

“Maple Bus 1.0” Peripheral Hardware (API) Specifications

Dreameye
Revision 0.71

Created

CS Development and Product.

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Attached documents

- ☐ CMOS Image Sensor (CIS) Data Sheet
- ☐ H1A424M167 Image Signal Processor (ISP) Data Sheet Version 1.01
- ☐ SEGA JangGu Information

Revision

0.70	00/03/10	New document
0.71	00/04/04	Upgraded supplementary specification H1A424M167 Image Signal Processor (ISP) Data sheet from version 0.9 to 1.01. Consolidated camera device list to Dreameye. Modified and enhanced description in sections 3.3.2. Data Erase and 3.3.3. Data Write (use prohibited)

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1 Dreameye function

1.1 Definition of Dreameye

Dreameye has the following functions.

- It can continuously transfer still images to the host. The details of these still images are as follows.
 - Size : QSIF (160 × 120 pixels), SIF (320 × 240 pixels), and VGA (640 × 480 pixels)
 - Data compression : JangGu format
 - Color composition : YUV (4:2:2), YUV (4:2:0)
 For more details, refer to the specifications for the Image Signal Processor (ISP).
- A VGA size still image (JPEG format, YUV(4:2:0)) saved when operating independently, can be uploaded to the host or deleted by means of FT₁₁ (camera function). It is not possible to write image data from the host to Dreameye.
- A firmware batch program region is reserved. Data is written to this region when the product is shipped. There is absolutely no access to this region.
- Dreameye is recognized by the host as one device and five extension devices (see figure below). Thus within one V_Blank image data can be sent to the host a maximum of five times. The number of extension devices used depends on the application, and Dreameye sends a command response to the AP specified by the application in each command frame.
- Dreameye has an ISP, and automatically makes exposure time, gamma correction, and white balance adjustments. For more details, refer to the separate ISP specification.

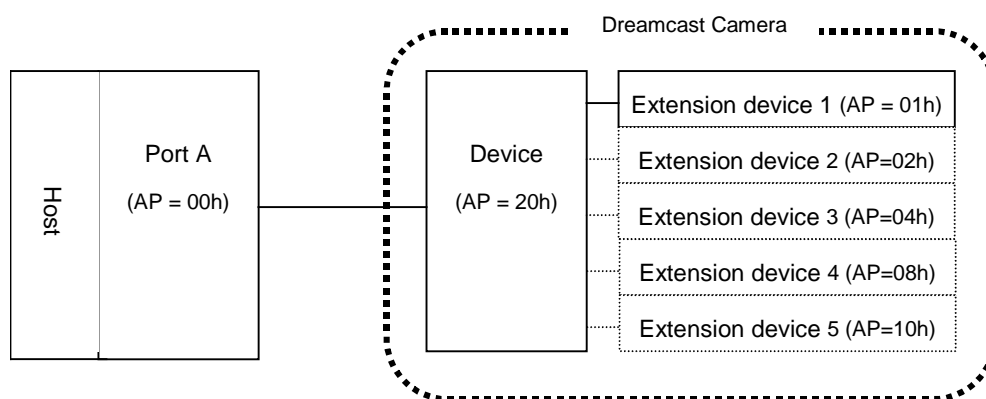


Figure 1-1 Dreameye internal conceptual figure

Devices:

Dreameye handles the Controller Function (FT₀) as a device.

However, as a controller, only the D button is supported.

The D button is assigned to the shutter button used when operating independently.

* See Section, "3.1 Commands supported as devices."

Extension devices:

Dreameye handles the Camera Device Function (FT₁₁) as an extension device.

* See Section, "3.2 Commands supported as extension devices."

2 Device IDs

Dreameye is recognized by the host as one device and five extension devices. Therefore, Dreameye has two types of device ID.

2.1 Device ID as a device

Bit	7	6	5	4	3	2	1	0	Explanation
1st Data	0	0	0	0	0	0	0	0	Function type (FT ₀ supported as a device)
2nd Data	0	0	0	0	0	0	0	0	
3rd Data	0	0	0	0	0	0	0	0	
4th Data	0	0	0	0	0	0	0	1	
5th Data	0	0	0	0	0	0	0	0	First function definition block
6th Data	0	0	0	0	0	0	0	0	
7th Data	0	0	0	0	1	0	0	0	
8th Data	0	0	0	0	0	0	0	0	
9th Data	0	0	0	0	0	0	0	0	Second function definition block (not used)
10th Data	0	0	0	0	0	0	0	0	
11th Data	0	0	0	0	0	0	0	0	
12th Data	0	0	0	0	0	0	0	0	
13th Data	0	0	0	0	0	0	0	0	Third function definition block (not used)
14th Data	0	0	0	0	0	0	0	0	
15th Data	0	0	0	0	0	0	0	0	
16th Data	0	0	0	0	0	0	0	0	

Figure 2-1 Device ID as a device

Function type:

Dreameye supports only the controller function (FT₀) as a device.

Function definition block:

The controller function is supported, but for the controller only the D button is supported.

Therefore the content of the function definition block is "00-00-08-00h".

Dreameye only supports one function, and therefore the second and third function definition blocks are not used.

2.2 Device ID as extension device

The device IDs as extension devices within Dreameye are as shown in the following table.

Dreameye supports the Camera Device Function (FT₁₁) as an extension device.

Bit	7	6	5	4	3	2	1	0	Explanation
1st Data	0	0	0	0	0	0	0	0	Function type (FT ₁₁ supported as an extension device)
2nd Data	0	0	0	0	0	0	0	0	
3rd Data	0	0	0	0	1	0	0	0	
4th Data	0	0	0	0	0	0	0	0	
5th Data	1	1	0	0	0	0	0	0	First function definition block (defines the functions handled by Dreameye)
6th Data	0	0	0	0	0	0	0	0	
7th Data	1	0	1	0	1	0	0	0	
8th Data	0	0	1	1	0	0	0	0	
9th Data	0	0	0	0	0	0	0	0	Second function definition block (not used)
10th Data	0	0	0	0	0	0	0	0	
11th Data	0	0	0	0	0	0	0	0	
12th Data	0	0	0	0	0	0	0	0	
13th Data	0	0	0	0	0	0	0	0	Third function definition block (not used)
14th Data	0	0	0	0	0	0	0	0	
15th Data	0	0	0	0	0	0	0	0	
16th Data	0	0	0	0	0	0	0	0	

Figure 2-2 Device ID as an extension device

Function type:

Dreameye supports the Camera Device Function(FT₁₁) as an extension device.

Function definition blocks:

The supported still image compression formats are JangGu and JPEG.

JPEG only is supported when operating independently, and JangGu only is supported when connected to the host.

The supported image sizes are VGA, SIF, and QSIF.

VGA only is supported when operating independently, and VGA, SIF, and QSIF are supported when connected to the host.

A still image captured when operating independently, can be saved in JPEG format.

A still image captured when connected to the host cannot be saved.

Program data can be saved. Program data may not be deleted or overwritten.

* For more details, refer to the FT₁₁ specification.

Dreameye only supports one function, and therefore the second and third function definition blocks are not used.

3 Supported commands

Dreameye supports the following commands. If it receives other commands, Dreameye returns [Command Unknown]. Since Dreameye supports two function types, based on the command AP sent to the Dreameye, it must determine whether the command was sent to the device or to an extension device.

3.1 Commands supported as devices

3.1.1. Device Request

Issued by	: Host
Command code	: 01h
Data size	: 00h
Data field	: None
Expected return value	: [Device Status]
Description	: Requests [Device Status] from Dreameye as a device.

3.1.2. All Status Request

Issued by	: Host
Command code	: 02h
Data size	: 00h
Data field	: None
Expected return value	: [Device All Status]
Description	: Requests [Device All Status] from Dreameye as a device.

3.1.3. Device Reset

Issued by	: Host
Command code	: 03h
Data size	: 00h
Data field	: None
Expected return value	: [Device Reply]
Description	: Requests a Dreameye reset. Dreameye returns [Device Reply], and is then reset.

3.1.4. Device Kill

Issuing authority	: Host
Command code	: 04h
Data size	: 00h
Data field	: None
Expected return value	: [Device Reply]
Explanation	: For the camera device function specified by the transfer destination AP, operation is not allowed. Dreameye switches to the standby current consumption, and does not accept any commands. To continue operation, a hard reset or power-off-on sequence is required. Dreameye sends [Device Reply] to the host, then stops operation. Whether a device or an L device, at the point that this command is received, all Dreameye operation stops.

3.1.5. Device Status

Issued by	: Dreameye
Command code	: 05h
Data size	: 1Ch (112 bytes)
Data field	: Fixed Device Status 112 bytes * See Section, "4.1 Fixed Device Status"
Description	: As a response to [Device Request], Dreameye uses this when returning Fixed Device Status to the host.

3.1.6. Device All Status

Issued by	: Dreameye
Command code	: 06h
Data size	: 1Ch + n (112 + 4 × n bytes)
Data field	: Fixed Device Status 112 bytes Free Device Status 44 bytes * See Section, "4.1 Fixed Device Status" and Section, "4.2 Free Device Status"
Description	: As a response to [All Status Request] Dreameye uses this when returning Fixed Device Status and Free Device Status to the host.

3.1.7. Device Reply

Issued by : Dreameye
 Command code : 07h
 Data size : 00h
 Data field : None
 Description : This is used as a response from Dreameye.

3.1.8. Data Transfer

Issued by : Host
 Command code : 08h
 Data size : 03h
 Data field : Function type 4 bytes
 Read format 8 bytes
 Description : This command is a response to [Get Condition].
 It is used when returning the Controller Function read format.

bit	7	6	5	4	3	2	1	0
1st Data	1	1	1	1	1	1	1	1
2nd Data	1	1	1	1	D	1	1	1
3rd Data	0	0	0	0	0	0	0	0
4th Data	0	0	0	0	0	0	0	0
5th Data	1	0	0	0	0	0	0	0
6th Data	1	0	0	0	0	0	0	0
7th Data	1	0	0	0	0	0	0	0
8th Data	1	0	0	0	0	0	0	0

Figure 3-1 Read format

Data address	Data	Example	Description
+0000h	Command code	08h	[Data Transfer]
+0001h	Transfer destination AP	20h	For device 1
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	01h	Data size is 4 bytes
+0004h	Function type	00h	Function type is Controller Function 00-00-00-01h
+0005h		00h	
+0006h		00h	
+0007h		01h	
+0008h	Read format	FFh	Holds above read format.
+0009h		FFh	
+000ah		00h	
+000bh		00h	
+000ch		80h	
+000dh		80h	
+000eh		80h	
+000fh		80h	

Figure 3-2 Data Transfer command

3.1.9 Get Condition

Issued by : Host

Command code : 09h

Data size : 01h

Data field : function type 4Byte

Expected return value : [Data Transfer] (button data)

Description : This command requests the button operating status from the Dreameye Controller Function.

Data address	Data	Example	Description
+0000h	Command code	09h	[Get Condition]
+0001h	Transfer destination AP	20h	For device 1
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	01h	Data size is 4 bytes
+0004h	Function type	00h	Function type is Controller Function 00-00-00-01h
+0005h		00h	
+0006h		00h	
+0007h		01h	

Figure 3-3 Get Condition command

3.1.10. Function Type Unknown

Issued by : Dreameye

Command code : FEh

Data size : 00h

Data content : None

Description : This is issued when the function specified by the function type sent does not exist in Dreameye.

3.1.11. Command Unknown

Issued by : Dreameye

Command code : FDh

Data size : 00h

Data field : None

Description : Dreameye returns this command when an unsupported command is received.

3.2 Commands supported as extension devices

3.2.1. Device Request

This is the same as the command as a device.

* Requests [Device Status] as an extension device.

3.2.2. All Status Request

This is the same as the command as a device.

* Requests [Device All Status] as an extension device.

3.2.3. Device Reset

This is the same as the command as a device.

3.2.4 Device Kill

This is the same as the command as a device.

3.2.5. Device Status

This is the same as the command as a device.

* Dreameye returns the device ID as an extension device.

3.2.6. Device All Status

This is the same as the command as a device.

* Dreameye returns the device ID as an extension device.

3.2.7. Device Reply

This is the same as the command as a device.

3.2.8. Data Transfer

Issued by	: Dreameye
Command code	: 08h
Data size	: n ($02h \leq n \leq FFh$)
Data	: Function type 4 bytes Data $(n-1) \times 4$ bytes
Description	: This command is a response to [Get Condition] and [Still Image Request]. Since the data for an image is large, and cannot be transmitted within a single [Data Transfer] command (960 bytes), in the Camera Device Function a special format is used for [Data Transfer].

3.2.9. Get Condition

Issued by	: Host
Command code	: 09h
Data size	: $01h + n$
Data field	: Function type 4 bytes Request $(n-1) \times 4$ bytes
Expected return value	: [Data Transfer] (register value or Camera Status)
Description	: This command requests a status or information relating to a function from Dreameye. A number of data items (maximum six) can be requested in a single issue of the command. The request is input every 4 bytes. The following is the frame configuration for this command.

Data address	Data	Example	Description
+0000h	Command code	09h	[Get Condition]
+0001h	Transfer destination AP	01h	For extension device 1
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	03h	When two items are requested, data size is 12 bytes
+0004h	Function type	00h	Function type is Camera Device Function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Parameter 1	94h	See Figure 3-5 Get Condition Parameter 1 (Example : RAM size)
+0009h	Parameter 2	00h	See Figure 3-6 Get Condition Parameter 2 (images stored: max. 80h) to Figure 3-11(Example: still image)
+000Ah	Reserved	00h	00h (fixed value)
+000Bh	Reserved	00h	00h (fixed value)
+000Ch	Parameter 1	92h	See Figure 3-(Example: compression format)
+000Dh	Parameter 2	00h	See Figure 3-6 to Figure 3-11 (Example: still image)
+000Eh	Reserved	00h	00h (fixed value)
+000Fh	Reserved	00h	00h (fixed value)

Figure 3-4 Get Condition command

Parameter 1:

Specify the item to be requested here.

The codes for items supported are shown in the following table.

If a code not shown below is sent, Dreameye returns [Camera Error], and the error code is "02-00-00h" (not supported).

Item		Parameter 1	Explanation
CIS		00h	Requests CIS register value.
ISP		10h	Requests ISP register value.
Still image compression	JangGu	20h	Requests register value from the JangGu compression engine.
Still image saving	Number of images that can be saved	80h	Requests the maximum number of still images that can be saved. (This is 31 images.)
	Number of images saved	81h	Requests the number of still images that are currently saved. 00h and 01h, used for continuous still images are not counted.
	Data size	83h	Requests the data size of the currently saved still images.
Hardware information	Maple bitrate	90h	Requests the Maple Bus transfer bitrate (upstream).
	Flash memory total capacity	94h	Requests the capacity of flash memory assigned to each application.
	Flash memory remaining capacity	96h	Requests the remaining capacity of flash memory for each application.

Figure 3-5 Get Condition Parameter 1

Parameter 2 :

Specify the item details as follows.

If a code not shown below is sent, Dreameye returns [Camera Error], and the error code is "02-00-00h" (Unsupported).

For details of CIS, ISP, and JangGu, refer to the respective specifications.

Item details	Parameter 2	Description
VGA	04h	Requests the maximum number of VGA size still images that can be saved.

Figure 3-6 Get Condition Parameter 2 (images stored: max. 80h)

Item details	Parameter 2	Description
VGA	04h	Requests the maximum number of VGA size still images that are currently saved.

Figure 3-7 Get Condition Parameter 2 (images stored: 81h)

Item details	Parameter 2	Description
File No.	02h - 21h	Enter the file No. of the file requested.

Figure 3-8 Get Condition Parameter 2 (image size / data size: 83h)

Continuous still images

When requesting continuous still image data using JangGu compression, get the data by accessing files 00h and 01h alternately. Files 00h and 01h form a double frame buffer, and whichever file is accessed, double-buffered data can be read out alternately.

Still images

Still images are saved in flash memory.

This flash memory consists of 31 blocks of 64 KB, and can hold 31 files (since the compression format is JPEG, it may not always be possible to store 31 files). The file numbers are always the first numbers in sequence.

(If the total number of files saved is five, the file numbers are 02h, 03h, 04h, 05h, and 06h.)

When operating independently, when an attempt to save a still image is made but there is insufficient capacity in flash memory to hold the still image, then garbage data will be written to flash memory. In this case, Dreameye handles the area in which the garbage data is written as a single file of 0 bytes.

When the remaining capacity returned to the host for [Get Condition] (Parameter 1 "96h", Parameter 2 "00h") is zero, always get the data size of the last file. If the data size obtained for this file is zero bytes, delete this file.

Program data

There are two areas holding program data. These are of 32 Kbytes and 16 Kbytes.

Data	File number	Details
Continuous still images	00h 01h	"00h": JangGu data frames 0 and 1 "01h": JangGu data frames 0 and 1
Still images	02h-21h	Maximum 31 files
Program data	00h-01h	"00h": 32 Kbytes "01h": 16 Kbytes

Figure 3-9 Contents of file for different purposes

Item details	Parameter 2	Description
Maple Bus	90h	Requests Maple Bus bitrate.

Figure 3-10 Get Condition Parameter 2(bitrate: 90h)

Item details	Parameter 2	Description
For saving still images	00h	Requests flash memory region for saving still images.
Program	C1h	Requests flash memory region for saving still images.

Figure 3-11 Get Condition Parameter 2 (RAM capacity, RAM remaining capacity: 94h, 96h)

3.2.10. Set Condition

Issuing authority : Host

Command code : 0Eh

Data size : 01h + n

Data field : Function type : 4 bytes
Setting value : 4 × n bytes (1 ≤ n ≤ 253)

Expected return value : [Device Reply]

Explanation : Used for Dreameye register value or parameter setting.

A number of data items (maximum six) can be requested in a single issue of the [Set Condition] command.

The request item is input every 4 bytes.

The following figure shows an example of the command when requesting two items.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	0Eh	[Set Condition] command
+0001h	Transfer destination AP	02h	For extension device 2
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	03h	When two items are requested, data size is 12 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Parameter 1	10h	See Figure 3-5
+0009h	Parameter 2	80h	Refer to specifications for each IC (Example: 80h address)
+000Ah	Setting value	3Ah	Setting value (Example: 3Ah)
+000Bh		00h	For an 8-bit register, not used.
+000Ch	Parameter 1	90h	See Figure 3-5 (Example bitrate)
+000Dh	Parameter 2	90h	See Figure 3-6 to Figure 3-11 (Example: Maple Bus)
+000Eh	Setting value	0Fh	See Figure 3-13 (Example: 4 MHz)
+000Fh		A0h	

Figure 3-12 Set Condition command

Parameter 1:

Specify the item to be set.

The item codes are the same as for the [Get Condition] command (see Figure 3-4).

* Specify the request details as parameter 2.

If the specified item is not provided in Dreameye, Dreameye returns the [Camera Error] command, and the error code is "02-00-00h" (unsupported).

Parameter 2:

When "20h" is specified for parameter 1, specify the address of the register to be set, and when "90h" is specified, set the details of the item to be set as shown below.

If the specified item is not provided in Dreameye, Dreameye returns the [Camera Error] command, and the error code is "02-00-00h" (unsupported).

When a fixed value item is specified, the camera device returns the [Camera Error] command, and the error code is "02-00-01h" (Fixed Value).

Setting value:

Enter the value to be set.

For details of the setting values, refer to the specifications for each IC.

For the setting of an 8-bit register, enter the register value in data 1, and set data 2 to "00h".

For the Maple Bus bitrate, enter according to the following figure.

Item details	Data format	
Bitrate	2 Mbps: "07-D0h"	4 Mbps: "0F-A0h"

Figure 3-13 Set Condition command / setting data format

3.2.11. Camera Command

Issued by	: Host		
Command code	: 11h		
Data size	: 02h	(8 bytes)	
Data content	: Function type	: 4 bytes	
	Subcommand code	: 1 byte	
	Parameters 1 to 3	: 3 bytes	
Expected return value	: Depends on the subcommand		
Description	: See Section, "3.3 Subcommands in [Camera Command]."		

3.2.12. Function Type Unknown

This is the same as the command as a device.

3.2.13. Command Unknown

This is the same as the command as a device.

3.3 Subcommands in [Camera Command]

These are subcommands for [Camera Command] which supports Dreameye.

An example of the command is shown in the following figure.

This command comprises a function type, parameters 1 to 3, and a data field.

* The data field uses the [Data Write] command, and cannot be used in other commands.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	11h	[Camera Command] command
+0001h	Transfer destination AP	04h	For extension device 3
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	02h	Data size is 8 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Subcommand code	04h	See 3.3.1 to 3.3.4. (Example: [Still Image Request])
+0009h	Parameter 1	00h	Image No. (Example: "00h" specified)
+000Ah	Parameter 2	00h	Not used in [Still Image Request]
+000Bh	Parameter 3	00h	Not used in [Still Image Request]
Data field follows. Since the [Data Write] command is prohibited, it is not used.			

Figure 3-14 Camera Command

The subcommands within the [Camera Command] are now described.

3.3.1. Still Image Request

Issuing authority	: Host
Subcommand code	: 04h
Parameter 1	: Image No. (00h to 21h)
Parameter 2	: Resend
Parameter 3	: Counter value of [Data transfer] to start the resend (when parameter 2 is "80h") * See Section, "3.4 Data Transfer command"
Expected return value	: [Data Transfer]
Explanation	: This requests a transfer of still image data saved on Dreameye. This command is also used for requesting continuous still images as a movie. Specify the image No. to be requested as parameter 1. Dreameye transmits the still image data to the host as a [Data Transfer] command. Because of the large size of still image data, it cannot be transferred with a single [Data Transfer] command. Thus when requesting still image data spread over a number of [Data Transfer] commands, this command must be sent repeatedly to Dreameye.

bit	7	6	5	4	3	2	1	0
Parameter 1	File No.							
Parameter 2	Resend		0	0	0	0	0	0
Parameter 3	[Data Transfer] counter value at start of resend (when parameter 2 is "80h")							

Figure 3-15 Still Image Request command / parameters 1 to 3

Resend: This is valid only when requesting still image (JPEG) data in flash memory.
 When requesting continuous still images, parameters 2 and 3 are ignored.
 If requesting data to be resent from Dreameye because of an error occurring in a data transfer, make the settings as shown in the figure below.
 * Use only when an error has occurred; normally set to "00".

bit 7	bit 6	Explanation
0	0	This is the normal setting.
0	1	Setting when movie data is to be transmitted from the beginning of the file.
1	0	Special [Data Transfer]. Setting when requesting a resend from a counter value. * Set parameter 3 to the counter value of [Data transfer] to start the resend.
1	1	Not used.

Figure 3-16 Still Image Request command / parameter 2

[Data Transfer] counter value for starting the resend:

By setting parameter 2 to "80h", and specifying the [Data Transfer] counter value to start the resend in parameter 3, a resend can be requested going back over the last 256 [Data Transfer] commands.

For more details of the [Data Transfer] counter, see Section, "3.4 Data Transfer command."

* Use only when an error has occurred; normally set to "00".

3.3.2. Data Erase

Issuing authority : Host
 Subcommand code : 05h
 Parameter 1 : Data type
 Parameter 2 : File No.
 Parameter 3 : Confirmation
 Expected return value : [Device Reply]
 Explanation : This requests deleting the still image data in Dreameye.

It is possible to delete the program data, but this command is prohibited.

(If the program data is deleted, Dreameye does not operate correctly.)

bit	7	6	5	4	3	2	1	0
Parameter 1	Still image	0	0	0 (program)	0	0	0	0
Parameter 2	File No. (02h to 21h)				"FFh": Delete all			
Parameter 3	0	0	Confirmation	0	0	0	0	0

Figure 3-17 Data Erase command / parameters 1 to 3

Parameter 1 : Set the bit or bits corresponding to the data to be deleted to "1".

Parameter 2 : Specify the file No. to be deleted.

Image data

A maximum of 31 images can be saved, but since JPEG compression is used, the capacity depends on the images captured. Therefore specify a value of "02h" to "21h".

By specifying "FFh", it is possible to request deleting all images in a single operation.

If the value is set to 00h, 01h, or 03h - FEh, Dreameye's firmware will hang up. Therefore, be careful not to use any of these values.

Program data

Single-operation deletion for program data is not supported. If a request to delete all program data is received, [Camera Error] (error code: "02-00-00h") is returned.

Parameter 3 (check) : When requesting confirmation of the deleted data from Dreameye, set this bit to "1".

Use this only when requesting confirmation, and normally set it to "0".

Specify the data for which the confirmation is requested in parameters 1 and 2.

The peripheral device issues a confirmation with respect to the data specified by parameters 1 and 2, and if there is an error returns [Camera Error] (error code: "04-00-00h" or "04-00-01h"); if there is no error, it returns [Device Reply].

3.3.3. Data Write (use prohibited)

Issuing authority : Host

Subcommand code : 06h

Parameter 1 : Data Type

Parameter 2 : File No.

Parameter 3 : Start / End / Confirmation

Data : Data to be sent

Expected return value : [Device Reply]

Explanation : This is used for transmitting program data from the Host to the camera device.

Use of this command is prohibited.

An example of the command and parameter details are shown below.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	11h	[Camera Command] command
+0001h	Transfer destination AP	04h	For extension device 3
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	FFh	Data size is 1020 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Subcommand code	06h	[Data Write] command
+0009h	Parameter 1	10h	Specify program data
+000Ah	Parameter 2	00h	File No. "00h"
+000Bh	Parameter 3	80h	Start of data
+000Ch	Data	81h	Program data
+03FFh	Data	22h	Program data

Figure 3-18 Data Write command

bit	7	6	5	4	3	2	1	0
Parameter 1	0	0	0	Program	0	0	0	0
Parameter 2	File No. (00h to 01h)							
Parameter 3	Start	End	Confir- mation	0	0	0	0	0

Figure 3-19 Data Write command / parameters 1 to 3

Data Type (parameter 1) : Set a bit to "1" corresponding to the type of data to be sent.

It is not possible to set more than one bit to "1".

File number : When it is set to 00h, write is to 32-Kbyte file; when it is set to 01h - FFh, write is to 16-Kbyte file. For details on the program file, see Figure 3-9 File content by application purpose.

Start : When this bit is "1", this [Data Write] command indicates the first set of data.
When this bit is "0", this [Data Write] command indicates intermediate or final data.

End : When this bit is "1", this [Data Write] command indicates the end of the data.
When this bit is "0", this [Data Write] command indicates initial or intermediate data.

Start	End	Explanation
0	0	When the data requires three or more [Data Write] command transmissions, set this value when the current [Data Write] command refers to intermediate data.
0	1	When the data requires two or more [Data Write] command transmissions, set this value when the current [Data Write] command refers to the last set of data.
1	0	When the data requires two or more [Data Write] command transmissions, set this value when the current [Data Write] command refers to the first set of data.
1	1	Use this setting when the data can be transmitted with a single [Data Write] command, and for confirmation.

Figure 3-20 Data Write command / header (Start / End)

Confirmation : When requesting confirmation of the transmitted data from the peripheral device, set this bit to "1".
Use this only when requesting confirmation, and normally set it to "0".
Specify the data for which the confirmation is requested in parameters 1 and 2.
For both start and end, specify "1".
The peripheral device issues a confirmation with respect to the data specified by parameters 1 and 2, and if there is an error returns [Camera Error] (error code: "04-00-00h" or " 04-00-01h"); if there is no error, it returns [Device Reply].

Data : Enter the data to be transmitted.
For each issued command 1 to 1012 bytes of data can be sent.
If the data size is not a multiple of four bytes, pad out to a multiple of four with null bytes.

3.3.4. Camera Error

Issuing authority	: Dreameye
Subcommand code	: FFh
Parameter 1	: Error code
Parameter 2	: Error code
Parameter 3	: Error code
Explanation	: This is an error command which Dreameye returns if error particular to the camera device function occurs.

The error codes are shown in the following figure.

Error	Error code	Explanation
Image Not Ready	00-00-00h	This error code is returned when for some reason occurring during exposure, for example, the requested image data is not available.
Image Not Found	00-00-01h	This error code is returned when requested image data cannot be found.
Unsupported	02-00-00h	This error code is returned when the specified item within the command is an unsupported item.
Fixed Value	02-00-01h	This error code is returned when the specified item in the [Set Condition] command has a fixed value and cannot be set.
System Busy	03-00-00h	This error code is returned when a command request cannot be executed because of a System Busy state.
Data Write Error (Verify)	04-00-00h	This error code is returned when a verify error occurred in respect of a [Data Write] command confirmation.
Data Write Error (Broken)	04-00-01h	This error code is returned when the write destination area was invalid in respect of a [Data Write] command confirmation. Since currently flash memory is used, it is possible for the write destination area to be corrupted, making subsequent use impossible.

Figure 3-21 Camera Error command / error codes

- * When multiple items are specified, if any one is an unsupported item, Dreameye returns Unsupported (02-00-00h).
- * When multiple items are specified, if any one has a fixed value and cannot be set, Dreameye returns Fixed Value (02-00-01h).
- * When multiple items are specified, if both an unsupported item and a fixed value item which cannot be set are present, the camera device returns unsupported (02-00-00h).
- * In these cases, to get the details of the error, specify the items individually, and reissue the commands.

3.4 Data Transfer command

The image data transferred from Dreameye to the host is too bulky to be transferred in a single [Data Transfer] command, and therefore in Dreameye function the [Data Transfer] command is used in the following special format.

Issuing authority : Dreameye

Command code : 08h

Data size : 02h to FFh

Data field : Function type : 4 bytes
Header : 2 bytes
Data : 1 to 1014 bytes
Null data : 0 to 3 bytes

Explanation : The two-byte header is attached to the front of the data. (For more details, see Figure 3-23)

If the data size is not a multiple of four bytes, pad out to a multiple of four with null bytes.

An example of the command is shown in the following figure.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	08h	[Data Transfer]
+0001h	Transfer destination AP	08h	For extension device 4
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	FFh	When data size is 1020 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Header 1	81h	See Figure 3-23 (Example: beginning of movie data)
+0009h	Header 2	00h	See Figure 3-23 (Example: [Data Transfer] number "00h")
+000Ah	Data	53h	See Sections 3.4.1 and 3.4.2
+03FFh	Data	C2h	See Sections 3.4.1 and 3.4.2

Figure 3-22 Data Transfer command

bit	7	6	5	4	3	2	1	0
Header1	Start	End	Data Type					
Header2	[Data Transfer] counter							

Figure 3-23 Data Transfer command / Header

Start : When this bit is "1", this [Data Transfer] command indicates the first set of data.
When this bit is "0", this [Data Transfer] command indicates intermediate or final data.

End : When this bit is "1", this [Data Transfer] command indicates the end of the data.
When this bit is "0", this [Data Transfer] command indicates initial or intermediate data.

Start	End	Explanation
0	0	When the data requires three or more [Data Transfer] command transmissions, set this value when the current [Data Transfer] command refers to intermediate data.
0	1	When the data requires two or more [Data Transfer] command transmissions, set this value when the current [Data Transfer] command refers to the last set of data.
1	0	When the data requires two or more [Data Transfer] command transmissions, set this value when the current [Data Transfer] command refers to the first set of data.
1	1	Use this setting when the data can be transmitted with a single [Data Transfer] command.

Figure 3-24 Data Transfer command / Header (Start / End)

Data Type : Specify the type of data to be transferred, as shown in the following table.

Data Type	Explanation
00-00-00b	Still image
01-00-00b	Response to [Get Condition] command
Other (up to 3Fh)	Reserved

Figure 3-25 Data Transfer command / Header (Data Type)

[Data Transfer] counter : When transferring a single data file spread across multiple [Data Transfer] commands, enter here the number of the [Data Transfer] command.
The [Data Transfer] counter starts from 00h.
When moving to the next data file (for example the next still image), the [Data Transfer] counter value is reset to 00h.
When transferring a data file which requires 256 or more [Data Transfer] commands, after FFh the [Data Transfer] counter returns to 00h.
By using this counter value, if an error of any sort occurs in a data transfer, a resend can be requested from the host going back over the last 256 [Data Transfer] commands.

3.4.1. Data transfers in response to the [Get Condition] command

Issuing authority	: Dreameye
Command code	: 08h
Data size	: 03h to FFh
Data field	: Function type : 4 bytes
	Header : 2 bytes
	Null data : 2 bytes
	Response : 4 × n bytes (1≦n≦253)
Explanation	: This is the response to a request for information relating to Dreameye status with the [Get Condition] command.
	A two-byte header and two bytes of null data are attached.
	For the Data Type, the response "01-00-00" to the [Get Condition] command is set.
	Since all data can be transmitted in a single [Data Transfer] command, both Start and End are set to "1".
	When setting an 8-bit register, as for the [Set Condition] command, the register value is entered in data 1, and "00h" in data 2.
	The response parameters 1 and 2 contain the same values as those requested in the [Get Condition] command.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	08h	[Data Transfer]
+0001h	Transfer destination AP	10h	For extension device 5
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	04h	When two items are requested, data size is 16 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Header 1	D0h	Both Start and End are set to "1". Data Type is the response to [Get Condition].
+0009h	Header 2	00h	This is always [Data Transfer] number "00h".
+000Ah	Null data	00h	"00h" (fixed)
+000Bh	Null data	00h	"00h" (fixed)
+000Ch	Parameter 1	10h	Response to the first request (up to address +000Fh) In parameters 1 and 2, the same settings as [Get Condition], register value response (Example: FCh) For an 8-bit register, data 2 contains "00h".
+000Dh	Parameter 2	80h	
+000Eh	Data 1	FCh	
+000Fh	Data 2	00h	
+0010h	Parameter 1	92h	Response to the second request (up to address +0013h) In parameters 1 and 2, the same settings as [Get Condition], I hardware information (Example: compression support) response (Example: Jang Gu and JPEG support)
+0011h	Parameter 2	00h	
+0012h	Data 1	C0h	
+0013h	Data 2	00h	

Figure 3-26 Data transfer in respect of [Get Condition] command

In a response giving Dreameye status or function related information, the response is according to the following figure.

Item "Parameter 1"	Data format	Example response
Image storage capacity "80h"	Number of images. (FF-FFh: not specified)	00-1Fh (31 images)
Stored images "81h"	Number of images.	00-01h (1 image)
Data size "83h"	Number of [Data Transfer] commands required to transmit the data.	00-10h (16 times)
Frequency "90h"	In 1 kHz units.	0F-A0h (4.0 MHz)
Resolution "91h"	In pixels.	02-80h (640 pixels)
Flash memory size "94h" "96h"	In 1 Kbyte units.	07-C0h (1324 Kbytes)

Figure 3-27 Data transfer in response to [Get Condition] command / data format

bit	7	6	5	4	3	2	1	0
Data 1	Jang Gu	JPEG	0	0	0	0	0	0
Data 2	0	0	0	0	0	0	0	0

Figure 3 - 28 Data transfer in response to [Get Condition] command / data format (compression support: still images)

3.4.2 Data transfer in response to [Still Image Request] command

Issuing authority : Dreameye

Command code : 08h

Data size : 02h to FFh

Data field :

	Still image files 2 to 21h	Continuous still images files 0 and 1h JangGu Uncompressed Mode	Continuous still images files 0 and 1h JangGu Compression Mode
Function type	4 bytes	4 bytes	4 bytes
Header	2 bytes	2 bytes	2 bytes
Null data	6 bytes	6 bytes	6 bytes
image Header	0 bytes	4 bytes	4 bytes
Data	4 to 512 bytes	956 bytes or 476 bytes	Max 1004 bytes or Max 492 bytes
Null data	0 to 3 bytes	0 bytes	Variable Shown by VB bit in image header.

Figure 3-29 Number of data items in transfer data

Explanation : This is the response when still image data is requested.

A two-byte header is attached to the front of the data.

If the data size is not a multiple of four bytes, pad out to a multiple of four with null bytes.

When transmitting a single file spread across a number of [Data Transfer] commands, header for the second and subsequent [Data Transfer] commands is as shown in Figure 3-31.

Similarly, the header for the last [Data Transfer] command for the file is as shown in Figure 3-32. An example of the command is shown in the following figure.

Still image data comprises still image data stored in flash memory, continuous still images (JangGu compression mode and JangGu uncompressed mode). The number of transfer data items and the data structure depends on the data to be transferred.

For more details, refer to the JangGu specification and Figure 3-29 and Figure 3-30.

Data address	Data	Setting example	Setting explanation
+0000h	Command code	08h	[Data Transfer] command
+0001h	Transfer destination AP	01h	For extension device 1
+0002h	Transfer source AP	00h	From port A
+0003h	Data size	FFh	Data size is 1020 bytes
+0004h	Function type	00h	Function type is camera device function 00-00-08-00h
+0005h		00h	
+0006h		08h	
+0007h		00h	
+0008h	Header 1	80h	Start of still image data
+0009h	Header 2	00h	"00h"回目の [Data Transfer] command
+000Ah	Null data	00h	"00h" (fixed)
+000Fh	Null data	00h	"00h" (fixed)
+0010h	Image data (Header1)	8Ch	Still image data (for continuous still images, image Header 1)
+0011h	Image data (Header2)	77h	Still image data (for continuous still images, image Header 2)
+0012h	Image data (Header3)	Edh	Still image data (for continuous still images, image Header 3)
+0013h	Image data (Header4)	A3h	Still image data (for continuous still images, image Header 4)
+0014h	Image data	42h	Still image data
+03FFh	Image data	C2h	Still image data

Figure 3-30 Data transfer in response to [Still Image Request] command

(First [Data Transfer] command)

Data address	Data	Example	Explanation
+0008h	Header 1	00h	Intermediate still image data
+0009h	Header 2	01h	[DataTransfer] command number $01h + 256 \times n$ (where n is an integer)

Figure 3-31 Data transfer in response to [Still Image Request] command

(Second and subsequent [Data Transfer] commands)

Data address	Data	Example	Explanation
+0003h	Data size	12h	Data size is 72 bytes
+0008h	Header 1	40h	End of still image data
+0009h	Header 2	3Ah	[DataTransfer] command number 3Ah+256 × n (where n is an integer)
+0046h	Image data	86h	End of still image data
+0047h	Image data (Null data)	00h	Padded with null data to a multiple of four bytes

Figure 3-32 Data transfer in response to [Still Image Request] command

(Last [Data Transfer] command)

Data address	Data	7	6	5	4	3	2	1	0
+0010h	Image Header 1	FI1	FI0	Not set	PC12	PC11	PC10	PC9	PC8
+0011h	Image Header 2	PC7	PC6	PC5	PC4	PC3	PC2	PC1	PC0
+0012h	Image Header 3	VB15	VB14	VB13	VB12	VB11	VB10	VB9	VB8
+0013h	Image Header 4	VB7	VB6	VB5	VB4	VB3	VB2	VB1	VB0

Figure 3-33 Image header details

【FI[1:0] : Frame Information register】

In continuous still image transfer, when one frame is divided for transfer, this shows which packet it belongs to.

FI1	FI0	Explanation
1	0	Indicates belonging to the first packet of an image frame.
0	0	Indicates belonging to an intermediate packet of an image frame.
0	1	Indicates belonging to the last packet of an image frame.

Figure 3-34 Details of FI[1:0]

【PC[12:0] : Pixel Count】

This indicates how many pixels are included in a packet. The value is expressed in hexadecimal.

【VB[15:0] : Valid Bit】

Indicates how many bits within a packet are valid data. The value is expressed in hexadecimal.

4 Device Status

It is not possible to change or delete Device Status.

4.1 Fixed Device Status

Fixed Device Status contains the following information.

(1) Device ID (device)

Size : 16 bytes (0000-0001-0000-0800-0000-0000-0000h)

Details : See Figure 2 - 1

(2) Device ID (extension device)

Size : 16 bytes (0000-0800-C000-A830-0000-0000-0000h)

Details : See Figure 2- 2

(3) Region (device / extension device)

Size : 1 byte data (FFh)

Details : Worldwide

(4) Connection (device / extension device)

Size : 1byte (00h)

Details : Dreameye is not fitted with an expansion connector.

(5) Product name (device)

Size : 30 bytes

Details : "Dreamcast Camera Flash Device" in ASCII characters.

Any unused bytes are padded with space codes (20h).

(6) Product name (extension device)

Size : 30 bytes

Details : "Dreamcast Camera Flash L Device" in ASCII characters.

Any unused bytes are padded with space codes (20h).

(7) License information (device / extension device)

Size : 60 bytes

Details : "Produced By or Under License From SEGA ENTERPRISES, LTD." in ASCII characters.

Any unused bytes are padded with space codes (20h).

(8) Current consumption in standby mode (device)

Size : 2 bytes

Data : 200 mA

Details : In units of 0.1 mA: for Dreameye this appears as "D0-07h".

(9) Current consumption in standby mode (extension device)

Size : 2 bytes

Data : 0 mA

Details : In units of 0.1 mA: for Dreameye this appears as "00-00h".

(10) Maximum current consumption (device)

Size : 2 bytes

Data : 240 mA

Details : In units of 0.1 mA: for Dreameye this appears as "60-09h".

(11) Maximum current consumption (extension device)

Size : 2 bytes

Data : 0 mA

Details : In units of 0.1 mA: for Dreameye this appears as "00-00h".

4.2 Free Device Status

Size : 44 bytes

Data : "Version 1.000, 2000/02/25, 315-6283 "

Description : Contains firmware version, release date, and CPU part number.

5 Afterword

This specification may be changed until Rev. 1.00 is released.