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1. Serial Port Setting

1.1 Serial Port Transmission Setting

Table 1 Serial Port Setting

Baud Rate	Trans-format			Parity Check
	Data bits	Start Bits	Stop Bits	
115200bps	8	1	1	none

Note: Start transmission from the Least Significant Bit(LSB) of each byte

1.2 Supportable Baud Rate

Table 2 Baud Rate Setting

NO.	Baud rate
1	96000bps
2	192000bps
3	384000bps
4	576000bps
5	115200bps

2. Command format

2.1 Format of incoming message

Table 3 Format of incoming message

Process Start	Byte Count	CW0	CW1	OW	PRM0	PRM1	…	PRMN	SC	Process End	
		Process Body									
0xAA	0x05	0x00	0x03	0x00	0x00	none	none	none	0xB1	0xEB	0xAA

Note：

1. All the format values described in Table2 are hexadecimal bytes
2. SC value is the sum of all the bytes before the SC byte Mod 256
3. The command and parameter information is described from Table5 to Form9
4. The process body byte count is the number of valid bytes from CW0 to SC
5. Process start is fixed to 0xAA, process end is fixed to 0xEB and 0xAA.

2.2 Format of reply message

Table 4 Format of reply message

Process Start	Byte Count	CW0	CW1	OW	RV	RV	…	RV	SC	Process End	
		Process Body									
0x55	0x06	0x00	0x03	0x33	0x00	0x02	none	none	0x93	0xEB	0xAA

Note:

1. Status information reflects command execution result.
2. CW and RV are described from Table5 to Table9.
3. Byte count is the number of process body bytes.
4. The OW (operation word) is fixed to 0x33.
5. The process start is fixed to 0x55.
6. The process end is fixed to 0xEB and 0xAA.

If two bytes of command words are 0xFF and the only one RV (returned value) is one of the values shown in Table 4, the command is error. Users can search for the cause of error by consulting Table 4.

Table 5 Error list of RV

Returned Value	Cause of Error
0xF1	Command sending overtime
0xFB	Error command
0xFD	SC error
0xFF	Process start 0xAA error

3. The Receiving command and status information

Table 6 Status Menu

Status						
CW0	CW1	Meaning	OW	PRM Byte Count	PRM	RV Bytes Count
0x00	0x00	Read SN	0x00	0	none	10
0x00	0x01	Read PN	0x00	0	none	20
0x00	0x02	Read FPA Width	0x00	0	none	2
0x00	0x03	Read FPA Length	0x00	0	none	2
0x00	0x04	Read FPA Temp.	0x00	0	none	2

Table 7 Setup Menu

	Setup					
CW	**CW1**	**Meaning**	**OW**	**PRM Bytes Count**	**PRM**	**RV Bytes Count**
0x00	0x05	Read camera temp.	0x00	0	None	2
0x00	0x11	Save settings	0x01	0	None	1
0x00	0x12	Restore factory settings	0x02	0	None	1
0x00	0x13	Camera reboot	0x02	0	None	1
0x00	0x15	NUC	0x01	1	0x00:Manual 0x01:Auto(default)	1
		Read status of Auto NUC	0x00	0	none	1
0x00	0x16	Set manual NUC	0x01	1	0x00:external shutter correction 0x02: Background correction	1
0x00	0x17	Set interval time of NUC	0x01	1	Interval time: 0-255	1
		Automatically Set interval time of NUC	0x00	0	none	1
0x00	0x18	Set interval temp. of NUC	0x01	1	Interval temp.: 0-255(integer)	1
		Automatically set interval temp. of NUC	0x00	0	none	1

Table 8 Video Menu

	Video					
CW0	**CW1**	**Meaning**	**OW**	**PRM Bytes Count**	**PRM**	**RV Bytes Count**
0x00	0x2A	Electronic Zoom	0x01	1	Refer to appendix 1	1
		Read E-zoom Status	0x00	0	none	2
0x00	0x2B	Cross cursor Display/Hide	0x01	1	0x02:Hide(default) 0x01:Display	1
		Cross curser load / type selection	0x01	2	load: 0x00 type 1 0x01 type 2 0x02 type 3 0x03 type 4 0x04 type 5 0x05 type 6 0x06 type 7 0x07 type 8 0x08 type 9 0x09 type 10 0x0A type 11 0x0B type 12	1
		Read cross cursor Status	0x00	0	none	2
0x00	0x2C	Set cross cursor position	0x02	1	The highest bit(bit8) is sign of step. Bit8=0: short step Bit8=1: Long step 0x05/0x85 ： Center（default） 0x06/0x86： Up 0x07/0x87： Down 0x08/0x88：Left 0x09/0x89：Right	1

				5 (Set Parameter)	PRM 1:0xA0 Means set cursor position directly PRM 2： X axis coordinate low byte parameter 3 ： X axis coordinate high byte parameter 4:Y axis coordinate low byte parameter 5:Y axis coordinate high byte	
0X01	0X44	Read cross cursor position	0x00	0	\	4
0x00	0x2D	Polarity/Pallete	0x01	1	0x00:WH(default) 0x01:BH 0x00：White Hot（Default） 0x01：Black Hot 0x02：Blue Red yellow 0x03：Purple red yellow 0x04：blue green red 0x05：1Rainbow 1 0x06：2 Rainbow 2 0x07：Black red 0x08：blackish green Red 0x09：**BGR -pink** 0x0A：mixed 0x0B：	1
		Current pallette	0x00	0	\	1
0x00	0x2E	Digital video source	0x01	1	0x00：ORG 0x01：NUC 0x02：DRC（default）	1
		Read the current digital video source	0x00	0	\	1
0x00	0x2F	Set digital video output interface	0x01	1	0x00：OFF（Default） 0x01：LVCOMS 0x02：LVDS 0x03：BT.656	1

		Read the current digital output interface	0x00	0	\	1
0x00	0x30	Image flip	0x01	1	bit0=1 no-operation （default） bit1=1 Horizontal bit2=1 Vertical bit3=1Diagonal	1
		Read flip status	0x00	0	none	1
0x00	0x32	Image freeze	0x02	1	0x01 :Analog video freeze 0x00:Analog video unfreeze	1

Table 9 AGC Menu

	AGC					
CW0	**CW1**	**Meaning**	**OW**	**PRM Bytes Count**	**PRM**	**RV Bytes Count**
0x00	0x3A	AGC mode	0x01	1	0x00: Manual 0x01: Auto 0 (default) 0x02: Auto 1	1
		Read current AGC mode	0x00	0	none	1
0x00	0x3B	Set contrast	0x01	1	Contrast(0-255) PRM1: low byte of contrast	1
		Read current Contrast vaue	0x00	0	\	\
0x00	0x40	Set contrast by steps	0x01	2	0x00 reduce contrast 0x01 increase contrast Step 0-255	1
0x00	0x3C	Set brightness	0x01	2	brightness (0-511) PRM1: low byte of brightness PRM2: high byte of brightness	1
		Read brightness value	0x00	0	none	2
0x00	0x41	Set brightness by step	0x01	2	PRM1:0x00 reduce bightness 0x01 increase brightness PRM2: Step 0-255	1
0x00	0x3E	DDE status	0x01	1	0: DDE open 1:DDE close	1
		Read DDE status	0x00	0	none	1
0x00	0x3F	DDE level	0x01	1	Limit : 0-7(integer)	1
		Read DDE level	0x00	0	none	1

0x00	0x31	Filter on/off	0x01	1	0x00：off 0x01：on	1
		Get image filter status	0x00	0	none	1

Table 10 Advance Menu

	Advance					
CW0	**CW1**	**Meaning**	**OW**	**PRM Bytes Count**	**PRM**	**RV Bytes Count**
0x00	0x14	Set baud rate	0x02	1	0x02：9600 0x04：19200 0x08：38400 0x10：115200 （default）	1

Appendix 1

Command Description	The incoming message		Remark
Read SN	Receive	AA 04 00 00 00 AE EB AA	For example: The returned SN is the ASCII of 010001. If the data length is not enough, the rest data position return '0x00'.
	Return	55 0D 00 00 33 30 31 30 30 30 3100 00 00 00 B7 EB AA	
Read PN	Receive	AA 04 00 01 00 AF EB AA	For example: The returned SN is the ASCII of LA3232. If the data length is not enough, the rest data position return '0x00'.
	Return	55 18 00 01 33 4C 41 33 32 33 30 00 00 00 00 00 00 00 00 00 00 00 00 00 F6 EB AA	
Read FPA Width	Receive	AA 04 00 02 00 B0 EB AA	
	Return	55 06 00 02 33 80 01 11 EB AA	
Read FPA Height	Receive	AA 04 00 03 00 B1 EB AA	
	Return	55 06 00 03 33 20 01 B2 EB AA	
Read FPA Temp.	Receive	AA 04 00 04 00 B2 EB AA	For example: If the readout temp. is 30.7℃,the returned value is 3070(30.7x100℃,decimal),and low byte returns first. If the temp. is below 0 ℃ ,the returned value is the complement code of current temp.
	Return	55 06 00 04 33 FE 0B 9B EB AA	
Read camera Temp.	Receive	AA 04 00 05 00 B3 EB AA	For example: If the readout temp. is 10.7℃,the returned value is 1070(10.7x100℃,decimal),and low byte returns first. If the temp. is below 0 ℃ ,the returned value is the complement code of current
	Return	55 06 00 05 33 37 04 CE EB AA	

			temp.
Save Setting	Receive	AA 04 00 11 01 C0 EB AA	
	Return	55 05 00 11 33 01 9F EB AA	
Restore factory setting	Receive	AA 04 00 12 02 C2 EB AA	
	Return	55 05 00 12 33 01 A0 EB AA	
	Return	55 05 00 13 33 01 A1 EB AA	
NUC	Receive	（Manual）AA 05 00 15 01 00 C5 EB AA （Auto）AA 05 0015 01 01 C6 EB AA	
	Return	55 05 00 15 33 01 A3 EB AA	
Read	Receive	AA 04 00 15 00 C3 EB AA	
Read NUC type	Return	（Auto mode）55 05 00 15 33 01 A3 EB AA （Manual Mode）55 05 00 15 33 00 A2 EB AA	0x01 means Auto mode 0x00 means Manual mode
Manual NUC	Receive	（shutter correction） AA 05 00 16 01 00 C6 EB AA （Background Correction） AA 05 00 16 01 02 C8 EB AA	
	Return	55 05 00 16 33 01 A4 EB AA	
Interval time of Auto NUC	Receive	AA 05 00 17 01 0A D1 EB AA	For example: The interval time is 10 minute(accurate to 1minute)
	Return	55 05 00 17 33 01 A5 EB AA	
Read Interval time of Auto NUC	Receive	AA 04 00 17 00 C5 EB AA	0x01 means the interval time is 1 minute
	Return	55 05 00 17 33 01 A5 EB AA	
Interval temp. Auto NUC	Receive	AA 05 00 18 01 14 DC EB AA	For example: 0x14 means the interval temp is 20/10 =2℃
	Return	55 05 00 18 33 01 A6 EB AA	
Read Interval Temp of Auto NUC	Receive	AA 04 00 18 00 C6 EB AA	
	Return	55 05 00 18 33 14 B9 EB AA	
Digital zoom	Receive	1X AA 0D 00 2A 01 00 00 00 00 00 7F 02 FF 01 63 EB AA 1.1 X AA 0D 00 2A 01 00 1D 00 17 00 61 02 E7 01 61 EB AA 1.2 X AA 0D 00 2A 01 00 35 00 2B 00 49 02 D4 01 62 EB AA 1.3 X AA 0D 00 2A 01 00 4A 00 3B 00 35 02 C3 01 62 EB AA	

		1.4 x AA 0D 00 2A 01 00 5B 00 49 00 23 02 B5 01 61 EB AA 1.5 x AA 0D 00 2A 01 01 6B 00 55 00 14 02 A9 01 63 EB AA 1.6 x AA 0D 00 2A 01 01 78 00 60 00 06 02 9E 01 62 EB AA 1.7 x AA 0D 00 2A 01 01 84 00 69 00 FB 01 95 01 62 EB AA 1.8 x AA 0D 00 2A 01 01 8E 00 72 00 F0 01 8D 01 62 EB AA 1.9 x AA 0D 00 2A 01 01 98 00 79 00 E7 01 85 01 62 EB AA 2.0 x AA 0D 00 2A 01 01 A0 00 80 00 DF 01 7F 01 63 EB AA 2.1 x AA 0D 00 2A 01 01 A8 00 86 00 D7 01 78 01 62 EB AA 2.2 x AA 0D 00 2A 01 01 AF 00 8C 00 D0 01 73 01 63 EB AA 2.3 x AA 0D 00 2A 01 01 B5 00 91 00 CA 01 6E 01 63 EB AA 2.4 x AA 0D 00 2A 01 01 BB 00 95 00 C4 01 69 01 62 EB AA 2.5 x AA 0D 00 2A 01 01 C0 00 9A 00 BF 01 65 01 63 EB AA 2.6 x AA 0D 00 2A 01 01 C5 00 9E 00 BA 01 61 01 63 EB AA 2.7 x AA 0D 00 2A 01 01 C9 00 A1 00 B5 01 5D 01 61 EB AA 2.8 x AA 0D 00 2A 01 01 CE 00 A5 00 B1 01 5A 01 63 EB AA 2.9 x AA 0D 00 2A 01 02 D2 00 A8 00 AD 01 57 01 64 EB AA 3.0 x AA 0D 00 2A 01 02 D5 00 AB 00 A9 01 54 01 63 EB AA 3.1 x AA 0D 00 2A 01 02 D9 00 AD 00 A6 01 51 01 63 EB AA 3.2 x AA 0D 00 2A 01 02 DC 00 B0 00 A2 01 4E 01 62 EB AA 3.3 x AA 0D 00 2A 01 02 DF 00 B2 00 9F 01 4C 01 62 EB AA 3.4 x AA 0D 00 2A 01 02 E2 00 B5 00 9D 01 4A 01 64 EB AA 3.5 x AA 0D 00 2A 01 02 E5 00 B7 00 9A 01 48 01 64 EB AA 3.6 x AA 0D 00 2A 01 02 E7 00 B9 00 97 01 46 01 63 EB AA 3.7 x AA 0D 00 2A 01 02 EA 00 BB 00 95 01 44 01 64 EB AA 3.8 x AA 0D 00 2A 01 02 EC 00 BD 00 93 01 42 01 64 EB AA 3.9 x AA 0D 00 2A 01 02 EE 00 BE 00 91 01 40 01 63 EB AA 4.0 x AA 0D 00 2A 01 02 F0 00 C0 00 8F 01 3F 01 64 EBAA	
	Return	55 05 00 2A 33 01 B8 EB AA	
Read Current E-zoom Value	Receive	AA 04 00 2A 00 D8 EB AA	Return 2 bite, example: return 0x64 , 0x00,means zoom time 100/100=1X
	Return	55 06 00 2A 33 64 00 1C EB AA	
Cross cursor display	Receive	（Type 1）AA 06 00 2B 01 03 00 DF EB AA （Type 2）AA 06 00 2B 01 03 01 E0 EB AA （Type 3）AA 06 00 2B 01 03 02 E1 EB AA （Type 4）AA 06 00 2B 01 03 03 E2 EB AA （Type 5）AA 06 00 2B 01 03 04 E3 EB AA	

		（Type 6）AA 06 00 2B 01 03 05 E4 EB AA （Type 7）AA 06 00 2B 01 03 06 E5 EB AA （Type 8）AA 06 00 2B 01 03 07 E6 EB AA （Type 9）AA 06 00 2B 01 03 08 E7 EB AA （Type 10）AA 06 00 2B 01 03 09 E8 EB AA （Type 11）AA 06 00 2B 01 03 0A E9 EB AA （Type 12）AA 06 00 2B 01 03 0B EA EB AA	
	Return	55 05 00 2B 33 01 B9 EB AA	
Get cursor staus	Receive	AA 04 00 2B 00 D9 EB AA	Return 2 bites bit 1： 0x00 hidden 0x01 display bit2： 0x00-0x0B means type 1-12
	Return	55 06 00 2B 33 01 03 BD EB AA	
Cross cursor hide	Receive	AA 05 00 2B 01 02 DD EB AA	
	Return	55 05 00 2B 33 01 B9 EB AA	
Cross cursor position setting	Receive	（up）Short step: AA 05 00 2C 02 06 E3 EB AA Long step: AA 05 00 2C 02 86 63 EB AA	Bit8=1: Long step
		（down）Short step: AA 05 00 2C 02 07 E4 EB AA Long step: AA 05 00 2C 02 87 64 EB AA	
		（left）Short step: AA 05 00 2C 02 08 E5 EB AA Long step: AA 05 00 2C 02 88 65 EB AA	
		（right）Short step: AA 05 00 2C 02 09 E6 EB AA Long step: AA 05 00 2C 02 89 66 EB AA	
		（Center）AA 05 00 2C 02 05 E2 EB AA	
	Return	55 05 00 2C 33 01 BA EB AA	
Polarity setting	Receive	（white hot）AA 05 00 2D 01 00 DD EB AA （black hot）AA 05 00 2D 0101 DE EB AA （BRY）AA 05 00 2D 01 02 DF EB AA （PRY）AA 05 00 2D 01 03 E0 EB AA （BGR）AA 05 00 2D 01 04 E1 EB AA （rainbow 1）AA 05 00 2D 01 05 E2 EB AA	

		（rainbow 2）AA 05 00 2D 01 06 E3 EB AA （B-R）AA 05 00 2D 01 07 E4 EB AA （blackish green Red）AA 05 00 2D 01 08 E5 EB AA （BGR-pink）AA 05 00 2D 01 09 E6 EB AA （mixed）AA 05 00 2D 01 0A E7 EB AA （Red hot）AA 05 00 2D 01 0B E8 EB AA	
	Return	55 05 00 2D 33 01 BB EB AA	
Get current Palette	Receive	AA 04 00 2D 00 DB EB AA	0x00：white hot 0x01：black hot 0x02：BRY 0x03：PRY 0x04：BGR 0x05：1 rainbow 1 0x06：2 rainbow 2 0x07：B-R 0x08：blackish green Red 0x09：BGR-pink 0x0A：mixed 0x0B：Red hot
	Return	55 05 00 2D 33 00 BA EB AA	
Digital video source	Receive	（ORG）AA 05 00 2E 01 00 DE EB AA （NUC）AA 05 00 2E 01 01 DF EB AA （DRC）AA 05 00 2E 01 02 E0 （DNS）AA 05 00 2E 01 05 E3 EB AA	
	Return	55 05 00 2E 33 01 BC EB AA	
Get current digital video source type	Receive	AA 04 00 2E 00 DC EB AA	
	Return	（ORG）55 05 00 2E 33 00 BB EB AA （NUC）55 05 00 2E 33 01 BC EB AA （DRC）55 05 00 2E 33 02 BD EB AA （DNS）55 05 00 2E 33 05 C0 EB AA	

Digital video data interface setting	Receive	（CMOS）AA 05 00 2F 01 01 E0 EB AA （LVDS）AA 05 00 2F 01 02 E1 EB AA （OFF）AA 05 00 2F 01 00 DF EB AA (BT.656) AA 05 00 2E 01 02 E0 EB AA	
	Return	55 05 00 2F 33 01 BD EB AA	
Get digital video interface type	Receive	AA 04 00 2F 00 DD EB AA	
	Return	(OFF) 55 05 00 2F 33 00 BC EB AA (LVCOMS) 55 05 00 2F 33 01 BD EB AA (LVDS) 55 05 00 2F 33 02 BE EB AA (BT.656) 55 05 00 2F 33 03 BF EB AA	
Image flip	Receive	（no-operation）AA 05 00 30 01 01 E1 EB AA （Horizontal）AA 05 00 30 01 02 E2 EB AA （Vertical）AA 05 00 30 01 04 E4EB AA （Diagonal ）AA 05 00 30 01 08 E8 EB AA	
	Return	55 05 00 30 33 01 BE EB AA	
Get current Flip Status	Receive	AA 04 00 30 00 DE EB AA	
	Return	（normal）55 05 00 30 33 01 BE EB AA （left to right）55 05 00 30 33 02 BF EB AA （up down）55 05 00 30 33 04 C1 EB AA （un down and left to right）55 05 00 30 33 08 C5 EB AA	
AGC mode setting	Receive	（Manual）AA 05 00 3A 01 00 EA EB AA （Auto 0）AA 05 00 3A 01 01 EB EB AA （Auto 1）AA 05 00 3A 01 02 EC EB AA	
	Return	55 05 00 3A 33 01 C8 EB AA	
Get current AGC Mode	Receive	AA 04 00 3A 00 E8 EB AA	
	Return	（Manual）55 05 00 3A 33 00 C7 EB AA （Auto 0）55 05 00 3A 33 01 C8 EB AA （Auto 1）55 05 00 3A 33 02 C9 EB AA	
Contrast setting	Receive	AA 05 00 3B 01 82 6D EB AA	For example: Set the contrast to 130(decimal).
	Return	55 05 00 3B 33 01 C9 EB AA	
Get current contrast	Receive	AA 04 00 3B 00 E9 EB AA	Return 1 bit ,0x82 means the current AGC value is 130
	Return	55 05 00 3B 33 82 4A EB AA	

Brightness setting	Receive	AA 06 00 3C 01 2C 01 1A EB AA	For example: Set the brightness to 300(decimal).
	Return	55 05 00 3C 33 01 CA EB AA	
adjust brightness by step	Receive	AA 06 00 41 01 01 05 F8 EB AA	PRM 1 :0x00 decrease , 0x01 increase PRM2 adjust step is 5。
	Return	55 05 00 41 33 01 CF EB AA	
get current brightness	Receive	AA 04 00 3C 00 EA EB AA	return 2 bits, example 0xF4,0x00 means brightness is 244
	Return	55 06 00 3C 33 F4 00 BE EB AA	
	Return	55 05 00 3D 33 01 CB EB AA	
	Return	55 05 00 3D 33 0A D4 EB AA	
DDE switch	Receive	（DDE open）AA 05 00 3E 01 01 EF EB AA （DDE close）AA 05 00 3E 01 00 EE EB AA	
	Return	55 05 00 3E 33 01 CC EB AA	
Get current DDE switch status	Receive	AA 04 00 3E 00 EC EB AA	
	Return	（DDE on）55 05 00 3E 33 01 CC EB AA （DDE off）55 05 00 3E 33 00 CB EB AA	
DDE class setting	Receive	AA 05 00 3F 01 03 F2 EB AA	For example: Set the DDE class to 3.
	Return	55 05 00 3F 33 01 CD EB AA	
Get current DDE level	Receive	AA 04 00 3F 00 ED EB AA	return one bit, 0x00 menas DDE level 0
	Return	55 05 00 3F 33 02 EB AA	
Analog Image freeze	Receive	（freeze）AA 05 00 32 02 01 E4 EB AA （unfreeze）AA 05 00 32 02 00 E3 EB AA	
	Return	55 05 00 32 33 01 C0 EB AA	
Digital Image freeze	Receive	（freeze）AA 05 00 32 02 02 E5 EB AA （unfreeze）AA 05 00 32 02 03 E6 EB AA	
	Return	55 05 00 32 33 01 C0 EB AA	
Analog video switch	Receive	（open）AA 05 01 3D 02 01 F0 EB AA （close）AA 05 01 3D 02 00 EF EB AA	
	Return	55 04 3D 33 01 CA EB AA	
Filter setting	Receive	AA 05 00 31 01 00 E1 EB AA（filter off） AA 05 00 31 01 01E2 EB AA（filter on）	
	Return	55 05 00 31 33 01 BF EB AA	
Get Filter status	Receive	AA 04 00 31 00 DF EB AA	

	Return	（filter off）55 05 00 31 33 00 8E EB AA （filter on）55 05 00 31 33 01 8F EB AA	
Baud rate setting	Receive	(115200bps) AA 06 00 14 02 00 10 D6 EB AA (9600bps) AA 06 00 14 02 00 02 C8 EB AA (19200bps) AA 06 00 14 02 00 04 CA EB AA （38400bps） AA 06 00 14 02 00 08 CE EB AA	For example: Set the baud rate to 115200bps.
	Return	55 05 00 14 33 01 A2 EB AA	

Note: All the data in the Table are hexadecimal.

Terminology:

SC:SUM Check

CW: Command Word

OW: Operation Word

RV: Returned Value

DDE: Digital Detail Enhancement

AGC: Automatic Gain Control

NUC: Non-uniform Correction

ORG: Original

DRC: Dynamic Range Compression