

SONY

RPU
VISCA Command Interface

Version 1.1

1. Overview of VISCA™

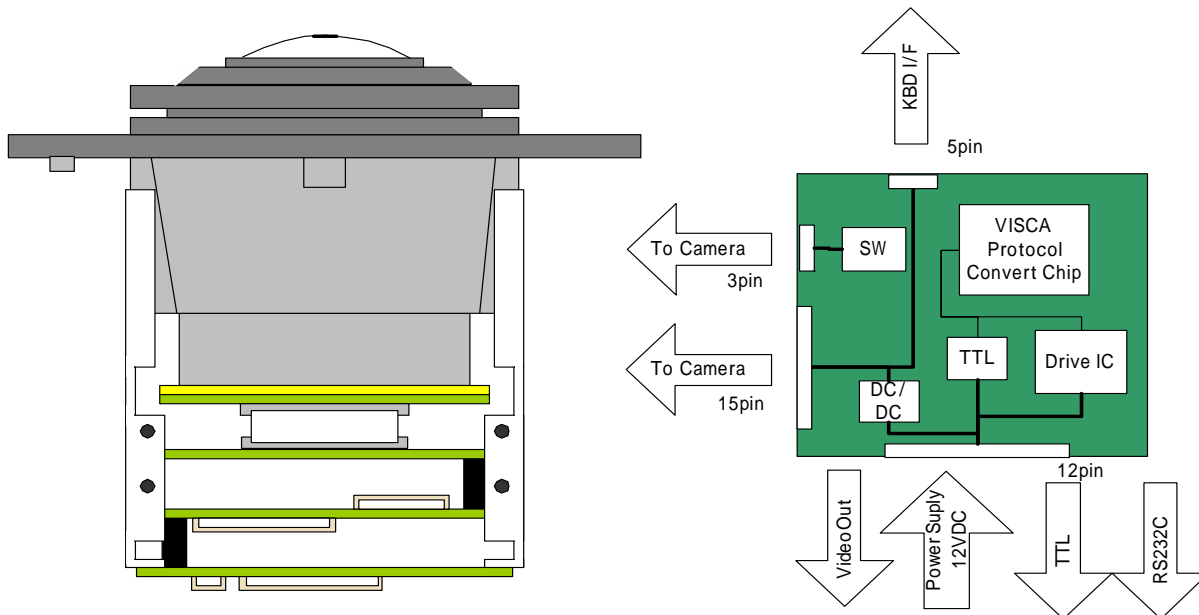
In VISCA™, the device outputting commands, for example, a computer is called the controller. The device receiving the commands and camera is called the peripheral device. In VISCA, up to seven peripheral devices like the RPU camera cab connected to one controller using communication conforming to the RS-232C standard. The parameters of RS-232C are as follows.

- Communication speed : 9600,19200 and 38400bps
- Data length : 8bit
- Start bit : 1bit
- Stop bit : 1bit
- Parity : none

Flow control using XON/XOFF and RTS/CTS, etc., is not supported.

In normally VISCA™, the peripheral devices are connected by daisy chains. But the RPU camera cannot support the daisy chains hardware.

2. Connection



3. VISCA™ specifications

3.1 VISCA™ packet structure

The basic unit of VISCA™ communication is called packet. (Please see Fig. 3.1) The first byte of packet is called the header and comprises the sender's and receiver's addresses. For example, the header of the packet sent to the RPU camera assigned address 1 from the controller (address 0) is hexadecimal 81H. The packet sent the camera assigned 2 is 82H. In the command list, as the hexadecimal is 8X, input the address of the camera at X. The header of the reply packet from the camera assigned address 1 is 90H. The packet from the camera assigned address 2 is A0H. When the terminator is FFH, it signifies the end of the packet.

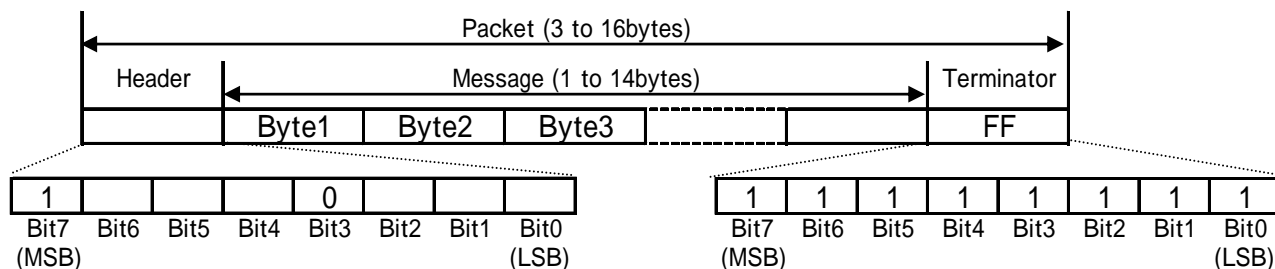


Figure 3.1 Packet structure

3.2 Command and Inquiry

- Command : Sends the operational commands to the camera
- Inquiry : Used for inquiring about the current state of the camera

Packet	Note
8X QQ RR ... FF	QQ = Command/Inquiry, RR = Category code

X = 1 to 7 : camera address
 QQ = 01(Command), 09(Inquiry)
 RR = 00(Interface), 04(Camera 1), 06(Pan/Tilt), etc.

3.3 Response for commands and inquiries

- ACK message : Returned by the camera when it receives a command. ACK message is not returned for inquiries.
- Completion message : Returned by the camera when execution of commands or inquiries is completed. In the case of inquiries after the 3rd byte of the packet. If the ACK message is omitted, the socket number will contain 0.

	Reply packet
ACK	X0 4Y FF
Completion for Command	X0 5Y FF
Completion for Inquiry	X0 5Y ... FF

X = 9 to F : the camera address + 8
 Y = socket number

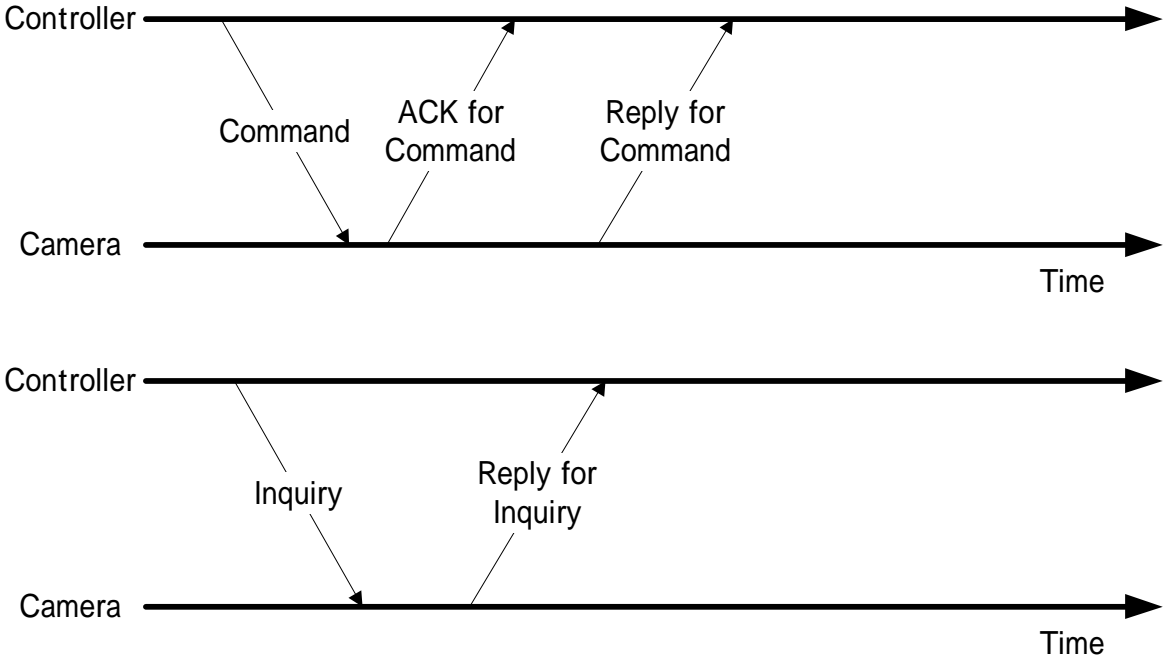


Fig3.3 (1) Command and Response

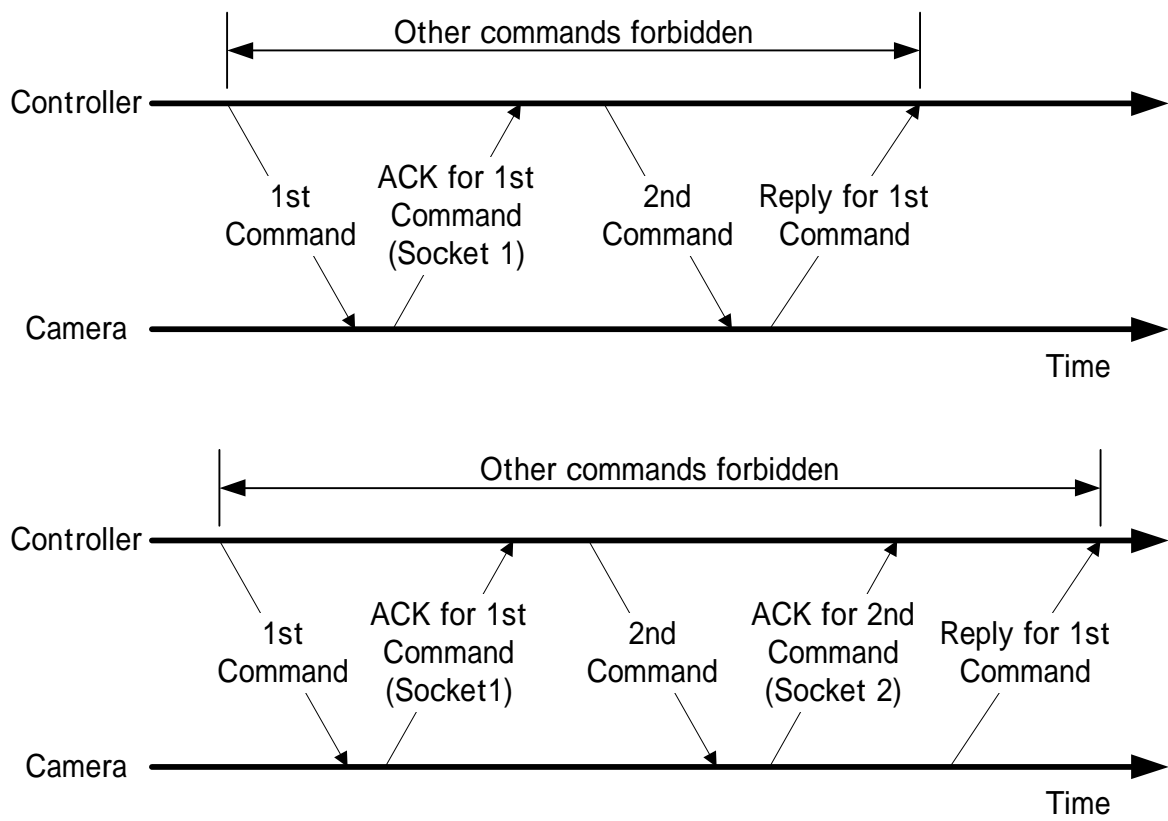


Fig3.3 (2) Command and Response (Multi commands)

- Error message : When an operational and inquiry commands could not be executed or failed, an error message is returned instead of the completion message.

Error packet	Note
X0 60 01 FF	Message length error (> 16 bytes)
X0 60 02 FF	Syntax error It receives unsupported commands or illegal commands (i.e. lack of the parameters).
X0 60 03 FF	Command buffer full Indicates that two sockets are already being used (executing two commands) and the command could not be accepted.
X0 6Y 04 FF	Command cancelled It receives a cancel command for which is being executed in a socket specified. The completion message for this command is not returned.
X0 6Y 05 FF	Command no exist It receives a cancel command for which is not being executed in a socket specified. Or It receives an invalid socket number.
X0 6Y 41 FF	Command not executable It receives a command which cannot be executed due to the current conditions. For example, when commands controlling the radius setting are receiving during the except the ring display mode.

X = 9 to F : the camera address + 8

Y = socket number

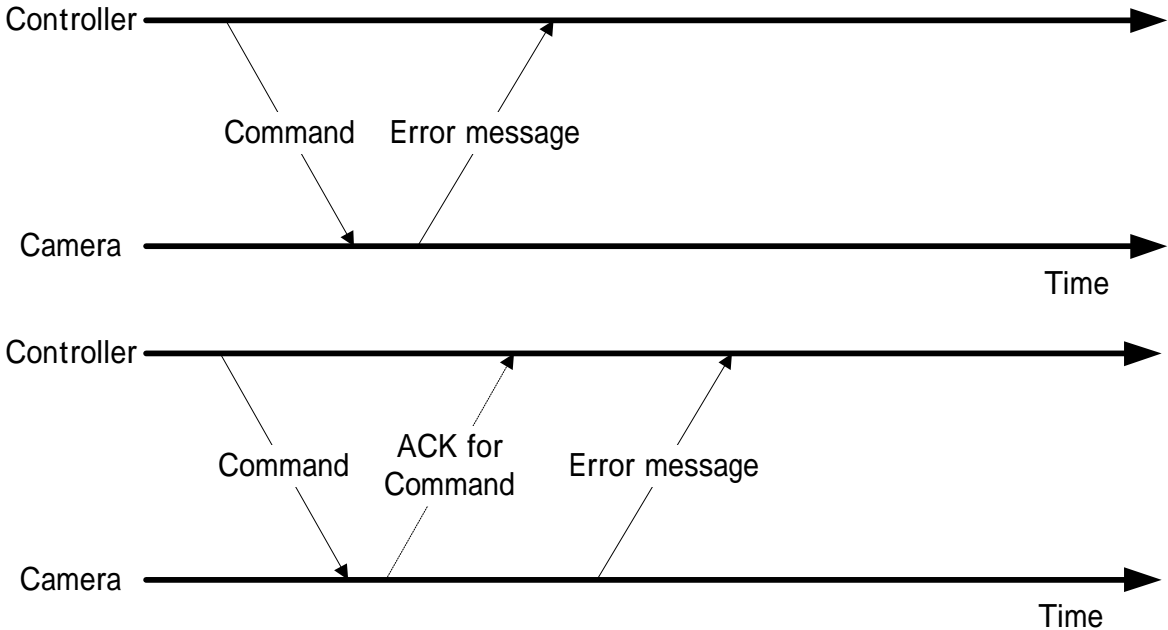


Fig 3.3 Error Message

3.4 Socket number

When command messages are sent to the RPU camera, it is normal to send the next command message after waiting for the completion message or error message to return. However to deal with advanced uses, the RPU camera has two buffers (memories) for commands, so that up to two commands including the commands currently being executed can be received. When the RPU camera receives commands, it notifies the sender which command buffer was used has socket number of the ACK message. As the completion message or error message also has a socket number, it indicates which command has ended. Even when two command buffers are being used at any one time, an RPU camera management command and some inquiry message can be executed. The ACK message is not returned for these commands and inquiries, and only the completion message of socket number 0 is returned.

3.5 Cancellation of command executions

To cancel a command which has already been sent, send the IF_Clear command as the next command.

To cancel one of any two commands which have been sent, use the cancel message

	Command packet
Cancel message	8X 2Y FF

X = 9 to F : the camera number + 8
 Y = socket number

An error message will be returned for this command, but this is not a fault. It indicates that the command has been canceled.

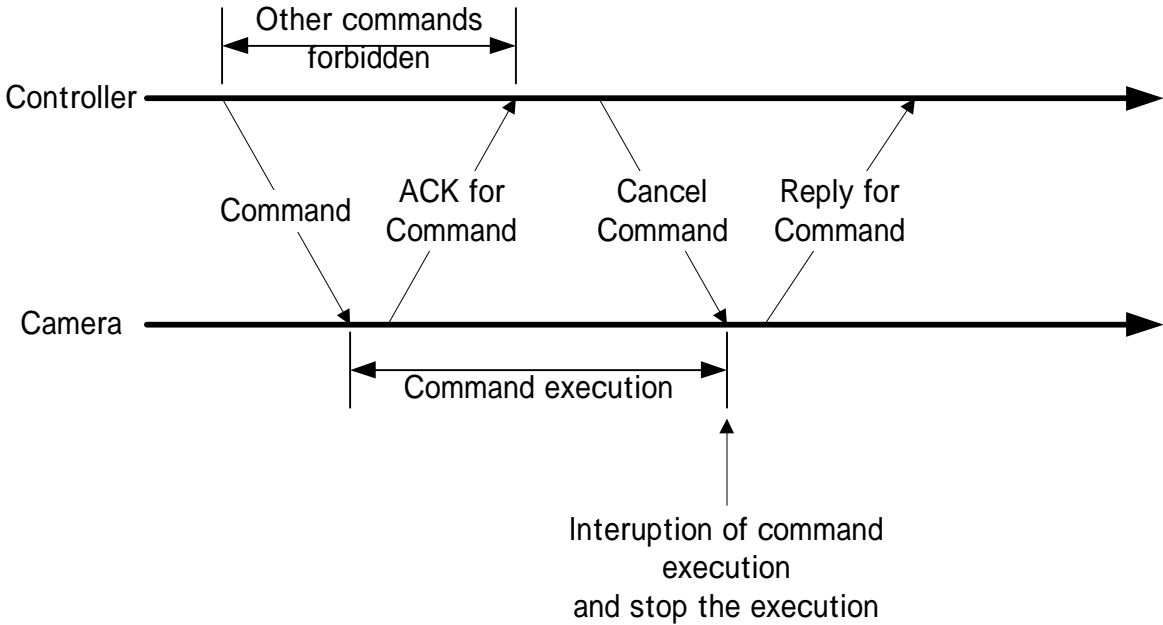


Fig 3.5 Cancellation of the command executions

4. VISCA™ device setting command

4.1 VISCA™ Network administration

- **AddressSet** : Sets an address of a peripheral device. Use when initializing the network, and receiving the following network change message.

	Command packet	Response packet
AddressSet	88 30 01 FF	88 30 0n FF

You can get the number of connecting devices. This number is (n - 1).

4.2 VISCA™ interface command

- **IF_Clear** : Clears the command buffer in the RPU camera and cancel the commands current being executed.

	Command packet	Response packet
IF_Clear	8x 01 00 01 FF	Y0 50 FF
IF_Clear (broadcast)	88 01 00 01 FF	88 01 00 01 FF

X = 1 to 7 : the camera address

Y =9 to F : the camera address + 8

4.3 VISCA™ interface and inquiry

- **IF_DeviceTypeInq** : Returns information on the VISCA™ interface.

	Command packet	Response packet
IF_DeviceTypeInq	8X 09 00 02 FF	Y0 50 GG GG HH HH JJ JJ KK FF

X = 1 to 7 : the camera address

Y = 9 to F : the camera address + 8

	Note	Value
GGGG	Vender ID	0001: Sony
HHHH	Model ID	0903: RPU-C2512 0904: RPU-C3522
JJJJ	ROM revision	0100: It means Rom version is 01.00
KK	Maximum socket number	02

4.4 VISCA™ interface: Initial start of the communication

It starts the communication according to the following method

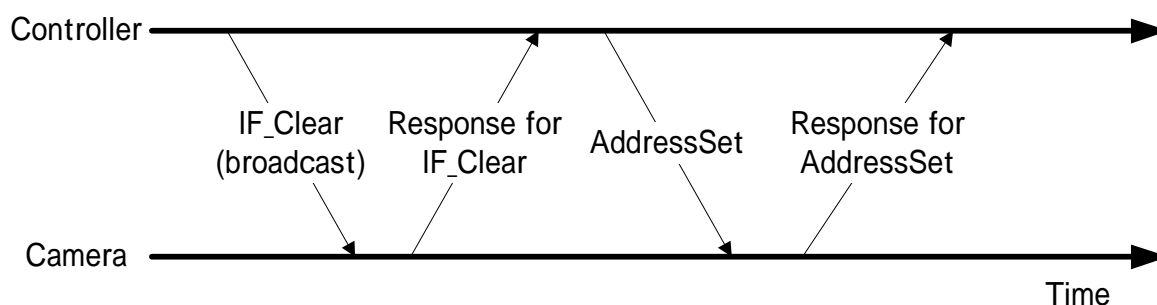


Fig 4.4 Initial start of the communication

5. Camera Control

5.1 Display mode

There are six patterns as the display mode.

(1) Ring display



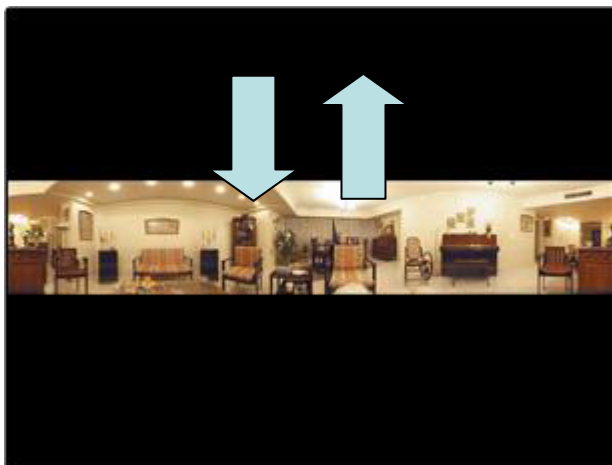
It displays the 360 degree image (original image) before converting processing.

(2) Dual Half Wide display



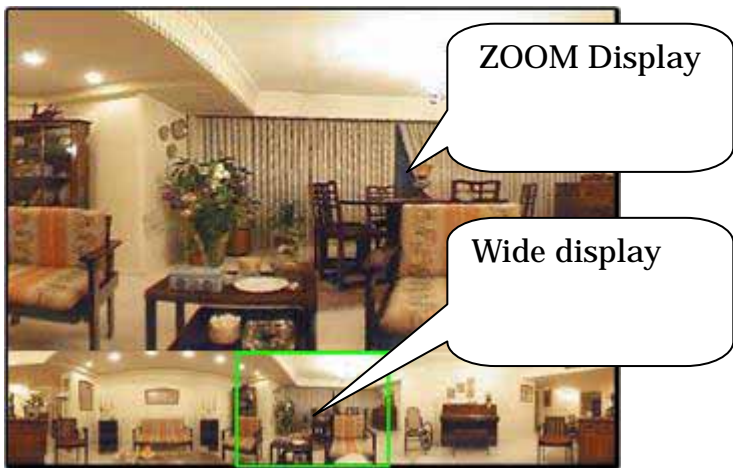
It displays two spread images from the 360 degree image.

(3) Wide display



It displays the spread image of 360 degree image.

(4) Wide & Zoom display



It displays at the same time the spread image of 360 degree image and a square image cut from the above spread image.

(5) Quad display



It displays four spread images which cut out about 120 degrees from the 360 degree image.

(6) Quad & Wide display



It displays at the same time the spread image of 360 degree image and four spread images which cut out about 120 degrees from the 360 degree image.

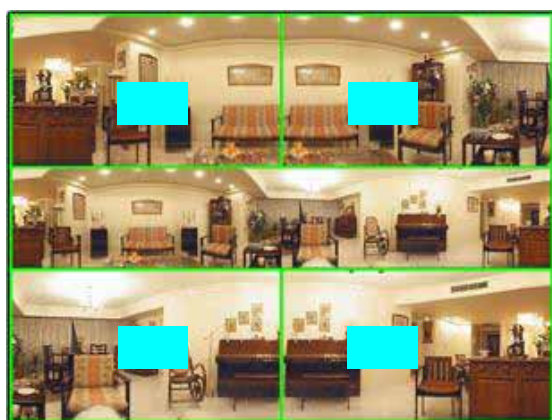
(7) Rear View image display



It displays two spread images from the 360 degree image. And 180 degree image below is displayed by the mirror.

5.2 Pan-Tilt-Zoom control

The RPU camera has four display areas as same as four Pan-Tilt-Zoom cameras. And when the Pan-Tilt-Zoom command is sent to the RPU camera, each display areas will be change.



5.3 Memory control

(1) Memory (Reset)

Resume the camera setting to the Factory setting.

(2) Memory (Set)

It stores the present value of Camera setting.

Even if a camera turns off, this setting is maintained.

Next, when a camera turns on, this storing setting value becomes valid.

(3) Memory (Load)

It reads the setting value which is storing into the camera.

The following parameter is the object of the control.

Display mode (Ring display, Dual half display,, etc.)

Display position (Pan, Tilt and Zoom)

The ON/OFF condition of Auto Exposure function and the AE Target value

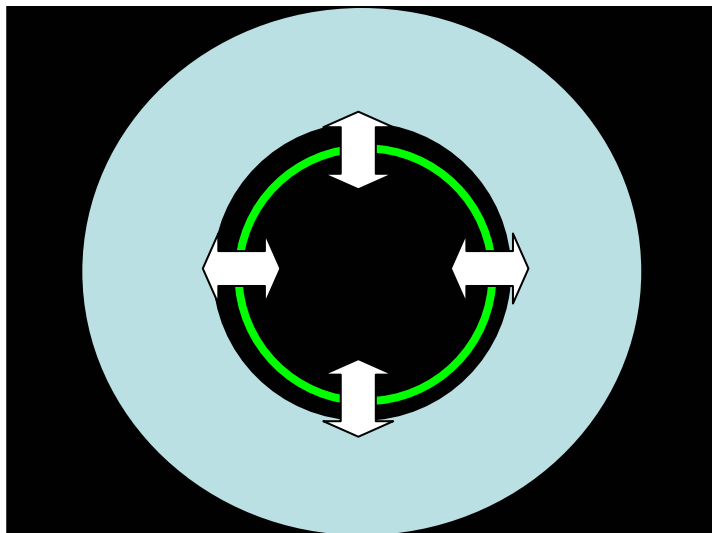
The ON/OFF condition of Auto White Balance function

Adjustment of Effective Area Ring position

The setting value of the camera feature (RGain, BGain, Shutter, Gain and Aperture)

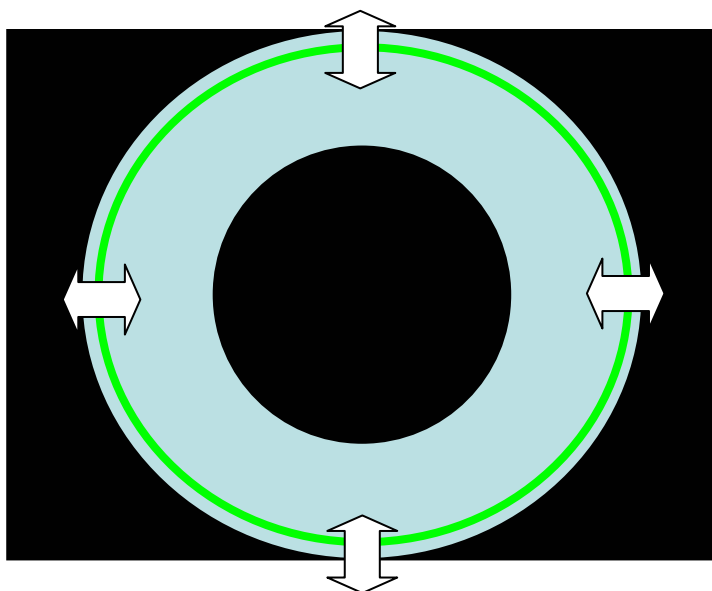
5.4 Adjustment of the effective area

(1) Inner Radius (+/-)



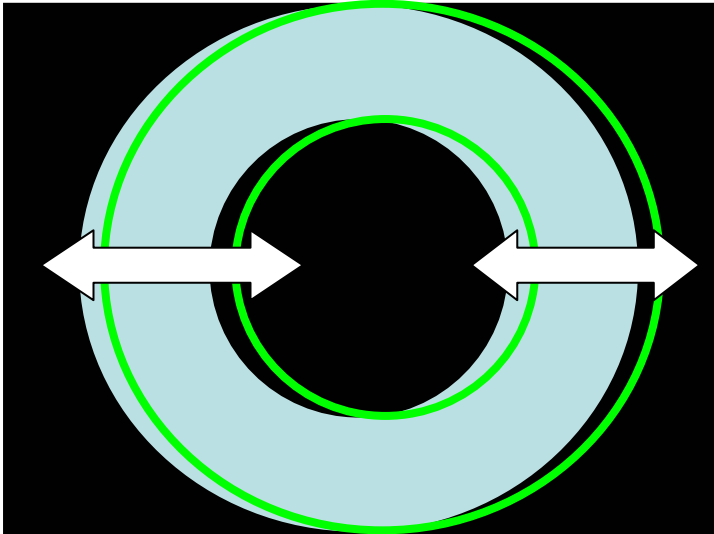
Specify the radius of the inner ring.

(2) Outer Radius (+/-)



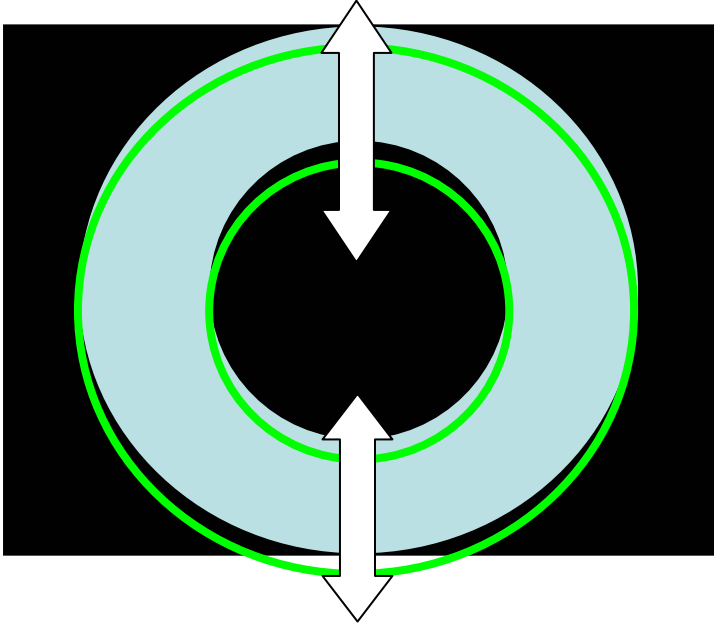
Specify the radius of the outer ring.

(3) Ring Center in X axis



Specify the X position (Horizontal Position) of the inner and outer ring.

(4) Ring Center in Y axis



Specify the Y position (Vertical Position) of the inner and outer ring.

6. Command Lists

Command Lists (1/3)

Command set	Command	Command packet	Comments	Execut-able mode
AddressSet	broadcast	88 30 01 FF	Address setting	ALL
IF_Clear	broadcast	88 01 00 01 FF	Interface Clear	ALL
CommandCancel		8x 2z FF	z is a socket number. 1 or 2	ALL
CAM_Zoom	Stop	8x 01 04 07 00 FF		Except Ring display
	Tele (Standard)	8x 01 04 07 02 FF	*1	
	Wide (Standard)	8x 01 04 07 03 FF	*1	
CAM_WB	Auto	8x 01 04 35 00 FF		ALL
	Manual	8x 01 04 35 05 FF		
CAM_RGain	Reset	8x 01 04 03 00 FF	value:0080(hex)	ALL
	Up	8x 01 04 03 02 FF		
	Down	8x 01 04 03 03 FF		
CAM_BGain	Reset	8x 01 04 04 00 FF	value:0080(hex)	ALL
	Up	8x 01 04 04 02 FF		
	Down	8x 01 04 04 03 FF		
CAM_AE	Full Auto	8x 01 04 39 00 FF		ALL
	Manual	8x 01 04 39 03 FF		
CAM_Shutter	Reset	8x 01 04 0A 00 FF	value:5	ALL
	Up	8x 01 04 0A 02 FF		
	Down	8x 01 04 0A 03 FF		
	Direct	8x 01 04 4A 0p 0p 0p 0p FF	pppp:0 to 15(hex)	
CAM_Gain	Reset	8x 01 04 0C 00 FF	value:2	ALL
	Up	8x 01 04 0C 02 FF		
	Down	8x 01 04 0C 03 FF		
	Direct	8x 01 04 4C 0p 0p 0p 0p FF	pppp:0 to 13(hex)	
CAM_ExpComp	On	8x 01 04 3E 02 FF		ALL
	Off	8x 01 04 3E 03 FF		
	Reset	8x 01 04 0E 00 FF	value:12C(hex)	
	Up	8x 01 04 0E 02 FF		
	Down	8x 01 04 0E 03 FF		
	Direct	8x 01 04 4E 0p 0p 0p 0p FF	pppp:0 to 3FF(hex)	

Command Lists (2/3)

Command set	Command	Command packet	Comments	Executable mode
CAM_Aperture	Reset	8x 01 04 02 00 FF	value:4	ALL
	Up	8x 01 04 02 02 FF		
	Down	8x 01 04 02 03 FF		
	Direct	8x 01 04 42 00 00 0p 0q FF	pq : 00 to 06	
CAM_Memory	Reset	8x 01 04 3F 00 0p FF	p: Memory number(0)	ALL
	Set	8x 01 04 3F 01 0p FF	Reset command loads the factory setting	
	Recall	8x 01 04 3F 02 0p FF		
CAM_KeyLock	Off	8x 01 04 17 00 FF	It makes a KBD command invalid.	ALL
	On	8x 01 04 17 02 FF		
Pan-tiltDrive	Up	8x 01 06 01 vv ww 03 02 FF	vv: Pan speed 1 to 18(hex)	Except Ring display
	Down	8x 01 06 01 vv ww 03 01 FF		
	Left	8x 01 06 01 vv ww 02 03 FF	ww: Tilt speed 1 to 18(hex)	
	Right	8x 01 06 01 vv ww 01 03 FF		
	UpLeft	8x 01 06 01 vv ww 02 02 FF	The Pan-tilt operation command continues operation until it receives a Stop command.	
	UpRight	8x 01 06 01 vv ww 01 02 FF		
	DownLeft	8x 01 06 01 vv ww 02 01 FF		
	DownRight	8x 01 06 01 vv ww 01 01 FF		
	Stop	8x 01 06 01 vv ww 03 03 FF		
	AbosultePosition	8x 01 06 02 vv ww 0y 0y 0y 0y 0z 0z 0z 0z FF	yyyy: Pan position 0 to 3200(hex) zzzz: Tilt position FF64 to 9B(hex) (z=0) is center position	
	RelaivePosition	8x 01 06 03 vv ww 0y 0y 0y 0y 0z 0z 0z 0z FF	yyyy: Pan position positive value is pan left and negative value is pan right zzzz: Tilt position positive value is tilt down and negative value is tilt up	
Home	8x 01 06 04 FF	pan position is 2580 (hex) tilt position is 0		
Reset	8x 01 06 05 FF			

Command Lists (3/3)

Command set	Command	Command packet	Comments	Executable mode
CAM_Mode	Up	8x 01 70 01 01 02 FF	Select a display mode It repeats the mode following 00 to 06 in order. pq: 00 to 05 00: Ring display 01: Dual Half Wide display 02: reserved 03: Wide & Zoom display 04: Quad display 05: Quad & Wide display 06: Wide display 07: Rear View image display Reset command displays Quad & Wide display	ALL
	Down	8x 01 70 01 01 01 FF		
	Reset	8x 01 70 01 01 00 FF		
	Direct	8x 01 70 41 0p 0q FF		
Inner radius	Reset	8x 01 70 10 00 FF	Loads a Factory setting	Ring display
	+	8x 01 70 10 02 FF		
	-	8x 01 70 10 03 FF		
	Direct	8x 01 70 50 0p 0p 0p 0p FF	pppp: 0 to 280(hex)	
Outer radius	Reset	8x 01 70 11 00 FF	Loads a Factory setting	Ring display
	+	8x 01 70 11 02 FF		
	-	8x 01 70 11 03 FF		
	Direct	8x 01 70 51 0p 0p 0p 0p FF	pppp: 0 to 280(hex)	
Ring center in X	Reset	8x 01 70 12 00 FF	Loads a Factory setting	Ring display
	+	8x 01 70 12 02 FF		
	-	8x 01 70 12 03 FF		
	Direct	8x 01 70 52 0p 0p 0p 0p FF	pppp: 0 to 500(hex)	
Ring center in Y	Reset	8x 01 70 13 00 FF	Loads a Factory setting	Ring display
	+	8x 01 70 13 02 FF		
	-	8x 01 70 13 03 FF		
	Direct	8x 01 70 53 0p 0p 0p 0p FF	pppp: 0 to 280(hex)	

Inquiry Commands

Inquiry Command	Command Packet	Reply packet	Comments	Executable mode
CAM_VersionInq	8x 09 00 02 FF	y0 50 00 01 mm mm nn pp ss FF	mmmm : Model ID nnnn : ROM version pp : Socket number	ALL
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	Always read On state	ALL
CAM_ZoomPosInq	8x 09 04 47 FF	y0 50 0z 0z 0z 0z FF	zzzz: Zoom position	ALL
CAM_WBModeInq	8x 09 04 35 FF	y0 50 00 FF	Auto	ALL
		y0 50 05 FF	Manual	
CAM_AEModeInq	8x 09 04 39 FF	y0 50 00 FF	Auto	ALL
		y0 50 03 FF	Manual	
CAM_RGainInq	8x 09 04 43 FF	y0 50 00 00 0p 0q FF	pq:R-Gain value	ALL
CAM_BGainInq	8x 09 04 44 FF	y0 50 00 00 0p 0q FF	pq:B-Gain value	ALL
CAM_ExpCompModeInq	8x 09 04 3E FF	y0 50 02 FF	On	ALL
		y0 50 03 FF	Off	
CAM_ExpCompPosInq	8x 09 04 4E FF	y0 50 00 00 0p 0q FF	pq: ExpComp value	ALL
CAM_ShutterPosInq	8x 09 04 4A FF	y0 50 00 00 0p 0q FF	pq: Shutter value	ALL
CAM_GainPosInq	8x 09 04 4C FF	y0 50 00 00 0p 0q FF	pq: Gain value	ALL
CAM_ApertureInq	8x 09 04 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture value	ALL
CAM_MemoryPosInq	8x 09 04 3F FF	y0 50 pp FF	pp: last recall memory number	ALL
CAM_KeyLockInq	8x 09 04 17 FF	y0 50 00 FF	Off	ALL
		y0 50 02 FF	On	
Pan-tiltPosInq	8x 09 06 12 FF	y0 50 0w 0w 0w 0w 0z 0z 0z 0z FF	wwww: Pan position zzzz: Tilt position	ALL
VideoSystemInq	8x 09 07 26 FF	y0 50 00 FF	NTSC	ALL
		y0 50 01 FF	PAL	
CAM_PictureFlipModeInq	8x 09 04 66 FF	y0 50 02 FF	On	ALL
		y0 50 03 FF	Off	
CAM_ModeInq	8x 09 70 01 FF	y0 50 pp FF	pp: Display mode	ALL
InnerRadiusSizeInq	8x 09 70 10 FF	y0 50 0p 0p 0p 0p FF	pppp: Inner radius size	ALL
OuterRadiusSizeInq	8x 09 70 11 FF	y0 50 0p 0p 0p 0p FF	pppp: Outer radius size	ALL
RingCenterXPosInq	8x 09 70 12 FF	y0 50 0p 0p 0p 0p FF	pppp: X axis position	ALL
RingCenterYPosInq	8x 09 70 13 FF	y0 50 0p 0p 0p 0p FF	pppp: Y axis position	ALL

7. Command Value

Shutter value	16(hex)	1/10,000 sec
	15(hex)	1/6,000 sec
	14(hex)	1/4,000 sec
	13(hex)	1/3,000 sec
	12(hex)	1/2,000 sec
	11(hex)	1/1,500 sec
	10(hex)	1/1,000 sec
	0F(hex)	1/725 sec
	0E(hex)	1/500 sec
	0D(hex)	1/350 sec
	0C(hex)	1/250 sec
	0B(hex)	1/180 sec
	0A(hex)	1/125 sec
	09	1/100 sec
	08	1/90 sec
	07	1/60 sec
	06	1/50 sec
	05	1/30 sec
	04	1/25 sec
	03	1/20 sec
02	1/10 sec	
01	1/8.5 sec	
00	1/8.5 sec	

Gain	11(hex)	24db
	10(hex)	24db
	0F(hex)	24db
	0E(hex)	24db
	0D(hex)	24db
	0C(hex)	22db
	0B(hex)	20db
	0A(hex)	18db
	09	16db
	08	14db
	07	12db
	06	10db
	05	8db
	04	6db
	03	4db
	02	2db
	01	0db
00	0db	

Zoom Ratio	4000(hex)	× 1
	5E00(hex)	× 2

		Pan Position Data (hex)
Angle	360 °	3200
	300 °	2DD5
	270 °	29AA
	240 °	2155
	210 °	1D2A
	180 °	1900
	150 °	14D5
	120 °	10AA
	90 °	C80
	60 °	855
	30 °	42A
	0 °	0

These below values are depending on the adjustment of ring setting.

Angle (Reference)		Tilt Position Data (hex)	
		RPU-C2512	RPU-C3522
	Min	FF71	FF64
	Max	8E	9B

History

Version	Date	Note
1.0	2004.10.08	<p>It rewrites as the official version.</p> <p>P2 Edited the communication speed</p> <p>P2 Changed the figure of "2. Connection"</p> <p>P8 Added the model ID to be able to be distinguished.</p> <p>P11 Changed the description to "5.3 Memory control"</p> <p>P15 to 18 Erased the "out of supporting" commands in the command list table.</p>
1.1	2005.03.01	<p>P11 Added the new display mode as "Rear View image"</p> <p>P17 Added the "Rear View image" of CAM_Mode command</p> <p>P17 Corrected a Reply packet for CAM_ModeInq command</p> <p>P19 Corrected the table of "Shutter value" and "Gain value" of "7.Command Value"</p>