`ContentType=json`
	`ContentLength=89`
	`{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMedia`

	Parsing `{"brightness":100,"degree":0,"osdState":0,"keepAliveTimeout":5,"maxSuspendMediaCount":5,"displayInSleep":0,"suspendMediaActive":[1,0,0,1,1]}` and extract “maxSuspendMediaCount“: 5

`set powerup media`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=39`
	
	`{"state":"success","blockMaxSize":1024}`

`powerup media completed`	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=19`
	
	`{"state":"success"}`

set device sn	`1 200` `AckNumber=43`

get device sn	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=41`
	`{"sn":"12345678901234567890123456789OAB"}`

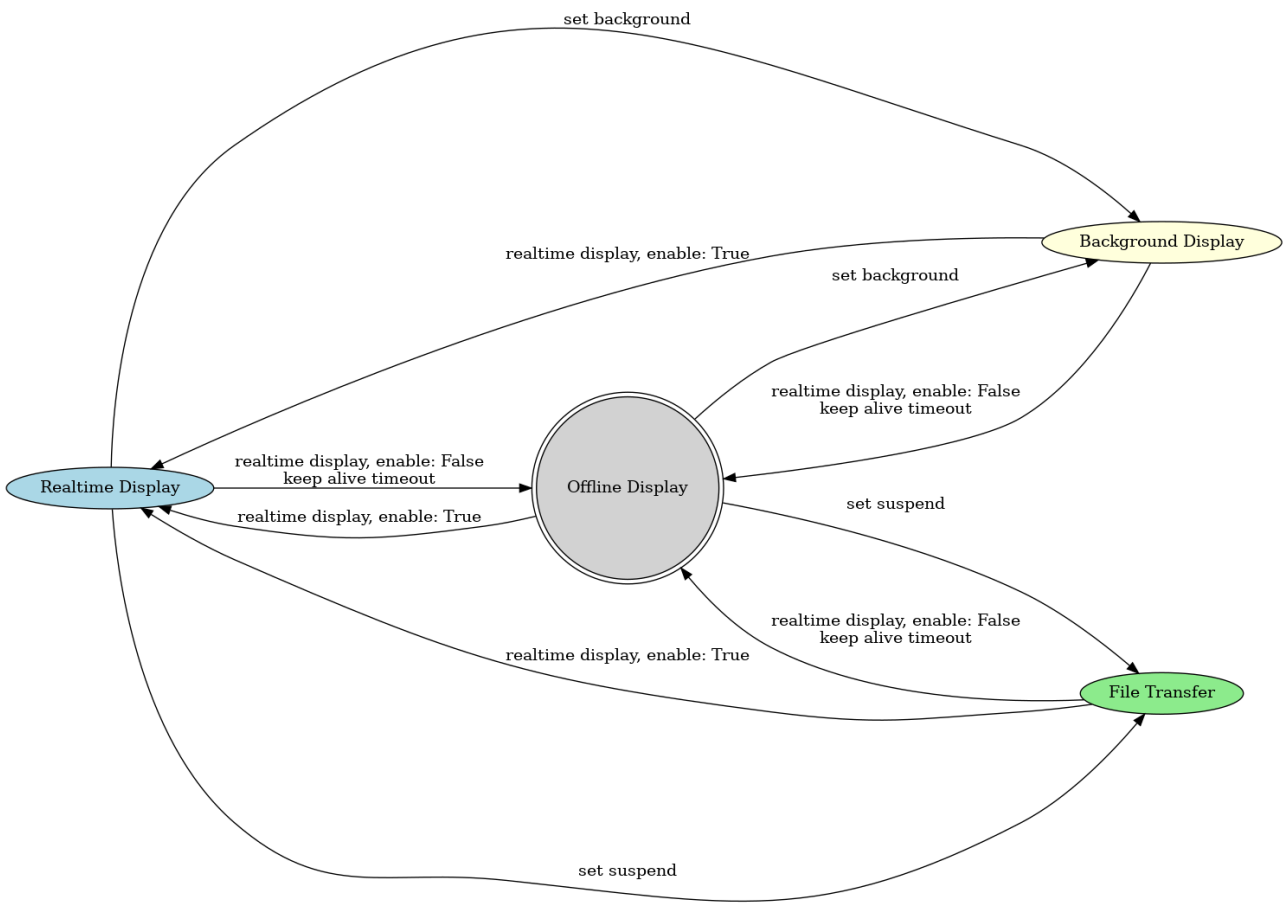
set color sku	`1 200` `AckNumber=43`

get color sku	`1 200`
	`AckNumber=43`
	`ContentType=json`
	`ContentLength=18`
	`{"color":"0x1234"}`

Respone when all packets in `display-ctrl-ssr-file-transfer` are received:

```
1 200
AckNumber=0
```

High level device state machine



Initial State After Powerup

Offline display state

State List

1. realtime display state
2. offline display state
3. background display state
4. file transfer state

State Transition Conditions (How Each State Transitions to Other States)

- For the **Realtime Display State**:
  - The command **"realtime display, enable: False"** triggers a transition to the **Offline Display State**.
  - The command **"set suspend"** triggers a transition to the **File Transfer State**
  - The command **"set background"** triggers a transition to the **Background Display State**
  - The event **"keep alive timeout"** triggers a transition to the **Offline Display State**

- For the **Offline Display State**:
  - The command **"realtime display, enable: True"** triggers a transition to the **Realtime Display State**
  - The command **"set suspend"** triggers a transition to the **File Transfer State**
  - The command **"set background"** triggers a transition to the **Background Display State**

- For the **Background Display State**:
  - The command **"realtime display, enable: False"** triggers a transition to the **Offline Display State**
  - The command **"realtime display, enable: True"** triggers a transition to the **Realtime Display State**
  - The event **"keep alive timeout"** triggers a transition to the **Offline Display State**

- For the **File Transfer State**:
  - The command **"realtime display, enable: False"** triggers a transition to the **Offline Display State**
  - The command **"realtime display, enable: True"** triggers a transition to the **Realtime Display State**
  - The event **"keep alive timeout"** triggers a transition to the **Offline Display State**