Specification of Communication Protocol for Open Platform Camera

1.0 alpha

OPC Hack & Make Project

Document History

Date	Version	Description
June 30, 2015	1.0 alpha	Initial version.

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1.Introduction

Scope

- This document describes the application programming interface specification to control open platform camera manufactured by Olympus Corporation via wireless communication.
- The scope of this document is wireless communication between the open platform camera (“camera”) and control device including smartphone, tablet, and PC.

Disclaimer

- This document does not guarantee the behavior of applications programmed according to this document.
- Error processing inside the camera is not guaranteed if application controls the camera with commands or sequence of commands different from this document. The camera may not work properly.
- This document gives high priority to understandability and may not be strictly accurate in representation and notation, etc.
- This document is checked carefully but may include some errors.

Supported Camera

Olympus AIR A01

Glossary

Term	Definition
Camera	Open platform camera supported by this document.
Control Device	Electronic device that communicates wirelessly with the camera, controls it, and receives images. Control device includes smartphone, tablet, PC and other wireless devices that support protocols used in this specification.
Application	Software installed in control device to control the camera.
HTTP	Protocol defined in RFC2616. Equivalent to HTTP1.1.
RTP	Protocol defined in RFC3550.
DCF	Design rule for camera file system defined by Japan Electronics and Information Technology Industries Association (JEITA).
EXIF	Exchangeable image file format defined by Japan Electronics and Information Technology Industries Association (JEITA).
Camera Property	Setting value of the camera.
Operation Mode	Internal state of the camera.
Camera Event Notification	Notification of an event that occurred inside the camera to control device asynchronously.

Live View Image	Image to confirm composition and focus when shooting a photo.
AF Point	Auto Focus Point (AF Point) is used to 1) set coordinates on the subject to use for auto focus 2) reset coordinates 3) get coordinates of valid area on live view image to specify auto focus point.
Preview Image	Image generated after shooting a photo in order to review composition and focus, etc.
Image Transfer without Copy	Transfer of captured image to control device immediately after shooting a photo when camera property DESTINATION_FILE is set to DESTINATION_FILE_WIFI.
Clips	Movie recorded when camera property QUALITY_MOVIE is set to QUALITY_MOVIE_SHORT_MOVIE.
Thumbnail Image	Small size (160x120) picture mainly used for image list.
Original Image	Captured image saved in memory card that is inserted in the camera.
Resized Image	Image resized from original image.
Image for Control Device Display	Image with adjusted size and quality suitable for display on control device. Image with size adjusted to maximum size inside rectangle of 1920 x 1440 pixels. If movie is specified, the first frame is used. This image is stored in the header of original image or movie and the camera only transfers the image without resizing.

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2.Communication Protocol

Communication Overview

Communication protocol between the camera and control device is defined for each layer of the OSI reference model as follows.

Physical Layer and Data Link Layer

- Wireless LAN (IEEE802.11n 2.4GHz). Not including 5.0GHz.
- The camera runs in access point mode (AP mode), and the control device runs in station mode (STA mode).
- Encryption type is WPA2-PSK (AES).

Network Layer

- IP or ARP.
- The camera's IP address is static, 192.168.0.10.

Application Layer

- DHCP is used for IP address resolution of control device.
  - Camera becomes DHCP server, and control device becomes client.

Communication Session

Table 2-1 shows three types of communication sessions between the camera and control device. Connection must be established between the camera (CAM) and control device (DEV) when TCP port is used.

Table 2-1: Communication Session

ID	Session	Protocol		Port No.		Data flow
		Transport Layer	Application Layer	DEV	CAM	
1	Command Communication	TCP	HTTP	-	80 Always open	CAM->DEV DEV->CAM
2	Live View Image Transfer	UDP	RTP	Specified as the parameter of command to start live view.(Ex.5555)	-	CAM->DEV
3	Event Notification	TCP	Original	-	Specified as parameter of command to start event notification. (Ex.65000)	CAM->DEV

Refer to the following chapter regarding the details of each session.

ID	Session	Chapter
1	Command Communication	Chapter 3 Command Communication Chapter 6 Command List
2	Live View Image Transfer	Chapter 4 Live View Image Transfer
3	Event Notification	Chapter 5 Event Notification
Common		Chapter 7 Command Sequence Chapter 8 Property List

Operation Mode and State Transition

- The camera has multiple operation modes. Different functions are available in each operation mode. Change the operation mode using commands according to the desired function.
- See “Supported Operation Mode for Command and Command Sequence” section for details on supported commands in each operation mode.
- Fig. 2-1 shows the operation modes and transitions between them.

  - Standalone Mode
  - Recording Mode
  - Playback (Normal) Mode
  - Playback (Administration) Mode

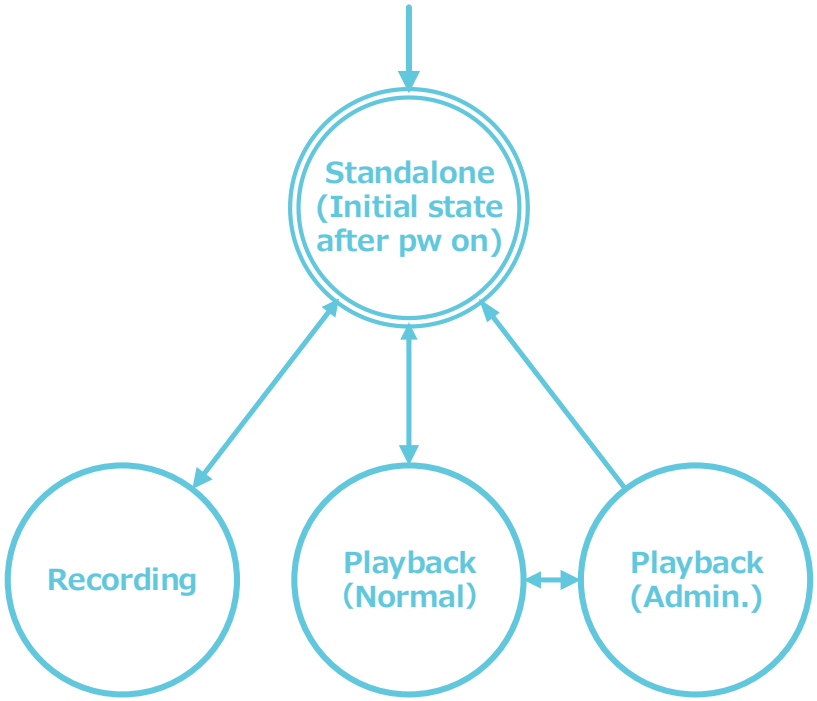


Fig. 2-1: Operation Mode Transition

NOTE

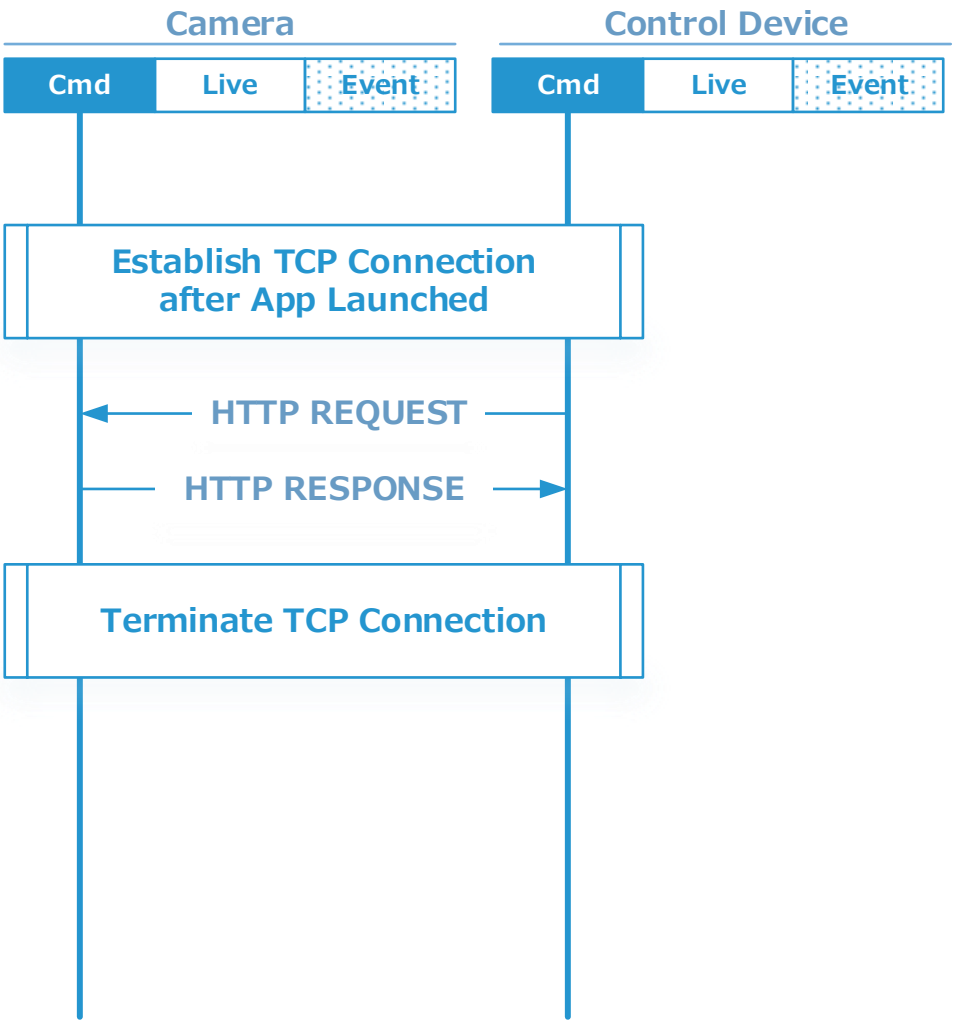
- The camera must return to standalone mode when application enters each of the following states.
  - Background state
  - Foreground state
- If the camera becomes standalone mode, exposure configuration of the camera is reset and becomes the same configuration as initial setting after power on.
- Transition from standalone mode to Playback (Administration) mode is not allowed.

3.Command Communication

Overview

- Main session to control the camera.
- Management and control of other sessions are performed via this session.
- Communication session in layers lower than application layer must be established according to “Communication Protocol” section.
- Application layer is HTTP communication.
  - Control device is HTTP client, and the camera is HTTP server.
  - Camera returns response for request from control device.
  - HTTP Version is 1.1.
  - HTTP method to be used is GET or POST.

Sequence



HTTP Request Format

HTTP request = Request Line Request Header CRLF Message Body

Request Line

Request Line = Method SP Request URI SP HTTP Version CRLF

Item	Description
Method Name	GET or POST
Request URI	Consist of command and its option for camera control. Refer to the following subsection for more details.
HTTP Version	HTTP/1.1

Request URI

Request URI = Command(? Option1 = Option Value1 & Option2 = Option Value 2 & …)

Item	Description
Command	Command for camera control
Option	■ Defined for each command. ■ If the command has an option, command and option are separated by "?." ■ Some commands have no option. ■ Option and its value are specified in the form of "option name = option value." ■ Multiple options are separated by "&." ■ The order of options is fixed. Different order of options may cause an error in the camera. See Command List for more details.

The camera interprets original letter and URL encoding in request URI. URL encode is not case-sensitive.

Original letter	URL encode (small letter)	URL encode (capital letter)
/	%2f	%2F
+	%2b	%2B
-	%2d	%2D

Request Header

- The camera accepts request if and only if the header and field value are set.
- RFC2616 distinguishes general header, request header and entity header, but this document handles all of them as request header.
- The camera accepts new line codes including CR+LF, CR and LF.

Header	Field value	Camera processing
Host	192.168.0.10	If not set, the camera returns error code 400.
User-Agent	OlympusCameraKit	If other values are set, the camera does not accept subsequent commands.

Request Message Body

- Format is XML.
- First line must be <?xml version="1.0"?>.
- When Content-type is text/xml and there are multiple elements in the first layer, wrap the elements with <request> and </request>.

```
<?xml version="1.0"?>
<request>
 <element1>…</element1>
 <element2>…</element2>
</request>
```

Request Example

```
GET /switch_cameramode.cgi?mode=play HTTP/1.1
Host:192.168.0.10
User-Agent:OlympusCameraKit
```

HTTP Response Format

HTTP Response = Status Line Response Header CRLF Message Body

Status Line

Status Line = HTTP Version SP Status Code SP Reason CRLF

Item	Description
HTTP Version	HTTP/1.1
Status code	Appended item
Reason	Appended item

Response Header

- RFC2616 distinguishes general header, response header and entity header, but this document handles all of them as response header.

Response header

Header	Field Value	Description
Connection	Keep-Alive / close	Field value is decided depending on the request header. The camera returns “close” anytime for exec_pwoff.cgi.
Content-type	Appended item	Field value is decided depending on the response body.
Content-Length	Positive integer number or zero	Byte count of content. Set zero value if message body does not exist.
Header started with “X”.		Original header used in the response of some commands.

Field Value of Content-type Header.

Content-type Field Value	Response Body
image/jpeg	File with .jpg extension or image data equivalent to JPEG file including preview image.
video/x-msvideo	File with .AVI extension.
video/quicktime	File with .MOV extension.
application/octet-stream	File with .MPO extension.
application/octet-stream	File with .ORF extension (RAW image).
text/plain	List of images
text/xml	XML

Non-supported Response Header

Header	Field Value	Description
Transfer-Encoding	chunked	The camera does not support chunk encoding.

Response Message Body

- Format is XML.
- First line must be <?xml version="1.0"?>.
- When Content-type is text/xml and there are multiple elements in the first layer, wrap the elements with <response> and </response>.

```
<?xml version="1.0"?>
<response>
 <element1>…..</element1>
 <element2>…..</element2>
</response>
```

- When status code is 520, additional information including error code is appended to message body.

Response Example

```
HTTP/1.1 200 OK
Content-Type: text/xml
Content-Length: ????
…

<?xml version="1.0"?>
<response>
<element1>xxxx</element1>
<element2>xxxx</element2>
</response>
```

Status Code

Camera returns appropriate status code and reason phrase to control device according to the requested processing result.

Status Code and Reason Phrase

Category	Status Code	Reason Phrase	Use Case

Success	200	OK	■ Standard response for successful HTTP response except code 202.
	202	Accepted	■ The request has been accepted for processing, but camera cannot send result soon. ■ Request for power-off.
Redirection	301	Moved Permanently	■ It's redirected to other directories. ■ Access to a root directory is redirected to a DCF directory.
Client Error	400	Bad Request	■ The request has bad syntax including the following cases: - There is no Host header. - Path starts without slash.
	404	Not Found	■ The requested file folder is not detected. ■ The requested file does not exist. ■ The requested file exists but cannot be accessed.
	408	Request Timeout	■ The camera timed out waiting for the request. ■ The request is not terminated with CRLF and camera does not receive subsequent data.
	411	Length Required	■ The POST request does not specify the length of its content by Content-Length header.
	413	Request Entity Too Large	■ The length of requested content is too large, and camera cannot process the body.
	414	Request-URI Too Long	■ The requested URI has more than 128 characters.
Server Error	500	Internal Server Error	■ CGI syntax error.
	501	Not Implemented	■ The requested method is not GET or POST.
	503	Service	■ Service temporarily can't be

		Unavailable	used. ■ Camera is overloaded.
	505	HTTP Version Not Supported	■ HTTP Version is not 1.1.
Vendor-defined Server Error	520	Vendor Internal Error	■ Error occurred in camera. ■ The error code is provided in body.

Additional Information of Status Code 520

Response Header

- Content-Type: text/xml

Message Body

- Format is XML.
- The following element is surrounded with <response> and </response>.

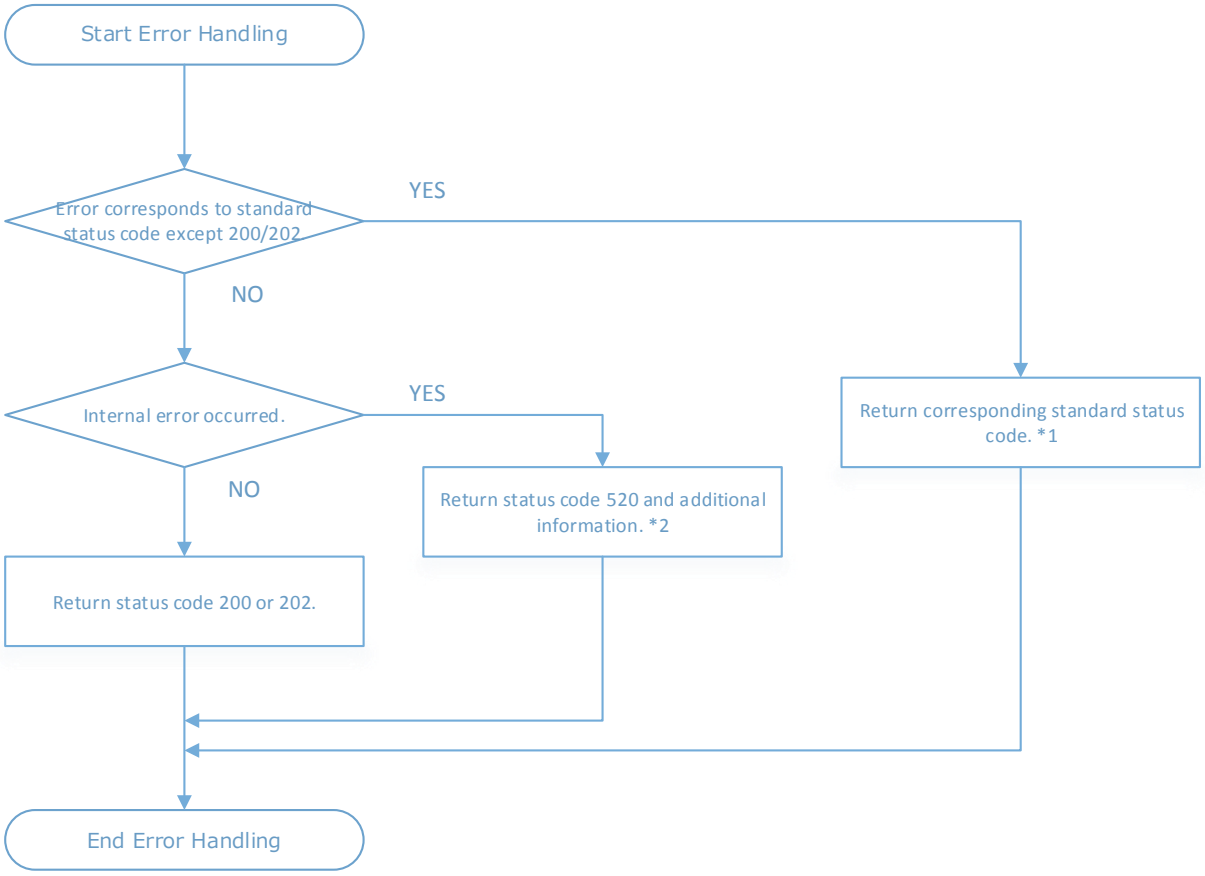
Element	Content
Errorcode	Error code See Error Code section.
Errormsg	Error message as reason phrase. "WIFI_INTERNAL_ERROR" is set as a fixed message.
Dbgmsg	Reserved area “reserved” is set as a fixed message.

Error Code

Error code	Description
0xB000	Internal error.

Sequence to Decide Status Code and Error Code

- The camera notifies of only one code, whichever is determined first.



1)
301 Moved Permanently
400 Bad Request
404 Not Found
408 Request Timeout
413 Request Entity Too Large
414 Request-URI Too Long
411 Length Required
500 Internal Server Error
501 Not Implemented
503 Service Unavailable
505 HTTP Version Not Supported

2)
0xB000 Internal error

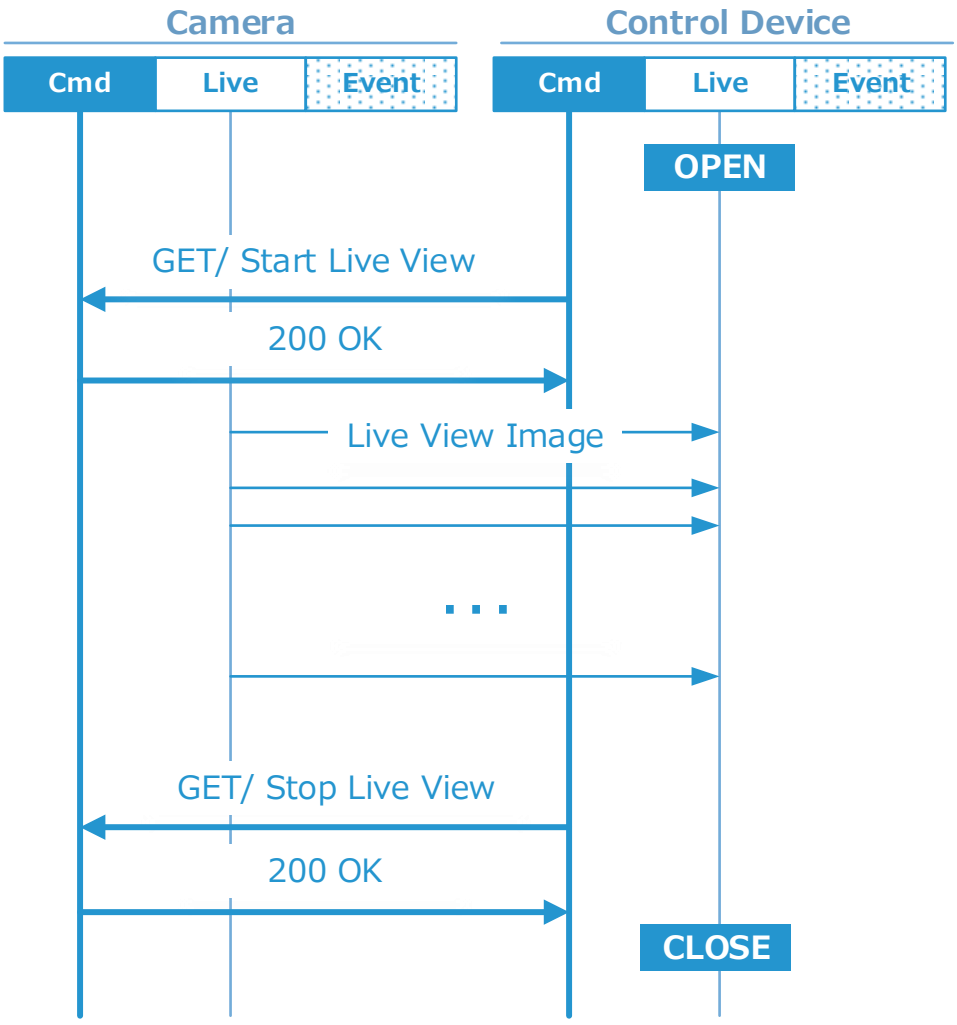
4. Live View Image Transfer

Overview

- Session used to transfer live view image from camera to control device.
- Transfer live view image data over RTP built on UDP/IP.
- Extension header of RTP packet has the camera's setting information, which is notified every frame of live view image.

Sequence

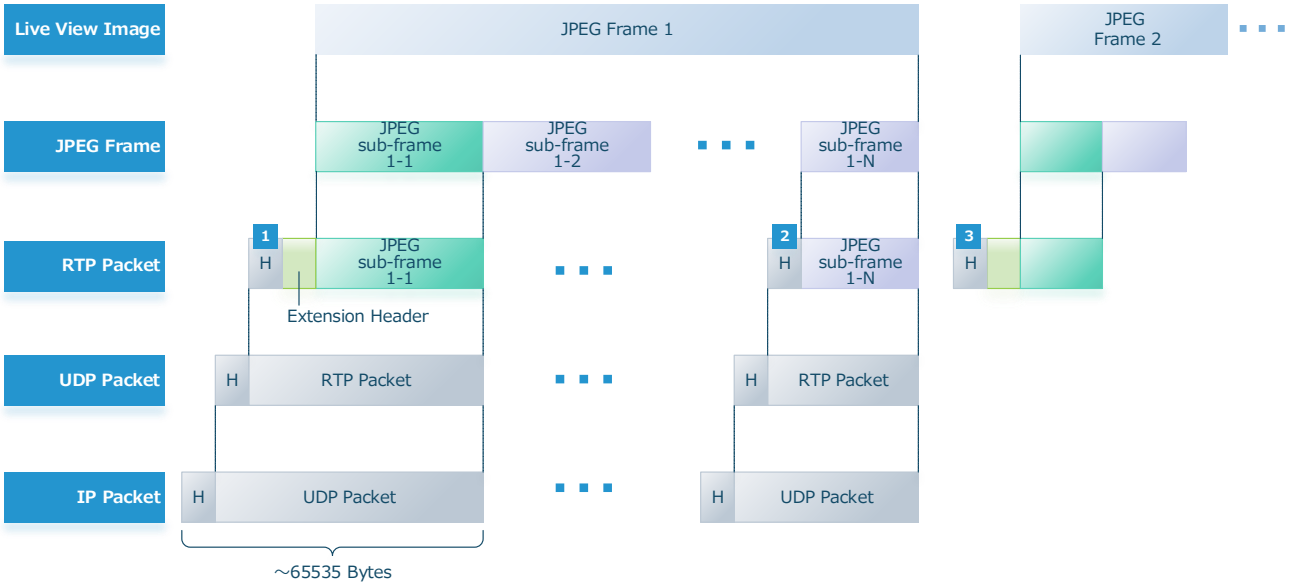
- Port number is assigned by the command to start live view image using the command communication.



Format of Live View Image

- Live view is a sequence of still images in JPEG format that are sent successively from the camera as a frame.
- One JPEG frame is divided into more than one sub-frame stored in the payload of the IP packet.

■ Extension header of RTP packet is added only to the first JPEG sub-frame.



* H: Standard header of each protocol

Fig. 4-1: Format of live view image

RTP Packet Format

■ Byte order is network byte order (big endian).

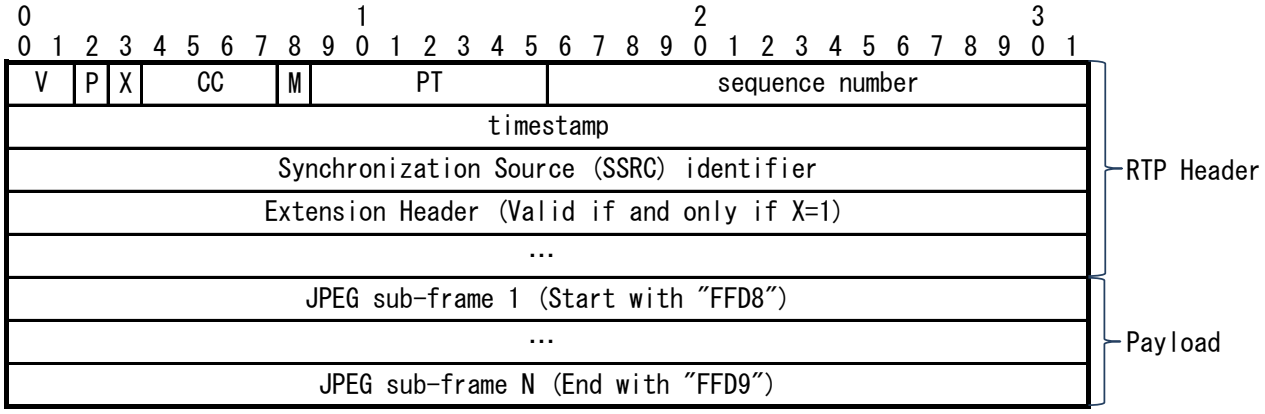


Fig. 4-2: Format of RTP Packet

RTP Header

Parameter	Value
V (Version)	'2' (Fixed value)
P (Padding)	'0' (Fixed value)
X (eXtension)	'1' when adding extension header. '0' when packet is without extension header. First packet will be '1',

	and others will be '0'.
CC (Contributing Source Count)	'0' (Fixed value)
M (Marker)	The last packet of JPEG payload will be '1', and others will be '0'. In Fig. 4-1, RTP Packets 1 and 3 will be '0' and Packet 2 will be '1'.
PT (Payload Type)	'96' (Fixed value)
sequence number	Start with '0' and increment by 1 for each divided RTP frame. Wrap around when overflow.
timestamp	Value describes JPEG frame number. Start with '0' and increment value with '1'. JPEG frame 1 is '0', JPEG frame 2 is '1', and JPEG frame 3 is '2.' Reset to '0' when overflow.
SSRC	Random value determined when RTP session starts. Same value is used until end of live-view image transfer. If unnecessary, receiver side can ignore the value.

Payload

Data	Description
JPEG sub-frame	Each frame starts with 'FFD8' and ends with 'FFD9'. The first JPEG sub-frame (JPEG sub-frame 1-1 in Fig. 4-1) starts with 'FFD8', and the last JPEG sub-frame (JPEG sub-frame 1-N in Fig. 4-1) ends with 'FFD9'.

RTP Extension Header

Overview

- Setting information and status of camera are stored.
- Extension header of RTP packet is added only to the first JPEG sub-frame.
- The extension header only exists when X parameter in the RTP Header is set to '1'.
- Extension header consists of header field and one or more individual information field(s).
- Header field includes version information and data length of individual information.

Format

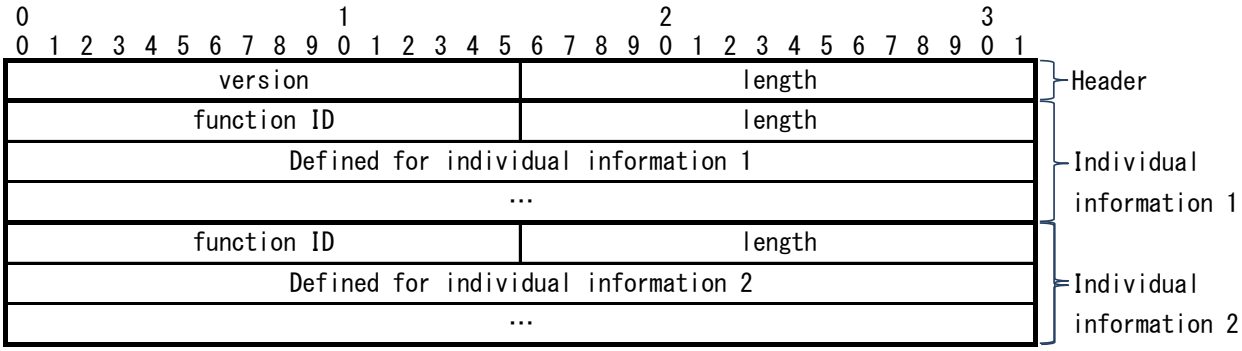


Fig. 4-3: RTP Extension Header Format

Parameter of Header Field

Parameter	Value
version	Protocol version of extension header. Currently fixed to '1'.
length	Data length of extension header excluding header. Count of 32-bit words.

Parameter of Individual Information Field

Parameter	Value
function ID	Every Individual information has a unique integer value.
length	32-bit word length of Individual information field excluding function ID parameter and this parameter.
Area defined for every Individual information.	See "Format of Individual Information Field" section for more details.

List of Individual Information

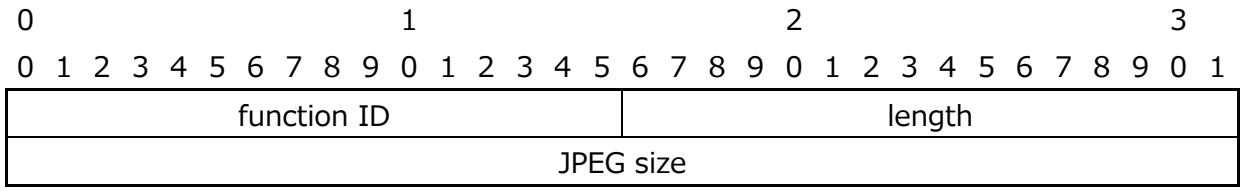
function ID	length	Description	Identifier
1	1	Frame Size of Live View Image	framesize
2	5	Auto Focus Information	afframeinfo
3	1	Status of Mounted Memory Card	mntmediainfo
4	1	Camera Orientation	rotation
5	1	Storage Capacity (Number of Images)	maxtakenum
8	3	Shutter Speed	shutspeedvalue
9	3	F-Number	focalvalue
10	3	Exposure Compensation	expcomp
12	3	ISO Sensitivity	isospeedvalue
16	1	Exposure / Exposure Metering Warning	expphotowarning
17	1	Focus Mode	focusinfo
18	3	Zoom	zoominfo

106	2	Storage Capacity (Number of Seconds for Movie Recording)	maxmovietime2
107	3	Level Meter	levelvial
108	2	Face Detection 1	facerecognize1
109	2	Face Detection 2	facerecognize2
110	2	Face Detection 3	facerecognize3
111	2	Face Detection 4	facerecognize4
112	2	Face Detection 5	facerecognize5
113	2	Face Detection 6	facerecognize6
114	2	Face Detection 7	facerecognize7
115	2	Face Detection 8	facerecognize8
200	1	Preview Image during Continuous Shooting	contrecview

Format of Individual Information Field

Frame Size of Live View Image

Format



Parameter

Parameter name	設定値
function ID	1
length	1
JPEG size	Bytes in one frame of JPEG image. When only extension information instead of JPEG image is sent, value is set to ‘0’.

Auto Focus (AF) Information

Format

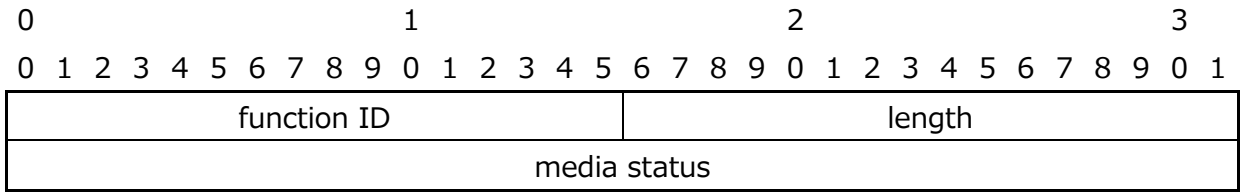
0										1										2										3		
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID										length																					
frame color																															
x-coordinate																															
y-coordinate																															
frame width																															
frame height																															

Parameter

Parameter	Value
function ID	2
length	5
frame color	Result of auto focus 0: Not performed 1: Succeeded 2: Failed >3: Not supported
x-coordinate	x coordinate of AF frame. If frame color is set to ‘0’, then value is set to ‘0’, and control device should ignore.
y-coordinate	y coordinate of AF frame. If frame color is set to ‘0’, then value is set to ‘0’, and control device should ignore.
frame width	Width of AF frame. If frame color is set to ‘0’, then value is set to ‘0’, and control device should ignore.
frame height	Height of AF frame. If frame color is set to ‘0’, then value is set to ‘0’, and control device should ignore.

Status of Mounted Memory Card

Format

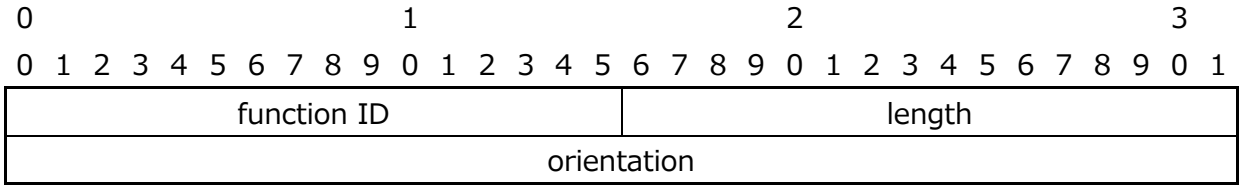


Parameter

Parameter	Value
function ID	3
length	1
media status	[1:0] Recording media information 01 Memory card mounted 00 Memory card not mounted [2] Capacity 1 Not full 0 Full [3] Write-protect 1 Protected 0 Unprotected [4] Media error 1 Error occurred 0 No error [5] Writing to media 1 Writing 0 Not writing [31:6] Reserved. Fixed to ‘0’.

Camera Orientation

Format

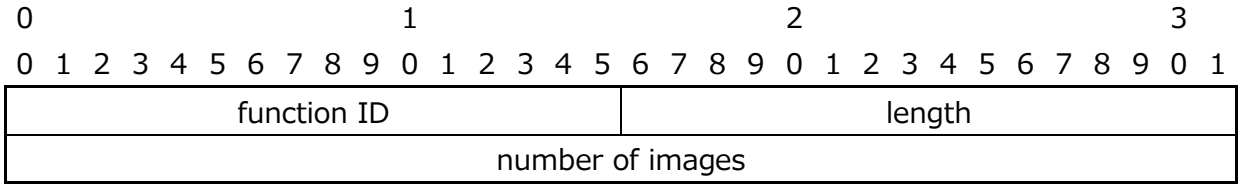


Parameter

Parameter	Value
function ID	4
length	1
orientation	Orientation of camera body. Same value will be written in orientation tag in EXIF. 1: 0 degrees 3: 180 degrees 6: 90 degrees clockwise 8: 270 degrees clockwise

Storage Capacity (Number of Images)

Format



Parameter

Parameter	Value
function ID	5
length	1
number of images	The maximum number of images that can be stored in the media. When number of images is over 10,000, returned value is 9,999.

Shutter Speed

Format

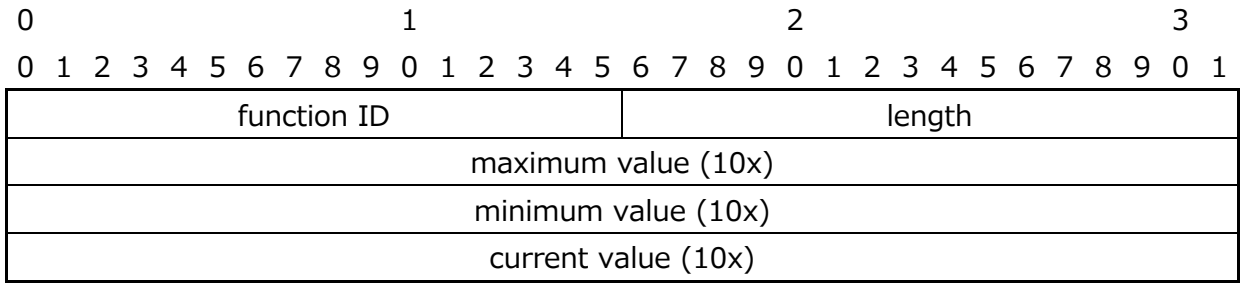
0										1										2										3	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID										length																			
minimum value (numerator)										minimum value (denominator)																			
maximum value (numerator)										maximum value (denominator)																			
current value (numerator)										current value (denominator)																			

Parameter

Parameter	Value
function ID	8
length	3
minimum value (numerator)	The lowest shutter speed value is set in numerator field and denominator field. Ex.) If shutter speed is 60 seconds, numerator is set to 60, and denominator is set to 1.
minimum value (denominator)	
maximum value (numerator)	The highest shutter speed value is set in numerator field and denominator field. Ex.) If shutter speed is 1/4000 seconds, numerator is set to 1, and denominator is set to 4000.
maximum value (denominator)	
current value (numerator)	Current shutter speed value in the same format as the highest or the lowest values. Numerator and denominator fields are limited to integer values without overflow. The same shutter speed can be expressed in multiple equivalent ways. Ex. 1) If the shutter speed is 3.2 seconds, possible numerator and denominator values are (32, 10) and (16, 5). Ex. 2) If the shutter speed is 1/2.5 seconds, possible values are (10, 25) and (2, 5). Ex. 3) If the shutter speed is 1/8 seconds, possible values are (1, 8) and (10, 80).
current value (denominator)	

F-Number

Format



Parameter

Parameter	Value
function ID	9
length	3
maximum value (10x)	Ten-times value of upper limit of F-number. Ex.) For lens with F-number between F1.8 and F22, 220 is set. If no lens is mounted, 0 is set.
minimum value (10x)	Ten-times value of lower limit of F-number. Ex.) For lens with F-number between F1.8 and F22, 18 is set. If no lens is mounted, 0 is set.
current value (10x)	Ten-times value of current F-number in the same format as upper limit or lower limit values. If no lens is mounted, 0 is set.

Exposure Compensation

Format

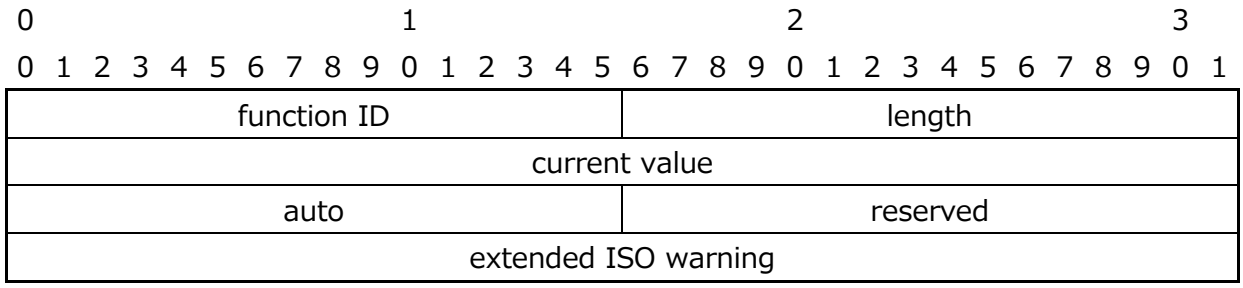
0	1	2	3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1			
function ID		length	
maximum value (10x)			
minimum value (10x)			
current value (10x)			

Parameter

Parameter	Value
function ID	10
length	3
maximum value (10x)	Ten-times value of upper limit in signed four-byte format. Ex.) If the range of exposure compensation is between +3.0 and -3.0, the upper limit value is +3.0, and 30 (0x0000001E) is set.
minimum value (10x)	Ten-times value of lower limit in signed four-byte format. Ex.) If the range of exposure compensation is between +3.0 and -3.0, the lower limit value is -3.0, and -30 (0xFFFFFFE2) is set.
current value (10x)	Ten-times value of current compensation value in the same format as upper limit or lower limit values.

ISO Sensitivity

Format



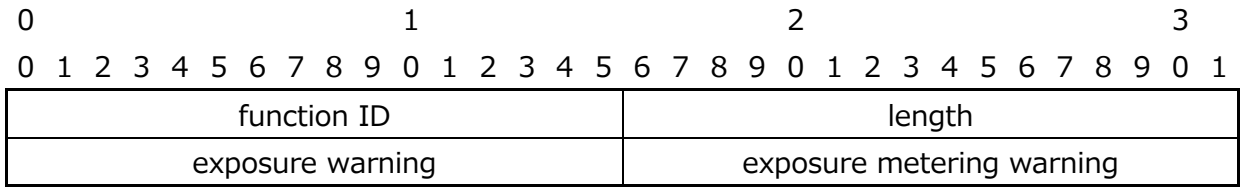
Parameter

Parameter	Value
function ID	12
length	3
current value	Refer to the table below.
auto	
extended ISO warning	When Auto mode is enabled and effective ISO value is equal to Extended ISO value, this warning flag is set to ‘1’. Otherwise, set to ’0’. Camera cannot guarantee high image quality when set to Extended ISO value.

current value	auto	Description
Effective ISO value	1	Auto mode is enabled and effective value is not LOW.
0xFFFE	1	Auto mode is enabled and effective value is LOW.
ISO value	0	ISO sensitivity is set to fixed value except LOW manually.
0xFFFE	0	ISO sensitivity is set to LOW manually.

Exposure/Exposure Metering Warning

Format



0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1	
function ID	length
exposure warning	exposure metering warning

Parameter

Parameter	Value
function ID	16
length	1
exposure warning	If warning occurs, camera cannot determine ISO sensitivity, shutter speed or aperture value corresponding to current exposure value. When shooting during the warning, the image may be underexposed or overexposed. 1: Warning 0: No warning
exposure metering warning	If warning occurs, subject is too dark or too bright to be measured by the camera's exposure meter. When shooting during the warning, the image may be underexposed or overexposed. 1: Warning 0: No warning

Focus Mode

Format

0										1										2										3	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID																length															
focus system																reserved															

Parameter

Parameter	Value
function ID	17
length	1
focus system	0: Single (S-AF) 1: Continuous (C-AF) 2: Manual (MF)

Zoom

Format

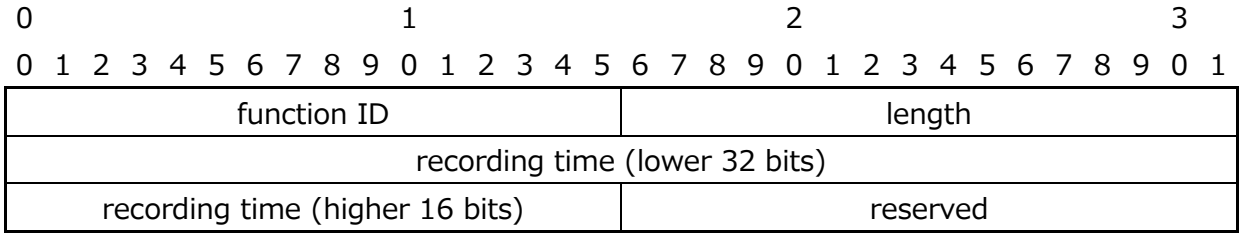
0										1										2										3	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID																length															
reserved																wide															
current value																tele															
reserved																															

Parameter

Parameter	Value
function ID	18
length	3
wide	Focal length at the wide end of the lens (mm). If prime lens is mounted, same as current value. If no lens is mounted, 0 is set.
current value	Current focal length of the lens (mm). If prime lens is mounted, current value is set. If no lens is mounted, 0 is set.
tele	Focal length at the telephoto end of the lens (mm). If prime lens is mounted, same as current value. If no lens is mounted, 0 is set.

Storage Capacity (Number of Seconds for Movie Recording)

Format



0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1	
function ID	length
recording time (lower 32 bits)	
recording time (higher 16 bits)	reserved

Parameter

Parameter	Value
function ID	106
length	2
recording time (lower 32 bits)	The maximum number of seconds a movie can be stored in the memory card.
recording time (higher 16 bits)	

Level Meter

Format

0	1	2	3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1			
function ID		length	
accuracy		orientation	
roll			
pitch			

Parameter

Parameter	Value
function ID	107
length	3
accuracy	Reliability of measurement of roll angle and pitch angle. [0] Roll angle 1 Reliable 0 Not reliable [1] Pitch angle 1 Reliable 0 Not reliable [2:31] Reserved
orientation	0x00: Lens mount tilt is 0 degrees. 0x01: Lens mount tilt is 90 degrees clockwise. 0x02: Lens mount tilt is 180 degrees. 0x03: Lens mount tilt is 270 degrees clockwise. 0x04 Camera is pointed down. 0x05 Camera is pointed up.
roll	Ten-times value of roll angle of camera body in degrees. Range is 0xFC7C (−900) to 0x0384 (900).
pitch	Ten-times value of pitch angle of camera body in degrees. Range is 0xFC7C (−900) to 0x0384 (900).

Face Detection 1-8

Format

0								1								2								3		
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID																length															
x-coordinate																y-coordinate															
width																height															

Parameter

Parameter	Value
function ID	108 to 115
length	2
x-coordinate	x coordinate of face detection frame. If not recognized, ‘0’ is set. The coordinate system is shown in Fig.6-1.
y-coordinate	y coordinate of face detection frame. If not recognized, ‘0’ is set. The coordinate system is shown in Fig.6-1.
width	Width of face detection frame. If not recognized, ‘0’ is set.
height	Height of face detection frame. If not recognized, ‘0’ is set.

Preview Image during Continuous Shooting

If this information is attached, following JPEG frame is not live view image but preview image during continuous shooting.

Format

0								1								2								3		
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
function ID																length															
JPEG size																															

Parameter

Parameter	Value
function ID	200
length	1
JPEG size	Byte size of JPEG image.

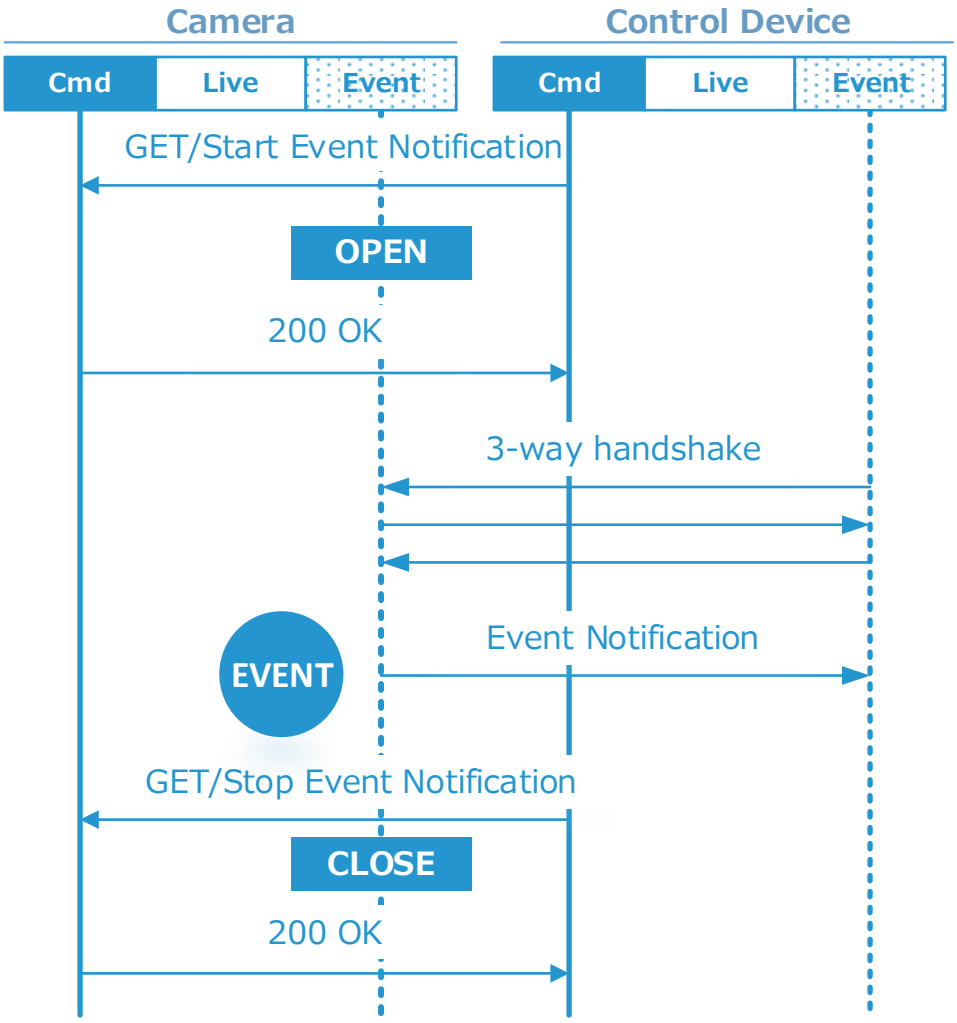
5.Event Notification

Overview

- Event notification is a communication session to notify of events that occurred in the camera.
- Event notification uses original communication protocol over TCP/IP.
- Control device must send the command to start event notification and establish communication session before using command with event notification.

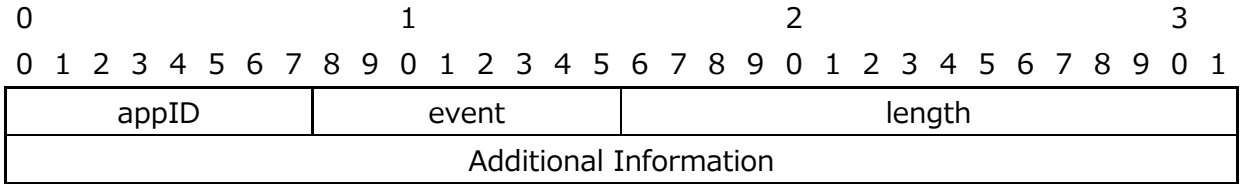
Sequence

- Control device assigns port number using the command to start event notification.
- The camera opens TCP port for event notification immediately after receiving the command to start event notification and waits for a connection request from the control device. If TCP port has been opened, the camera resets and reopens the port.



Format

- Use network byte order (big endian).



Parameter

Parameter	Description
appID	Application ID
event	Event ID
length	Byte length of additional information. If there is no additional information, value is zero.

Additional Information

- Additional information is in XML format.
- Start with <?xml version =“1.0”?>.
- Root element is <root>.

```
<?xml version="1.0"?>
<root>
 <element1>…..</element1>
 <element2>…..</element2>
</root>
```

Camera Event List

appID	event	Description	Additional Information	
			Element	Content
2	5	Battery Level Changed	-	
	101	Auto Focus Result	result	ok : Auto focus succeeded ng : Auto focus failed none : Auto focus disabled (For example, the camera is in manual focus mode or lens without electrical contact is mounted.)
			location	Auto focus coordinates in form of (X coord.)x(Y coord.). Returned coordinates is top-left corner of auto focus frame. Coordinate value is four-digit zero-padded positive integer number in live view coordinate system. This element is notified if and only if result is ok. Ex.)0320x0240 See Auto Focus Point section for more details on coordinate system.
			size	Size of auto focus frame in form of (Width)x(Height). The values of width and height are four-digit zero-padded positive integer numbers. This element is notified if and only if result is ok. Ex.)0036x0036
	102	Ready to Capture	-	
	103	Capture Started	-	
	106	Capture Finished	-	
	107	Capture Process Finished	-	
	108	Preview Image Generated	-	
	110	Movie Recording Stopped	-	
	111	Progress Changed	processing	Progress rate as a fraction. Denominator is fixed to 100. Ex.)10/100
	117	Image Transfer Requested	-	

	120	Lens Mount Status Changed	-	
	122	Lens Drive Stopped	-	
	132	Memory Card Mount Status Changed	-	
	133	Temperature Condition Changed	-	
	134	Media Protection Removed	-	
	135	Movie Recording Started	-	
	201	Operation Mode Changed	-	
	206	Camera Property Value Changed	prop	Property name whose value changed Note) If there are multiple properties to be notified, this event occurs for each property. The response body does not include multiple XML elements.

6. Command List

Camera System Category

Get Connection Mode

HTTP REQUEST

Method

GET	POST

Command

```
get_connectmode.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Header	Field Value
Content-type	text/xml

Message Body

Element	Content	Description
connectmode	OPC	Fixed value If this value has other content, command receiver is not OPC. Control device should not send subsequent commands.

Switch Operation Mode

HTTP REQUEST

Method

GET	POST

Command

```
switch_cameramode.cgi
```

Option

No.	Option Name	Description
1	mode	Camera Mode

Option 1. **mode**

Option Value	Description
play	Playback Mode (Normal)
rec	Recording Mode
standalone	Standalone Mode (Initial State after power on)
playmaintenance	Playback Mode (Administration)

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Header	Field Value
Content-type	text/xml

Message Body

Element	Content	Description
result	OK	Command succeeded.
	NG	Command failed.

Get Communication Interface

HTTP REQUEST

Method

GET	POST

Command

```
get_commpath.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Header	Field Value
Content-type	text/xml

Message Body

Element	Content	Description
path	wifi	Use Wi-Fi interface.
	ble	Use Bluetooth Smart interface.

Switch Communication Interface

HTTP REQUEST

Method

GET	POST

Command

```
switch_commpath.cgi
```

Option

No.	Option Name	Description
1	path	Communication interface

Option 1. **path**

Option Value	Description
wifi	Use Wi-Fi interface.
ble	Use Bluetooth Smart interface.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

N/A

Message Body

N/A

Power Off

HTTP REQUEST

Method

GET	POST

Command

```
exec_pwoff.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

202

Response Header

N/A

Message Body

N/A

Start Event Notification

HTTP REQUEST

Method

GET	POST

Command

```
start_pushevent.cgi
```

Option

No.	Option Name	Description
1	port	Port Number

Option 1. **port**

Option Value	Description
Port Number	TCP listening port number of the camera. Positive decimal integer number from 1024 to 65535.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

N/A

Stop Event Notification

HTTP REQUEST

Method

GET	POST

Command

```
stop_pushevent.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

N/A

Get Camera Status

HTTP REQUEST

Method

GET	POST

Command

```
get_state.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

Element	Description	Content	Description
cardstatus	Status of memory card mount	unmount	Disabled because the card is not mounted.
		readonly	The card is already mounted. But cannot write because the card is read-only.
		cardfull	The card is already mounted. But cannot write because the card has no free space.
cardremainnum	The maximum number of images that can be stored on the memory card.	Number of images	Decimal integer number. If memory card is not mounted, zero is set.
cardremainsec	The maximum number of seconds for a movie that can be stored on the memory card.	Number of seconds [sec]	Decimal integer number. If memory card is not mounted, zero is set.
cardremainbyte	Free space of the memory card attached to the camera.	Free space [byte]	Decimal integer number.
lensmountstatus	Status of lens mount	normal	The lens is mounted and available.
		down	The lens is mounted. However retractable lens is not extended.
		cantshoot	Disabled because of other reason.
		nolens	Disabled because no lens is mounted.
imagingstate	Temperature condition inside the camera	normal	Normal temperature.
		hightemp	High temperature.
focallength	Focal Length	Focal length [mm]	Decimal integer number. If mounted lens has no

			electrical contact, zero is set.
widefocallength	Focal length at the wide end of the lens.	Focal length [mm]	Same as focallength element for prime lenses. If mounted lens has no electrical contact, zero is set.
telefocallength	Focal length at the telephoto end of the lens.	Focal length [mm]	Same as focallength element for prime lenses. If mounted lens has no contact, zero is set.
electriczoom	The lens is equipped with a motorized zoom.	OK	Equipped.
		NG	Not equipped.
macrosetting	The lens is equipped with a macro mode switch, and the switch is on.	OK	Macro mode switch is on.
		NG	Other cases.

Camera Property Control Category

Get Camera Property Descriptor

HTTP REQUEST

Method

GET	POST

Command

```
get_camprop.cgi
```

Option

No.	Option Name	Description
1	com [required]	Subcommand
2	propname	Camera property name

Option 1. **com**

Option Value	Description
desc	Subcommand to get descriptor.

Option 2. **propname**

Option Value	Description
Camera property name	Camera Property name to get descriptor.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

■ Level 1

Element	Description	Content	Description
desc	descriptor	Elements in level 2.	

■ Level 2

Element	Description	Content	Description
propname	Camera property name	Camera property name	See camera property list.
attribute	Access permission flag	get	Read-only.
		getset	Readable and writable.
value	Camera property value	Camera property value	Value set in the camera property.
enum	List of camera property values	List of camera property values	List of values that can be set in the camera property. Values are separated by spaces. If the camera property does not provide the list of available values, this element is not included in the message body.

Get Camera Property Value

HTTP REQUEST

Method

GET	POST

Command

```
get_camprop.cgi
```

Option

No.	Option Name	Description
1	com [required]	Subcommand
2	propname	Camera property name

Option 1. **com**

Option Value	Description
get	Subcommand to get camera property value.

Option 2. **propname**

Option Value	Description
Camera property name	Property name of desired value. See camera property list for more details.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

■ Level 1

Element	Description	Content	Description
get	Fixed element name.	Element in level 2.	

■ Level 2

Element	Description	Content	Description
value	Camera property value	Camera property value	Value set in the camera property.

Set Camera Property Value

HTTP REQUEST

Method

GET	**POST**

Command

```
set_camprop.cgi
```

Option

No.	Option Name	Description
1	com [required]	Subcommand
2	propname	Camera property name

Option 1. **com**

Option Value	Description
set	Subcommand to set camera property value.

Option 2. **propname**

Option Value	Description
Camera property name	Property name to set the value. See camera property list for more details.

Message Body

■ Level 1

Element	Description	Content	Description
set	Fixed element	Element in level 2	

■ Level 2

Element	Description	Content	Description
value	Camera property value	Camera property value	Value to set in the camera property.

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

N/A

Image Browsing Category

Get Resized Image

HTTP REQUEST

Method

GET	POST

Command

```
get_resizeimg.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to original image.
2	size	Pixel size of the long side of the resized image in decimal.

Option 1. **DIR**

Option Value	Description
File path to original image.	Ex.)/DCIM/100OLYMP/P6230001.JPG

Option 2. **size**

Option Value	Description
0640	Resize long side of the image to 640 pixels.
1024	Resize long side of the image to 1024 pixels.
1280	Resize long side of the image to 1280 pixels.
1600	Resize long side of the image to 1600 pixels.
1920	Resize long side of the image to 1920 pixels.
2048	Resize long side of the image to 2048 pixels.
2560	Resize long side of the image to 2560 pixels.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:image/jpeg
```

Message Body

Resize Image (JPEG)

Get Image List

HTTP REQUEST

Method

GET	POST

Command

```
get_imglist.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to DCF directory[1].

Option 1. **DIR**

Option Value	Description
File path to DCF directory.	Ex.) /DCIM/100OLYMP

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/plain
```

Message Body

Image list.
See the next page for more details.

1) DCF directory contains image and video files. See “Directory Tree of Content Files” section.

Format of Image List

- Line 1 (Fixed value)

```
VER_100
```

- Lines after line 1: File information (One file per line).

```
<Directory>,<filename>,<size>,<attribute>,<date>,<time>
```

Option Name	Description
directory	Name of directory that includes image or movie files.
filename	File name.
size	File size in decimal.
attribute	File attribute in decimal. If only bit1 is set, this value is 2 in decimal. ■ bit 0: read only ■ bit 1: hidden file ■ bit 2: system file ■ bit 3: volume ■ bit 4: directory ■ bit 5: archive
date	Date information in decimal. ■ bits 4-0: day (1-31) ■ bits 8-5: month (1-12) ■ bits 15-9: year (0 is 1980. 35 is 2015.)
time	Time information in decimal. ■ bits 4-0: seconds/2 (0-29) ■ bits 10-5: minutes (0-59) ■ bits 15-11: hours (0-23)

- Example

```
VER_100
/DCIM/100OLYMP,P6230001.JPG,269117,32,18324,25692
```

NOTE

- The list may not be sorted by file name or date and time information.

Get Image for Control Device Display

HTTP REQUEST

Method

GET	POST

Command

```
get_screennail.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to DCF object[1]

Option 1. **DIR**

Option Value	Description
File path to DCF object	Ex.) /DCIM/100OLYMP/P6230001.MOV /DCIM/100OLYMP/P6230002.JPG

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Header	Field Value
Content-type	image/jpeg

Message Body

Image for control device display[2] (JPEG image)

1) DCF object is image and video files. See “Directory Tree of Content Files” section.
2) The image size is adjusted to maximum size inside the rectangle of 1920 x 1440. If movie is specified, the first frame is used. This image is stored in the header of original image or movie, and the camera just transfers the image without resizing.

Get Movie Information

HTTP REQUEST

Method

GET	POST

Command

```
get_movfileinfo.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to original movie.

Option 1. **DIR**

Option Value	Description
File path to original movie.	Ex.) /DCIM/100OLYMP/P6230001.MOV

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

Element	Content	Description
playtime	Recording time [sec]	Positive integer number in decimal.
moviesize	Frame size	Width and height of movie frame. Width and height are zero-padded four-digit integer numbers in decimal. Ex.) Width: 320px, Height: 240px moviesize=0320x0240
shortmovie	yes	Movie is recorded as Clips.
	no	Movie is not recorded as Clips.
shootingdatetime	Shooting date and time	Format is "YYYYMMDDThhmm". 'T' is delimiter. If date information is not set, the element is returned without content. Ex.) 20141124T1234

Get Image Information

HTTP REQUEST

Method

GET	POST

Command

```
get_imageinfo.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to original image.

Option 1. **DIR**

Option Value	Description
File path to original image.	Ex.) /DCIM/100OLYMP/P6230001.JPG

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

List of image information

Format of Image Information List

XML Element	Description	XML Content	Description	
DateTime	Capture date and time	Format is "YYYYMMDDThhmm." 'T' is delimiter.	Capture date and time	Ex.) 20140630T0302
LocationStatus	Existence of location info.	OK / NG	exist / not exist	
DetectVersion	Detection version of OA.Genius App.	Decimal number	Detection version of OA.Genius App.	
DetectID	Detection ID of OA.Genius App.	Decimal number	Detection ID of OA.Genius App.	
EXPREV	Exposure Compensation	-5.0 to +5.0	-5.0 to +5.0EV	Same as camera property EXPREV
DigitalTelecon	Use of digital tele-converter	OK / NG	used / not used	
GroupID	Group ID	Decimal number	ID	
COLORTONE	Picture mode	FLAT etc.	Mode setting	
Tone	Tone	HIGHKEY etc.	Tone setting	Same as camera property TONE_I_FINISH etc.
Sharpness	Sharpness	-2 to +2	-2 to +2	Same as camera property SHARP_I_FINISH etc.
Contrast	Contrast	-2 to +2	-2 to +2	Same as camera property CONTRAST_I_FINISH etc.
Saturation	Saturation	-2 to +2	-2 to +2	Same as camera property CONTRAST_I_FINISH etc.
EffectType	Art Filter Variations	TYPE1 etc.	Art Filter Variations	Same as camera property ART_EFFECT_TYPE_POPART etc.
FantasicFocus	Soft focus effect	ON / OFF	Effect ON / Effect OFF	If the image is captured in a mode where these effects are disabled, OFF is set as a fixed value.
ToyPhoto	Pin hole effect	ON / OFF	Effect ON / Effect OFF	
WhiteEdge	White edges effect	ON / OFF	Effect ON / Effect OFF	
FrameJaggy	Frame effect	ON / OFF	Effect ON / Effect OFF	
Starlight	Starlight effect	ON / OFF	Effect ON / Effect OFF	
MiniatureVertical	Blur effect on top and bottom sides	ON / OFF	Effect ON / Effect OFF	
MiniatureHorizon	Blur effect on left and right sides	ON / OFF	Effect ON / Effect OFF	
ShadingHorizon	Shade effect on top and bottom sides	ON / OFF	Effect ON / Effect OFF	
ShadingVertical	Shade effect on left and right sides	ON / OFF	Effect ON / Effect OFF	
MonotoneFilter	Monochrome Filter Effect	NORMAL etc.	Filter setting	Same as camera property MONOTONEFILTER_MONOCHROME etc. If the image is captured in a mode where the effect is disabled, NORMAL is set as a fixed value.

MonotoneColor	Monochrome Picture Tone Effect	NORMAL etc.	Color setting	Same as camera property MONOTONECOLOR_MONOCHROME etc. If the image is captured in a mode where the effect is disabled, NORMAL is set as a fixed value.
ColorCreatorColor	Color Creator Hue	0 to 29	Hue pattern 0 to 29	Same as camera property COLOR_CREATOR_COLOR.
ColorCreatorVivid	Color Creator Saturation	-4 to +3	Saturation -4 to +3	Same as camera property COLOR_CREATOR_VIVID.
ColorPhase	Part Color Hue	0 to 17	Hue pattern 0 to 17	Same as camera property COLOR_PHASE. If the image is not captured using the partial color art filter, fixed value is set.
WhiteBalance	White balance mode	AUTO	Auto White Balance.	
		FINE	Preset white balance for shooting outdoors on a clear day.	
		SHADE	Preset white balance for shooting outdoors in the shadows on a clear day.	
		CLOUD	Preset white balance for shooting outdoors on a cloudy day.	
		LAMP	Preset white balance for shooting under a tungsten light.	
		FLUORESCENCE1	Preset white balance for shooting under fluorescent lights.	
		WATER1	Preset white balance for underwater photography.	
		CUSTOM1	Custom White Balance.	
CustomWBBias	Color temperature for custom white balance	2000 to 14000	2000 to 14000K	Same as camera property CUSTOM_WB_KELVIN_1. If white balance mode is not custom, minimum value (2000) is set.
WBAutoLightBulbColorLeaving	WB AUTO Keeping Warm Colors	ON / OFF	Keep warm colors / Eliminate warm colors	Same as camera property AUTO_WB_DENKYU_COLORED_LEAVING.
WBBiasA	White Balance Adjustment(A)	-7 to +7	-7 to +7	Same as camera property WB_REV_AUTO etc.
WBBiasG	White Balance Adjustment(G)	-7 to +7	-7 to +7	Same as camera property WB_REV_G_AUTO etc.
ToneControlHigh	Control exposure of bright part	-7 to +7	-7 to +7	Same as camera property TONE_CONTROL_HIGH.
ToneControlMiddle	Control exposure of middle part	-7 to +7	-7 to +7	Same as camera property TONE_CONTROL_MIDDLE.
ToneControlShadow	Control exposure of dark part	-7 to +7	-7 to +7	Same as camera property TONE_CONTROL_SHADOW.
AspectRatio	Aspect ratio of image	04_03 etc.	Aspect ratio of image	Same as camera property ASPECT_RATIO

PhotoStory	Use of Photo Story	OK / NG	Used / Not used	
PhotoStoryMode	Mode of Photo Story	STANDARD	Standard	
		SPEED	Speed	
		ZOOM_IN_OUT	Zoom In / Out	
		LAYOUT	Layout	
		FUNFRAME	Fun Frames	
PhotoStoryType	Filter for Photo Story	DAYDREAM	Pale & Light Color	
		POPART	Pop Art	
		ROUGHMONOCHROME	Grainy Film	
		NATURAL	Natural	
		TOYPHOTO	Pin Hole	
		DIORAMA	Diorama	
PhotoStoryDevideNumAspectRatio	Number of sub-frames / Aspect ratio	02_04_03	2 frames / 4:3	
		03_04_03	3 frames / 4:3	
		02_01_01	2 frames / 1:1	
		03_01_01	3 frames / 1:1	
		04_01_01	4 frames / 1:1	
		05_16_09	5 frames / 16:9	
		02_16_09	2 frames / 16:9	
		02_03_02	2 frames / 3:2	
		03_03_02	3 frames / 3:2	
PhotoStoryLayout	Aspect ratio / Number of sub-frames in layout mode	03_02_03	3:2 / 3 frames	
		03_02_02_01	3:2 / 2 frames TYPE1	
		03_02_02_02	3:2 / 2 frames TYPE2	
		03_02_02_03	3:2 / 2 frames TYPE3	
PhotoStoryEffect	Effect for Photo Story	SIMPLE_BLACKBORDER	Black frame	
		SIMPLE_WHITEBORDER	White frame	
		PINHOLE_BLACKBORDER	Black frame with pin hole effect	
		WHITEEDGE_WHITEBORDER	White frame with white edges effect	
		POLAROID_DATE	Instant photo frame with capture date	
		FILM_DATE	Film frame with capture date	
RollAngleReliability	Measurement reliability of roll angle of camera body	OK / NG	Reliable / Not reliable	
PitchAngleReliability	Measurement	OK / NG	Reliable / Not reliable	

	reliability of pitch angle of camera body			
Location	Orientation of camera body	0x01: 0 degrees 0x02: 90 degrees 0x03: 180 degrees 0x04: 270 degrees 0x05: The camera is pointed down 0x06: The camera is pointed up	Orientation of camera body	
RoleAngle	Roll angle of camera body	0xFC7C (-900) to 0x0384 (900)	10 times the value of roll angle of camera body	
PitchAngle	Pitch angle of camera body	0xFC7C (-900) to 0x0384 (900)	10 times the value of pitch angle of camera body	
LensID	Lens ID	Decimal number	Lens ID	If there are multiple IDs, the same XML elements are returned.
AccessaryID	Accessory ID	Decimal number	Accessory ID	If there are multiple IDs, the same XML elements are returned.
CameraName	Model name of camera	Text data	Model name of camera	

Get Thumbnail Image

HTTP REQUEST

Method

GET	POST

Command

```
get_thumbnail.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to DCF object[1]

Option 1. **DIR**

Option Value	Description
File path to DCF object.	Ex.) /DCIM/100OLYMP/P6230001.JPG

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Header	Header Description	Field Value	Field Value Description
Content-Type	Type of message body	image/jpeg:	JPEG image
Content-Length	Data size of message body	Byte length of message body	
X-GPS-Tag	Reliability of GPS measurement	0	Reliable
		1	Not reliable
X-Movie-Sec	Movie recording time in decimal. Unit is seconds.	Movie recording time	Ex.) If ten seconds, “10”
X-Rotation-Info	Orientation same as EXIF specification.	1	Lens mount tilt is 0 degrees.
		3	Lens mount tilt is 180 degrees.
		6	Lens mount tilt is 90 degrees

			clockwise.
		8	Lens mount tilt is 270 degrees clockwise.
X-Photorecipe-DetectVersion	OA.Genius detection version. Positive integer number in decimal.	non-zero	Version number
		zero	Image is not generated by OA.Genius.
X-Photorecipe-DetectID	Genius detection ID. Positive integer number in decimal.	non-zero	Detection ID
		zero	Image is not generated by OA.Genius.
X-Photorecipe-GroupID	Genius group ID. Positive integer number in decimal.	non-zero	Group ID
		zero	Image is not generated by OA.Genius.
X-Movie-ShortMovie	Clips	yes	The movie is Clips.
		no	The movie is not Clips.

Message Body

Thumbnail Image (JPEG Image)

1) DCF object is image and video files. See “Directory Tree of Content Files” section.

Transfer Image without Copy[1]

HTTP REQUEST

Method

GET	POST

Command

```
exec_storeimage.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:image/jpeg
```

Message Body

JPEG Image

1) See glossary.

Shooting Category

Execute Shooting

HTTP REQUEST

Method

GET	POST

Command

```
exec_takemotion.cgi
```

Option

No.	Option Name	Description
1	com [required]	Subcommand
2	point	Coordinates where to focus. Use this option with supported subcommand.
3	upperlimit	The maximum number of pictures taken by one continuous shooting. Use this option with supported subcommand.

Option 1. **com**

Table below also shows supported combination of options.

Option Value	Description	Option2 point	Option3 upperlimit
newstarttake	Start shooting photo.	Use this option to specify coordinates where to focus. If not specified, the camera uses default coordinates.	Only for continuous shooting
newstoptake	Stop shooting photo.	N/A	N/A
newstartmovietake	Start recording movie.	N/A	N/A
newstopmovietake	Stop recording movie.	N/A	N/A

Option 2. **point**

Option Value	Description
Coordinates where to focus.	■ Direct focus point coordinate as four-digit zero-padded positive integer number in decimal. ■ Use this option with supported subcommand according to the table shown for Option 1. ■ Ex.) Specified coordinates (x, y) = (600, 200) point=0600x0200

Option 3. **upperlimit**

Option Value	Description
The maximum number of pictures taken by one continuous shooting.	■ Positive integer number in decimal. ■ Use this option with supported subcommand. ■ Ex.) The maximum number is 200. upperlimit=200

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

N/A

NOTE

■ The camera rejects specified auto focus point while the focus mode is set to manual focus. The application must check the focus mode before shooting with auto focus point.

Execute Support Function for Shooting

HTTP REQUEST

Method

GET	POST

Command

```
exec_takemisc.cgi
```

Option

- Use options except subcommand with supported subcommand.
- See the table shown for Option 1 for the supported subcommand.

No.	Option Name	Description
1	com [required]	Subcommand.
2	port	Port number to receive live view image.
3	ctrl	Start / stop driving optical zoom.
4	dir	Driving direction for optical zoom.
5	method	Driving method for optical zoom.
6	focallen	Focal length where to zoom.
7	lvqty	Frame size of live view image.

Option 1. **com**

Table below also shows supported options combinations.

Option Value	Description	Required	Optional
startliveview	Start live view.	port	N/A
stopliveview	Stop live view.	N/A	N/A
getrecview	Get preview image after taking picture.	N/A	N/A
newctrlzoom	Drive optical zoom.	ctrl, dir	method, focallen (One option is required.)
changelvqty	Change the size of live view.	lvqty	

Option 2. **port**

Option Value	Description
Port number to receive live view image	■ Direct port number to receive live view image that is transferred via RTP. ■ Five-digit zero-padded positive integer number. ■ Use this option with supported subcommand according to the table shown for Option 1.

Option 3. **ctrl**

Option Value	Description
start	Start driving optical zoom.
stop	Stop driving optical zoom.

Option 4. **dir**

Option Value	Description
tele	Towards the telephoto end (zoom in).
wide	Towards the wide end (zoom out).
fix	Zoom to the specified focal length.

Option 5. **method (Valid when dir=tele or wide)**

Option Value	Description
contslow	Zoom at low speed.
contnormal	Zoom at medium speed.
contfast	Zoom at high speed.
burst	Zoom to wide or telephoto end at once.

Option 6. **focallen (Valid when dir=fix)**

Option Value	Description
Focal length	■ Focal length in decimal. Unit is mm. ■ Ex.) Zoom to the position of focal length 20mm. focallen=20

Option 7. **lvqty**

Option Value	Description
0320x0240	Display in QVGA (320x240) size live view.
0640x0480	Display in VGA (640x480) size live view.
0800x0600	Display in SVGA (800x600) size live view.
1024x0768	Display in XGA (1024x768) size live view.
1280x0960	Display in Quad-VGA (1280x960) size live view.

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

Subcommand (Option com)	Header	Field Value	Description
startliveview	N/A		
stopliveview	N/A		
newctrlzoom	Content-type	text/xml	Processing result
changelvqty	Content-type	text/xml	Processing result

Message Body

- com=newctrlzoom
- com=changelvqty

Element	Content	Description
result	OK	Command succeeded.
	NG	Command failed.

Administration Category

Delete media (still image and movie)

HTTP REQUEST

Method

GET	POST

Command

```
exec_erase.cgi
```

Option

No.	Option Name	Description
1	DIR	File path to DCF object[1]

Option 1. **DIR**

Option Value	Description
File path to DCF object	Ex.) /DCIM/100OLYMP/P6230001.JPG

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

Element	Content	Description
result	OK	Command succeeded.
	NG	Command failed.

1) DCF object is image and video files. See “Directory Tree of Content Files” section.

Remove protection of all media (still image and movie)

HTTP REQUEST

Method

GET	POST

Command

```
release_allprotect.cgi
```

Option

N/A

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

Element	Content	Description
result	OK	Command succeeded.
	NG	Command failed.

Protect media (still image and movie)

HTTP REQUEST

Method

GET	POST

Command

```
exec_protect.cgi
```

Option

No.	Option Name	Description
1	com	Subcommand
2	DIR	File path to DCF object[1]

Option 1. **Subcommand**

Option Value	Description
set	Protect media
release	Remove protection of media

Option 2. **DIR**

Option Value	Description
File path to DCF object	Ex.) /DCIM/100OLYMP/FA000001.JPG

Message Body

N/A

HTTP RESPONSE

Default Status Code

200

Response Header

```
Content-type:text/xml
```

Message Body

Element	Content	Description
result	OK	Command succeeded.
	NG	Command failed.

1) DCF object is image and video files. See “Directory Tree of Content Files” section.

Auto Focus Point

Overview

- Auto Focus Point (AF Point) is used to
  1) set coordinates on the subject to use for auto focus,
  2) reset coordinates, and
  3) get coordinates of valid area on live view image to specify auto focus point.
- The size of the live view images can be set by lvqty option of switch_cameramode.cgi or exec_takemisc.cgi?com=changelvqty
- Coordinates for AF Point are in live view coordinate system shown in Fig.6-1.

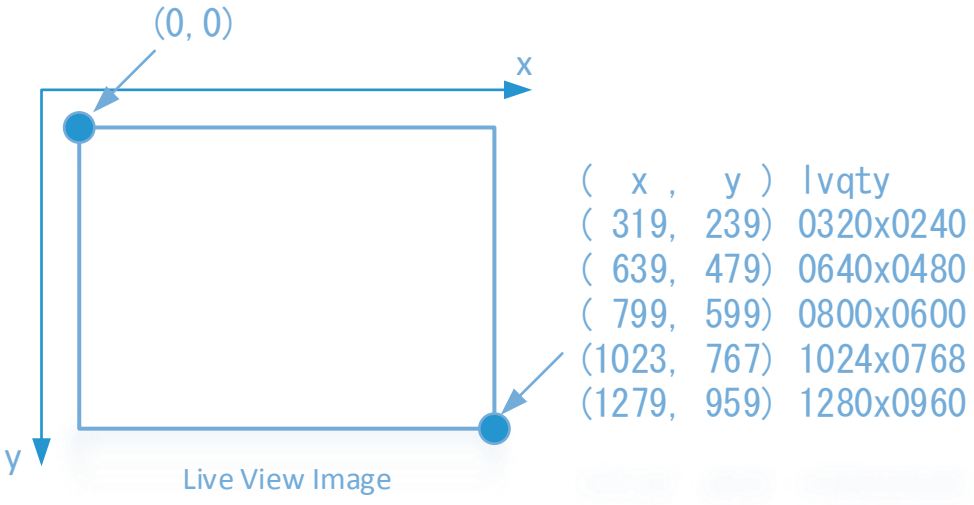


Fig. 6-1: Live View Coordinate System

Valid Area to Specify Auto Focus Point

- Peripheral area of live view image with constant width cannot be used for auto focus as shown in Fig. 6-2.
- Valid area can be acquired as camera property.

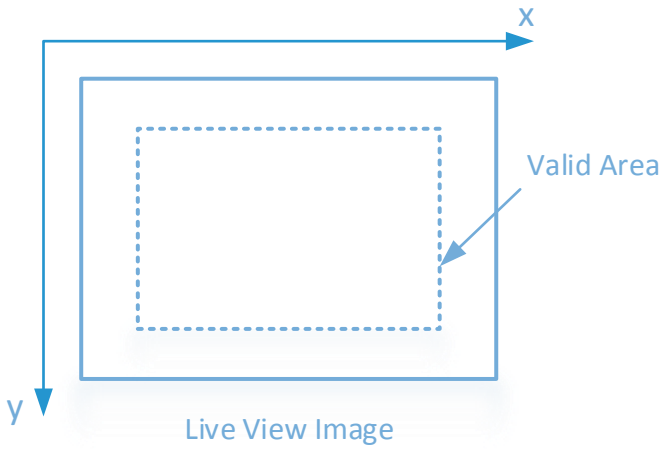


Fig. 6-2: Valid Area to Specify Auto Focus Point

Set Coordinates

- exec_takemotion.cgi can set coordinates on the subject to use for auto focus.
- If the coordinates are set, auto focus frame centered around the specified coordinates are shown in Fig. 6-3.

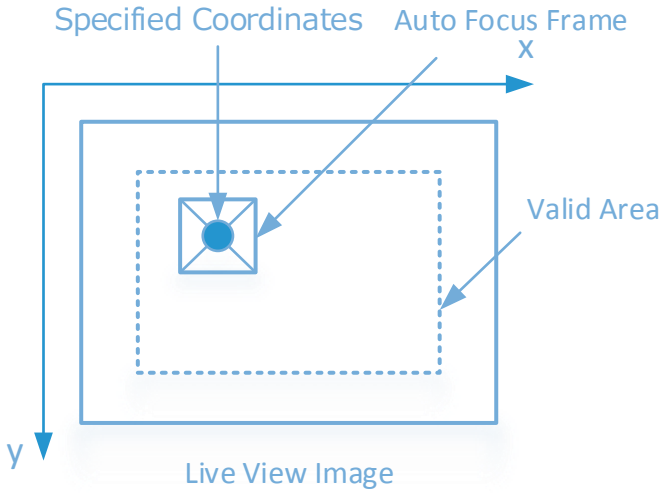


Fig. 6-3: Coordinates for Auto Focus.

- The camera returns response for setting coordinates including top-left coordinate and width and height of auto focus frame shown in Fig. 6-4. Returned Autofocus Coordinates are different from the specified coordinates.
- The response is returned as camera event or RTP extension header.

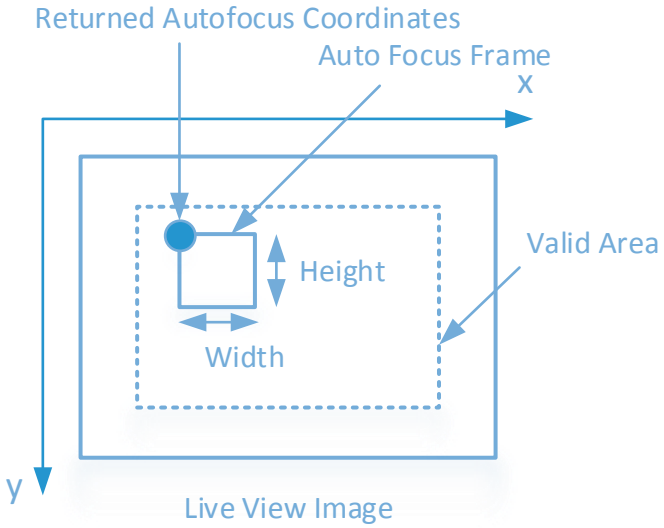


Fig. 6-4: Response for Setting Coordinates

Reset Coordinates

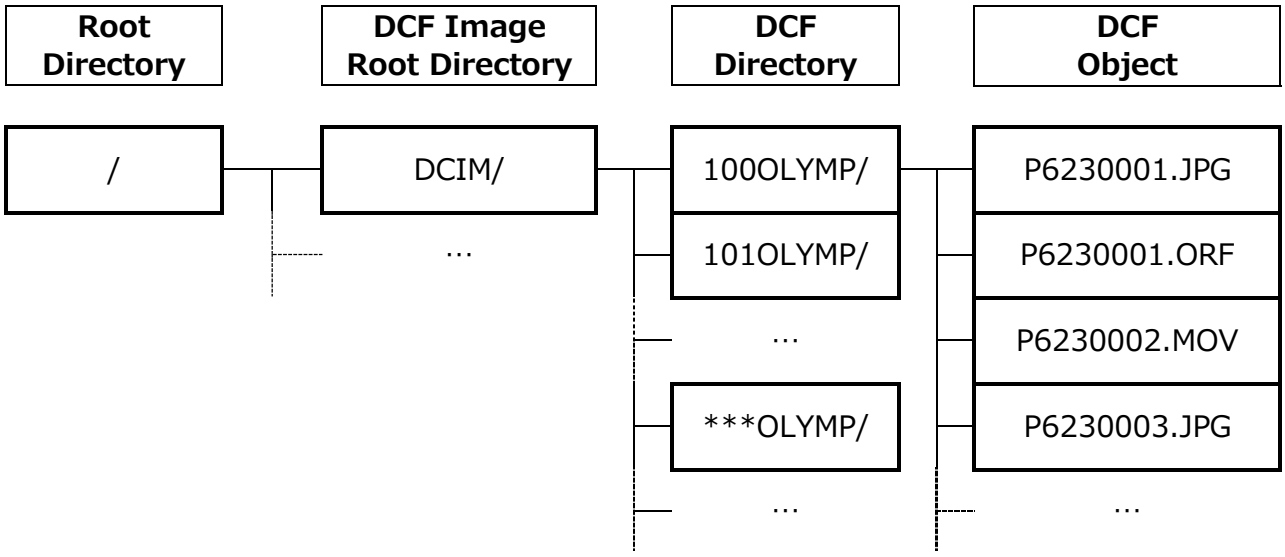
- The camera resets specified coordinates automatically after taking a picture.

Directory Tree of Content Files

Target Content

- DCF objects can be browsed under directory tree that follows the standard Design rule for Camera File system (DCF).
- DCF objects include files in the following formats.
  - JPEG
  - ORF (Olympus RAW Format)
  - MOV
- Each JPEG and MOV file has a thumbnail image and an image for control device display.
- Files and directories with hidden attributes cannot be accessed.

Directory Tree



Access Permission

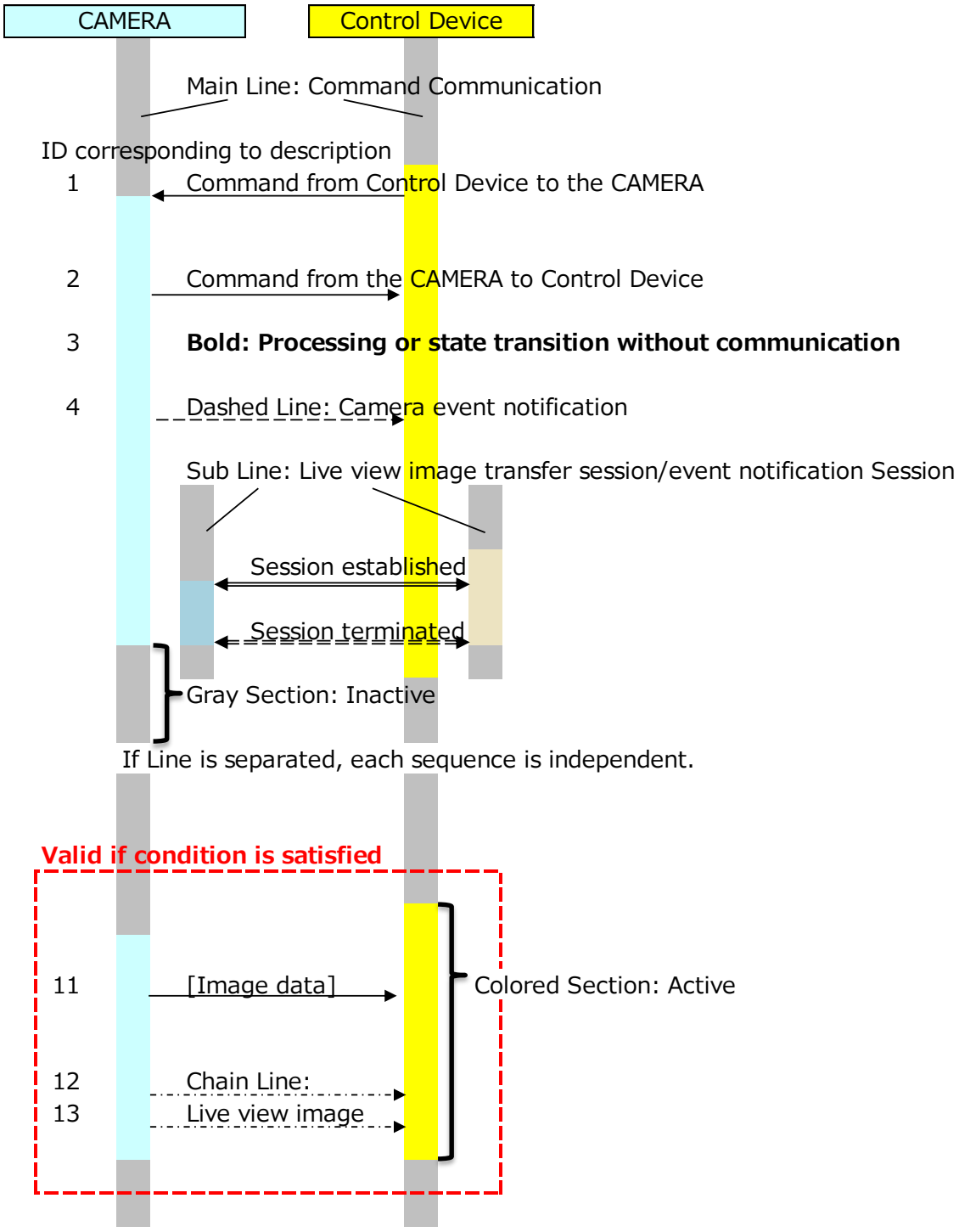
Directory, File	Permission
Root directory	Redirect to DCF image root directory.
DCF image root directory	Access allowed.
DCF directory	Access allowed.
DCF object	DCF object under DCF directory can be accessed.

7.Command Sequence

Supported Operation Mode for Command and Command Sequence

Command Command Sequence	Standalone Mode	Rec. Mode	Playback Mode	
			Normal	Admin.
Sequence (Camera Event Notification)	✓	✓	✓	✓
Sequence (Switch Operation Mode)	✓	✓	✓	✓
Sequence (Get Camera Property)	✓	✓	✓	✓
Sequence (Set Camera Property)	✗	✓	✗	✗
Sequence (Shoot using Shutter Button)	✗	✓	✗	✗
Sequence (Normal Shooting)	✗	✓	✗	✗
Sequence (Continuous Shooting)	✗	✓	✗	✗
Sequence (Movie Recording)	✗	✓	✗	✗
Sequence (Drive Optical Zoom)	✗	✓	✗	✗
Sequence (Remove Protection of All Media)	✗	✗	✗	✓
get_connectmode.cgi	✓	✓	✓	✓
get_state.cgi	✓	✓	✓	✓
switch_commpath.cgi	✓	✓	✓	✓
get_commpath.cgi	✓	✓	✓	✓
exec_erase.cgi	✗	✗	✗	✓
exec_protect.cgi	✗	✗	✗	✓
exec_pwoff.cgi	✓	✓	✓	✓
get_imageinfo.cgi	✗	✗	✓	✗
get_screennail.cgi	✗	✗	✓	✗
get_resizeimg.cgi	✗	✗	✓	✗
get_imglist.cgi	✓	✓	✓	✓
get_thumbnail.cgi	✓	✓	✓	✓
Get original file using HTTP get command.	✓	✓	✓	✓

Legend

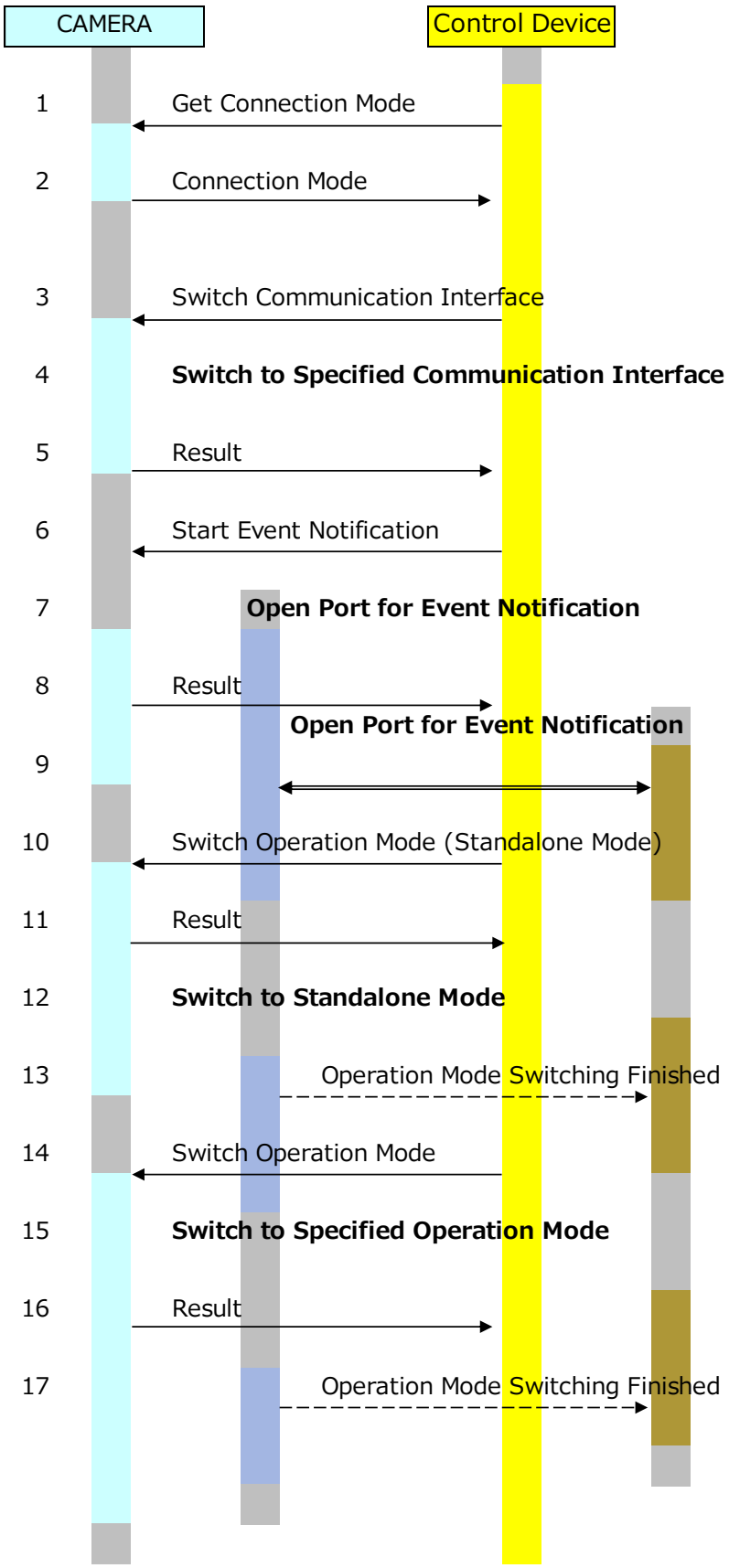


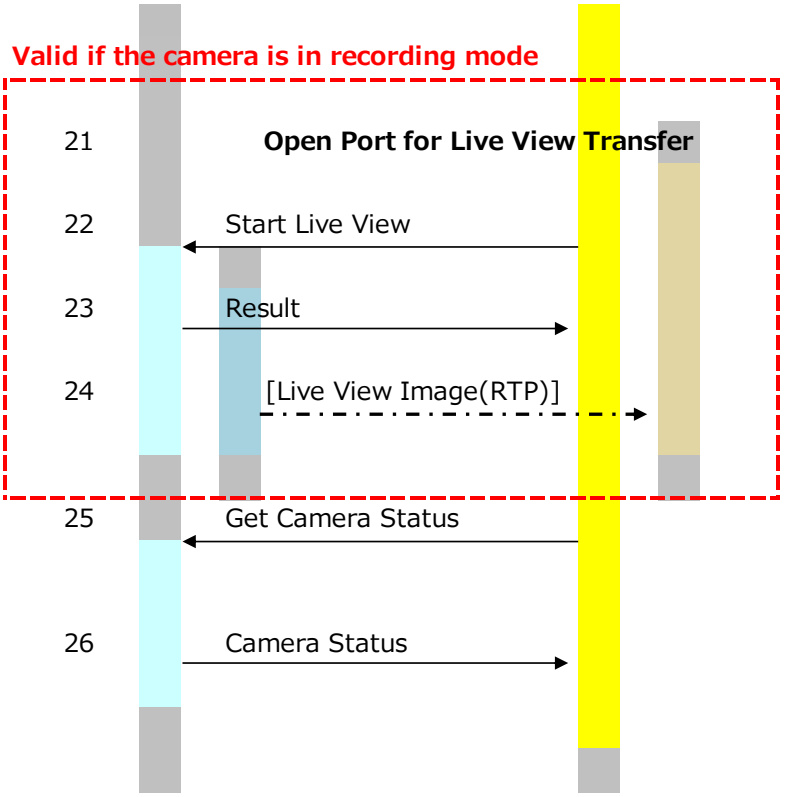
NOTE

- In some cases, sub line is not represented if live view image transfer session or event notification session is active. Main Line may send and receive not only command, but live view image and camera event.

Negotiation

Sequence





Description

1. Get Connection Mode

Command	get_connectmode.cgi
Option	N/A

2. Connection Mode

- The camera returns “connectmode” element in XML format. The content of the element is a fixed value, “OPC.”
- If this value is not “OPC”, command receiver is not OPC. Control device should not send subsequent commands.

3. Switch Communication Interface

Command	switch_commpath.cgi
Option	path=wifi

6. Start Event Notification

Command	start_pushevent.cgi
Option	Ex.) port=65000

7. Open Port for Event Notification

- The camera opens TCP port after receiving command to start event notification.

9. Open Port for Event Notification

- Control device opens TCP port after sending command to start event notification and establishes session to the camera.

10. Switch Operation Mode (Standalone Mode)

Command	switch_cameramode.cgi
Option	mode=standalone

12. Switch to Standalone Mode

- Suspended if the camera cannot switch operation mode because of memory card access, etc.

13. Operation Mode Switching Finished

AppID	2
EventID	2 01

14. Switch Operation Mode

Command	switch_cameramode.cgi
Option	mode=standalone / rec / play / playmaintenance
	lvqty=0320x0240/0640x0480/0800x0600/1024x0768/1024x0768/1280x0960 Valid when mode=rec.

15. Switch to Specified Operation Mode

- Suspended if the camera cannot switch operation mode because of memory card access, etc.

17. Operation Mode Switching Finished

AppID	2
EventID	201

21. Open Port for Live View Transfer

- Control device must open RTP port before sending command to start live view.

22. Start Live View

Command	exec_takemisc.cgi?com=startliveview
Option	Ex.) port=5555

25. Get Camera Status

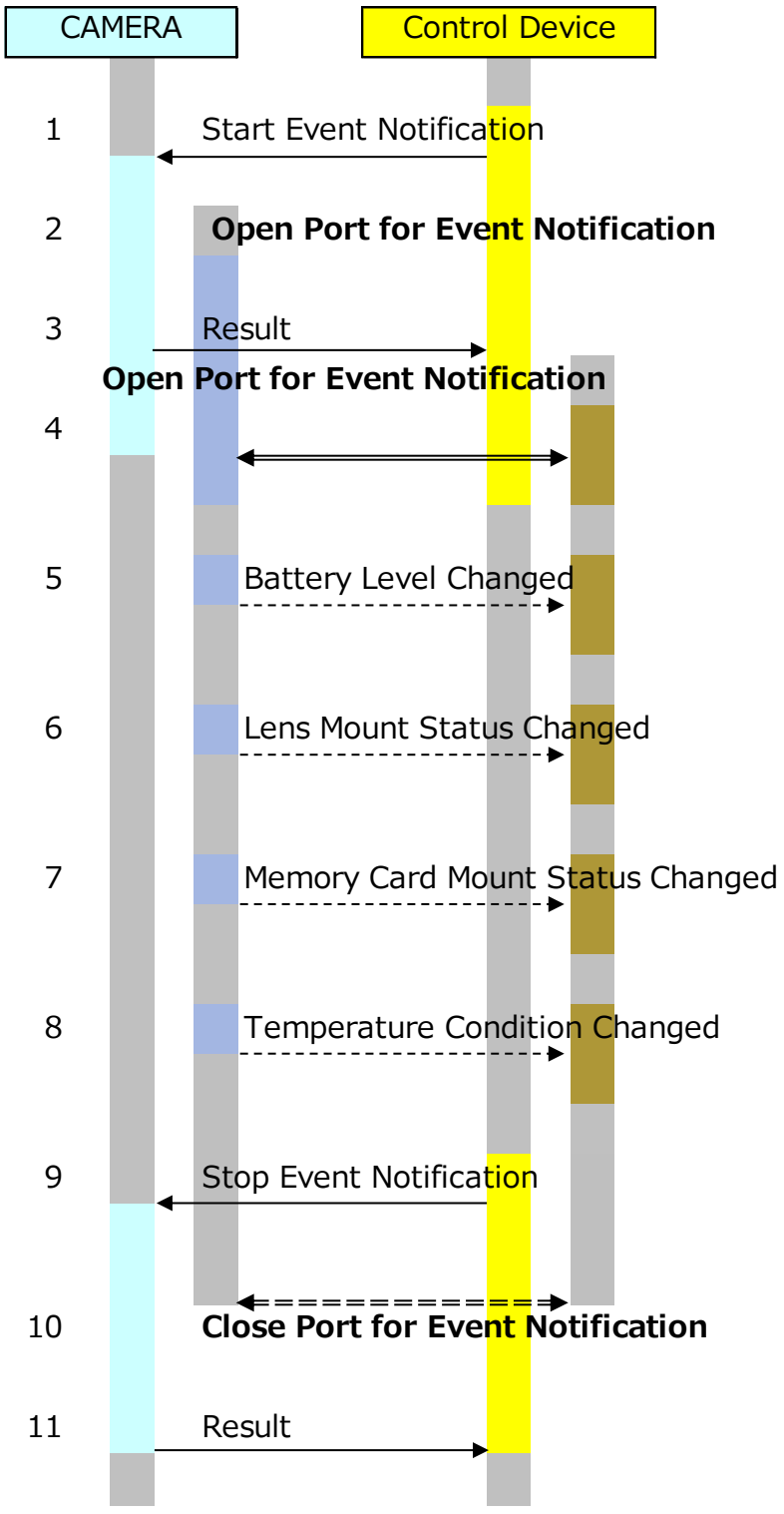
Command	get_state.cgi
Option	N/A

26. Camera Status

- The camera returns the status of camera including status of memory card mount, lens mount, temperature condition inside the camera, and lens information.

Camera Event Notification

Sequence



Description

1. Start Event Notification

Command	start_pushevent.cgi
Option	Ex.) port=65000

2. Open Port for Event Notification

- The camera opens TCP port after receiving command to start event notification.

4. Open Port for Event Notification

- Control Device opens TCP port after sending command to start event notification and establishes session to the camera.

5. Battery Level Changed

AppID	2
EventID	5

- Use get_camprop.cgi command to actively get battery level.

6. Lens Mount Status Changed

AppID	2
EventID	120

- Use get_state.cgi command to actively get the status of lens mount.

7. Memory Card Mount Status Changed

AppID	2
EventID	132

- Use get_state.cgi command to actively get the status of memory card mount.

8. Temperature Condition Changed

AppID	2
EventID	133

- Use get_state.cgi command to actively get temperature condition of inside of the camera.

9. Stop Event Notification

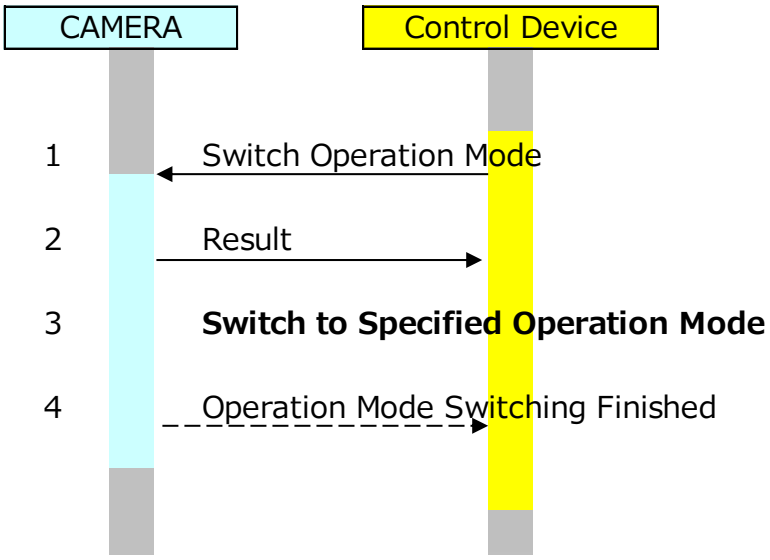
Command	stop_pushevent.cgi
Option	-

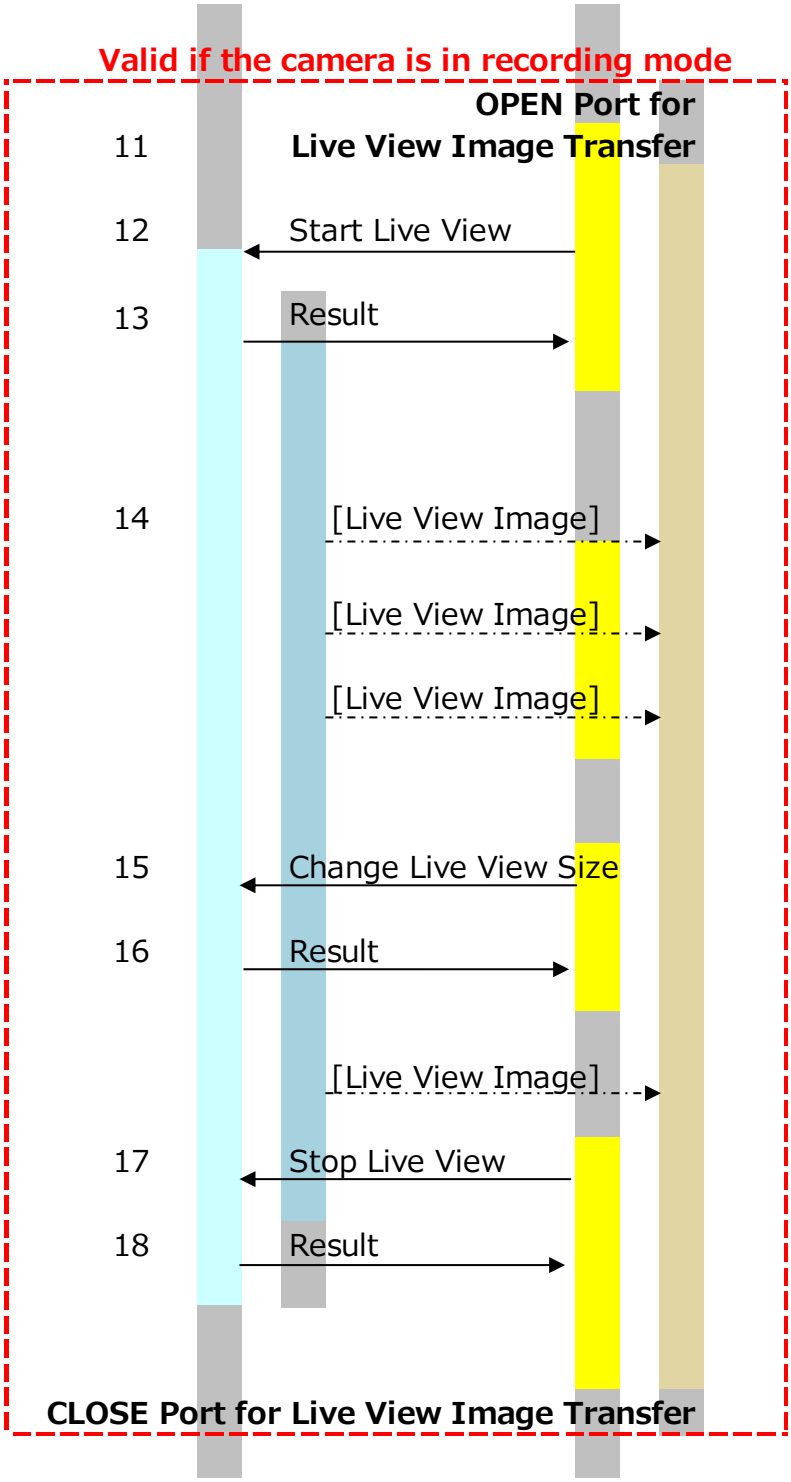
10. Close Port for Event Notification

- The camera must close TCP port after receiving command to stop event notification.

Switch Operation Mode

Sequence





Description

1. Switch Operation Mode

Command	switch_cameramode.cgi
Option	mode=standalone / play / rec / playmaintenance
	lvqty=0320x0240/0640x0480/0800x0600/1024x0768/1024x0768/1280x0960 Valid when mode=rec.

3. Switch to Specified Operation Mode

- Suspended if the camera cannot switch operation mode because of memory card access, etc.
- The camera starts generating live view images internally when its operation mode is changed to standalone mode or recording mode.

4. Operation Mode Switching Finished

AppID	2
EventID	201

12. Start Live View

Command	exec_takemisc.cgi
Option	com=startliveview
	Ex.) port=5555

15. Change Live View Size

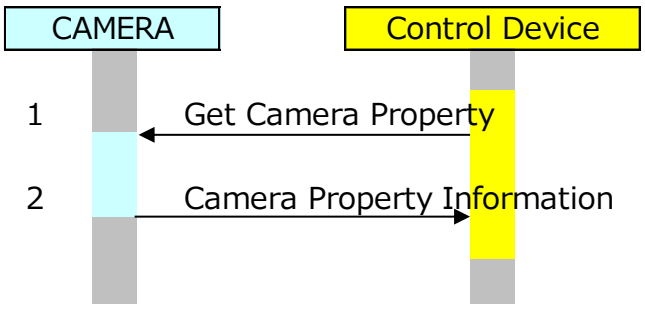
Command	exec_takemisc.cgi
Option	com=changelvqty
	Ex.) lvqty=0320x0240 Valid when mode=rec.

17. Stop Live View

Command	exec_takemisc.cgi
Option	com=stopliveview

Get Camera Property

Sequence



Description

1. Get Camera Property

Command	get_camprop.cgi
Option	com=desc/get
	propname=camera property name

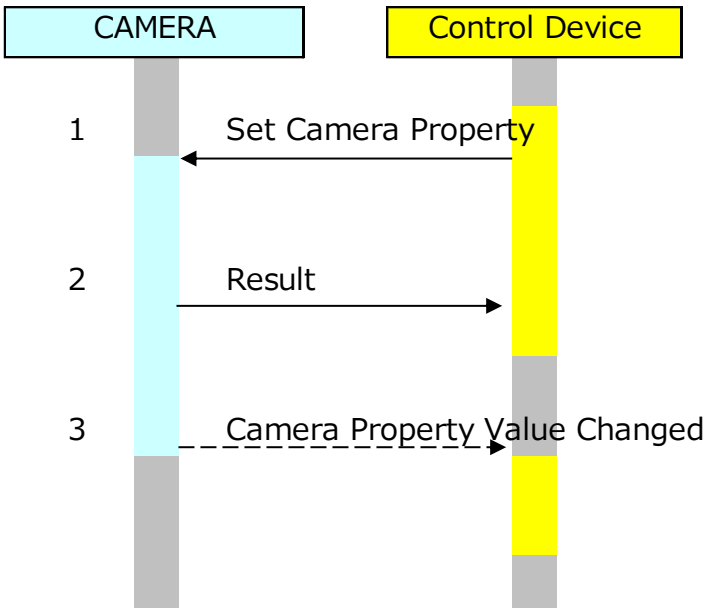
2. Camera Property Information

■ The camera returns the following elements in XML format. See the command list to confirm which element is returned.

- Camera property name (propname)
- Access permission flag (attribute)
- Camera property value (value)
- List of camera property values (enum)

Set Camera Property

Sequence



Description

1. Set Camera Property

Command	set_camprop.cgi
Option	com=set
	propname=Camera property name

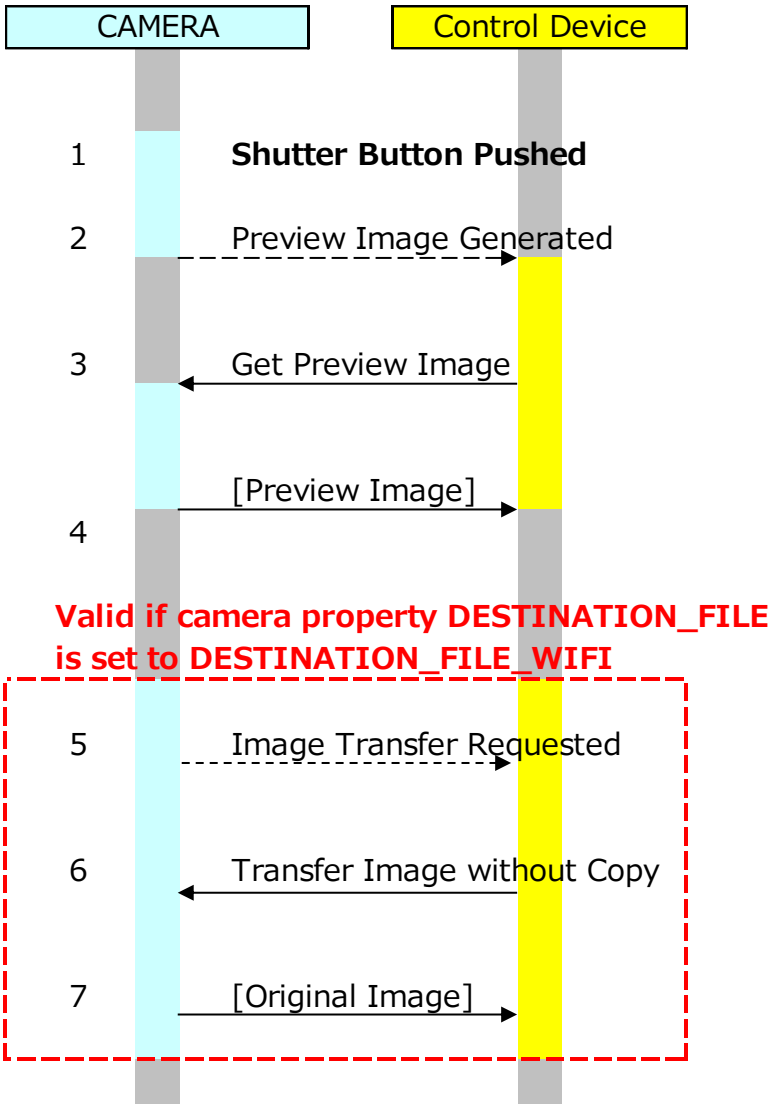
■ Control device send Message body with camera property value. See the command list for format details.

3. Camera Property Value Changed

AppID	2
EventID	206

Shoot using Shutter Button

Sequence



Description

2. Preview Image Generated

AppID	2
EventID	108

3. Get Preview Image

Command	exec_takemisc.cgi
Option	com=getrecview

5. Image Transfer Requested

AppID	2
EventID	117

6. Transfer Image without Copy

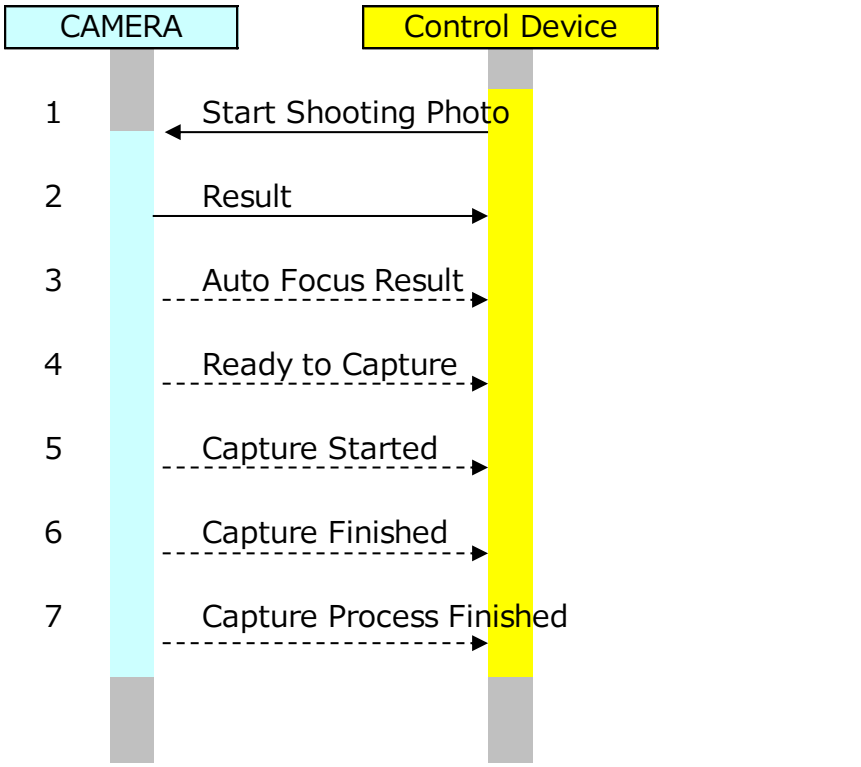
Command	exec_storeimage.cgi
Option	N/A

7. Original Image

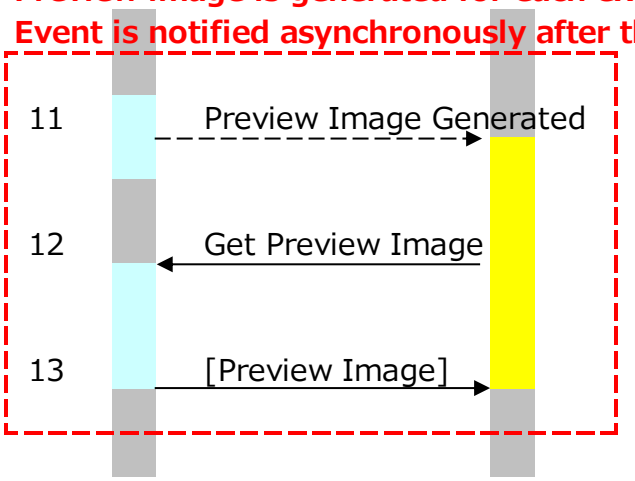
- Resized image is not available.

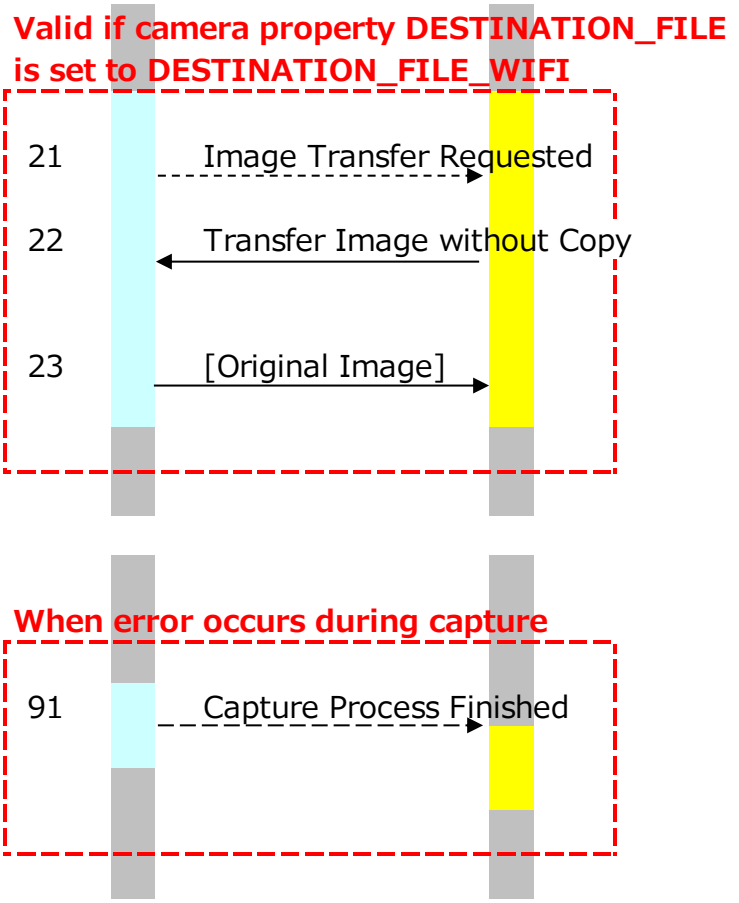
Normal Shooting

Sequence



Preview image is generated for each exposure.
Event is notified asynchronously after the generation.





Description

1. Start Shooting Photo

Command	exec_takemotion.cgi
Option	com=newstarttake
	point=0600x0200 (optional)

3. Auto Focus Result

AppID	2
EventID	101
Additional Information	Auto focus result (result element). Auto focus coordinates (location element). Size of auto focus frame (size element).

4. Ready to Capture

AppID	2
EventID	102

5. Capture Started

AppID	2
EventID	103

- An application should let user know the camera is shooting a photo.

6. Capture Finished

AppID	2
EventID	106

7. Capture Process Finished

AppID	2
EventID	107

11. Preview Image Generated

AppID	2
EventID	108

12. Get Preview Image

Command	exec_takemisc.cgi
Option	com=getrecview

---

21. Image Transfer Requested

- The captured image is transferred in asynchronous timing to capture process.

AppID	2
EventID	117

22. Transfer Image without Copy

Command	exec_storaimage.cgi
Option	N/A

23. Captured Image

- Resized image is not available.

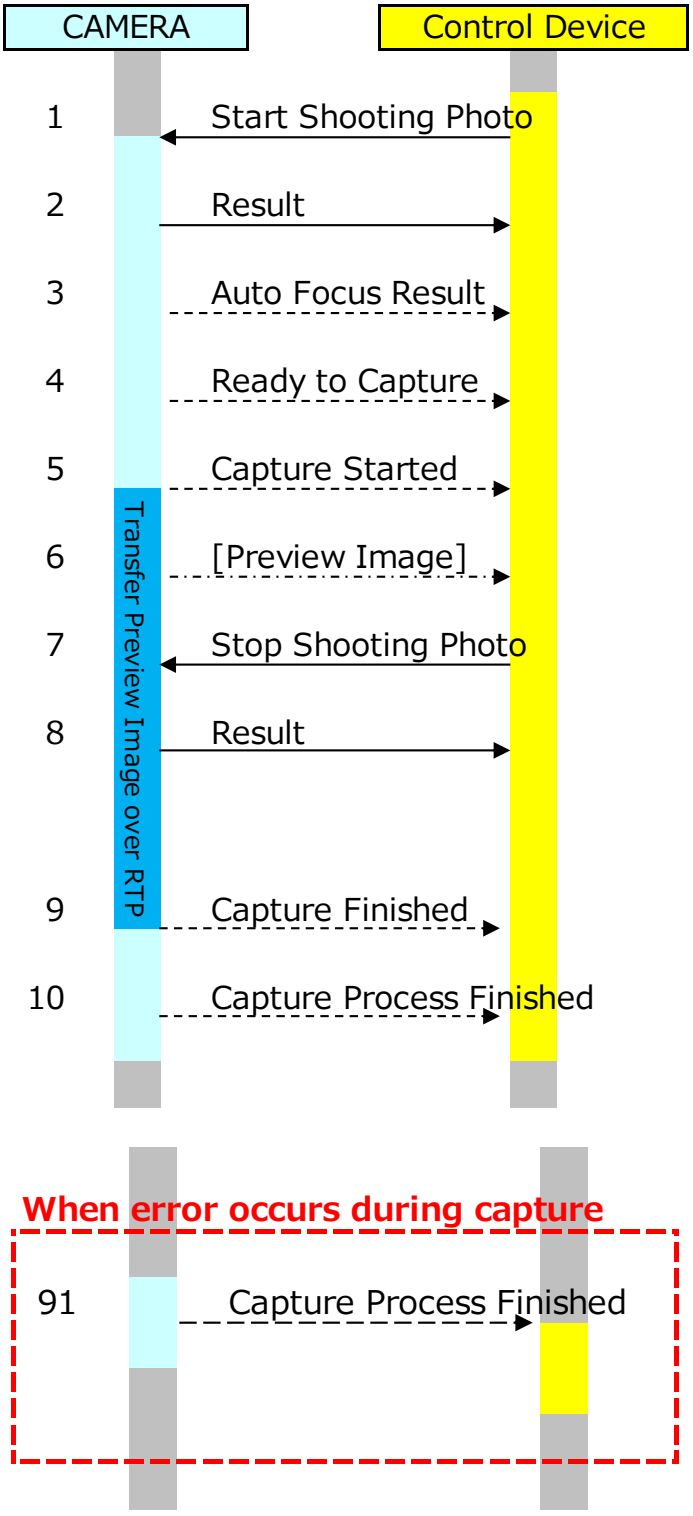
---

91. Capture Process Finished

AppID	2
EventID	107

Continuous Shooting

Sequence



Description

1. Start Shooting Photo

Command	exec_takemotion.cgi
Option	com=newstarttake
	point=0600x0200 (optional)

3. Auto Focus Result

AppID	2
EventID	101
Additional Information	Auto focus result (result element). Auto focus coordinates (location element). Size of auto focus frame (size element).

4. Ready to Capture

AppID	2
EventID	102

5. Capture Started

AppID	2
EventID	103

- An application should let user know the camera is shooting a photo.

7. Stop Shooting Photo

- An application requests to stop continuous shooting, but the camera has not stopped shooting yet.

Command	exec_takemotion.cgi
Option	com=newstoptake

9. Capture Finished

AppID	2
EventID	106

10. Capture Process Finished

AppID	2
EventID	107

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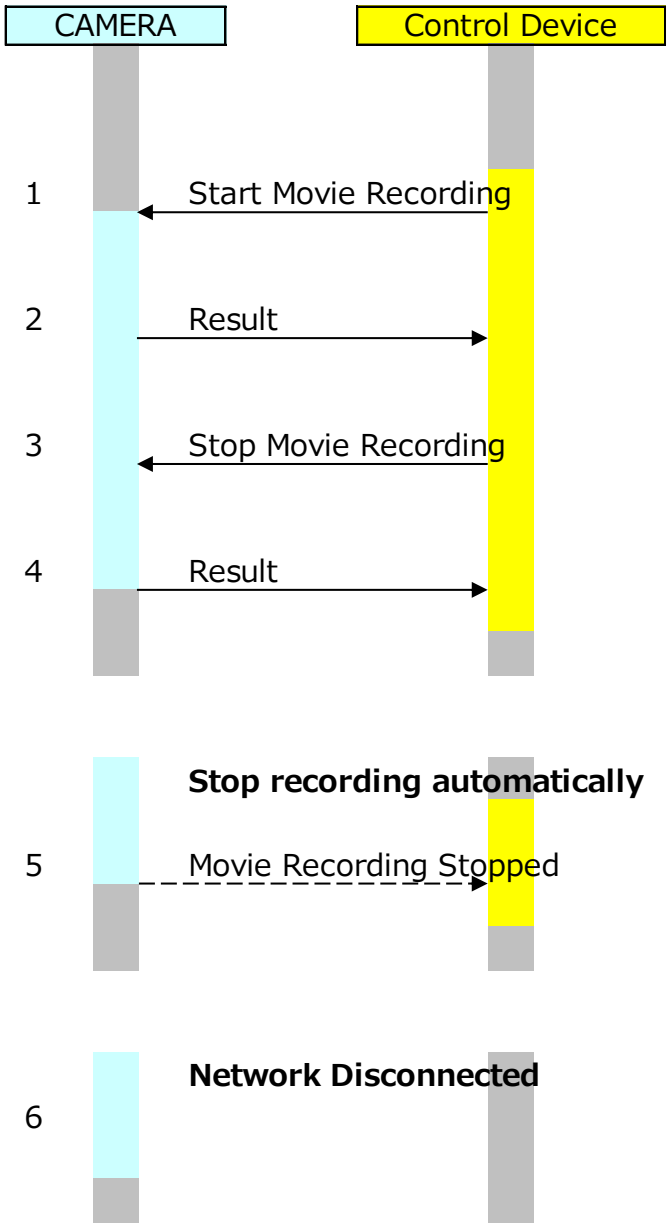
91. Capture Process Finished

AppID	2
EventID	107

Movie Recording

Sequence



Description

1. Start Movie Recording

Command	exec_takemotion.cgi
Option	com=newstartmovietake

3. Stop Movie Recording

Command	exec_takemotion.cgi
Option	com=newstopmovietake

5. Movie Recording Stopped

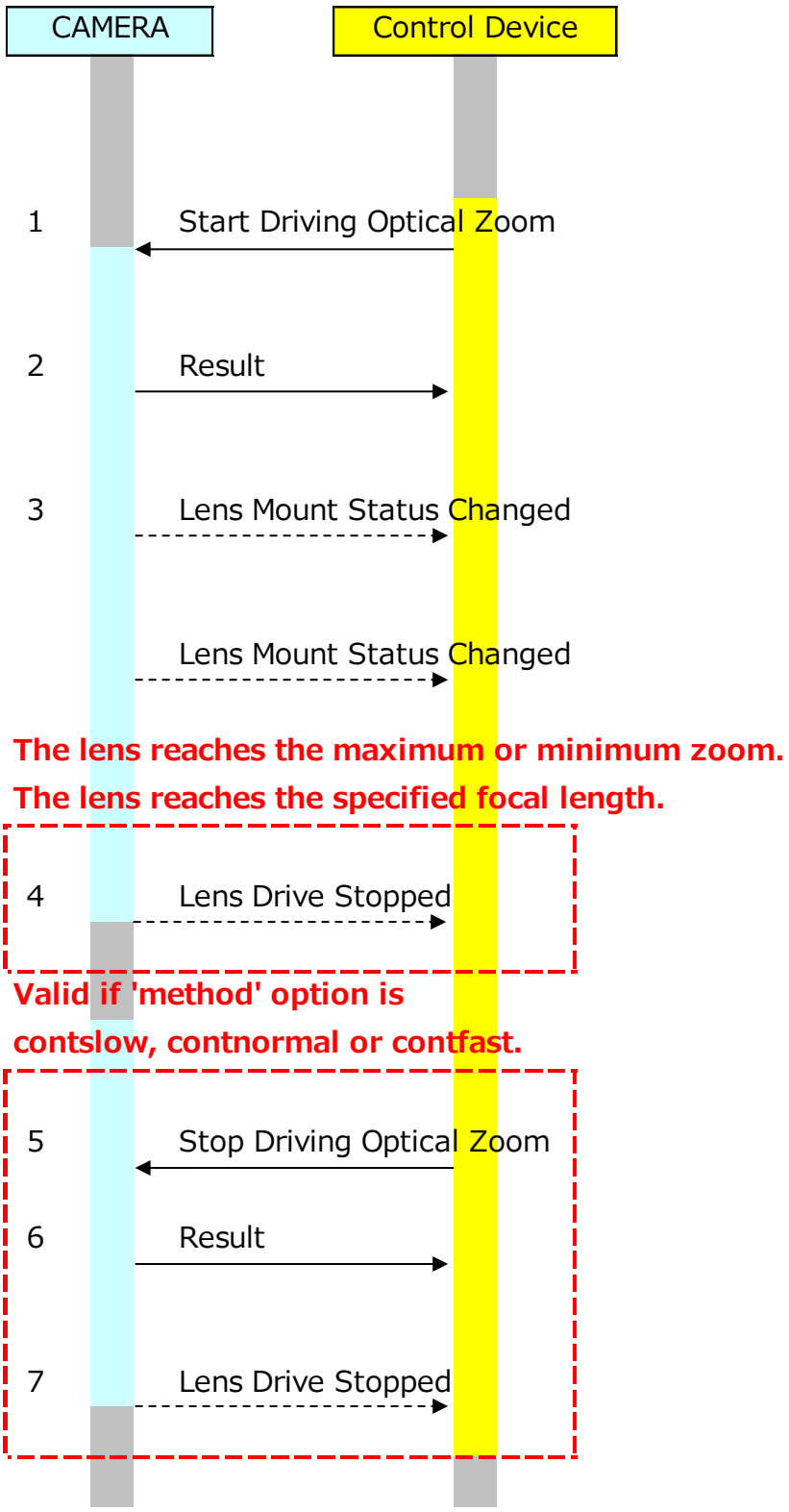
AppID	2
EventID	110

6. Network Disconnected

- The camera stops movie recording automatically after disconnection.

Drive Optical Zoom

Sequence



Description

1. Start Driving Optical Zoom

Command	exec_takemisc.cgi
Option	ctrl=start / stop
	dir=tele / wide / fix
	method=contslow / contnormal / contfast / burst Valid when dir=tele / wide.
	Ex.) focallen=20 Valid when dir=fix.

3. Lens Mount Status Changed

AppID	2
EventID	120

4. Lens Drive Stopped

AppID	2
EventID	122

5. Stop Driving Optical Zoom

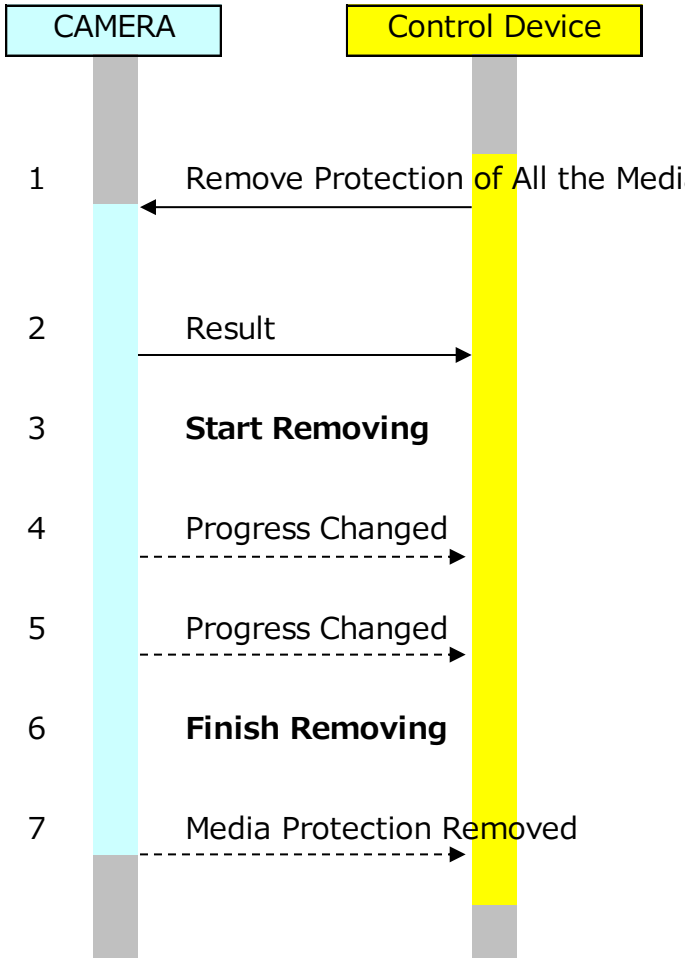
Command	exec_takemisc.cgi
Option	com=newctrlzoom

7. Lens Drive Stopped

AppID	2
EventID	122

Remove Protection of All Media

Sequence



Description

1. Remove Protection of All Media

Command	release_allprotect.cgi
Option	N/A

3. Start Removing

- The camera starts removing process.

4. Progress Changed

AppID	2
EventID	111

6. Finish Removing

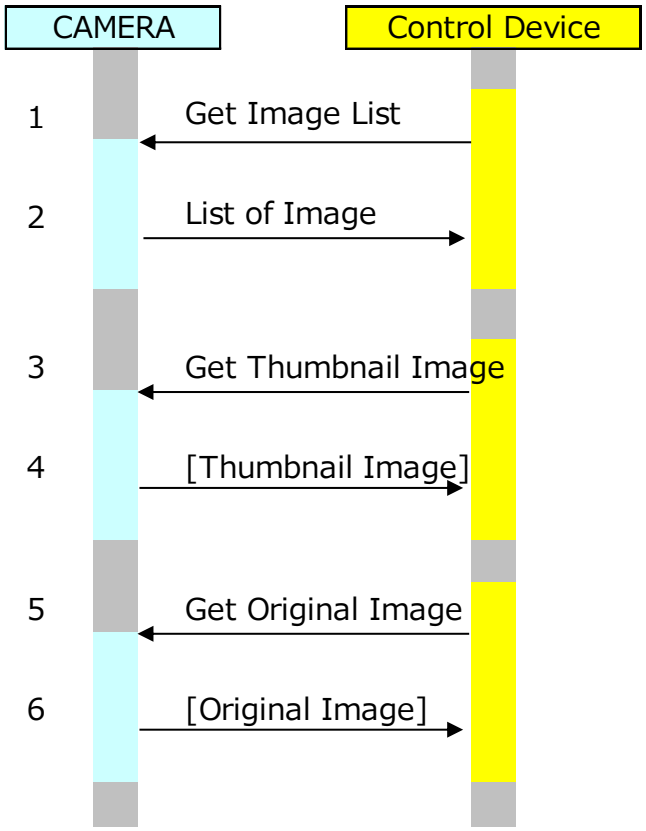
- The camera finishes removing process.

7. Media Protection Removed

AppID	2
EventID	134

Get Image

Sequence



Description

1. Get Image List

Command	get_imglist.cgi
Option	Ex.) DIR=/DCIM/100OLYMP

3. Get Thumbnail Image

- Use filename in the list of images acquired using get_imglist.cgi.
- Repeat getting thumbnail images in the list of images if necessary.

Command	get_thumbnail.cgi
Option	Ex.) DIR=/DCIM/100OLYMP/P62300001.JPG

5. Get Original Image/Movie

- No CGI command is available.
- Use “HTTP Get” command with target image or movie filename with full path.
- See Command Communication section for the format of HTTP Request.

Command･Option	GET /DCIM/100OLYMP/P62300001.JPG HTTP/1.1

8. Camera Property

Overview

- Property is setting value of camera.
- There are “Read Only” properties and “Read-Write (Writable)” properties.
- The value for a writable property can be changed by specifying property name and property value.
- Commands to control property can read and write property.

Details of Camera Property

- Camera property is common to Olympus Camera Kit for Developers (Camera Kit).
- See the list of camera properties in the document for Camera Kit.