APPENDIX C

DATE ; 16 . DEC . 98
VERSION 2.0

RS-232C PROTOCOL

MODEL : LVC-A800's

L G Electronics Inc.
Multimedia Division
VIDEO OBU

1. Communication Format

1. Connection Conditions ;

Data Length	**1 Byte (8 Bit)**
Start/Stop Bit	**1 Bit**
Parity Bit	**None**
Baud rate	**9,600 bps**

2. The communication data format from PC to Camera

; The data of total 6 bytes is transmitted from PC to camera.

1) Format ;

BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6
0xC5	CODE 1	CODE 2	CODE 3	CAM_ID	C·S

2) Description ; a) BYTE 1 : Camera is realized the protocol comes from PC.
b) BYTE 2 : The changed data according to PC Command.(Refer to 10-2. PC Command)
c) BYTE 3 : The changed data according to PC Command.(Refer to 10-2. PC Command)
d) BYTE 4 : The changed data according to PC Command.(Refer to 10-2. PC Command)
e) BYTE 5 : Camera's ID (Identification) number to Communicate (0 ~ 255) .
In case of difference between this value of CAM_ID and the given value of Camera's ID, It is impossible to communicate wide.
f) BYTE 6 : The value of Check Sum from ' BYTE 1 " to ' BYTE 5 ".
ex) In case of transmission , ' 0xC5 , 0xF0 , 0x10 , 0x00 , 0x25 '

0xC5 + 0xF0 + 0x10 + 0x00 + 0x25 = 0x1EA
therefore, ***C·S = 0xEA***

3. The communication data format from Camera to PC

; The data of total 9 bytes is transmitted from Camera to PC.

1) Format ;

BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8	BYTE 9
0xC5	CODE1	CODE2	CODE3	DATA1	DATA2	DATA3	DATA4	C·S

2) Description ; a) BYTE 1 : Camera is realized the protocol comes from PC.
b) BYTE 2 : BYTE 1 data is received from PC.
c) BYTE 3 : BYTE 2 data is received from PC.
d) BYTE 4 : BYTE 3 data is received from PC.
e) BYTE 5 : The changed data according to PC Command.(Refer to 10-2. PC Command)
f) BYTE 6 : The changed data according to PC Command.(Refer to 10-2. PC Command)
g) BYTE 7 : The changed data according to PC Command.(Refer to 10-2. PC Command)
h) BYTE 8 : The changed data according to PC Command.(Refer to 10-2. PC Command)
i) BYTE 9 : The value of Check Sum from ' BYTE 1 " to ' BYTE 8 ".
The computing method is the same of '" BYTE6 of the communication from PC to Camera ".

2. PC Command

1. EEPROM Data Read Command

; Read the data of EEPROM indicated by “E2_ADR”.

1) PC -> Camera

0xC5	0xF0	E2_ADR	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xF0	E2_ADR	0x00	E2_DAT	0xXX	0xXX	0xXX	C·S

a) E2_ADR : The address of EEPROM to read.
b) E2_DAT : The Data of EEPROM located on E2_ADR.
c) 0xXX : The unfixed Data transmitted from Camera to PC.

2. EEPROM Data Write Command

; Write the data of ‘ E2_DAT’ into the position of EEPROM designated by ‘ E2_ADR ‘ .

1) PC -> Camera

0xC5	0x0F	E2_ADR	E2_DAT	CAM_ID	C·S

2) Camera -> PC

0xC5	0x0F	E2_ADR	E2_DAT	E2_ADR	0xXX	0xXX	0xXX	C·S

a) E2_ADR : The address of EEPROM to write.
b) E2_DAT : The Data to write on ‘ E2_ADR ‘ .

3. Exposure Mode Set Command

; Set the mode of Exposure according to AEmodeCNT

1) PC -> Camera

0xC5	0xAA	0x60	AEmodeCNT	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x60	AEmodeCNT	0x60	0xXX	0xXX	0xXX	C·S

a) AEmodeCNT : The counter for setting Exposure mode

1. In case of AEmodeCNT = 0x00, the Exposure mode becomes a “AUTO” mode.
2. In case of AEmodeCNT = 0x01, the Exposure mode becomes a “SHUTTER FIX” mode. And you can adjust “SHUTTER speed” only.
3. In case of AEmodeCNT = 0x02, the Exposure mode becomes a “IRIS FIX” mode. And you can adjust “IRIS level” only.
4. In case of AEmodeCNT = 0x03, the Exposure mode becomes a “AGC FIX” mode. And you can adjust “AGC level” only.
5. In case of AEmodeCNT = 0x04, the Exposure mode becomes a “MANUAL” mode. And you can adjust all(I.e. SHUTTER, IRIS, and AGC).

Caution : When Menu is not displayed, “SHUTTER speed” can be adjusted on all mode.

4. BACKLIGHT Level Read

; Read the current BACKLIGHT level of Camera .

1) PC -> Camera

0xC5	0xAA	0x61	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x61	0x00	BL_level	0xXX	0xXX	0xXX	C·S

a) BL_level : This is a value of the camera for controlling BACKLIGHT .

5. Adjust BACKLIGHT level

; Adjust current BACKLIGHT level of Camera.

1) PC -> Camera

0xC5	0xAA	0x62	BL_level	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x62	BL_level	0x62	0xXX	0xXX	0xXX	C·S

a) BL_level : This is a value to adjust BACKLIGHT level of camera.

6. White Balance Mode Set Command

; Set the mode of White Balance according to WB_CNT .

1) PC -> Camera

0xC5	0xAA	0x65	WB_CNT	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x65	WB_CNT	0x65	0xXX	0xXX	0xXX	C·S

a) WB_CNT : This is a counter value to change the mode of White Balance

1. In case of WB_CNT = 0, the mode of White Balance becomes a “AUTO” mode.
2. In case of WB_CNT = 1, the mode of White Balance becomes a “SPECIAL” mode.
3. In case of WB_CNT = 2, the mode of White Balance becomes a “INDDOR” mode.
4. In case of WB_CNT = 3, the mode of White Balance becomes a “OUTDOOR” mode.
5. In case of WB_CNT = 4, the mode of White Balance becomes a “PUSH AUTO” mode.

7. Camera ID Display ON/OFF control

; Switch the display of camera ID (ON/OFF).

1) PC -> Camera

0xC5	0xAA	0x6A	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x6A	0x00	0x6A	0xXX	0xXX	0xXX	C·S

Caution ; If the Camera ID is 0x00, then the Camera ID is not displayed.

8. Iris Area Weighting Value Read

; Read the current weighting value of Iris area.

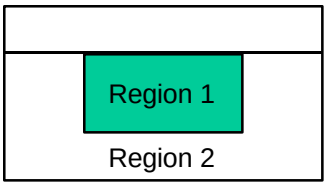
1) PC -> Camera

0xC5	0xAA	0x6B	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x6B	0x00	Weight	0xXX	0xXX	0xXX	C·S

Weight : This is a weighting value for region of Iris Area.
Upper 4 bits :: Weighting value for Region 2 of Iris Area.
Lower 4 bits :: Weighting value for Region 1 of Iris Area.



9. Iris Area Weighting value Adjust

; Change the weighting value of Iris Area

1) PC -> Camera

0xC5	0xAA	0x6C	Weight	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x6C	Weight	0x6C	0xXX	0xXX	0xXX	C·S

Caution ; In this case, “Weight” means equal to “Weight” of # 8 command .

10. Zoom Lens Position Read ; Read the current position value of Zoom lens.

1) PC -> Camera

0xC5	0x36	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x36	0x00	0x00	ZP_CNT+1	ZP_CNT	V_MAG	0xXX	C·S

a) ZP_CNt+1 :: Upper byte of Zoom lens position.
b) ZP_CNT :: Lower byte of Zoom lens position.
c) V_MAG :: Digital zoom data

Ex) In case of Zoom lens Position = 0x12A & Digital zoom data = 0x10,
ZP_CNT+1 = 0x01
ZP_CNT = 0x2A
V_MAG = 0x10
Caution ; This command is used to set the PRESET mode .

11. Focus Lens Position Read ; Read the current value of Focus lens.

1) PC -> Camera

0xC5	0x37	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x37	0x00	0x00	FP_CNT+1	FP_CNT	0xXX	0xXX	C·S

a) FP_CNT+1 :: Upper byte of Focus lens position.
b) FP_CNT :: Lower byte of Focus lens position.

Ex) In case of Focus lens Position = 0x1A2,
FP_CNT+1 = 0x01
FP_CNT = 0xA2
Caution ; This command is used to set the PRESET mode .

12. Camera Power ON ; Turn on the power of Camera.

1) PC -> Camera

0xC5	0x3A	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x3A	0x00	0x00	0x00	0x00	0xXX	0xXX	C·S

13. Camera Power OFF ; Turn off the power of Camera.

1) PC -> Camera

0xC5	0x3E	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x3E	0x00	0x00	0x00	0x00	0x00	0xXX	C·S

14. Memorize Zoom Lens Position for External PRESET control

; Memorize the Zoom lens position into the volatile “Buffer RAM” designated “Buffer RAM Index” for the external PRESET Move control .

1) PC -> Camera

0xC5	0x49	PRE_I_ZH	ZPL	CAM_ID	C·S

2) Camera -> PC

0xC5	0x49	PRE_I_ZH	ZPL	PRE_I_ZH	0xXX	0xXX	0xXX	C·S

a) PRE_I_ZH ; The index value of Buffer RAM to store the position of Zoom lens for the PRESET mode, and the upper data of position value for Zoom lens .

Bit No.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Description	Buffer RAM Index (0 ~ 7)				Upper data of Zoom lens position			

b) ZPL ; Lower data of position value for Zoom lens .

Ex) The position of Zoom lens to memorize = 0I26h (294d) &
the index of Buffer RAM for PRESET = 2

0xC5	*0x49*	*PRE_I_ZH*	*ZPL*	*CAM_ID*	*C·S*
0xC5	*0x49*	*21h*	*26h*	*CAM_ID*	*C·S*

15. Memorize Focus Lens Position for External PRESET control

; Memorize the Focus lens position into the volatile “Buffer RAM” designated “Buffer RAM Index” for the external PRESET Move control .

1) PC -> Camera

0xC5	0x4A	PRE_I_FH	FPL	CAM_ID	C·S

2) Camera -> PC

0xC5	0x4A	PRE_I_FH	FPL	PRE_I_FH	0xXX	0xXX	0xXX	C·S

a) PRE_I_FH ; The index value of Buffer RAM to store the position of Focus lens for the PRESET mode, and the upper data of position value for Focus lens .

Bit No.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Description	Buffer RAM Index (0 ~ 7)				Upper data of Focus lens position			

b) FPL ; Lower data of position value for Zoom lens .

Ex) Memorize 021Fh (543d) to the Focus lens position in PRESET 3 .

0xC5	*0x4A*	*PRE_I_FH*	*FPL*	*CAM_ID*	*C·S*
0xC5	*0x4A*	*32h*	*1Fh*	*CAM_ID*	*C·S*

16. Memorize Digital Zoom Position for External PRESET control

; Memorize the Digital Zoom position into the volatile “Buffer RAM” designated “Buffer RAM Index” for the external PRESET Move control .

1) PC -> Camera

0xC5	0x4B	PRE_I	DZP	CAM_ID	C·S

2) Camera -> PC

0xC5	0x4B	PRE_I	DZP	PRE_I	0xXX	0xXX	0xXX	C·S

a) PRE_I ; The index of Buffer RAM to store the position of Digital Zoom for the PRESET mode .

Bit No.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Description	Buffer RAM Index (0 ~ 7)							

b) DZP ; Digital Zoom position.

Ex) Memorize 20h (32d) to the Digital Zoom position in PRESET 0 .

0xC5	*0x4B*	*PRE_I*	*DZP*	*CAM_ID*	*C·S*
0xC5	*0x4B*	*00h*	*20h*	*CAM_ID*	*C·S*

17. Non Zoom Tracking External PRESET Move Control

; Move the Zoom and Focus lens to each position and set the
Digital Zoom ratio according to data memorized in PRESET "Buffer RAM" designated ' INDEX' ,

1) PC -> Camera

0xC5	0x4D	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x4D	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

a) INDEX ; Position setting index of PRESET Buffer RAM to change Zoom, Focus & Digital Zoom position.
Caution ; The range of INDEX is from 0x00 to 0x07.

18. Camera RESET

; Reset the Camera's micro controller (u-COM).

1) PC -> Camera

0xC5	0x4F	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x4F	0x00	0x00	0x00	0xXX	0xXX	0xXX	C·S

19. Digital Zoom Power Adjust

; Adjust Digital Zoom Max Power.

1) PC -> Camera

0xC5	0x52	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x52	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

a) INDEX ; Index value for setting Digital Zoom Max Power .
1. In case of INDEX = 0, the Digital Zoom Max Power = 2 X. Therefore, Total Zoom = 32 X .
2. In case of INDEX = 1, the Digital Zoom Max Power = 3 X. Therefore, Total Zoom = 48 X .
3. In case of INDEX = 2, the Digital Zoom Max Power = 4 X. Therefore, Total Zoom = 64 X .
4. In case of INDEX = 3, the Digital Zoom Max Power = 5 X. Therefore, Total Zoom = 80 X .
5. In case of INDEX = 4, the Digital Zoom Max Power = 6 X, Therefore, Total Zoom = 96 X .
6. In case of INDEX = 5, the Digital Zoom Max Power = 7 X. Therefore, Total Zoom = 112 X .
7. In case of INDEX = 6, the Digital Zoom Max Power = 8 X. Therefore, Total Zoom = 128 X .

20. Key Action ; Perform the Key action according to the data of " KEY_NUM" .
Caution ; After using the Key action , Camera has to be notified by stop of key action code " KN_STOP " .

1) PC -> Camera

0xC5	0x5F	KEY_NUM	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x5F	KEY_NUM	0x00	KEY_NUM	0xXX	0xXX	0xXX	C·S

a) KEY_NUM ; The Key code for operation (Refer to 10-3. Key Code Table).

21. Changing CAM ID ; Change the data of CAM_ID to " NEW_C_ID " .

1) PC -> Camera

0xC5	0x78	NEW_C_ID	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x78	NEW_C_ID	0x00	NEW_C_ID	0xXX	0xXX	0xXX	C·S

a) NEW_C_ID ; New data to change Camera ID .
b) In this case, The Camera ID is displayed at the left-bottom position of the screen .
But if the Camera ID is 0x00, It is not displayed.

22.CAM ID Read ; Read the data of Camera 's ID .
Caution ; This command must be used only in the condition of one by one connection PC vs CAMERA.

1) PC -> Camera

0xC5	0xCC	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xCC	0x00	0x00	CAM_ID	0xXX	0xXX	0xXX	C·S

a) CAM_ID ; The Camera ID data of a CAMERA .
b) In this case, The Camera ID is displayed at the left-bottom position of the screen .
But if the Camera ID is 0x00, It is not displayed.

23. Auto Back Light Mode ON/OFF control

; Change the Auto Back Light Mode of camera.

1) PC -> Camera

0xC5	0xAA	0x6D	MODE	CAM_ID	C·S

2) Camera -> PC

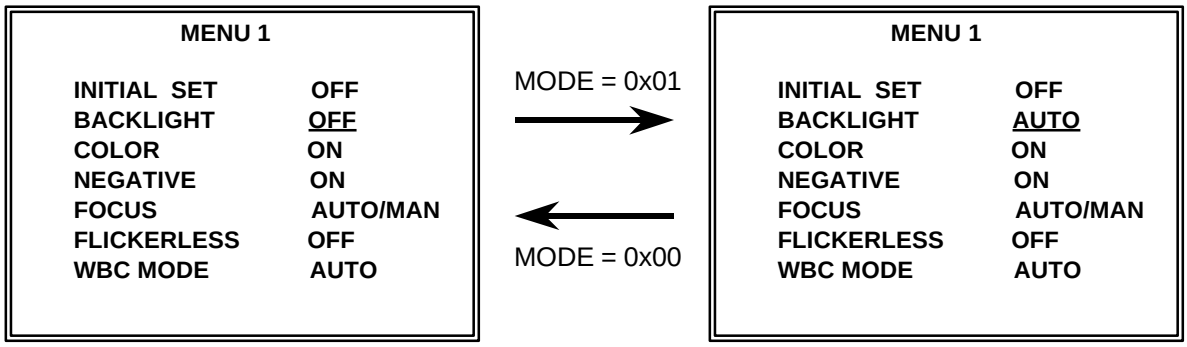
0xC5	0xAA	0x6D	MODE	0x6D	0xXX	0xXX	0xXX	C·S

MODE :: 1) In case of MODE = 0x00, The Auto Back Light Mode of camera becomes OFF mode. In this case, Back Light ON/OFF is controlled by camera key manually.

2) In case of MODE = 0x01, The Auto Back Light Mode of camera becomes ON mode. In this case, Back Light ON/OFF is controlled automatically depending on the status of scene.

3) In case of MODE = Others, The Auto Back Light Mode of camera is not changed.

***. Transition of MENU Screen Display**



24. BACKLIGHT ON/OFF control

; Switch the BACKLIGHT mode to On/Off according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x70	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x70	MODE	0x70	0xXX	0xXX	0xXX	C·S

a) MODE ; In case of MODE = 0x01, The BACKLIGHT mode becomes ON mode.
In case of MODE = 0x00, The BACKLIGHT mode becomes OFF mode.
Otherwise, The BACKLIGHT mode is not changed.

25. COLOR ON/OFF control

; Switch the COLOR mode to On/Off according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x71	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x71	MODE	0x71	0xXX	0xXX	0xXX	C·S

a) MODE ; In case of MODE = 0x01, The COLOR mode becomes ON mode.
In case of MODE = 0x00, The COLOR mode becomes OFF mode.
Otherwise, The COLOR mode is not changed.

26. 100% NEGATIVE ON/OFF control

; Switch the 100% NEGATIVE mode to On/Off according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x72	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x72	MODE	0x72	0xXX	0xXX	0xXX	C·S

a) MODE ; In case of MODE = 0x01, The 100% NEGATIVE mode becomes ON mode.
In case of MODE = 0x00, The 100% NEGATIVE mode becomes OFF mode.
Otherwise, The 100% NEGATIVE mode is not changed.

27. FOCUS Mode Setting

; Switch the FOCUS mode to AUTO/MANUAL or PUSH_AUTO according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x73	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x73	MODE	0x73	0xXX	0xXX	0xXX	C·S

a) MODE ; In case of MODE = 0x01, The FOCUS mode becomes "PUSH_AUTO" mode.
In case of MODE = 0x00, The FOCUS mode becomes "AUTO/MANUAL" mode.
Otherwise, The FOCUS mode is not changed.

28. FLICKERLESS Mode ON/OFF Setting

; Switch the FLICKERLESS mode to ON or OFF according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x74	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x74	MODE	0x74	0xXX	0xXX	0xXX	C·S

a) MODE ; In case of MODE = 0x01, The FLICKERLESS mode becomes "ON" mode.
In case of MODE = 0x00, The FLICKERLESS mode becomes "OFF" mode.
Otherwise, The FLICKERLESS mode is not changed.

29. SPECIAL White Balance Mode RED adjust data Setting

; Set the RED adjust data at SPECIAL White Balance mode according to the data of "RED_ADJ" .

1) PC -> Camera

0xC5	0xAA	0x75	RED_ADJ	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x75	RED_ADJ	0x75	0xXX	0xXX	0xXX	C·S

a) RED_ADJ ; This is a data for which adjusts a RED point at the Special White Balance mode.
data value setting ::

RED_ADJ data ::	0xFD	0xFE	0xFF	0x00	0x01	0x02	0x03
Decimal data ::	-3	-2	-1	0	+1	+2	+3

30. SPECIAL White Balance Mode BLUE adjust data Setting

; Set the BLUE adjust data at SPECIAL White Balance mode according to the data of "BLUE_ADJ" .

1) PC -> Camera

0xC5	0xAA	0x76	BLUE_ADJ	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x76	BLUE_ADJ	0x76	0xXX	0xXX	0xXX	C·S

a) BLUE_ADJ ; This is a data for which adjusts a BLUE point at the Special White Balance mode.
data value setting ::

BLUE_ADJ data ::	0xFD	0xFE	0xFF	0x00	0x01	0x02	0x03
Decimal data ::	-3	-2	-1	0	+1	+2	+3

31. MANUAL White Balance Mode MWB_CTL data Setting

; Set the MWB_CTL data at MANUAL White Balance mode according to the data of "MWB_CTL" .

1) PC -> Camera

0xC5	0xAA	0x77	MWB_CTL	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x77	MWB_CTL	0x77	0xXX	0xXX	0xXX	C·S

BLUE_ADJ ; This is a data for which adjusts a HUE point at the Manual White Balance mode.
Data range :: 00d ~ 99d

32. White Balance PUSH_AUTO ON/OFF Setting

; Switch the PUSH AUTO White Balance state to ON or OFF at PUSH AUTO White Balance mode according to the data of "MODE".

1) PC -> Camera

0xC5	0xAA	0x78	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x78	MODE	0x78	0xXX	0xXX	0xXX	C·S

MODE :: In case of MODE = 0x01, The PUSH AUTO White Balance state becomes to ON.
In case of MODE = 0x00, The PUSH AUTO White Balance state becomes to OFF.
Otherwise, The PUSH AUTO White Balance state is not changed.

Caution :: This mode is not saved when the power of a camera turns OFF/ON.
Default mode is "OFF" mode.

33. SHARPNESS Data Setting

; Set the sharpness level of the camera according to the data of "Sharpness" .

1) PC -> Camera

0xC5	0xAA	0x79	Sharpness	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x79	Sharpness	0x79	0xXX	0xXX	0xXX	C·S

Sharpness ; This is a data for which adjusts a sharpness level of the camera.
Data value range :: 00d ~ 15d. Therefore, 0x00 ~ 0x0F

34. BRIGHTNESS Data Setting

; Set the brightness level of the camera according to the data of "Brightness" .

1) PC -> Camera

0xC5	0xAA	0x7A	Brightness	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7A	Brightness	0x7A	0xXX	0xXX	0xXX	C·S

Brightness ; This is a data for which adjusts a brightness level of the camera.

35. MENU OSD Display ON/OFF Setting

; Set the MENU OSD Display mode of the camera to ON or OFF according to the data of "MODE" .

1) PC -> Camera

0xC5	0xAA	0x63	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x63	MODE	0x63	0xXX	0xXX	0xXX	C·S

MODE ; In case of MODE = 0x01, MENU OSD Display mode is changed to ON mode.
In case of MODE = 0x00, MENU OSD Display mode is changed to OFF mode.
Otherwise, MENU OSD Display mode is not changed.

36. SHUTTER Speed Setting

; Set the shutter speed of the camera according to the data of "SSC_CNT" .

1) PC -> Camera

0xC5	0xAA	0x7B	SSC_CNT	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7B	SSC_CNT	0x7B	0xXX	0xXX	0xXX	C·S

SSC_CNT	NTSC	PAL	SSC_CNT	NTSC	PAL
0	1/60	1/60	14	1/1000	1/1000
1	1/125	1/125	15	1/1100	1/1100
2	1/150	1/150	16	1/1200	1/1200
3	1/200	1/200	17	1/1300	1/1300
4	1/250	1/250	18	1/1500	1/1500
5	1/300	1/300	19	1/1600	1/1600
6	1/350	1/350	20	1/1800	1/1800
7	1/400	1/400	21	1/2000	1/2000
8	1/450	1/450	22	1/2500	1/2500
9	1/500	1/500	23	1/3000	1/3000
10	1/600	1/600	24	1/3500	1/3500
11	1/700	1/700	25	1/4000	1/4000
12	1/800	1/800	26	1/6000	1/6000
13	1/900	1/900	27	1/10000	1/10000

37. IRIS OPEN Level Setting

; Set the IRIS OPEN Level of the camera according to the data of "IRIS_CTL" .

1) PC -> Camera

0xC5	0xAA	0x7C	IRIS_CTL	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7C	IRIS_CTL	0x7C	0xXX	0xXX	0xXX	C·S

38. AGC Level Setting

; Set the AGC Level of the camera according to the data of "AGC_CTL" .

1) PC -> Camera

0xC5	0xAA	0x7D	AGC_CTL	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7D	AGC_CTL	0x7D	0xXX	0xXX	0xXX	C·S

AGC_CTL ; This is a data for which adjusts a AGC level of the camera.
Data value range :: 00d(Minimum AGC Level) ~ 255d(Maximum AGC Level)

39. Function OSD Display Mode Change

; Change the Function OSD Display Mode of the camera according to the data of "OSD_CNT" .

1) PC -> Camera

0xC5	0xAA	0x64	OSD_CNT	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x64	OSD_CNT	0x64	0xXX	0xXX	0xXX	C·S

OSD_CNT ; In case of OSD_CNT = 0x00, The Function OSD Display Mode is changed to "Whole Function OSD OFF" mode.
In case of OSD_CNT = 0x01, The Function OSD Display Mode is changed to "Bottom line Function OSD Only OFF" mode.
In case of OSD_CNT = 0x02, The Function OSD Display Mode is changed to "Bottom line Function OSD Only ON" mode.
In case of OSD_CNT = 0x03, The Function OSD Display Mode is changed to "Whole Function OSD ON" mode.
Otherwise, The Function OSD Display Mode is not changed.

40. Digital Zoom Mode ON/OFF Setting

; Switch the Digital Zoom mode to ON or OFF according to the data of "MODE".

1) PC -> Camera

0xC5	0xAA	0x6E	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x6E	MODE	0x6E	0xXX	0xXX	0xXX	C·S

MODE ; In case of MODE = 0x01, The Digital Zoom Mode is changed to "ON" mode.
In case of MODE = 0x00, The Digital Zoom Mode is changed to "OFF" mode.
Otherwise, The Digital Zoom Mode is not changed.

41. 80% NEGATIVE ON/OFF Setting

; Switch the 80% NEGATIVE mode to ON or OFF according to the data of "MODE".

1) PC -> Camera

0xC5	0xAA	0x7E	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7E	MODE	0x7E	0xXX	0xXX	0xXX	C·S

MODE ; In case of MODE = 0x01, The 80% NEGATIVE Mode is changed to "ON" mode.
In case of MODE = 0x00, The 80% NEGATIVE Mode is changed to "OFF" mode.
Otherwise, The 80% NEGATIVE Mode is not changed.

42. SCREEN INVERSION (FULL MIRROR) ON/OFF Setting

; Switch the SCREEN INVERSION mode to ON or OFF according to the data of "MODE".

1) PC -> Camera

0xC5	0xAA	0x7F	MODE	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x7F	MODE	0x7F	0xXX	0xXX	0xXX	C·S

MODE ; In case of MODE = 0x01, The SCREEN INVERSION Mode is changed to "ON" mode.
In this case, The Screen is reversed.
In case of MODE = 0x00, The SCREEN INVERSION Mode is changed to "OFF" mode.
Otherwise, The SCREEN INVERSION Mode is not changed.

43. Slow Speed Zoom Tracking External PRESET Move Control

; Perform the Zoom Tracking PRESET action to the target zoom position memorized in the volatile PRESET Buffer RAM indicated by the “INDEX” value.
In this case, The Zoom Tracking is performed slowly.

1) PC -> Camera

0xC5	0x7B	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7B	INDEX	0x00	Index	0xXX	0xXX	0xXX	C·S

INDEX ; This is a index value of PRESET Buffer RAM taking the target Zoom position data.
Caution ; The range of INDEX value is from 0x00 to 0x07.

44. Quick Speed Zoom Tracking External PRESET Move Control

; Perform the Zoom Tracking PRESET action to the target zoom position memorized in the volatile PRESET Buffer RAM indicated by the data of “INDEX”.
In this case, The Zoom Tracking is performed quickly.

1) PC -> Camera

0xC5	0x7C	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7C	INDEX	0x00	Index	0xXX	0xXX	0xXX	C·S

INDEX ; This is a index value of PRESET Buffer RAM taking the target Zoom position data.
Caution ; The range of INDEX value is from 0x00 to 0x07.

45. Zoom Tracking PRESET status Read

; Read the status of Zoom Tracking PRESET action to judge that the PRESET action is complete or performing.

1) PC -> Camera

0xC5	0x7F	0x00	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7F	0x00	0x00	Status	0xXX	0xXX	0xXX	C·S

Status ; In case of Status = 0x00, The Zoom Tracking PRESET action is complete.
In case of Status = 0x01, The Zoom Tracking PRESET action is performing currently.

46. CAMERA status Read Command 1

; Read the current status of the Camera. The return data is “CAM_CON1”.

1) PC -> Camera

0xC5	0xAA	0x80	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x80	0x00	CAM_CON1	0xXX	0xXX	0xXX	C·S

• Construction of CAM_CON1 data

BIT	EXPLANATION
BIT 7	1 : Focus Manual state, 0 : Focus Auto state
BIT 6	1 : Camera ID Display ON mode, 0 : Camera ID Display OFF mode
BIT 5	1 : WB Push_Auto ON state, 0 : WB Push_Auto OFF state
BIT 4	1 : BACKLIGHT ON state, 0 : BACKLIGHT OFF state
BIT 3	1 : FLICKERLESS ON state, 0 : FLICKERLESS OFF state
BIT 2	1 : Focus PUSH_AUTO mode, 0 : Focus AUTO/MANUAL mode
BIT 1	1 : Digital Zoom ON mode, 0 : Digital Zoom OFF mode
BIT 0	1 : MENU data INITIAL state, 0 : MENU data NOT INITIAL state

47. CAMERA status Read Command 2

; Read the current status of the Camera. The return data is “CAM_CON2”.

1) PC -> Camera

0xC5	0xAA	0x81	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x81	0x00	CAM_CON2	0xXX	0xXX	0xXX	C·S

• Construction of CAM_CON2 data

BIT	EXPLANATION
BIT 7	Not use. Don’t care.
BIT 6	Not use. Don’t care.
BIT 5	Not use. Don’t care.
BIT 4	Not use. Don’t care.
BIT 3	Not use. Don’t care.
BIT 2	Not use. Don’t care.
BIT 1	Not use. Don’t care.
BIT 0	1 : Auto BACKLIGHT Mode ON state, 0 : Auto BACKLIGHT Mode OFF state

48. Digital Effect status of the Camera Read Command

; Read the current Digital Effect status of the Camera. The return data is “DEFT_CON”.

1) PC -> Camera

0xC5	0xAA	0x82	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x82	0x00	DEFT_CON	0xXX	0xXX	0xXX	C·S

• Construction of DEFT_CON data

BIT	EXPLANATION
BIT 7	Not use. Don’t care.
BIT 6	Not use. Don’t care.
BIT 5	1 : Color OFF state, 0 : Color ON state
BIT 4	1 : 80% Negative ON state, 0 : 80% Negative OFF state
BIT 3	1 : 100% Negative ON state, 0 : 100% Negative OFF state
BIT 2	1 : Screen Inversion ON state, 0 : Screen Inversion OFF state
BIT 1	1 : Art ON state, 0 : Art OFF state
BIT 0	1 : Wide Vision ON state, 0 : Wide Vision OFF state

49. Read the White Balance Mode

; Read the current White Balance Mode of the Camera. The return data is “WB_MODE”.

1) PC -> Camera

0xC5	0xAA	0x83	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x83	0x00	WB_MODE	0xXX	0xXX	0xXX	C·S

• Explanation of “WB_MODE” data

WB_MODE	EXPLANATION
00h	AUTO White Balance mode.
01h	SPECIAL White Balance mode.
02h	INDOOR White Balance mode.
03h	OUTDOOR White Balance mode.
04h	MANUAL White Balance mode.
05h	PUSH AUTO White Balance mode.

50. Read the Exposure Mode

; Read the current Exposure Mode of the Camera. The return data is “AE_MODE”.

1) PC -> Camera

0xC5	0xAA	0x84	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x84	0x00	AE_MODE	0xXX	0xXX	0xXX	C·S

• Explanation of “AE_MODE” data

AE_MODE	EXPLANATION
00h	AUTO Exposure mode.
01h	SHUTTER FIX Exposure mode.
02h	IRIS FIX Exposure mode.
03h	AGC FIX Exposure mode.
04h	MANUAL Exposure mode.

51. Read the RED Adjust data at the SPECIAL White Balance Mode

; Read the current RED Adjust data of the Camera at the SPECIAL White Balance Mode.
The return data is “RED_ADJ”.

1) PC -> Camera

0xC5	0xAA	0x85	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x85	0x00	RED_ADJ	0xXX	0xXX	0xXX	C·S

52. Read the BLUE Adjust data at the SPECIAL White Balance Mode

; Read the current BLUE Adjust data of the Camera at the SPECIAL White Balance Mode.
The return data is “BLUE_ADJ”.

1) PC -> Camera

0xC5	0xAA	0x86	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x86	0x00	BLUE_ADJ	0xXX	0xXX	0xXX	C·S

53. Read the current MWB_CTL data at the MANUAL White Balance Mode

; Read the current HUE point adjust data of the Camera at the MANUAL White Balance Mode.
The return data is “MWB_CTL”.

1) PC -> Camera

0xC5	0xAA	0x87	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x87	0x00	MWB_CTL	0xXX	0xXX	0xXX	C·S

54. Read the current SHARPNESS data

; Read the current SHARPNESS data of the Camera.
The return data is “Sharpness”.

1) PC -> Camera

0xC5	0xAA	0x88	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x88	0x00	Sharpness	0xXX	0xXX	0xXX	C·S

55. Read the current BRIGHTNESS data

; Read the current BRIGHTNESS data of the Camera.
The return data is “Brightness”.

1) PC -> Camera

0xC5	0xAA	0x89	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x89	0x00	Brightness	0xXX	0xXX	0xXX	C·S

56. Read the current Shutter Speed Control counter value

; Read the current counter value to control Shutter Speed.
The return data is “SSC_CNT”.

1) PC -> Camera

0xC5	0xAA	0x8A	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8A	0x00	SSC_CNT	0xXX	0xXX	0xXX	C·S

57. Read the IRIS control data

; Read the current IRIS control value to control IRIS OPEN level.
The return data is “IRIS_CTL”.

1) PC -> Camera

0xC5	0xAA	0x8B	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8B	0x00	IRIS_CTL	0xXX	0xXX	0xXX	C·S

58. Read the AGC control data

; Read the current AGC control value to control AGC level.
The return data is “AGC_CTL”.

1) PC -> Camera

0xC5	0xAA	0x8C	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8C	0x00	AGC_CTL	0xXX	0xXX	0xXX	C·S

59. Read the MENU OSD ON/OFF status

; Read the current MENU OSD ON/OFF state of the Camera. The return data is “M_STATE”.

1) PC -> Camera

0xC5	0xAA	0x8D	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8D	0x00	M_STATE	0xXX	0xXX	0xXX	C·S

M_STATE :: In case of “M_STATE = 0x00”, The MENU OSD is not displayed currently.
In case of “M_STATE = 0x01”, The MENU OSD is displayed currently.

60. Read the Function OSD Display Mode

; Read the current Function OSD Display mode counter of the Camera.
The return data is “OSD_CNT”.

1) PC -> Camera

0xC5	0xAA	0x8E	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8E	0x00	OSD_CNT	0xXX	0xXX	0xXX	C·S

61. Read the Digital Zoom Max Power Mode

; Read the current Digital Zoom Max Power Mode of the Camera. The return data is “DZ_MAX”.

1) PC -> Camera

0xC5	0xAA	0x8F	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0xAA	0x8F	0x00	DZ_MAX	0xXX	0xXX	0xXX	C·S

Caution :: The return data of this command is valid only when the Digital Zoom mode is ON.

• Explanation of “DZ_MAX” data

DZ_MAX	EXPLANATION
02h	The current Digital Zoom Max Power of the Camera is “x2”.
03h	The current Digital Zoom Max Power of the Camera is “x3”.
04h	The current Digital Zoom Max Power of the Camera is “x4”.
05h	The current Digital Zoom Max Power of the Camera is “x5”.
06h	The current Digital Zoom Max Power of the Camera is “x6”.
07h	The current Digital Zoom Max Power of the Camera is “x7”.
08h	The current Digital Zoom Max Power of the Camera is “x8”.

62. Memorize Internal PRESET Position for Internal PRESET control

; Memorize the current zoom, focus, and digital zoom position value into the internal nonvolatile memory of the CAMERA for controlling the Internal PRESET Move.
The memory position to store is indicated by the “INDEX” value.

1) PC -> Camera

0xC5	0x79	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x79	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

INDEX : This is a value for indicating the memory position to store the zoom, focus, and digital zoom position value.
The range of this value is from “00d” to “49d”.

63. Internal Non Zoom Tracking PRESET Moving control

; Perform the Internal PRESET Moving action.
When the camera receive this command, the zoom, focus, and digital zoom position is moved to the position memorized in the internal nonvolatile memory of the camera according to “INDEX” value.

1) PC -> Camera

0xC5	0x7A	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7A	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

INDEX : This is a value for indicating the memory position to store the zoom, focus, and digital zoom position value.
The range of this value is from “00d” to “49d”.

64. Slow Speed Internal Zoom Tracking PRESET Moving control

; Perform the Zoom Tracking PRESET action to the target zoom position slowly.
In this case, The target zoom position value is memorized in the internal nonvolatile memory.
And, the memory position is indicated by the “INDEX” value

1) PC -> Camera

0xC5	0x7D	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7D	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

INDEX : This is a value for indicating the memory position to store the zoom, focus, and digital zoom position value.
The range of this value is from “00d” to “49d”.

65. Quick Speed Internal Zoom Tracking PRESET Moving control

; Perform the Zoom Tracking PRESET action to the target zoom position quickly.
In this case, The target zoom position value is memorized in the internal nonvolatile memory.
And, the memory position is indicated by the “INDEX” value

1) PC -> Camera

0xC5	0x7E	INDEX	0x00	CAM_ID	C·S

2) Camera -> PC

0xC5	0x7E	INDEX	0x00	INDEX	0xXX	0xXX	0xXX	C·S

INDEX : This is a value for indicating the memory position to store the zoom, focus, and digital zoom position value.
The range of this value is from “00d” to “49d”.

3. Key Code Table

Key Variable	Key Code	Description
KN_NOT	0x00	Any key function do not operate.
KN_TELE	0x01	Perform Zoom Tracking to TELE side by Normal speed. In case of displaying the MENU, operate as the “MENU selection scroll up “ .
KN_QTELE	0x02	Perform Zoom Tracking to TELE side by quick speed. In case of displaying the MENU, operate as the “MENU selection scroll up “ .
KN_WIDE	0x03	Perform Zoom Tracking to WIDE side by Normal speed. In case of displaying the MENU, operate as the “MENU selection scroll down “ .
KN_QWIDE	0x04	Perform Zoom Tracking to WIDE side by quick speed. In case of displaying the MENU, operate as the “MENU selection scroll down “ .
KN_FAR	0x08	In the manual focus mode , move the Focus lens to “ FAR “ side quickly . In case of displaying the MENU, operate as the “ Increase the data of a selected item on the MENU “.
KN_NEAR	0x09	In the manual focus mode , move the Focus lens to “ WIDE “ side quickly . In case of displaying the MENU, operate as the “ Decrease the data of a selected item on the MENU “.
KN_SFAR	0x0A	In the manual focus mode , move the Focus lens to “ FAR “side by 1 step . In case of displaying the MENU, operate as the “ Increase the data of a selected item on the MENU “.
KN_SNEAR	0x0B	In the manual focus mode , move the Focus lens to “NEAR “side by 1 step . In case of displaying the MENU, operate as the “ Decrease the data of a selected item on the MENU “.
KN_STOP	0x0C	Stop all key actions that are being performed currently .
KN_BL	0x1A	Switch the BACKLIGHT mode (ON / OFF) .
KN_FLICKER	0x1B	Switch the FLICKERLESS mode (ON / OFF) .
KN_NEGA	0x1E	Switch the NEGATIVE mode (Negative / Positive) .
KN_BW	0x21	Switch the MONOCHROME mode (Monochrome / Color) .
KN_DZOOM	0x22	Switch the Digital Zoom mode (ON / OFF) .
KN_OSD	0x24	Switch the Key function OSD (ON / OFF) .
KN_MENU	0x25	Switch the main MENU (ON / OFF) .

Key Variable	Key Code	Description
KN_M_UP	0x27	Increase the data of a selected item on the main MEMU .
KN_M_DN	0x28	Decrease the data of a selected item on the main MENU .
KN_POWER	0x32	Switch the power of the Camera (ON / OFF) .
KN_R_FAR	0x38	In the manual focus mode , move the Focus lens to " FAR " side slowly . In case of displaying the MENU, operate as the " Increase the data of selected item in MENU ".
KN_R_NEAR	0x39	In the manual focus mode , move the Focus lens to " WIDE " side slowly . In case of displaying the MENU, operate as the " Decrease the data of selected item in MENU ".
KN_AM_P	0x3F	According to Key selection mode , operate the key such as " AUTO / MANUAL Toggle" or " Push AUTO " .
KN_RS_SSCup	0x40	Use for RS-232C Serial Communication : Scroll up the " Shutter Speed " . In case of displaying MENU , The AE mode must be " Shutter Adjust " , or " Manual mode " .
KN_RS_SSCdn	0x41	Use for RS-232C Serial Communication : Scroll down the " Shutter Speed ".In case of displaying MENU , The AE mode must be " Shutter Adjust " , or " Manual mode " .
KN_RS_IRISup	0x42	Use for RS-232C Serial Communication : Scroll up the Iris level of lens . In case of displaying MENU , The AE mode must be " Iris Adjust " , or " Manual mode " .
KN_RS_IRISdn	0x43	Use for RS-232C Serial Communication : Scroll down the Iris level of lens . In case of displaying MENU , The AE mode must be " Iris Adjust " , or " Manual mode " .
KN_RS_AGCup	0x44	Use for RS-232C Serial Communication : Scroll up the AGC level . In case of displaying MENU , The AE mode must be " AGC Adjust " , or " Manual mode " .
KN_RS_AGCdn	0x45	Use for RS-232C Serial Communication : Scroll down the AGC level . In case of displaying MENU , The AE mode must be " AGC Adjust " , or " Manual mode " .
KN_RS_BRTup	0x46	Use for RS-232C Serial Communication : Scroll up the Brightness level .
KN_RS_BRTdn	0x47	Use for RS-232C Serial Communication : Scroll down the Brightness level .

Key Variable	Key Code	Description
KN_RS_Rup	0x48	Use for RS-232C Serial Communication : Scroll up the Red level of Color in Special White Balance mode .
KN_RS_Rdn	0x49	Use for RS-232C Serial Communication : Scroll down the Red level of Color in Special White Balance mode .
KN_RS_Bup	0x4A	Use for RS-232C Serial Communication : Scroll up the Blue level of Color in Special White Balance mode .
KN_RS_Bdn	0x4B	Use for RS-232C Serial Communication : Scroll down the Blue level of Color in Special White Balance mode .
KN_RS_HUEup	0x4C	Use for RS-232C Serial Communication : Scroll up the HUE level in Manual White Balance mode .
KN_RS_HUEdn	0x4D	Use for RS-232C Serial Communication : Scroll down the HUE level in Manual White Balance mode .
KN_RS_WB_PUSH	0x4E	Use for RS-232C Serial Communication : Switch the Push White Balance ON or OFF in Push White Balance mode .
KN_RS_MITEM_UP	0x4F	Use for RS-232C Serial Communication : In case of displaying the MENU . Scroll up the MENU item .
KN_RS_MITEM_DN	0x50	Use for RS-232C Serial Communication : In case of displaying the MENU . Scroll down the MENU item .
KN_RS_AMkey_SET	0x51	Use for RS-232C Serial Communication : Switch the Focus mode “ AUTO/MANUAL “ , or “ Push AUTO “ .
KN_RS_INIT_SET	0x52	Use for RS-232C Serial Communication : Reset the Camera mode to default value .
KN_RS_SRPup	0x53	Use for RS-232C Serial Communication : Scroll up the Shrpness level .
KN_RS_SRPdn	0x54	Use for RS-232C Serial Communication : Scroll up the Shrpness level .
KN_OSD_MSET	0x55	Function OSD Display On/Off control Whole OSD OFF --> Bottom line OSD OFF --> Top line OSD OFF --> Whole OSD ON --> Whole OSD OFF