

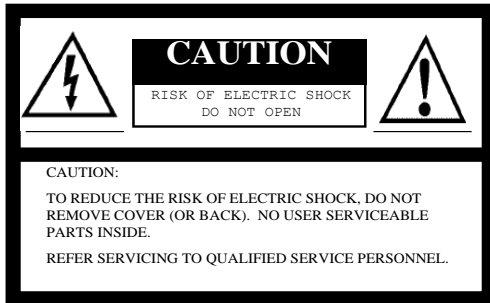
The logo for SENTTECH, featuring the word "SENTTECH" in a bold, blue, sans-serif font. The letters "S", "E", "N", and "T" are white with a blue outline, while "T", "E", "C", and "H" are solid blue. The logo is set against a white rectangular background.

SENTTECH

STC-AF134DV
Protocol Specification

16:9 Format 720p
11x Auto Focus Zoom
CMOS Camera

Safety Precautions



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, I.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap the unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the CCD or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
 - In wet, moist, and high humidity areas
 - Under hot direct sunlight
 - In high temperature areas
 - Near an object that releases a strong magnetic or electric field
 - Areas with strong vibrations
- Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

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Contents

I. Communication Settings	5
II. Communication Format	5
III. Camera Control Commands	6-8
A. Command List for the Communication	6-7
B. Table A: Slave Address for the ICs (8bit) list	7
C. Error Code List.....	8
IV. uCOM Register Mapping List	9-24
A. Color Code List	14
V. DSP Register Mapping List	25-30
VI. OSD (On Screen Character Display) Command	31-33
A. One Byte Command	31
B. Two Byte Command	32
C. Consecutive Type Byte Command	33

I. Communication Settings

Setting	Value
Baud Rate	9,600 bps / 19,200 bps / 38,400 bps (Default)
Data Bit	8 bits
Parity	None
Stop Bit	1 bit
Flow Control	None

II. Communication Format

The format for sending and/or receiving data between the PC and the camera is as follows:

SOF	Command	Direction	Data Length	Data	Check Sum	EOF
8 bits	8 bits	1 bit	15 bits	[Data length] byte (Variable)	8 bits	8 bits

Details for the format:

	Details
SOF	Start of the Frame. This value is always "0x02".
Command	Command Code refers to: "The Camera Control Command"
Direction	"0": When reading or receiving data from the camera; the command value is always a "0". "1": When writing or sending data to the camera the command value is always a "1". Note: This value is always "0" when the STC-AF134 responds.
Data Length	The "Data Length" must be specified in bytes. This "Data Length" value tells how many bytes the "Data" will contain.
Data	This field is for an option, set and/or acquired value. The size must be specified as "Data Length".
Check Sum	The "Check Sum" function is used to verify the integrity of the communication transmission. The "Check Sum" value should equal the last (low) 8 bits of the summary of ["Command"+"Direction"+"Data Length"+"Data"]. If this value of "Check Sum" does not match the last (low) 8bits of the summary data of ["Command" + "Direction" + "Data Length" + "Data"], then the camera will generate the following error message: "Check Sum Error".
EOF	End of the Frame. This value is always "0x03"

III. Camera Control Commands

Note: All data in this section is described in hexadecimal format (HEX).

A. Command List for the Communication

Command (HEX)	Command Details												
4A	<p>The command value 4A is for reading or writing data from the camera's ICs (i.e.: the EEPROM, DSP, or CPU)</p> <p>Use the slave addresses described in "Table A: Salve Address of the ICS (8 bits) List" to address each IC.</p> <p>By setting "000" in [Start] and "07FF" in [End], all data can be acquired with one communication.</p> <p>Since the maximum number of addresses that can be written at once is 32, the data must be written 64 times separately to write 2048 bytes of data (i.e.: 32bytes x 64 = 2048 written bytes)</p> <table border="1" data-bbox="342 720 1401 989"> <tr> <td>[SLV]:</td> <td>Slave address of ICs (See Table A on the following page)</td> </tr> <tr> <td>[START_H] x 16 + [END_L]:</td> <td>First address (0000 to 07FF)</td> </tr> <tr> <td>[END_H] x 16 + [END_L]:</td> <td>Last address (0000 to 07FF)</td> </tr> <tr> <td>[DATA (i)]:</td> <td>Data of the address (i)</td> </tr> <tr> <td>[DataLenH]:</td> <td>Higher Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$</td> </tr> <tr> <td>[DataLenL]:</td> <td>Lower Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$</td> </tr> </table> <p>1. The format for reading data from the ICs is as follows:</p> <p>A. The command to prepare the camera's ICs to send data is:</p> <p>02, 4A, 00, 05, [SLV], [START_H], [START_L], [END_H], [END_L], [CHK], 03</p> <p>In this example, the value of [CHK] = the last (low) 8 bits of the summary of (4A, 00, 05, [SLV], [START_H], [START_L], [END_H], [END_L])</p> <p>B. The data received based on the command above will be in the following format:</p> <p>02, 4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1],..., [DATAEND], [CHK], 03</p> <p>In this example, the value of [CHK] + the last (low) 8 bits of summary of (4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1],..., [DATAEND])</p> <p>*An example of sending a command to read out all data (address 0000 to 07FF)from the IC (IC slave address is 50) is as follows:</p> <p>(02, 4A, 00, 03, 50, 00, 00, 07, FF, A3, 03)</p> <p>Continues on next page...</p>	[SLV]:	Slave address of ICs (See Table A on the following page)	[START_H] x 16 + [END_L]:	First address (0000 to 07FF)	[END_H] x 16 + [END_L]:	Last address (0000 to 07FF)	[DATA (i)]:	Data of the address (i)	[DataLenH]:	Higher Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$	[DataLenL]:	Lower Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$
[SLV]:	Slave address of ICs (See Table A on the following page)												
[START_H] x 16 + [END_L]:	First address (0000 to 07FF)												
[END_H] x 16 + [END_L]:	Last address (0000 to 07FF)												
[DATA (i)]:	Data of the address (i)												
[DataLenH]:	Higher Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$												
[DataLenL]:	Lower Byte of the two bytes is calculated as $(([END_H] \times 16 + [END_L] - [START_H] \times 16 + [START_L] + 6)$												

Command (HEX)	Command Details
4A	<p>2. The format for writing data to the camera's ICs is as follows:</p> <p>A. The command to the camera to receive data being sent to the ICs is:</p> <p>02, 4A, [DataLenH] +80, [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART1], ..., [DATAEND], [CHK], 03</p> <p>In this example, the value of [CHK] = the last (low) 8 bits of the summary of</p> <p>(4A, [DataLenH] + 80, [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1], ..., [DATAEND])</p> <p>B. The format used by the camera to confirm the data written to the camera's ICs is as follows:</p> <p>02, 4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1],..., [DATAEND], [CHK], 03</p> <p>In this example, the value of [CHK] + the last (low) 8 bits of summary of</p> <p>(4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1],..., [DATAEND])</p> <p>*An example of sending a command to write 23 to address 10 of the IC (IC slave address is 50) is as follows: (02, 4A, 80, 04, 50, 00, 10,00, 10, 23, 61, 03)</p>
50	<p>This command is for sending an OSCD (On Screen Character Display) command to the camera.</p> <p>As stated above, when writing OSCD commands to the camera, 16 bytes is the maximum amount of data that can be written to the camera with one communication.</p> <p>For additional information, please check section "OSCD Command".</p> <p>In order to generate an OSCD, set the "Command" to a value of 50. Set OSCD command to "DATA", set the number of byte of the OSCD command to "Data Length".</p> <p>1. The format for sending a command to the camera to clear the display and then to generate a display of [0123] on the 3rd row of the 1st column is as follows: (02, 50, 80, 0A, 00, 1E, 7E, 88, 60, C0, 00, 01, 02, 03, 24, 03)</p>

B. Table A: Slave Address for the ICs (8 bits) List

IC	Address	Description of the Chip / IC
DSP	80	DSP
EEPROM	50	The EEPROM zone for the Picture mode DSP data
EEPROM	51	The EEPROM zone for the Bright mode DSP data
EEPROM	52	The EEPROM zone for the Pseudo mode DSP data
EEPROM	D0	The Virtual EEPROM zone for the currently selected mode of the Picture Mode (50), Bright Mode (51) or Pseudo Color Mode (52).
uCOM	10	The uCOM for the Lens control, the Iris control and/or the Color Mode.
EEPROM	53	The EEPROM zone for uCOM Data

Note: There is a maximum number of writing to EEPROM of 1,000,000, times.

C. Error Code List

If an error occurs, the camera sends an error code with the following format:

The Command number o the Error Message is FF (HEX). The data length is 0002.

Error	Receiving Data
EOF is missing	02, FF, 00, 02, 02, 00, 03, 03
Check sum does NOT match the data being transmitted	02, FF, 00, 02, 03, 00, 03, 03
The command being transmitted does not exist or is invalid	02, FF, 00, 02, 04, 00, 03, 03
Unprocessed data remains in the receiving buffer	02, FF, 00, 02, 05, 00, 03, 03
Timed out	02, FF, 00, 02, 06, 00, 03, 03
Overrun error	02, FF, 00, 02, 08, 00, 03, 03
Framing error	02, FF, 00, 02, 09, 00, 03, 03
Parity error	02, FF, 00, 02, 0A, 00, 03, 03
Data length error (too long)	02, FF, 00, 02, 0B, 00, 03, 03
I2C communication error	02, FF, 00, 02, 10, 00, 03, 03

Notes:

- 1. The camera disregards any data that does not start with SOF.*
- 2. The time out error occurs if it does not receive the next data 2 seconds (110/60 seconds at 60Hz, 110/50 seconds at 50Hz) after receiving the data.*

IV. uCOM Register Mapping List

Address	7	6	5	4	3	2	1	0	Details	Initial Data
000								X	Control by the "Push button" on the side of the camera 0: Disable 1: Enable	1
	X	X	X	X	X	X	X		Reserved	
001						X	X	X	Reserved	
					X				Interval AF 0: Disable 1: Enable *The push-to-set iris is enabled during each period of the time that is the interval AF time [006H] of the uCOM when the interval AF is enabled.	
				X					Push-to-set Iris 0: Disable 1: Enable *When push-to-set iris is enabled, the iris adjusts automatically once. Automatically resets to Disable after iris is adjusted.	0
			X						Iris Mode 0: Fixed iris 1: Auto iris *When auto iris is selected, please set the target video output value for auto iris to ALC brightness [700H] of the DSP	1
		X							Push-to-set Focus 0: Disable 1: Enable *When push-to-set focus is enabled, focus adjusts automatically once. Automatically resets to disable after focus is adjusted.	0
	X							Focus Mode 0: Manual focus 1: Auto focus	1	
002								X	Reserved	
							X		Motion Detection 0: Disable 1: Enable *When enable is selected, the focus will become stable while the object is moving.	1
	X	X	X	X	X	X			Reserved	
003	X	X	X	X	X	X	X	X	Reserved	
004				X	X	X	X	X	Picture Mode *When this value saves to the EEPROM, the camera starts with saved picture mode at the power-up. 0: Picture mode 1: Bright mode 2: Pseudo color mode 00 3: Pseudo color mode 01 4: Pseudo color mode 02 5: Pseudo color mode 03 6: Pseudo color mode 04 7: Pseudo color mode 05 8: Pseudo color mode 06 9: Pseudo color mode 07 10: Pseudo color mode 08 11: Pseudo color mode 09 12: Pseudo color mode 10 13: Pseudo color mode 11 14: Pseudo color mode 12 15: Pseudo color mode 13 16: Pseudo color mode 14 17: Pseudo color mode 15 18: Pseudo color mode 16 19: Pseudo color mode 17 20: Pseudo color mode 18 21: Pseudo color mode 19 22: Pseudo color mode 20 23: Pseudo color mode 21 24: Pseudo color mode 22 25: Pseudo color mode 23 26: Pseudo color mode 24 27: Pseudo color mode 25 28: Pseudo color mode 26 29: Pseudo color mode 27 30: Pseudo color mode 28 31: Pseudo color mode 29	0
	X	X	X						Reserved	
005	0	0	0	0	0	X	X	X	Color for the OSD menu 0: Black 1: Blue 2: Green 3: Cyan 4: Red 5: Magenta 6: Yellow 7: White	7
006	0	0	0	0	0	X	X	X	Interval AF time Sets the interval AF time with second	60

007	X	X	X	X	X	X	X	X	Reserved	
Address	7	6	5	4	3	2	1	0	Details	Initial Data
008	X	X	X	X	X	X	X	X	Zoom Position [little-endian]	22
009	0	0	0	0	X	X	X	X	22: Wide end 1200: Tele end of the optical zoom 1200-2047: Tele end of the optical and digital combination zoom *When this value saves to the EEPROM, the zoom position moves to the saved position at the power-up. *Zooming is stopped by the zoom position at moment when sets 0 while zooming. *When the digital zoom link is enabled, the optical and digital zoom positions are changed with this.	
00A	X	X	X	X	X	X	X	X	Focus distance [little-endian]	193
00B	0	0	0	0	0	0	X	X	193: Infinity 381: Approximately 0.7m *When this value saves to the EEPROM, the focus adjusts to the saved distance at the power-up. *Focusing is stopped by the focus distance at the moment when 0 is set while focusing.	
00C	X	X	X	X	X	X	X	X	Iris Opening Ratio	500
00D	0	0	0	0	0	0	X	X	0: 100% closed 1000: 100% open *When this value saves to the EEPROM, the iris adjusts to the last saved opening ratio at the power-up.	
00E	X	X	X	X	X	X	X	X	Reserved	
00F							X	X	UART baud rate 0: 9,600 bps 1: 19,200 bps 2: 38,400 bps 3: 9,600 bps *Change to the lower baud rate if a communication error occurs	2
			X	X	X	X			Reserved	
		X							Return data and data length of UART write command 0: Return data and data length of UART write command 1: Return data is excluding data of write command and data length is 0.	0
		X							UART check sum 0: Disable 1: Enable *When disable is selected, the camera processes command even if the check sum of sent command does not match	1
010-019	X	X	X	X	X	X	X	X	Reserved	
01A	X	X	X	X	X	X	X	X	Optical zoom range (Wide-end) [little-endian]	10
01B	0	0	0	0	X	X	X	X	22: Wide end 1200: Tele end	
01C	X	X	X	X	X	X	X	X	Optical zoom range (Tele-end) [little-endian]	1200
01D	0	0	0	0	X	X	X	X	22: Wide end 1200: Tele end	
01E-01F	X	X	X	X	X	X	X	X	Reserved	
020	X	X	X	X	X	X	X	X	Auto iris minimum iris opening ratio [little-endian]	0
021	0	0	0	0	0	0	X	X	0: 100% close 1000: 100% open *Iris opening ratio is always greater than this ratio when in auto iris mode.	
022	X	X	X	X	X	X	X	X	Auto iris maximum iris opening ratio [little-endian]	1000
023	0	0	0	0	0	0	X	X	0: 100% close 1000: 100% open *Iris opening ratio is always smaller than this ratio when in auto iris mode.	
024	X	X	X	X	X	X	X	X	Auto iris control tolerance *When the difference between the current brightness and target brightness becomes less than value, the auto iris control stops.	6
025	X	X	X	X	X	X	X	X	Auto iris control threshold *When the difference between the current brightness and target brightness becomes beyond "tolerance + threshold", start auto iris control.	6

Address	7	6	5	4	3	2	1	0	Details	Initial Data
026	X	X	X	X	X	X	X	X	Auto iris step multiplier Adjust the amount of change of iris control voltage *Amount of change of iris control voltage= (Current brightness – Target brightness) x (Auto iris step multiplier) / (Auto iris step divisor +1)	24
027	X	X	X	X	X	X	X	X	Auto iris step divisor Adjusts the amount of change of iris control voltage *Amount of change of iris control voltage = (Current brightness – target brightness) x (Auto iris step multiplier) / (Auto iris step divisor +1)	6
028	X	X	X	X	X	X	X	X	Amount of change of maximum voltage for auto iris 1-16383: Minimum to maximum *Set the limit on the amount of change of iris control voltage derived from auto iris step multiplier and divisor *When small value is set in the field, smooth auto iris operation is achieved however the movement becomes slower.	0
029	0	0	X	X	X	X	X	X		
02A-02F	X	X	X	X	X	X	X	X	Reserved	
030	X	X	X	X	X	X	X	X	Reserved	
031	X	X	X	X	X	X	X	X	Shadow mask shading level 0: No masking (or invisible) 255: Black *The depth (or contrast) of the shadow mask changes. *The shadow mask does NOT appear when this is set to 0.	0
032	X	X	X	X	X	X	X	X	Horizontal shadow mask upper part position (Top to xxx) [little-endian] 0: Top 2047: Bottom	0
033	0	0	0	0	0	X	X	X	Reserved	
034	X	X	X	X	X	X	X	X	Horizontal shadow mask lower part position (Top to xxx) [little-endian] 0: Top 2047: Bottom	720
035	0	0	0	0	0	X	X	X		
036	X	X	X	X	X	X	X	X	Reserved	
037					X	X	X	X	Horizontal line marker color *Please see the Color Code Chart	0
	X	X	X	X					Reserved	
038	X	X	X	X	X	X	X	X	Horizontal line marker position [little-endian] 0: Top 2047: Bottom	0
039	0	0	0	0	0	0	0	0		
03A	X	X	X	X	X	X	X	X	Horizontal line marker size [little-endian] 0: No line (or invisible) 2047: Thickest line *The line marker does NOT appear when this setup is 0.	0
03B	0	0	0	0	0	0	0	X		
03C-041	X	X	X	X	X	X	X	X	Reserved	
042	X	X	X	X	X	X	X	X	Vertical shadow mask left part position (Left to xxx) [little-endian] 0: Left 2047: Right	0
043	0	0	0	0	0	X	X	X		
044	X	X	X	X	X	X	X	X	Vertical shadow mask right part position (Right to xxx) [little-endian] 0: Left 2047: Right	1280
045	0	0	0	0	0	X	X	X		
046	X	X	X	X	X	X	X	X	Reserved	
047					X	X	X	X	Vertical line marker color *Please see color code chart	0
	X	X	X	X					Reserved	
048	X	X	X	X	X	X	X	X	Vertical line marker position [little-endian] 0: Left 2047: Right	0
049	0	0	0	0	0	0	0	X		
04A	X	X	X	X	X	X	X	X	Vertical line marker size [little-endian] 0: No line (or invisible) 2047: Thickest line *The line marker does NOT appear when this setup is 0.	0
04B	0	0	0	0	0	0	0	X		
04C-05F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
060	X	X	X	X	X	X	X	X	User defined color 0 Red	255
061	X	X	X	X	X	X	X	X	User defined color 0 Green	128
062	X	X	X	X	X	X	X	X	User defined color 0 Blue	0
063	X	X	X	X	X	X	X	X	User defined color 1 Red	255
064	X	X	X	X	X	X	X	X	User defined color 1 Green	0
065	X	X	X	X	X	X	X	X	User defined color 1 Blue	128
066	X	X	X	X	X	X	X	X	User defined color 2 Red	128
067	X	X	X	X	X	X	X	X	User defined color 2 Green	255
068	X	X	X	X	X	X	X	X	User defined color 2 Blue	0
069	X	X	X	X	X	X	X	X	User defined color 3 Red	0
06A	X	X	X	X	X	X	X	X	User defined color 3 Green	255
06B	X	X	X	X	X	X	X	X	User defined color 3 Blue	128
06C	X	X	X	X	X	X	X	X	User defined color 4 Red	128
06D	X	X	X	X	X	X	X	X	User defined color 4 Green	0
06E	X	X	X	X	X	X	X	X	User defined color 4 Blue	255
06F	X	X	X	X	X	X	X	X	User defined color 5 Red	0
070	X	X	X	X	X	X	X	X	User defined color 5 Green	128
071	X	X	X	X	X	X	X	X	User defined color 5 Blue	255
072	X	X	X	X	X	X	X	X	User defined color 6 Red	128
073	X	X	X	X	X	X	X	X	User defined color 6 Green	128
074	X	X	X	X	X	X	X	X	User defined color 6 Blue	128
075	X	X	X	X	X	X	X	X	User defined color 7 Red	255
076	X	X	X	X	X	X	X	X	User defined color 7 Green	207
077	X	X	X	X	X	X	X	X	User defined color 7 Blue	0
078-07F	X	X	X	X	X	X	X	X	Reserved	
080	X	X	X	X	X	X	X	X	Binary process threshold *This defines the threshold level to create a binary signal.	48
081	X	X	X	X	X	X	X	X	Binary process slope *This defines the slope (or inclination) in the binary process of the signal. The slope is defined as (Set value +8)/8 *When the set value is "0", the binary process does not occur at all and it keeps full gray scale representation. *If a large number is set, pixel flickering may occur at the edge of the letters.	16
082					X	X	X	X	Pseudo color 00 background color code	0
	X	X	X	X					Pseudo color 00 foreground color code	1
083					X	X	X	X	Pseudo color 01 background color code	0
	X	X	X	X					Pseudo color 01 foreground color code	3
084					X	X	X	X	Pseudo color 02 background color code	0
	X	X	X	X					Pseudo color 02 foreground color code	15
085					X	X	X	X	Pseudo color 03 background color code	0
	X	X	X	X					Pseudo color 03 foreground color code	5
086					X	X	X	X	Pseudo color 04 background color code	0
	X	X	X	X					Pseudo color 04 foreground color code	7
087					X	X	X	X	Pseudo color 05 background color code	0
	X	X	X	X					Pseudo color 05 foreground color code	6
088					X	X	X	X	Pseudo color 06 background color code	0
	X	X	X	X					Pseudo color 06 foreground color code	2
089					X	X	X	X	Pseudo color 07 background color code	3
	X	X	X	X					Pseudo color 07 foreground color code	1

Address	7	6	5	4	3	2	1	0	Details	Initial Data
08A					X	X	X	X	Pseudo color 08 background color code	2
	X	X	X	X					Pseudo color 08 foreground color code	1
08B					X	X	X	X	Pseudo color 09 background color code	6
	X	X	X	X					Pseudo color 09 foreground color code	1
08C					X	X	X	X	Pseudo color 10 background color code	4
	X	X	X	X					Pseudo color 10 foreground color code	1
08D					X	X	X	X	Pseudo color 11 background color code	4
	X	X	X	X					Pseudo color 11 foreground color code	7
08E					X	X	X	X	Pseudo color 12 background color code	1
	X	X	X	X					Pseudo color 12 foreground color code	0
08F					X	X	X	X	Pseudo color 13 background color code	3
	X	X	X	X					Pseudo color 13 foreground color code	0
090					X	X	X	X	Pseudo color 14 background color code	15
	X	X	X	X					Pseudo color 14 foreground color code	0
091					X	X	X	X	Pseudo color 15 background color code	5
	X	X	X	X					Pseudo color 15 foreground color code	0
092					X	X	X	X	Pseudo color 16 background color code	7
	X	X	X	X					Pseudo color 16 foreground color code	0
093					X	X	X	X	Pseudo color 17 background color code	6
	X	X	X	X					Pseudo color 17 foreground color code	0
094					X	X	X	X	Pseudo color 18 background color code	2
	X	X	X	X					Pseudo color 18 foreground color code	0
095					X	X	X	X	Pseudo color 19 background color code	1
	X	X	X	X					Pseudo color 19 foreground color code	3
096					X	X	X	X	Pseudo color 20 background color code	1
	X	X	X	X					Pseudo color 20 foreground color code	2
097					X	X	X	X	Pseudo color 21 background color code	1
	X	X	X	X					Pseudo color 21 foreground color code	6
098					X	X	X	X	Pseudo color 22 background color code	1
	X	X	X	X					Pseudo color 22 foreground color code	4
099					X	X	X	X	Pseudo color 23 background color code	7
	X	X	X	X					Pseudo color 23 foreground color code	4
09A					X	X	X	X	Pseudo color 24 background color code	0
	X	X	X	X					Pseudo color 24 foreground color code	8
09B					X	X	X	X	Pseudo color 25 background color code	0
	X	X	X	X					Pseudo color 25 foreground color code	9
09C					X	X	X	X	Pseudo color 26 background color code	0
	X	X	X	X					Pseudo color 26 foreground color code	10
09D					X	X	X	X	Pseudo color 27 background color code	0
	X	X	X	X					Pseudo color 27 foreground color code	11
09E					X	X	X	X	Pseudo color 28 background color code	0
	X	X	X	X					Pseudo color 28 foreground color code	12
09F					X	X	X	X	Pseudo color 29 background color code	0
	X	X	X	X					Pseudo color 29 foreground color code	13
0A0-0AF	X	X	X	X	X	X	X	X	Reserved	

A. Color Code List

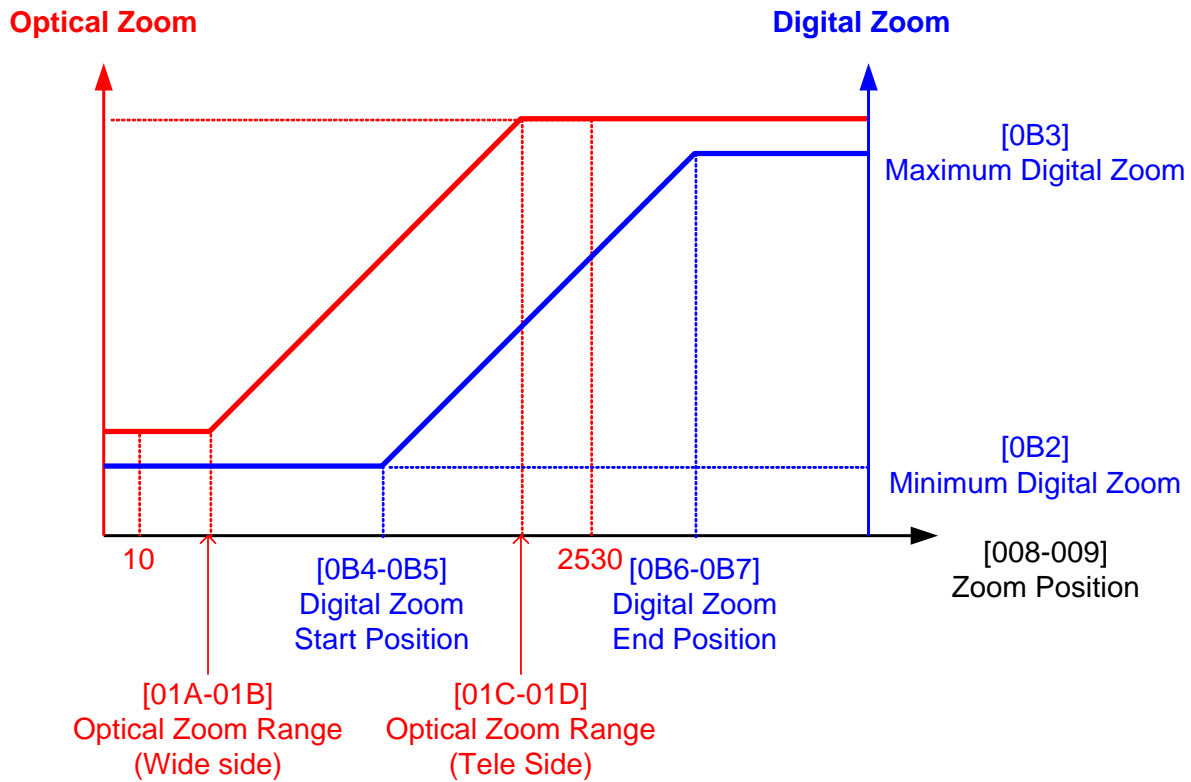
The line marker colors and pseudo colors can be selected from the following 15 colors.

The last 8 colors are user definable and they can be defined through the serial communication.

Color Code	Color
0	Black
1	White
2	Red
3	Green
4	Blue
5	Cyan
6	Magenta
7	Yellow
8	User defined color 0
9	User defined color 1
10	User defined color 2
11	User defined color 3
12	User defined color 4
13	User defined color 5
14	User defined color 6
15	User defined color 7

Address	7	6	5	4	3	2	1	0	Details	Initial Data
0B0								X	Digital Zoom Link 0: Disable (Digital zoom and optical zoom control separately) 1: Enable(Optical and digital combination zoom control) *When the digital zoom link is disabled, the digital zoom controls with "0B8: Digital zoom magnification". *When the digital zoom link is enabled, the digital zoom operates with "008-009: Zoom position".	1
	X	X	X	X	X	X	X		Reserved	
0B1	X	X	X	X	X	X	X	X	Digital Zoom Speed 0: Fastest digital zoom speed 255: Slowest digital zoom speed *Set the digital zooming speed for the digital zoom, when the digital zoom link is enabled.	130
0B2	0	X	X	X	X	X	X	X	Minimum digital zoom magnification 0-127: Minimum digital zoom magnification calculation value *Set the value for calculating the minimum digital zoom magnification, when the digital zoom link is enabled. *Minimum digital zoom magnification = 128 / (128-value)	0
0B3	0	X	X	X	X	X	X	X	Maximum digital zoom magnification 0-127: Maximum digital zoom magnification *Set the value for calculating the maximum digital zoom magnification when the digital zoom link is enabled. *Maximum digital zoom magnification = 128 / (128-value)	64
0B4	X	X	X	X	X	X	X	X	Digital zoom start point [little-endian]	1200
0B5	0	0	0	0	X	X	X	X	0-1200: Digital zoom start position *Set the digital zoom start position, when the digital zoom link is enabled. *Please set this value less than the value of "1C-1DH:Optical zoom range (Tele end)".	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
0B6	X	X	X	X	X	X	X	X	Digital zoom end point	2047
0B7	0	0	0	0	X	X	X	X	0-2047: Digital zoom end position *Set the digital zoom end position, when the digital zoom link is enabled.	
0B8	0	X	X	X	X	X	X	X	Digital Zoom Magnification 0-128: Digital zoom magnification calculation value. *Set the value for calculating the digital zoom magnification, when the digital zoom link is enabled. *Digital zoom magnification = 128 / (128-value)	0
0B9	X	X	X	X	X	X	X	X	Reserved	
0BA	X	X	X	X	X	X	X	X	Digital zoom (Pan, horizontal offset) [little-endian]	0
0BB	X	X	X	X	X	X	X	X	*Two's complement	
0BC	X	X	X	X	X	X	X	X	Digital zoom (Tilt, vertical offset) [little-endian]	0
0BD	X	X	X	X	X	X	X	X	*Two's complement	



Settings to the optical and digital combination zoom control.

1. Set 1 to "0B0H.0"
2. Set the optical zoom range with "01A-01BH" and "01C-01DH".
When set 10 to "01A-01BH" and 2530 to "01C-01DH", optical zoom operates with full range of the optical zoom .
3. Set the digital zoom magnification range with "0B2H" and "0B3H".
When set 0 to "0B2H" and 255 to "0B3H", digital zoom operates with full magnification range of the digital zoom.
4. Set the digital zoom range with "0B4-0B5H" and "0B6-0B7H" for zoom position "008-009H".
When "0B4-0B5H" is set to match "01C-01DH", then the digital zoom operates after the maximum optical zooming.
When "0B4-0B5H" is set to be less than "01C-01DH", then the digital zoom operates after the maximum optical zooming.

Address	7	6	5	4	3	2	1	0	Details	Initial Data
0C0	X	X	X	X	X	X	X	X	Initial function for SW11 *Set the following functions for the push-button 0: Disable 1: Display Menu 2: Zoom (TELE) 3: Zoom (WIDE) 4: Focus (NEAR) 5: Focus (FAR) 6: Push to set focus 7: Auto focus OFF 8: Auto focus ON 9: Push to set iris 10: Auto iris OFF 11: Auto iris ON 12: Iris (OPEN) 13: Iris (Close) 14: Picture Mode (+) 15: Picture Mode (-) 16: Contrast (+) 17: Contrast (-) 18: Shadow mask shading level (+) 19: Shadow mask shading level (-) 20: Shadow mask top (+) 21: Shadow mask top (-) 22: Shadow mask bottom (+) 23: Shadow mask bottom (-) 24: Shadow mask top / bottom (+) 25: Shadow mask top/bottom (-) 26: Shadow mask left (+) 27: Shadow mask left (-) 28: Shadow mask right (+) 29: Shadow mask right (-) 30: Shadow mask left/right (+) 31: Shadow mask left/right (-) 32: Horizontal line marker color (+) 33: Horizontal line marker color (-) 34: Horizontal line marker size (+) 35: Horizontal line marker size (-) 36: Horizontal line maker position (+) 37: Horizontal line maker position (-) 38: Vertical line marker color (+) 39: Vertical line marker color (-) 40: Vertical line marker size(+) 41: Vertical line marker size (-) 42: Vertical line maker position (+) 43: Vertical line maker position (-) 44: Mirror OFF 45: Horizontal Mirror 46: Upside down 47: Rotation 180 degrees 48: Still image OFF 49: Still image ON 50: IRC filter ON 51: IRC filter OFF 52: Manual white balance 53: Auto white balance 54: Push to set white balance 55- No Function 127: *Set the following functions for push-and-release of the push button 128: Auto focus OFF/ON 129: Auto iris OFF/ON 130: Reverse OFF / Horizontal mirror 131: Reverse OFF / Upside down 132: Reverse OFF / Rotation 180 degrees 133: Horizontal mirror / Upside down 134: Horizontal mirror / Rotation 180 degrees 135: Upside down / Rotation 180 degrees 136: Still image OFF/ON 137: IRC filter ON/OFF 138: Manual white balance / Auto white balance 139-255: No Function	3
0C1	X	X	X	X	X	X	X	X	Initial function for SW12 *Please see the "0C0" for details	2
0C2	X	X	X	X	X	X	X	X	Initial function for SW13 *Please see the "0C0" for details	1
0C3	X	X	X	X	X	X	X	X	Initial function for SW21 *Please see the "0C0" for details	6
0C4	X	X	X	X	X	X	X	X	Initial function for SW22 *Please see the "0C0" for details	0
0C7	X	X	X	X	X	X	X	X	Initial function for SW32 *Please see the "0C0" for details	0

Address	7	6	5	4	3	2	1	0	Details	Initial Data
0C8	X	X	X	X	X	X	X	X	Initial function for SW33 *Please see the "0C0" for details	0
0C9-0CF	X	X	X	X	X	X	X	X	Reserved	
0E0								X	Polarity of SW11 0: Normal 1: Reverse	0
							X		Polarity of SW12 0: Normal 1: Reverse	0
						X			Polarity of SW13 0: Normal 1: Reverse	0
					X				Polarity of SW21 0: Normal 1: Reverse	0
				X					Polarity of SW22 0: Normal 1: Reverse	0
			X						Polarity of SW23 0: Normal 1: Reverse	0
		X							Polarity of SW31 0: Normal 1: Reverse	0
0E1	X								Polarity of SW32 0: Normal 1: Reverse	0
	X	X	X	X	X	X	X		Reserved	
0E2-0E3	X	X	X	X	X	X	X	X	Reserved	
0E4	X	X	X	X	X	X	X	X	Shadow mask minimum shading level for the push button	0
0E5	X	X	X	X	X	X	X	X	Shadow mask maximum shading level for the push button	255
0E6	X	X	X	X	X	X	X	X	Minimum horizontal line marker position for the push button	0
0E7	0	0	0	0	0	X	X	X		
0E8	X	X	X	X	X	X	X	X	Maximum horizontal line marker position for the push button	1280
0E9	0	0	0	0	0	X	X	X		
0EA	X	X	X	X	X	X	X	X	Minimum horizontal line marker size for the push button	0
0EB	0	0	0	0	0	X	X	X		
0EC	X	X	X	X	X	X	X	X	Maximum horizontal line marker size for the push button	1280
0ED	0	0	0	0	0	X	X	X		
0EE	X	X	X	X	X	X	X	X	Minimum vertical line marker position for the push button	0
0EF	0	0	0	0	0	X	X	X		
0F0	X	X	X	X	X	X	X	X	Maximum vertical line marker position for the push button	720
0F1	0	0	0	0	0	X	X	X		
0F2	X	X	X	X	X	X	X	X	Minimum vertical line marker size for the push button	0
0F3	0	0	0	0	0	X	X	X		
0F4	X	X	X	X	X	X	X	X	Maximum vertical line marker size for the push button	720
0F5	0	0	0	0	0	X	X	X		
0F6	X	X	X	X	X	X	X	X	Minimum contrast for the push button	0
0F7	X	X	X	X	X	X	X	X	Maximum contrast for the push button	128
0F8	0	0	0	X	X	X	X	X	Minimum number of color modes for the push button	0
0F9	0	0	0	X	X	X	X	X	Maximum number of color modes for the push button	25
0FA-1FF	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
200								X	Character size for the OSD function 0: Large 1: Small	0
	X	X	X	X	X	X	X		Reserved	
201	X	X	X	X	X	X	X		Reserved	
202	X	X	X	X	X	X	X	X	OSD horizontal display position 0: Left 255: Right	0
203	X	X	X	X	X	X	X	X	Reserved	
204	X	X	X	X	X	X	X	X	OSD vertical display position 0: Top 255: Bottom	0
205-20F	X	X	X	X	X	X	X	X	Reserved	
210	0	0	0	0	0	0	0	X	Still image 0: Off (Live image) 1: On (Still image)	0
211	X	X	X	X	X	X	X	X	Reserved	
212	0	0	0	0	0	0	0	X	50 / 60 Hz selection 0: 60 Hz 1: 50 Hz *When this function is changed and saved to the EEPROM, user must power off/on the camera.	0
213-2DD	X	X	X	X	X	X	X	X	Reserved	
2DE	0	0	0	0	0	0	X	X	Test Pattern 0: Video out 1: Gray scale 2: Color bar 3: Color bar and gray scale	0
2DF	X	X	X	X	X	X	X	X	Reserved	
2E0								X	Pixel blemish auto detection 0: Off (Manual detection) 1: On (Auto detection) *Change "Off" to "On" after shield the camera. The pixel blemish detection automatically starts when "Off" changes to "On". "On" will automatically change to "Off" when the auto detection is finished. Pixel blemish detection starts from upper left corner to bottom right corner (From left to right and top to bottom). Auto detects a maximum of 64 pixel blemishes. Pixel blemish detection stops halfway when it detects 64 pixel blemishes.	0
					X	X	X		Reserved	
				X					Pixel blemish correction 0: Off 1: On *Please set the address for the pixel blemish correction from 300 to 3FF address	1
	X	X	X						Reserved	
2E1								X	Display the pixel blemish 0: Off 1: On *Corrected pixel blemish is displayed on the image.	0
	X	X	X	X	X	X	X		Reserved	
2E2	X	X	X	X	X	X	X	X	White pixel blemish threshold for the pixel blemish auto detection	200
2E3	0	0	0	0	0	0	X	X	*When running the pixel blemish auto detection, the pixel blemish will be greater than this value.	
2E4	X	X	X	X	X	X	X	X	Black pixel blemish threshold for the pixel blemish auto detection *When running the pixel blemish auto detection, the pixel blemish will be less than this value.	0
2E5	0	0	0	0	0	0	X	X		
2E6-2FF	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
300	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 00 *Please set most upper and left pixel blemish.	Factory default
301	0	0	0	0	0	X	X	X		
302	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 00 *Please set most upper and left pixel blemish.	Factory default
303	0	0	0	0	0	X	X	X		
304	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 01	Factory default
305	0	0	0	0	0	X	X	X		
306	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 01	Factory default
307	0	0	0	0	0	X	X	X		
308	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 02	Factory default
309	0	0	0	0	0	X	X	X		
30A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 02	Factory default
30B	0	0	0	0	0	X	X	X		
30C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 03	Factory default
30D	0	0	0	0	0	X	X	X		
30E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 03	Factory default
30F	0	0	0	0	0	X	X	X		
310	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 04	Factory default
311	0	0	0	0	0	X	X	X		
312	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 04	Factory default
313	0	0	0	0	0	X	X	X		
314	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 05	Factory default
315	0	0	0	0	0	X	X	X		
316	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 05	Factory default
317	0	0	0	0	0	X	X	X		
318	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 06	Factory default
319	0	0	0	0	0	X	X	X		
31A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 06	Factory default
31B	0	0	0	0	0	X	X	X		
31C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 07	Factory default
31D	0	0	0	0	0	X	X	X		
31E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 07	Factory default
31F	0	0	0	0	0	X	X	X		
320	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 08	Factory default
321	0	0	0	0	0	X	X	X		
322	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 08	Factory default
323	0	0	0	0	0	X	X	X		
324	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 09	Factory default
325	0	0	0	0	0	X	X	X		
326	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 09	Factory default
327	0	0	0	0	0	X	X	X		
328	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 10	Factory default
329	0	0	0	0	0	X	X	X		
32A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 10	Factory default
32B	0	0	0	0	0	X	X	X		
32C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 11	Factory default
32D	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial Data
32E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 11	Factory default
32F	0	0	0	0	0	X	X	X		
330	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 12	Factory default
331	0	0	0	0	0	X	X	X		
332	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 12	Factory default
333	0	0	0	0	0	X	X	X		
334	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 13	Factory default
335	0	0	0	0	0	X	X	X		
336	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 13	Factory default
337	0	0	0	0	0	X	X	X		
338	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 14	Factory default
339	0	0	0	0	0	X	X	X		
33A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 14	Factory default
33B	0	0	0	0	0	X	X	X		
33C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 15	Factory default
33D	0	0	0	0	0	X	X	X		
33E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 15	Factory default
33F	0	0	0	0	0	X	X	X		
340	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 16	Factory default
341	0	0	0	0	0	X	X	X		
342	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 16	Factory default
343	0	0	0	0	0	X	X	X		
344	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 17	Factory default
345	0	0	0	0	0	X	X	X		
346	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 17	Factory default
347	0	0	0	0	0	X	X	X		
348	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 18	Factory default
349	0	0	0	0	0	X	X	X		
34A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 18	Factory default
34B	0	0	0	0	0	X	X	X		
34C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 19	Factory default
34D	0	0	0	0	0	X	X	X		
34E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 19	Factory default
34F	0	0	0	0	0	X	X	X		
350	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 20	Factory default
351	0	0	0	0	0	X	X	X		
352	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 20	Factory default
353	0	0	0	0	0	X	X	X		
354	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 21	Factory default
355	0	0	0	0	0	X	X	X		
356	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 21	Factory default
357	0	0	0	0	0	X	X	X		
358	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 22	Factory default
359	0	0	0	0	0	X	X	X		
35A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 22	Factory default
35B	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial Data
35C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 23	Factory default
35D	0	0	0	0	0	X	X	X		
35E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 23	Factory default
35F	0	0	0	0	0	X	X	X		
360	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 24	Factory default
361	0	0	0	0	0	X	X	X		
362	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 24	Factory default
363	0	0	0	0	0	X	X	X		
364	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 25	Factory default
365	0	0	0	0	0	X	X	X		
366	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 25	Factory default
367	0	0	0	0	0	X	X	X		
368	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 26	Factory default
369	0	0	0	0	0	X	X	X		
36A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 26	Factory default
36B	0	0	0	0	0	X	X	X		
36C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 27	Factory default
36D	0	0	0	0	0	X	X	X		
36E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 27	Factory default
36F	0	0	0	0	0	X	X	X		
370	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 28	Factory default
371	0	0	0	0	0	X	X	X		
372	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 28	Factory default
373	0	0	0	0	0	X	X	X		
374	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 29	Factory default
375	0	0	0	0	0	X	X	X		
376	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 29	Factory default
377	0	0	0	0	0	X	X	X		
378	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 30	Factory default
379	0	0	0	0	0	X	X	X		
37A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 30	Factory default
37B	0	0	0	0	0	X	X	X		
37C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 31	Factory default
37D	0	0	0	0	0	X	X	X		
37E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 31	Factory default
37F	0	0	0	0	0	X	X	X		
380	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 32	Factory default
381	0	0	0	0	0	X	X	X		
382	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 32	Factory default
383	0	0	0	0	0	X	X	X		
384	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 33	Factory default
385	0	0	0	0	0	X	X	X		
386	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 33	Factory default
387	0	0	0	0	0	X	X	X		
388	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 34	Factory default
389	0	0	0	0	0	X	X	X		
38A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 34	Factory default
38B	0	0	0	0	0	X	X	X		
38C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 35	Factory default
38D	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial Data
38E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 35	Factory default
38F	0	0	0	0	0	X	X	X		
390	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 36	Factory default
391	0	0	0	0	0	X	X	X		
392	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 36	Factory default
393	0	0	0	0	0	X	X	X		
394	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 37	Factory default
395	0	0	0	0	0	X	X	X		
396	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 37	Factory default
397	0	0	0	0	0	X	X	X		
398	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 38	Factory default
399	0	0	0	0	0	X	X	X		
39A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 38	Factory default
39B	0	0	0	0	0	X	X	X		
39C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 39	Factory default
39D	0	0	0	0	0	X	X	X		
39E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 39	Factory default
39F	0	0	0	0	0	X	X	X		
3A0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 40	Factory default
3A1	0	0	0	0	0	X	X	X		
3A2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 40	Factory default
3A3	0	0	0	0	0	X	X	X		
3A4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 41	Factory default
3A5	0	0	0	0	0	X	X	X		
3A6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 41	Factory default
3A7	0	0	0	0	0	X	X	X		
3A8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 42	Factory default
3A9	0	0	0	0	0	X	X	X		
3AA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 42	Factory default
3AB	0	0	0	0	0	X	X	X		
3AC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 43	Factory default
3AD	0	0	0	0	0	X	X	X		
3AE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 43	Factory default
3AF	0	0	0	0	0	X	X	X		
3B0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 44	Factory default
3B1	0	0	0	0	0	X	X	X		
3B2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 44	Factory default
3B3	0	0	0	0	0	X	X	X		
3B4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 45	Factory default
3B5	0	0	0	0	0	X	X	X		
3B6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 45	Factory default
3B7	0	0	0	0	0	X	X	X		
3B8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 46	Factory default
3B9	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial Data
3BA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 46	Factory default
3BB	0	0	0	0	0	X	X	X		
3BC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 47	Factory default
3BD	0	0	0	0	0	X	X	X		
3BE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 47	Factory default
3BF	0	0	0	0	0	X	X	X		
3C0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 48	Factory default
3C1	0	0	0	0	0	X	X	X		
3C2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 48	Factory default
3C3	0	0	0	0	0	X	X	X		
3C4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 49	Factory default
3C5	0	0	0	0	0	X	X	X		
3C6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 49	Factory default
3C7	0	0	0	0	0	X	X	X		
3C8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 50	Factory default
3C9	0	0	0	0	0	X	X	X		
3CA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 50	Factory default
3CB	0	0	0	0	0	X	X	X		
3CC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 51	Factory default
3CD	0	0	0	0	0	X	X	X		
3CE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 51	Factory default
3CF	0	0	0	0	0	X	X	X		
3D0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 52	Factory default
3D1	0	0	0	0	0	X	X	X		
3D2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 52	Factory default
3D3	0	0	0	0	0	X	X	X		
3D4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 53	Factory default
3D5	0	0	0	0	0	X	X	X		
3D6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 53	Factory default
3D7	0	0	0	0	0	X	X	X		
3D8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 54	Factory default
3D9	0	0	0	0	0	X	X	X		
3DA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 54	Factory default
3DB	0	0	0	0	0	X	X	X		
3DC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 55	Factory default
3DD	0	0	0	0	0	X	X	X		
3DE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 55	Factory default
3DF	0	0	0	0	0	X	X	X		
3E0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 56	Factory default
3E1	0	0	0	0	0	X	X	X		
3E2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 56	Factory default
3E3	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial Data
3E4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 57	Factory default
3E5	0	0	0	0	0	X	X	X		
3E6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 57	Factory default
3E7	0	0	0	0	0	X	X	X		
3E8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 58	Factory default
3E9	0	0	0	0	0	X	X	X		
3EA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 58	Factory default
3EB	0	0	0	0	0	X	X	X		
3EC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 59	Factory default
3ED	0	0	0	0	0	X	X	X		
3EE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 59	Factory default
3EF	0	0	0	0	0	X	X	X		
3F0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 60	Factory default
3F1	0	0	0	0	0	X	X	X		
3F2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 60	Factory default
3F3	0	0	0	0	0	X	X	X		
3F4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 61	Factory default
3F5	0	0	0	0	0	X	X	X		
3F6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 61	Factory default
3F7	0	0	0	0	0	X	X	X		
3F8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 62	Factory default
3F9	0	0	0	0	0	X	X	X		
3FA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 62	Factory default
3FB	0	0	0	0	0	X	X	X		
3FC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 63	Factory default
3FD	0	0	0	0	0	X	X	X		
3FE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 63	Factory default
3FF	0	0	0	0	0	X	X	X		

Note:

Factory default: The following is the address of the condition pixel during the factory inspection.

*Exposure time: **TBD***

White pixel blemish threshold for the pixel blemish auto detection: 200

Black pixel blemish threshold for the pixel blemish auto detection: 0

V. The DSP Register Mapping List

Address	7	6	5	4	3	2	1	0	Details	Initial Data
000			X	X	X	X	X	X	Reserved	
		X							Exposure Control 0: Fixed shutter 1: AEE (Auto Shutter)	0
	X								Gain Control 0: Fixed gain control 1: AGC (Auto Gain Control)	0
001		X	X	X	X	X	X	X	Reserved	
002	X	X	X	X	X	X	X	X	Brightness target for ALC Initial Data: 90 for the picture mode 120 for the bright mode 128 for the pseudo color mode	
003	X	X	X	X	X	X	X	X	Reserved	
004					X	X	X	X	Edge ALC weight	4
	X	X	X	X					Center ALC weight	4
005					X	X	X	X	ALC peak	2
	X	X	X	X					Reserved	
006-007	X	X	X	X	X	X	X	X	Reserved	
008	0	0	0	0	X	X	X	X	ALC average integration frames *Calculate average of the brightness with these frames for ALC control 0: 1 (No average) 1: 2 frames 2: 4 frames 3: 8 frames 4: 16 frames 5: 32 frames 6: 64 frames 7: 128 frames 8: 256 frames 9: 512 frames 10: 1024 frames 11: 2048 frames 12: 4096 frames 13: 8191 frames 14: 16384 frames 15: 32768 frames	1
009	X	X	X	X	X	X	X	X	Reserved	
00A	0	0	0	0	X	X	X	X	ALC single-frame quantity *Calculate average of the brightness with these frames for fast ALC control when power on the camera or change the color mode. 0: 1 (No average) 1: 2 frames 2: 4 frames 3: 8 frames 4: 16 frames 5: 32 frames 6: 64 frames 7: 128 frames 8: 256 frames 9: 512 frames 10: 1024 frames 11: 2048 frames 12: 4096 frames 13: 8191 frames 14: 16384 frames 15: 32768 frames	0
00B-00F	X	X	X	X	X	X	X	X	Reserved	
010	X	X	X	X	X	X	X	X	Exposure time [little-endian]	
011	0	0	0	0	0	X	X	X	*Two's complement Range is -640 to 749. Please see exposure time table on the following page Initial Data: 300 for the picture mode 300 for the bright mode 525 for the pseudo color mode	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
012	X	X	X	X	X	X	X	X	AEE minimum exposure time	749
013	0	0	0	0	0	X	X	X	*Two's complement Range is -640 to 749. Please see exposure time table in the following section	
014	X	X	X	X	X	X	X	X	AEE middle exposure time (Minimum side)	300
015	0	0	0	0	0	X	X	X	*Two's complement Range is -640 to 749. Please see exposure time table in the following section	
016	X	X	X	X	X	X	X	X	AEE middle exposure time (Maximum side)	0
017	0	0	0	0	0	X	X	X	*Two's complement Range is -640 to 749. Please see exposure time table in the following section	
018	X	X	X	X	X	X	X	X	AEE maximum exposure time	0
019	0	0	0	0	0	X	X	X	*Two's complement Range is -640 to 749. Please see exposure time table in the following section	
01A	X	X	X	X	X	X	X	X	AEE tolerance *AEE control stops when "Target brightness-current brightness" is less than this value.	6
01B	X	X	X	X	X	X	X	X	AEE threshold *AEE control begins when "Target brightness – current brightness" is larger than "Tolerance+threshold"	6
01C	X	X	X	X	X	X	X	X	AEE speed *AEE control speed, which is the maximum change at one step.	6
01D-02F	X	X	X	X	X	X	X	X	Reserved	

A. ALC Function

Object	Exposure Time	Iris	Gain
Bright	Minimum	Minimum open ratio	Minimum
	Change		
	Middle (Minimum)	Change	
	Change	Maximum open ratio	
Dark	Middle (Maximum side)		Change
	Change		Middle
	Maximum		Change
			Maximum

B. Exposure Time Setting

1. At 60Hz

Value	High Speed Shutter		Value	Slow Shutter	
0	16.7ms	1/60s	-64	33.3ms	1/30s
375	8.3ms	1/120.1s	-128	66.7ms	1/15s
562	4.2ms	1/239.7s	-192	133.3ms	2/15s
656	2.1ms	1/480.3s	-256	266.7ms	4/15s
703	1.0ms	1/963.6s	-320	533.3ms	8/15s
726	526.7us	1/1,898.7s	-384	1.07s	16/15s
738	260.0us	1/3,846.2s	-448	2.13s	32/15s
744	126.7us	1/7,894.7s	-512	4.27s	64/15s
749	15.6us	1/64,283.9s	-576	8.53s	128/15s
			-640	17.1s	256/15s

2. At 50Hz

Value	High Speed Shutter		Value	Slow Shutter	
0	20.0ms	1/50s	-64	40.0ms	1/25s
375	10.0ms	1/100.1s	-128	80.0ms	2/25s
562	5.01ms	1/199.8s	-192	160.0ms	4/25s
656	2.50ms	1/400.2s	-256	320.0ms	8/25s
703	1.25ms	1/803.0s	-320	640.0ms	16/25s
726	632.0us	1/1,582.3s	-384	1.28s	32/25s
738	312.0us	1/3,205.1s	-448	2.56s	64/25s
744	156.25us	1/6,578.9s	-512	5.12s	128/25s
749	18.67us	1/53,570.5s	-576	10.2s	256/25s
			-640	20.5s	512/25s

Address	7	6	5	4	3	2	1	0	Details	Initial Data
030	X	X	X	X	X	X	X	X	Gain [little-endian]	0
031	0	0	0	0	0	0	0	X	Value range is 0 - 80 *Gain [dB] = 0.3 x Value	
032	X	X	X	X	X	X	X	X	Minimum gain for AGC	0
033	0	0	0	0	0	0	0	X	Value range is 0 - 80 *Gain [dB] = 0.3 x Value	
034	X	X	X	X	X	X	X	X	Middle gain for AGC	80
035	X	X	X	X	X	X	X	X	Value range is 0 - 80 *Gain [dB] = 0.0359 x Value	
036	X	X	X	X	X	X	X	X	Maximum gain for AGC	80
037	0	0	0	0	0	0	0	X	Value range is 0 - 80 *Gain [dB] = 0.0359 x Value	
038	X	X	X	X	X	X	X	X	AGC Tolerance *AGC control is stopped when "Target brightness – current brightness" is less than this value.	6
039	X	X	X	X	X	X	X	X	AGC Threshold *AGC control is start when "Target brightness – current brightness" is bigger than "Tolerance + threshold".	6
03A	X	X	X	X	X	X	X	X	AGC speed *AGC control speed, which is the maximum change at one step.	0
03B-03F	X	X	X	X	X	X	X	X	Reserved	
040	X	X	X	X	X	X	X	X	Gain value for disabling motion detection	80
041	0	0	0	0	0	0	0	X	Value range is 0 - 80 *Motion detection is disabled when the gain is greater that this value.	
042-05F	X	X	X	X	X	X	X	X	Reserved	
060								X	White balance mode 0: Manual white balance 1: Auto white balance	0
		X	X	X	X	X	X		Reserved	
	X								Push to set white balance 0: Off 1: On (Change to "Off" automatically after adjust white balance)	0
061	X	X	X	X	X	X	X	X	Reserved	
062	X	X	X	X	X	X	X	X	White balance R gain [little-endian]	
063								X X	*Magnification = (Value +256) / 256 Initial Data: 305 for the picture mode 305 for the bright mode 0 for the pseudo color mode	
064	X	X	X	X	X	X	X	X	White balance G gain [little-endian]	0
065									*Magnification = (Value + 256) / 256	
066	X	X	X	X	X	X	X	X	White balance B gain [little-endian]	
067									*Magnification = (Value +256) / 256 Initial Data: 455 for the picture mode 455 for the bright mode 0 for the pseudo color mode	
068-06B	X	X	X	X	X	X	X	X	Reserved	
06C	X	X	X	X	X	X	X	X	Auto white balance tolerance *Auto white balance control is stopped when "Target brightness – current brightness" is less than this value.	3
06D	X	X	X	X	X	X	X	X	Auto white balance threshold *Auto white balance control is start when "Target brightness – current brightness" is bigger than "Tolerance + threshold".	3
06E-06F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
070	0	0	0	0	X	X	X	X	Auto white balance average integral frames *Calculate average of the gain with these frames for auto white balance control 0: 1 (No average) 1: 2 frames 2: 4 frames 3: 8 frames 4: 16 frames 5: 32 frames 6: 64 frames 7: 128 frames 8: 256 frames 9: 512 frames 10: 1024 frames 11: 2048 frames 12: 4096 frames 13: 8191 frames 14: 16384 frames 15: 32768 frames	0
071	X	X	X	X	X	X	X	X	Reserved	
072					X	X	X	X	Auto white balance single-frame process quantity *Calculate average of the brightness with these frames for fast auto white balance control when power on the camera or change the color mode. 0: 1 (No average) 1: 2 frames 2: 4 frames 3: 8 frames 4: 16 frames 5: 32 frames 6: 64 frames 7: 128 frames 8: 256 frames 9: 512 frames 10: 1024 frames 11: 2048 frames 12: 4096 frames 13: 8191 frames 14: 16384 frames 15: 32768 frames	0
073	X	X	X	X	X	X	X	X	Reserved	
074	X	X	X	X	X	X	X	X	Auto white balance R change limit Adjust R control speed for auto white balance. *As a larger value is set, the R control speed becomes slower.	32
075	X	X	X	X	X	X	X	X	Auto white balance B change limit Adjust B control speed for auto white balance. *As a larger value is set, the B control speed becomes slower.	32
076-1FF	X	X	X	X	X	X	X	X	Reserved	0
200								X	Horizontal mirror image 0: Off (Normal image) 1: On (Horizontal mirror image)	1
							X		Vertical mirror image 0: Off (Normal image) 1: On (Vertical mirror image)	0
	X	X	X	X	X	X			Reserved	
201-20F	X	X	X	X	X	X	X	X	Reserved	
210	X	X	X	X	X	X	X	X	Digital gain Initial data: 320 for the picture mode 320 for the bright mode 511 for the pseudo color mode	128
211-21F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
220						X	X	X	Preset Gamma 0: 1.0 1: 0.9 2: 0.8 3: 0.7 4: 0.6 5: 0.5 6: 0.45 7: 0.3 Initial Data: 4 for the picture mode 4 for the bright mode 3 for the pseudo color mode	
		X	X	X	X				Reserved	
	X								Gamma Mode 0: Preset Gamma 1: Manual Gamma Initial Data: 1 for the picture mode 1 for the bright mode 0 for the pseudo color mode	
221	X	X	X	X	X	X	X	X	Reserved	
222	X	X	X	X	X	X	X	X	Control point 0 for manual gamma [little-endian]	0
223	0	0	0	0	0	0	X	X	*Two's complement	
224	X	X	X	X	X	X	X	X	Control point 1 for manual gamma [little-endian]	
225	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 39 for the picture mode 39 for the bright mode 93 for the pseudo color mode	
226	X	X	X	X	X	X	X	X	Control point 2 for manual gamma [little-endian]	
227	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 104 for the picture mode 104 for the bright mode 125 for the pseudo color mode	
228	X	X	X	X	X	X	X	X	Control point 3 for manual gamma [little-endian]	
229	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 153 for the picture mode 153 for the bright mode 155 for the pseudo color mode	
22A	X	X	X	X	X	X	X	X	Control point 4 for manual gamma [little-endian]	
22B	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 194 for the picture mode 194 for the bright mode 178 for the pseudo color mode	
22C	X	X	X	X	X	X	X	X	Control point 5 for manual gamma [little-endian]	
22D	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 222 for the picture mode 222 for the bright mode 200 for the pseudo color mode	
22E	X	X	X	X	X	X	X	X	Control point 6 for manual gamma [little-endian]	
22F	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 236 for the picture mode 236 for the bright mode 220 for the pseudo color mode	
230	X	X	X	X	X	X	X	X	Control point 7 for manual gamma [little-endian]	
231	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 244 for the picture mode 244 for the bright mode 235 for the pseudo color mode	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
232	X	X	X	X	X	X	X	X	Control point 8 for manual gamma [little-endian]	
233	0	0	0	0	0	0	X	X	*Two's complement Initial Data: 251 for the picture mode 251 for the bright mode 250 for the pseudo color mode	
234	X	X	X	X	X	X	X	X	Control point 9 for manual gamma [little-endian]	256
235	0	0	0	0	0	0	X	X	*Two's complement	
236-265	X	X	X	X	X	X	X	X	Reserved	
266	0	X	X	X	X	X	X	X	R-Y gain	83
267	X	X	X	X	X	X	X	X	Reserved	
268	0	X	X	X	X	X	X	X	B-Y gain	78
269	X	X	X	X	X	X	X	X	Reserved	
26A	X	X	X	X	X	X	X	X	R-Y hue *Two complement	-5
26B	X	X	X	X	X	X	X	X	Reserved	
26C	X	X	X	X	X	X	X	X	B-Y hue *Two complement	-6
26D-27F	X	X	X	X	X	X	X	X	Reserved	
280	X	X	X	X	X	X	X	X	High luminance chroma suppress threshold	255
281	X	X	X	X	X	X	X	X	Reserved	
282	X	X	X	X	X	X	X	X	High luminance chroma suppress slope	0
283-28F	X	X	X	X	X	X	X	X	Reserved	
290	0	0	0	0	X	X	X	X	Gain for the front-end edge enhancement (horizontal) process	2
291	0	0	0	0	X	X	X	X	Gain for the front-end edge enhancement (vertical)process	2
292	0	0	0	0	X	X	X	X	Coring for the front-end edge enhancement process	0
293	X	X	X	X	X	X	X	X	Reserved	
294	0	0	0	0	X	X	X	X	Gain for the back-end edge enhancement (horizontal) process	4
295	0	0	0	0	X	X	X	X	Gain for the back-end edge enhancement (vertical)process	6
296	0	0	0	0	X	X	X	X	Coring for the back-end edge enhancement process	3
297-29F	X	X	X	X	X	X	X	X	Reserved	
2A0	X	X	X	X	X	X	X	X	Contrast *Adjust gain for the output Magnification = value/128	128
2A1-2A7	X	X	X	X	X	X	X	X	Reserved	
2A8	0	X	X	X	X	X	X	X	RGB Offset	0
2A9-3FF	X	X	X	X	X	X	X	X	Reserved	

VI. OSD (On Screen Character Display) Command

A. One Byte Command

Function	D7	D6	D5	D4	D3	D2	D1	D0
Video Ram batch clear	0	0	0	0	0	0	0	0
Display control	0	0	0	1	D0	1	BL1	BLO
Background color / frame color control	0	0	1	0	R	G	B	BFC
3-channel independent display ON/OFF	0	1	1	1	0	DOA	DOB	0
Character color reverse ON/OFF	0	0	1	1	1	0	0	BCRE
Blue back ON/OFF	0	1	1	1	1	CLR	0	BB
Change character address bank	0	1	1	1	1	1	1	C8

Video RAM Batch Clear

This command can be used to clear the video RAM.

Clear all character data (Display OFF Data (FEH)) from the video RAM (12 rows, 28 columns)

When using this command, set the display control to OFF and the address of the Video RAM to (Row0, column 0).

Display Control

This command controls the display output and blinking the characters.

D0: Character display ON/OFF control (0: Display off, 1: Display on)

BL1 & 0: Blinking control

(00: Blinking off, 01: Blinking frequency 2Hz, 10: Blinking frequency 1Hz, 11: Blinking frequency 0.5Hz)

Background color / frame color control

This command specifies the background color and frame color.

R, G & B: Background color control (0: Black, 1: Blue, 2: Green, 3: Cyan, 4: Red, 5: Magenta, 6: Yellow, 7: White)

BFC: Frame color control (0: Black frame color, 1: White frame color)

3-Channel Independent Display ON/OFF

This command can turn the display of the character output of 3 channels independently ON/OFF.

DOA: Display RGB output character (0: OFF, 1: ON)

DOB: Display Vc1 output character (0: OFF, 1: ON)

Character Color Reverse ON/OFF

This command specifies the reversal of the character color in the screen units.

BCRE: Character color reverse control (0: Color NOT reversed, 1: Color reversed)

Blue Back ON/OFF

This command turns the blue back function in the screen units ON and OFF.

CLR: Blue back color specification (0: OFF, 1: ON)

BB: Blue back control (0: OFF, 1: ON)

Character Address Bank Select

This command selects the area of the character address specified by the character address specification bit of the display character control command.

C8: Change address bank select (0: select low rank bank, 1: high-order bank)

B. Two Bytes Command

Function	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Write address control	1	0	0	0	1	0	0	AR3	AR2	AR1	AR0	AC4	AC3	AC2	AC1	AC0
Character size control	1	0	0	1	1	0	SV1	SV0	SH1	SH0	0	0	AR3	AR2	AR1	AR0
3-channel background control	1	0	1	1	0	0	1	BA1	BA0	BFA	BB1	BB0	BFB	0	0	0
Initial status setting	1	0	1	1	0	1	0	0	0	BR	RS	0	0	0	VST	1

Write Address Control

This command is used to specify a write address when characters are written to the display area (video RAM) of the 12 rows and 28 columns.

AR3, 2 & 1: Assign the number of the row (0000 to 1011)

AC4, 3, 2 & 1: Assign the number of the column (00000 to 11011)

Character Size Control

The character size can be specified in row units.

SV1 & 0: The vertical character size (height) (00: Standard, 01: 2x size, 10: 3x size, 11: 4x size)

SH1 & 0: The horizontal character size (width) (00: Standard, 01: 2times, 10: 3times, 11: 4times)

AR3, 2, 1, & 0: Row specification control (0000 to 1011)

3-Channel Background Control

This command can be used to independently specify the background for the output of the 3 channels.

BA1 & 0: RGB background control

(00: No background, 01: Blank background, 10: Must not be specified, 11: Filled background)

BAF: RGB framing control (0: OFF, 1: ON)

BB1 & 0: Vc1 background control

(00: No background, 01: Blank background, 10: Must not be specified, 11: Filled background)

BBF: Vc1 framing control (0: OFF, 1: ON)

Initial Status Setting

This command initializes the operation mode.

BR: Function selection (0: Character blinks, 1: Character left to right reverse)

RS: Character color reverse control

(0: Black character color (frame specification is invalid), 1: White character color (frame specification is valid))

VST: Vertical display start position control (0: 3 rows, 1: 9 rows)

C. Consecutive Two Bytes Command

Notes: Send in the order of D15 ~D8 and D7~D0

Function	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Display character control	1	1	RV	R	G	B	BL	0	C7	C6	C5	C4	C3	C2	C1	C0

Display Character Control

This command specifies the character data to be written to the video RAM, blinking data, and character color. The write address is automatically incremented after written the character. Please send xFF to finish the character control.

RV: Character color reverse specification (0: OFF, 1: ON)

R, G & B: Character color specification

(0: Black, 1: Blue, 2: Green, 3: Cyan, 4: Red, 5: Magenta, 6: Yellow, 7: White)

BL: Blinking control (when blinking selected) (0: OFF, 1: ON)

Left and right reverse control (when reverse selected) (0: OFF, 1: ON)

C7-C0: Character specification (Please check below table)

C7-C0	Character	C7-C0	Character	C7-C0	Character
000	0	016	M	112	l
001	1	017	N	113	j
002	2	018	O	114	k
003	3	019	P	115	l
004	4	01A	Q	116	m
005	5	01B	R	117	n
006	6	01C	S	118	o
007	7	01D	T	119	p
008	8	01E	U	11A	q
009	9	01F	V	11B	r
00A	A	020	W	11C	s
00B	B	021	X	11D	t
00C	C	022	Y	11E	u
00D	D	023	Z	11F	v
00E	E	10A	a	120	w
00F	F	10B	b	121	x
010	G	10C	c	122	y
011	H	10D	d	123	z
012	I	10E	e	*FE	No display
013	J	10F	f	*FF	2 byte command finish
014	K	110	g		
015	L	111	h		

Note: Please refer to the "RENESAS uPD6467" data sheet when requiring additional character to the ones listed above.

Revisions

Rev	Date	Changes	Notes
1.0	2009/10/14	New Document	
1.1	2009/11/19	Update Added push button function (Address 120 to 123H of uCOM)	
1.2	2010/07/30	Update Made changes for the 60fps STC-AF133	
1.2	2010/08/27	Update Cleaned up English and converted to STA formatting	
1.3	2010/12/27	Update Change from "Gray scale test pattern" to "Test pattern" (2DEH of uCOM) Change the initial data for the pixel blemish auto detection (2E0H.0 of uCOM) Change the initial data for the pixel blemish correction (2E0H.4 of uCOM) Change the initial data for the B-Y hue (26CH of uCOM)	

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