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Document name : Product specifications CE	Date of implementation: Oct.29, '08	Date of revision: Jan.19,'11
	Document number: OP8-SPC101A	

Command Description

Customer:	
Product name :	Ultra-wide angle compact camera
Model name :	NM33

Company Name / Person to Authorize	Signature



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Check of drawing	Check of drawing	PREPARED

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1. Application

This document applies to NM33, Ultra-wide angle compact camera.

Commands are sent out from RS232C via Serial port of NM33.

Changing and getting the camera setting is available.

2. COM port setting

1	Baud rate	115200 bit/sec
2	Data bit	8 bits
3	Parity	None
4	Stop bit	1 bit
5	Flow control	None

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3. List of Commands

Command	Note
getmode	Get the current Display mode
setmode	Set the Display mode
getpan	Get the current PAN value (round angle)
setpan	Set the Round angle(*)
gettilt	Get the current TILT value (elevation angle)
settilt	Set the Elevation angle(*)
getzoom	Get the current Zoom magnification (field of view angle)
setzoom	Set the Zoom magnification(*)
getroll	Get the current Roll value (rotation angle)
setroll	Set the Rotation angle
setlocation1 ID	Set the PAN, TILT, ZOOM, ROLL values at once.
setlocation2 ID	Set the Display mode, PAN, TILT, ZOOM, ROLL values at once.
flip	Get and set the valid/invalid of vertical flip in the display (available only in Round mode)
mirror	Get and set the valid/invalid of horizontal flip in the display
aps	Set the Automatic PAN speed
start	Start the image from the stopping Image Sensor
pause	Pause to get the image from Image Sensor
setv	Switch the display ON/OFF of Performance Message
setr	Get and set the setting for the sub hemispheric screen
ae	Get and set the valid/invalid of AE (auto exposure control) mode
aet	Get and set the target value in AE mode
awb	Get and set the valid/invalid of AWB (auto white balance control)
afr	Get and set the valid/invalid of AFR (auto frame rate control)
fr	Get and set the frame rate of Image Sensor
et	Get and set the shutter speed of Image Sensor
gain	Get and set the analog gain register of Image Sensor
jpegq	Get and set the quality of the JPEG image output to the USB
sfilter	Get and set the sharpness filter
mfilter	Get and set the valid/invalid of media filter
save	Save the parameter into the flash
ptspeed	Get and set the magnification of moving speed for PAN and TILT
buttons	Conduct the same function as External control signals ([E]/[W]/[N]/[S]/[ZoomIn]/[ZoomOut]/[Menu]/[Select])
character	Get and set the valid/invalid of one letter command (serial command)
usbreso	Change the image size

(*) Angles are based on the line from the center of the original image and the display image.

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4. Command Transmission

(1) Transmit the command

To execute the command, transmit according to the following transmission format.

Transmission Format

[ESC] command string <Enter>

[ESC] command string_ parameter <Enter>

Whereas:

[ESC] : ESC code (0x1b)

<Enter> : one letter of CR(0x0d) or LF(0x0a)

Command string is to be referred to the next Chapter.

If a parameter is available, follow the command string with a space.

If multiple number of parameters are available, repeat ' a space + a parameter '.

(2) Response from the camera

When sending the command by the transmission format, the following response will be returned.

Response

[command] => (command string) <CR+LF> (returned value) <CR+LF>

Whereas:

"[command] =>" is a prompt to be returned when sending [ESC] code.

" (command string) " is the echo back to the sent command (except CR, LF) .

" (returned value) <CR+LF>" is to be returned only to the command with the returned value.

Ignore the strings prior to the returned value for getting the returned value.

(3) Precaution in getting the returned value

Some messages would be output from the camera other than the responses by the execution of commands.

(Examples of message)

Start message

Message output by a frame

Message output after switching the display mode

etc...

If sending a command with a returned value, execute the following operation to get only the returned value properly from the string output from the camera by removing such the messages as above.

Before sending a command first time:

Send as [ESC]setv off<Enter>

then save the parameter.

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This command stops the message output per each frame.

Under the condition to have such messages, getting the returned value may be affected by being interrupted by unnecessary control code.

Before sending a command every time:

Remove all transmission string from the camera and make it ready to receive only the responses to the commands.

(4) Other Precautions

- 1) When handling commands transmission via RS232C or USB through the camera serial port by micon or like, transmit commands at the timing as follows.
Otherwise, unexpected motion may be occurred by the camera buffer being over flown due to transmitting commands consecutively in a short period.

When sending a command, an echo will be returned after sending the last letter, ENTER key (Break code ('¥n')).

After receiving this echo, send the next command.

- 2) When handling the command transmission, using a virtual USB serial port, under the condition that the performance message (to be output per each frame) indication is set as ON (default=ON), it is necessary to keep reading the responses from the camera while the serial port is open.
The performance message indication can be stopped by the [setv] command.

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5. Command Description

If a parameter is available in the set command, follow the command string with a space then parameter. The examples in this Chapter are explained assuming to send commands by a hyper terminal from a Windows PC.

Command	Description
getmode	<p>Retrieve the current display mode.</p> <p>The following values are returned in strings.</p> <p>"0" Original image (hemisphere)</p> <p>"1+" Zoom I (straight move mode, 1 scene)</p> <p>"1" Zoom II (round move mode, 1 scene)</p> <p>"2" Half wide</p> <p>"4" 4-Quad</p> <p>Example to use: > getmode <Enter></p>
setmode	<p>Set up the display mode.</p> <p>Assign the parameter in the same form as the value returned by getmode command.</p> <p>Example to use: > setmode 2 <Enter></p> <p> > setmode 1+ <Enter></p>
getpan	<p>Retrieve the current PAN value (round angle).</p> <p>The unit of the returned value is "degree".</p> <p>When the upward angle of the original image is 0 degree, it grows larger in counterclockwise direction.</p> <p>Example to use: > getpan <Enter></p>
setpan	<p>Set up the PAN value (round angle).</p> <p>The unit of the value specified for parameter is "degree".</p> <p>Assign in between [0 ~ 359] .</p> <p>Example to use: > setpan 60 <Enter></p>
gettilt	<p>Retrieve the current TILT value (elevation angle).</p> <p>The unit of the returned value is "degree".</p> <p>When the center of the original image is 0 degree and the lens is set to the upward direction, the horizontal angle is 90 degree.</p> <p>Example to use: > gettilt <Enter></p>
settilt	<p>Set up the TILT value (elevation angle).</p> <p>The unit of the value specified as parameter is "degree".</p> <p>Assign in between [0 ~ 90] .</p> <p>TILT value will be limited according to the preset ZOOM magnification value.</p> <p>Example to use: > settilt 45 <Enter></p>

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Command	Description
getzoom	Return the current zoom magnification in field angle. The unit of the returned value is "degree". This angle indicates the degree relevant to the angle of circle of the original image. Example to use: > getzoom <Enter>
setzoom	The zoom magnification is set up in field angle. The unit of the parameter value is "degree". The range for the zoom magnification is approx. [10 ~ 130] degree. Example to use: > setzoom 120 <Enter>
getroll	Retrieve the current ROLL value (rotation angle). The unit of the returned value is "degree". When the upward direction of the original image is 0 degree, it grows larger in counterclockwise direction. Example to use: > getroll <Enter>
setroll	Set up the ROLL value (rotation angle). The unit of the value specified as a parameter is "degree". Assign in between [0 ~ 359] . If the display mode is the Round mode or the Half wide, setting the ROLL value will not be effective. Example to use: > setroll 90 <Enter>
setlocation1	Set up the PAN value, TILT value, ZOOM magnification, and ROLL value at once. Specify any value for the 1st parameter ID. This ID will be written in the header of the JPEG file of the JPEG image saved by the standard application software through the USB connection. It is used to judge if the setting is reflected from what command. Receiving this command will replace the command ID part of the JPEG header with the specified value. Use as: > setlocation1 [ID] [P] [T] [Z] [R] <Enter> whereas: PAN value =P, TILT value =T, ZOOM value=Z, ROLL value==R. Example to use: > setlocation1 1 60 45 120 90 <Enter>
setlocation2	In addition to the setlocation1 command, it also allows to set up the display mode. Use as: > setlocation2 [ID] [Display mode] [P] [T] [Z] [R] <Enter> Note: The meanings of command ID and PTZR is the same as setlocation1. Example to use: > setlocation2 1 1+ 60 45 120 90 <Enter>

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Command	Description
flip	<p>Get and set the valid/invalid of vertical flip in the display. This is available only in Round mode.</p> <p>Make the vertical flip setting valid, both of the vertical flip and the horizontal flip will be done. If giving no parameter or specify a wrong value, the current set value will be returned.</p> <p>No parameter --- retrieve the current flip setting</p> <p>The 1st parameter is [ON/OFF] --- switch the ON/OFF of the vertical flip.</p> <p>Example to use: > flip <Enter></p> <p>> flip off <Enter></p>
mirror	<p>Get and set the valid/invalid of horizontal flip in the display.</p> <p>If giving no parameter or specify a wrong value, the current set value will be returned.</p> <p>No parameter --- retrieve the current horizontal flip setting.</p> <p>The 1st parameter is [ON/OFF] --- switch the ON/OFF of the horizontal flip.</p> <p>Example to use: > mirror <Enter></p> <p>> mirror off <Enter></p>
aps	<p>Get and set the Automatic PAN speed.</p> <p>The speed can be switched in 7 steps of [-3 ~ +3].</p> <p>Setting [0] stops the Auto PAN motion.</p> <p>Set Auto PAN speed is workable only in the round mode and the half wide.</p> <p>No parameter --- retrieve the current Auto PAN speed.</p> <p>The 1st parameter is [-3 ~ +3] --- set the Auto PAN speed at the assigned value.</p> <p>Example to use: > aps <Enter></p> <p>> aps 3 <Enter></p>
start	<p>Resume the capturing work of sensor image under suspension.</p> <p>Example to use: > start <Enter></p>
pause	<p>Stop the capturing of sensor image.</p> <p>Switching of the display mode and PTZR, etc can be performed while in a suspended mode.</p> <p>Example to use: > pause <Enter></p>
setv	<p>Retrieve and set up the status of the performance counter (valid/invalid) output to the serial port. Specifying "ON" to the parameter in a string will be valid and "OFF" will be invalid. If giving no parameter or specify a wrong value, it returns the current setting in a string ("ON"/"OFF").</p> <p>No parameter --- retrieve the current performance message setting.</p> <p>The 1st parameter is [ON/OFF] --- switch the ON/OFF of the performance message.</p> <p>Example to use: > setv <Enter></p> <p>> setv on <Enter></p>

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Command	Description																				
setr	<p>Retrieve and set up the display setting of Sub-image (small display of the original hemisphere image).</p> <p>If giving no parameter or specify a wrong value, it returns the current setting value.</p> <p>The Sub-image is not displayed in the original hemisphere image. When switching to the original hemisphere image, this setting will return to [0].</p> <p>The following values are to be specified for the parameter.</p> <table> <tr> <td>"0" "OFF"</td><td>Non display</td></tr> <tr> <td>"1" "ON"</td><td>Upper left</td></tr> <tr> <td>"2"</td><td>Upper center</td></tr> <tr> <td>"3"</td><td>Upper right</td></tr> <tr> <td>"4"</td><td>Middle left</td></tr> <tr> <td>"5"</td><td>Middle center</td></tr> <tr> <td>"6"</td><td>Middle right</td></tr> <tr> <td>"7"</td><td>Lower left</td></tr> <tr> <td>"8"</td><td>Lower center</td></tr> <tr> <td>"9"</td><td>Lower right</td></tr> </table> <p>The 1st parameter is [0 ~ 9] --- display the Sub-image at the specified position. The 1st parameter is [ON] --- display the Sub-image at the Upper left position. The 1st parameter is [OFF] --- no display as same as the setting [0]. No parameter --- get the current set value of the Sub-image.</p> <p>Example to use: > setr <Enter> > setr on <Enter></p>	"0" "OFF"	Non display	"1" "ON"	Upper left	"2"	Upper center	"3"	Upper right	"4"	Middle left	"5"	Middle center	"6"	Middle right	"7"	Lower left	"8"	Lower center	"9"	Lower right
"0" "OFF"	Non display																				
"1" "ON"	Upper left																				
"2"	Upper center																				
"3"	Upper right																				
"4"	Middle left																				
"5"	Middle center																				
"6"	Middle right																				
"7"	Lower left																				
"8"	Lower center																				
"9"	Lower right																				
ae	<p>Retrieve and set up valid/invalid of AE (Auto Exposure) mode.</p> <p>Specifying "ON" string to the parameter will be valid, and "OFF" string will be invalid.</p> <p>If giving no parameter or specify a wrong value, it returns the current setting in a string ("ON"/"OFF").</p> <p>No parameter --- retrieve the current AE mode setting.</p> <p>The 1st parameter is [ON/OFF] --- switch the ON/OFF of the AE mode.</p> <p>Example to use: > ae <Enter> > ae off <Enter></p>																				
aet	<p>Retrieve and set up the AE target level value (the target to be used for auto exposure control). The value to be specified should be integer between 5 and 1000, and the bigger the value, the brighter. When assigning a value out of specified range, it will be clipped at the upper or lower limit value.</p> <p>If giving no parameter or specify a wrong value, it returns the current setting value.</p> <p>No parameter --- retrieve the current AE target level value.</p> <p>The 1st parameter is [5~1000] --- set at the assigned AE target level value.</p> <p>Example to use: > aet <Enter> > aet 220 <Enter></p>																				

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Command	Description
awb	<p>Retrieve and set up valid/invalid of the auto white balance control (AWB). Specifying "ON" string to the parameter will be valid, and "OFF" string will be invalid. If giving no parameter or specify a wrong value, it returns the current setting in a string ("ON"/"OFF").</p> <p>No parameter --- retrieve the current AWB setting. The 1st parameter is [ON/OFF] --- switch the ON/OFF of the AWB.</p> <p>Example to use: > awb <Enter> > awb on <Enter></p>
afr	<p>Retrieve and set up valid/invalid of the auto frame rate control (AFR). Specifying "ON" string to the parameter will be valid, and "OFF" string will be invalid. If giving no parameter or specify a wrong value, it returns the current setting in a string ("ON"/"OFF").</p> <p>Note: If selecting the half wide in the display mode, AFR will be invalid automatically. Use it as is.</p> <p>No parameter --- retrieve the current AFR setting. The 1st parameter is [ON/OFF] --- switch the ON/OFF of the AFR.</p> <p>Example to use: > afr <Enter> > afr on <Enter></p>
fr	<p>Retrieve and set up the frame rate (fps) of the image sensor. The minimum value is 6.4. The maximum value depends on display mode and zoom magnification, etc.</p> <p>If giving no parameter or specify a wrong value, it returns the current setting value. No maximum limit value is specified for this parameter. In case of assigning a value larger than the maximum frame rate allowed for the current display mode, the value will be the maximum value depending on the display mode.</p> <p>Note: You must make the AFR invalid before setting a value by this command.</p> <p>No parameter --- retrieve the current Frame Rate setting. The 1st parameter is [6.4] --- regard the assigned value as the number of frame per 1 sec.</p> <p>Example to use: > fr <Enter> > fr 9.5 <Enter></p>
et	<p>Retrieve and set up the Shutter speed (exposure time) (usec) of the image sensor. The minimum value is 5. It is possible to set up to 500000 (0.5 sec).</p> <p>If giving no parameter or specify a wrong value, it returns the current setting value.</p> <p>Note: You need to make the AE mode (auto exposure time control function) invalid before setting a value by this command.</p> <p>Note: Since the value assigned to the parameter will be rounded to the value usable for the image sensor setting, a little difference will be.</p> <p>No parameter --- retrieve the current Shutter Speed setting. The 1st parameter is [5~500000] --- regard the assigned value as the Shutter Speed.</p> <p>Example to use: > et <Enter> > et 65000 <Enter></p>

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Command	Description
gain	<p>Retrieve and set up the analog gain register of the image sensor. When assigning a value out of specified range, it will be clipped at the upper or lower limit value. If giving no parameter or specify a wrong value, it returns the current setting value. The value to be specified is the following; Note: You need to make the AE mode (auto exposure time control function) invalid before setting a value by this command.</p> <p style="text-align: center;">[0.125~32.00]</p> <p style="text-align: center;">0.125~4.000 by 0.125 interval 4.000~8.000 by 0.250 interval 8.000~32.000 by 1.000 interval</p> <p>No parameter --- retrieve the current gain value setting. The 1st parameter is from the above range --- set the each gain corresponding to the assigned value. Example to use: > gain <Enter> > gain 2 <Enter></p>
jpegq	<p>Retrieve and set up the quality (Q value) of JPEG image output to USB. The value to be specified should be an integer between 0 and 99, and the bigger the value, the more the data amount. When assigning a value out of specified range, it will be clipped at the upper or lower limit value. If giving no parameter or specify a wrong value, it returns the current setting value. No parameter --- retrieve the current JPEG image quality set value. The 1st parameter is [0 ~ 99] --- set the JPEG quality corresponding to the assigned value. Example to use: > jpegq <Enter> > jpegq 80 <Enter></p>
sfilter	<p>Retrieve and set up the sharpness filter (5 x 5 filter). 0 will make it invalid. 1 to 8 will apply the preset filter. The smaller the value, the better the sharpness becomes. If giving no parameter or specify a wrong value, it returns the current setting value. No parameter --- retrieve the current sharpness filter set value. The 1st parameter is [0 ~ 8] --- set the sharpness corresponding to the assigned value. Example to use: > sfilter <Enter> > sfilter 5 <Enter></p>

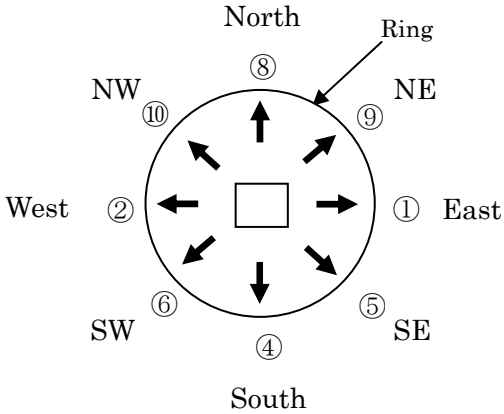
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Command	Description																
mfilter	<p>Retrieve and set up valid/invalid of the Median Filter (Blur Filter). Specifying "ON" to the parameter will make it valid, and "OFF" will invalid. If giving no parameter or specify a wrong value, it returns the current setting in a string ("ON"/"OFF").</p> <p>No parameter --- retrieve the current Median Filter setting value. The 1st parameter is [ON/OFF] --- switch the ON/OFF of the Median Filter.</p> <p>Example to use: > mfilter <Enter> > mfilter on <Enter></p>																
save	<p>Save the parameters into the flash memory. This command is to be used without parameters. The subject to save would like to be referred to the Chapter 6. Save Parameter.</p> <p>Note: This command is available with the firmware version [o.5.24, w.0.2.3] and later.</p>																
ptspeed	<p>Retrieve and set up the magnification of the PAN and TILT moving speed. The followings are the parameter value to be assigned. If giving no parameter, it returns the current set value.</p> <table> <tr><td>"0"</td><td>×1.000</td></tr> <tr><td>"1"</td><td>×1.250</td></tr> <tr><td>"2"</td><td>×0.062</td></tr> <tr><td>"3"</td><td>×0.094</td></tr> <tr><td>"4"</td><td>×0.125</td></tr> <tr><td>"5"</td><td>×0.250</td></tr> <tr><td>"6"</td><td>×0.500</td></tr> <tr><td>"7"</td><td>×0.750</td></tr> </table> <p>No parameter --- retrieve the current magnification of the PAN & TILT moving speed setting value. The 1st parameter is [0 ~ 7] --- set the magnification of the PAN and TILT moving speed corresponding to the assigned value.</p>	"0"	×1.000	"1"	×1.250	"2"	×0.062	"3"	×0.094	"4"	×0.125	"5"	×0.250	"6"	×0.500	"7"	×0.750
"0"	×1.000																
"1"	×1.250																
"2"	×0.062																
"3"	×0.094																
"4"	×0.125																
"5"	×0.250																
"6"	×0.500																
"7"	×0.750																
character	<p>Get and set the valid/invalid of one letter command (serial command). Note: This command is available with the firmware version [o.5.25, w.0.2.4] and later.</p> <p>No parameter --- retrieve the current status of the one letter command valid or invalid. The 1st parameter is [ON/OFF] --- switch the ON/OFF of the one letter command.</p> <p>Example to use: > character <Enter> > character on <Enter></p>																

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Command	Description																												
buttons	<p>Execute the same function as what the external control signals ([E] / [W] / [N] / [S] / [ZoomIn] / [ZoomOut] / [Menu] / [Select]) do.</p> <p>Note: This command is available with the firmware version [o.5.25, w.0.2.4] and later.</p> <table border="1"> <thead> <tr> <th>Corresponding button</th><th>parameter</th></tr> </thead> <tbody> <tr><td>Release a button</td><td>0</td></tr> <tr><td>East button:</td><td>1</td></tr> <tr><td>West button:</td><td>2</td></tr> <tr><td>South button:</td><td>4</td></tr> <tr><td>North button:</td><td>8</td></tr> <tr><td>SE</td><td>5</td></tr> <tr><td>SW</td><td>6</td></tr> <tr><td>NE</td><td>9</td></tr> <tr><td>NW</td><td>10</td></tr> <tr><td>Up button:</td><td>16</td></tr> <tr><td>Down button:</td><td>32</td></tr> <tr><td>Menu button:</td><td>64</td></tr> <tr><td>Select button:</td><td>128</td></tr> </tbody> </table>  <p>※ The numbers in the above Figure are relating to the parameter in the left table. The arrows mean the direction of the Extracted frame to move.</p> <p>No parameter --- return the parameter value of the currently pressed button.</p> <p>The 1st parameter is [the number in the above table]</p> <p>--- PTZR will move in the direction corresponding to the button.</p> <p>If intending to move in an in-between direction, assign the total number of its both sides as the parameter value.</p> <p>If no button is pressed, it returns [0].</p> <p>Note: Unless the button was released (assign the parameter [0]) after setting the condition by pressing any button to assign some PTZR parameter value, the condition continues as if some button keeps being pressed.</p> <p>Example to use:</p> <ul style="list-style-type: none"> > buttons 6 <Enter> : Press [West]+[South] button (2+4=6) > buttons 0 <Enter> : release button 	Corresponding button	parameter	Release a button	0	East button:	1	West button:	2	South button:	4	North button:	8	SE	5	SW	6	NE	9	NW	10	Up button:	16	Down button:	32	Menu button:	64	Select button:	128
Corresponding button	parameter																												
Release a button	0																												
East button:	1																												
West button:	2																												
South button:	4																												
North button:	8																												
SE	5																												
SW	6																												
NE	9																												
NW	10																												
Up button:	16																												
Down button:	32																												
Menu button:	64																												
Select button:	128																												
usbreso	<p>Retrieve and set up the size (VGA/QVGA/LARGE) of the currently set image.</p> <p>Note: This command is available with the firmware version [o.6.00, w.1.0.0] and later.</p> <p>No parameter --- retrieve the current image size.</p> <p>The 1st parameter is [vga/qvga/large] --- switch the image size [VGA/QVGA/LARGE].</p> <p>Example to use:</p> <ul style="list-style-type: none"> > usbreso <Enter> > usbreso vga <Enter> 																												

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6. Save Parameter

The set value assigned by the parameters listed in the below table can be saved in the camera by the save command. The saved parameter can be hold after re-started.

No.	Description	Relating commands
1	Display mode setting	setmode, setlocation2
2	Sub-image display setting	setr
3	PAN value	setpan, setlocation1
4	TILT value	settilt, setlocation1
5	ZOOM value	setzoom, setlocation1
6	ROLL value	setroll, setlocation1
7	Display vertical flip (up side down)	flip
8	AE mode setting	ae
9	AE target level value	aet
10	AWB setting	awb
11	Gain value	gain
12	Shutter speed value	et
13	Sharpness Filter setting	sfilter
14	Median Filter setting	mfilter
15	PAN & TILT moving speed setting	ptspeed
16	One letter command valid/invalid	character
17	Image size	usbreso

Note: Gain value and Shutter Speed value are automatically set when the AE is ON.