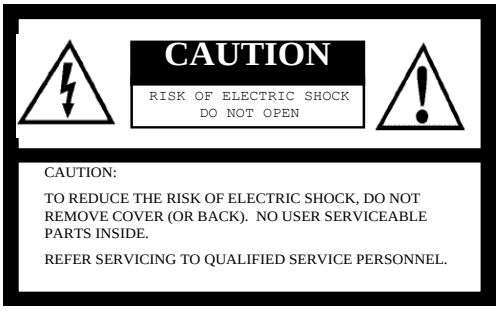
SENTECH

STC-HD133DV
STC-HD133DV-B

Protocol Specification

16:9 Format
720p Color Camera

Safety Precautions



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.

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.

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.

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.

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 he 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

Settings	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 / 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 refer to: “The Camera Control Command”
Direction	“0”: Reading or receiving data from the camera is always a “0” value. “1”: Writing or sending data to the camera is always a “1” value. Note: This value is always “0” when the STC-HD133 responds
Data Length	This “Data Length” value tells how m any bytes the “Data” will contain. The “Data Length” must be specified in bytes.
Data	This field is for setting the value and/or acquired value. The size must be specified as “Data Length”.
Check Sum	The “Check Sum” function is to verify the integrity of the communication transmission. The “Check Sum” value should equal the last (low) 8bits of the summary of [“Command” + “Direction” + “Data Length” + “Data”.] If this value of “Check Sum” do3es not match with the last (low) 8 bits of the summary data of [“Command” + “Direction” + “Data Length” + “Data”], then the camera will generate an error message: “Check Sum Error”.
EOF	End of Frame. The value is always “0x03”.

III. Camera Control Commands

All data in this section is described in Hexadecimal format (HEX).

The command list for the communication

Command (HEX)	Command Details
4A	The command value 4A is for Reading from or Writing data to the camera ICs (i.e. the EEPROM, the DSP and/or the CPU). Use the slave address described in “Table A: Slave address of the ICS (8 bits) list” to address each IC. By setting “0000” in [Start] and “07FF” in [End], all data can be acquired with one communication. In the case of writing, since the maximum number of addresses can be written at once is 32 addresses, the data must be written 8 times separately if 256 bytes of data must be written. [SLV]: Slave address of ICs (See Table A below, on page 4.) [START_H] x 16 + [START_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 calculated as ([END_H] x 16 + [END_L] – [START_L] +6) [DataLenL]: Lower Byte of the two Bytes calculated as ([END_H] x 16 + [END_L] – [START_L] +6) 1. The format for reading data from the ICs is as follows: A. The command to prepare the camera ICs to send data is 02, 4A, 00, 05, [SLV], [START_H], [START_L], [END_H], [END_L], [CHK], 03 In this example, the alue of [CHK] = the last (low) 8 bits of the summary of (4A, 00, 05, [SLV], [START_H], [START_L], [END_H], [END_L]). B. The data received based on the command above will be in the following format: 02, 4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1], …, [DATAEND], [CHK], 03 In this example, the alue 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]) 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: (02, 4A, 00, 03, 50, 00, 00, 07, FF, A3, 03)

The command list for the communication

Command (HEX)	Command Details
4A	2. The format for writing data from the ICs is as follows: A. The command to the camera to receive data being sent to the ICs is: 02, 4A, [DataLenH]+80, [DataLenL, [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART1], …, [DATAEND], [CHK], 03 In this example, the value of [CHK] = the last (low) 8bits of summary of (4A, [DataLenH] + 80, [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1], …, [DATAEND]) B. The format used by the camera to confirm the data written to the camera's ICs is as follows: 02, 4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1], …, [DATAEND], [CHK], 03 In this example, the value of [CHK] + the last (low) 89 bits of summary of (4A, [DataLenH], [DataLenL], [SLV], [START_H], [START_L], [END_H], [END_L], [DATASTART], [DATASTART+1], …, [DATAEND]) *An example of the sending data 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)
50	This command is for sending an OSCD (On Screen Character Display) command to the camera. As stated above, when writing OSCD commands to the camera, 32 bytes is the maximum amount of data that can be written to the camera with one communication. For additional information, please check section "OSCD". In order to generate an OSCD, set the "Command" to a value of 50. Set OSCD command to Data, set the number of bytes of the OSCD command to Data length. 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)

Slave address for the ICs (8bits) list

IC	address	Description of the chip / IC
DSP	81	DSP
EEPROM	50	The EEPROM zone for the Preset00 DSP data
EEPROM	51	The EEPROM zone for the Preset01 DSP data
EEPROM	52	The EEPROM zone for the Preset02 DSP data
EEPROM	53	The EEPROM zone for the Preset03 DSP data
EEPROM	54	The EEPROM zone for the Preset04 DSP data
EEPROM	55	The EEPROM zone for the Preset05 DSP data
EEPROM	56	The EEPROM zone for the Preset06 DSP data
EEPROM	57	The EEPROM zone for the Preset07 DSP data
EEPROM	58	The EEPROM zone for the Preset08 DSP data
EEPROM	59	The EEPROM zone for the Preset09 DSP data
EEPROM	5A	The EEPROM zone for the Preset10 DSP data
EEPROM	5B	The EEPROM zone for the Preset11 DSP data
EEPROM	5C	The EEPROM zone for the Preset12 DSP data
EEPROM	5D	The EEPROM zone for the Preset13 DSP data
EEPROM	5E	The EEPROM zone for the Preset14 DSP data
EEPROM	5F	The EEPROM zone for the Preset15 DSP data
EEPROM	60	The EEPROM zone for the Preset16 DSP data
EEPROM	61	The EEPROM zone for the Preset17 DSP data
EEPROM	62	The EEPROM zone for the Preset18 DSP data
EEPROM	63	The EEPROM zone for the Preset19 DSP data
EEPROM	64	The EEPROM zone for the Preset20 DSP data
EEPROM	65	The EEPROM zone for the Preset21 DSP data
EEPROM	66	The EEPROM zone for the Preset22 DSP data
EEPROM	67	The EEPROM zone for the Preset23 DSP data
EEPROM	68	The EEPROM zone for the Preset24 DSP data
EEPROM	69	The EEPROM zone for the Preset25 DSP data
EEPROM	6A	The EEPROM zone for the Preset26 DSP data
EEPROM	6B	The EEPROM zone for the Preset27 DSP data
EEPROM	D1	The Virtual EEPROM zone for the currently selected DSP preset mode of the Preset00 to Preset 27.
uCOM	11	The uCOM data
EEPROM	12	The EEPROM zone for uCOM Data.

Note: The maximum number of writing to the EEPROM is 1,000,000 times.

Error Code List

If an error occurs, the camera sends an error code with the following format:
The command number of 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, 04, 03
The command being transmitted does NOT exist or is invalid	02, FF, 00, 02, 04, 00, 05, 03
Unprocessed data remains in the receiving buffer	02, FF, 00, 02, 05, 00, 06, 03
Time out	02, FF, 00, 02, 06, 00, 07, 03
Over run error	02, FF, 00, 02, 08, 00, 09, 03
Framing error	02, FF, 00, 02, 09, 00, 0A, 03
Parity error	02, FF, 00, 02, 0A, 00, 0B, 03
Data length error (too long)	02, FF, 00, 02, 0B, 00, 0C, 03
I2C communication error	02, FF, 00, 02, 10, 00, 11, 03

Note 1: The camera disregards the data that does not start with SOF.
Note 2: The time out error occurs when the data is received and the next set of data is not received within 2 seconds (110/60 seconds at 60Hz, 110/50 seconds at 50Hz) afterwards.

IV. The 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 - 003	X	X	X	X	X	X	X	X	Reserved	
004				X	X	X	X	X	DSP Preset mode * When this value saves to the EEPROM, the camera starts with saved DSP Preset mode at the power up. 0: DSP Preset00 1: DSP Preset01 2: DSP Preset02 3: DSP Preset03 4: DSP Preset04 5: DSP Preset05 6: DSP Preset06 7: DSP Preset07 8: DSP Preset08 9: DSP Preset09 10: DSP Preset10 11: DSP Preset11 12: DSP Preset12 13: DSP Preset13 14: DSP Preset14 15: DSP Preset15 16: DSP Preset16 17: DSP Preset17 18: DSP Preset18 19: DSP Preset19 20: DSP Preset20 21: DSP Preset21 22: DSP Preset22 23: DSP Preset23 24: DSP Preset24 25: DSP Preset25 26: DSP Preset26 27: DSP Preset27	0
	X	X	X						Reserved	
005						X	X	X	OSD menu color 0: Black 1: Blue 2: Green 3: Cyan 4: Red 5: Magenta 6: Yellow 7: White	7
	x	x	x	x	x				Reserved	
006 - 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 when the communication error is occurred.	2
			X	X	X	X			Reserved	
		X							Return data and data length of UART write command 0: Return data is including exact same data of 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 select disable, the camera process command even check sum of send command is not mach.	1

Address	7	6	5	4	3	2	1	0	Details	Initial data
010	X	X	X	X	X	X	X	X	User defined color 0 Red	255
011	X	X	X	X	X	X	X	X	User defined color 0 Green	128
012	X	X	X	X	X	X	X	X	User defined color 0 Blue	0
013	X	X	X	X	X	X	X	X	User defined color 1 Red	255
014	X	X	X	X	X	X	X	X	User defined color 1 Green	0
015	X	X	X	X	X	X	X	X	User defined color 1 Blue	128
016	X	X	X	X	X	X	X	X	User defined color 2 Red	128
017	X	X	X	X	X	X	X	X	User defined color 2 Green	255
018	X	X	X	X	X	X	X	X	User defined color 2 Blue	0
019	X	X	X	X	X	X	X	X	User defined color 3 Red	0
01A	X	X	X	X	X	X	X	X	User defined color 3 Green	255
01B	X	X	X	X	X	X	X	X	User defined color 3 Blue	128
01C	X	X	X	X	X	X	X	X	User defined color 4 Red	128
01D	X	X	X	X	X	X	X	X	User defined color 4 Green	0
01E	X	X	X	X	X	X	X	X	User defined color 4 Blue	255
01F	X	X	X	X	X	X	X	X	User defined color 5 Red	0
020	X	X	X	X	X	X	X	X	User defined color 5 Green	128
021	X	X	X	X	X	X	X	X	User defined color 5 Blue	255
022	X	X	X	X	X	X	X	X	User defined color 6 Red	128
023	X	X	X	X	X	X	X	X	User defined color 6 Green	128
024	X	X	X	X	X	X	X	X	User defined color 6 Blue	128
025	X	X	X	X	X	X	X	X	User defined color 7 Red	255
026	X	X	X	X	X	X	X	X	User defined color 7 Green	207
027	X	X	X	X	X	X	X	X	User defined color 7 Blue	0
028 - 02B	X	X	X	X	X	X	X	X	Reserved	
02C					X	X	X	X	Control button (Decrease page) for display menu 0: SW11 1: SW12 2: SW13 3: SW21 4: SW22 5: SW23 6: SW31 7: SW32 8: SW33 9: WB 10: SW A 11: SW B 12: SW C 13: SW D 14: SW E 14: SW F	0
	X	X	X	X					Control button (Increase page) for display menu * Please check the "Control button (Decrease page) for display menu"	2
02D					X	X	X	X	Control button (Decrement) for display menu * Please check the "Control button (Decrease page) for display menu"	15
	X	X	X	X					Control button (Inclement) for display menu * Please check the "Control button (Decrease page) for display menu"	11
02E					X	X	X	X	Control button (Select right) for display menu * Please check the "Control button (Decrease page) for display menu"	14
	X	X	X	X					Control button (Select left) for display menu * Please check the "Control button (Decrease page) for display menu"	12
02F					X	X	X	X	Control button (Return) for display menu * Please check the "Control button (Decrease page) for display menu"	10
	X	X	X	X					Control button (Execute) for display menu * Please check the "Control button (Decrease page) for display menu"	13

Address	7	6	5	4	3	2	1	0	Details	Initial data
030	X	X	X	X	X	X	X	X	Initial press function for SW11 * Please check the push button function for set this.	0
031	X	X	X	X	X	X	X	X	Initial press function for SW12 * Please check the push button function for set this.	0
032	X	X	X	X	X	X	X	X	Initial press function for SW13 * Please check the push button function for set this.	0
033	X	X	X	X	X	X	X	X	Initial press function for SW21 * Please check the push button function for set this.	0
034	X	X	X	X	X	X	X	X	Initial press function for SW22 * Please check the push button function for set this.	0
035	X	X	X	X	X	X	X	X	Initial press function for SW23 * Please check the push button function for set this.	0
036	X	X	X	X	X	X	X	X	Initial press function for SW31 * Please check the push button function for set this.	0
037	X	X	X	X	X	X	X	X	Initial press function for SW32 * Please check the push button function for set this.	0
038	X	X	X	X	X	X	X	X	Initial press function for SW33 * Please check the push button function for set this.	0
039	X	X	X	X	X	X	X	X	Initial press function for WB button * Please check the push button function for set this.	138
03A	X	X	X	X	X	X	X	X	Initial press function for SW A * Please check the push button function for set this.	1
03B	X	X	X	X	X	X	X	X	Initial press function for SW B * Please check the push button function for set this.	0
03C	X	X	X	X	X	X	X	X	Initial press function for SW C * Please check the push button function for set this.	0
03D	X	X	X	X	X	X	X	X	Initial press function for SW D * Please check the push button function for set this.	0
03E	X	X	X	X	X	X	X	X	Initial press function for SW E * Please check the push button function for set this.	0
03F	X	X	X	X	X	X	X	X	Initial press function for SW F * Please check the push button function for set this.	0
040	X	X	X	X	X	X	X	X	Initial hold function for SW11 * Please check the push button function for set this.	0
041	X	X	X	X	X	X	X	X	Initial hold function for SW12 * Please check the push button function for set this.	0
042	X	X	X	X	X	X	X	X	Initial hold function for SW13 * Please check the push button function for set this.	0
043	X	X	X	X	X	X	X	X	Initial hold function for SW21 * Please check the push button function for set this.	0
044	X	X	X	X	X	X	X	X	Initial hold function for SW22 * Please check the push button function for set this.	0
045	X	X	X	X	X	X	X	X	Initial hold function for SW23 * Please check the push button function for set this.	0
046	X	X	X	X	X	X	X	X	Initial hold function for SW31 * Please check the push button function for set this.	0
047	X	X	X	X	X	X	X	X	Initial hold function for SW32 * Please check the push button function for set this.	0
048	X	X	X	X	X	X	X	X	Initial hold function for SW33 * Please check the push button function for set this.	0

Address	7	6	5	4	3	2	1	0	Details	Initial data
049	X	X	X	X	X	X	X	X	Initial hold function for WB button * Please check the push button function for set this.	137
04A	X	X	X	X	X	X	X	X	Initial hold function for SW A * Please check the push button function for set this.	0
04B	X	X	X	X	X	X	X	X	Initial hold function for SW B * Please check the push button function for set this.	0
04C	X	X	X	X	X	X	X	X	Initial hold function for SW C * Please check the push button function for set this.	0
04D	X	X	X	X	X	X	X	X	Initial hold function for SW D * Please check the push button function for set this.	0
04E	X	X	X	X	X	X	X	X	Initial hold function for SW E * Please check the push button function for set this.	0
04F	X	X	X	X	X	X	X	X	Initial hold function for SW F * Please check the push button function for set this.	0
050								X	Polarity of SW11 0: Noraml 1: Reverse	0
							X		Polarity of SW12 0: Noraml 1: Reverse	0
						X			Polarity of SW13 0: Noraml 1: Reverse	0
					X				Polarity of SW21 0: Noraml 1: Reverse	0
				X					Polarity of SW22 0: Noraml 1: Reverse	0
			X						Polarity of SW23 0: Noraml 1: Reverse	0
		X							Polarity of SW31 0: Noraml 1: Reverse	0
	X								Polarity of SW32 0: Noraml 1: Reverse	0
051								X	Polarity of SW33 0: Noraml 1: Reverse	0
							X		Polarity of WB 0: Noraml 1: Reverse	0
	X	X	X	X	X	X			Reserved	
052 - 053	X	X	X	X	X	X	X	X	Reserved	

V. Push Button Function List

When the menu is displayed, the following function is assigned for each SW.
The SW33 and WB buttons are not functional at this moment.

SW11: Decrease page Decrease page number
SW12: Increment Increment cursor or value
SW13: Increase page Increase page number
SW21: Select left Select left selection
SW22: Execute Execute the selected function
SW23: Select right Select right selection
SW31: Return Close the menu
SW32: Decrement Decrement cursor or value
SW33: NO FUNCTION

Value	Function	Function Description
0x00	Disable	
0x01	Display Menu	
0x02-0x03	No Function	
0x04	DSP Preset (+)	
0x05	DSP Preset (-)	
0x06-0x07	No Function	
0x08	Contrast (+)	
0x09	Contrast (-)	
0x0A-0x0F	No Function	
0x10	Shadow mask shading level (+)	
0x11	Shadow mask shading level (-)	
0x12	Shadow mask top (+)	
0x13	Shadow mask top (-)	
0x14	Shadow mask bottom (+)	
0x15	Shadow mask bottom (-)	
0x16	Shadow mask top / bottom (+)	
0x17	Shadow mask top / bottom (-)	
0x18	Shadow mask left (+)	
0x19	Shadow mask left (-)	
0x1A	Shadow mask right (+)	
0x1B	Shadow mask right (-)	
0x1C	Shadow mask left / right (+)	
0x1D	Shadow mask left / right (-)	
0x1E-0x1F	No Function	
0x20	Horizontal line maker color (+)	
0x21	Horizontal line maker color (-)	
0x22	Horizontal line maker size (+)	
0x23	Horizontal line maker size (-)	
0x24	Horizontal line maker position (+)	
0x25	Horizontal line maker position (-)	
0x26	Vertical line maker color (+)	
0x27	Vertical line maker color (-)	
0x28	Vertical line maker size (+)	
0x29	Vertical line maker size (-)	
0x2A	Vertical line maker position (+)	

Value	Function	Function Description
0x2B	Vertical line maker position (-)	
0x2C-0x3F	No Function	
0x40	Horizontal Mirror OFF	
0x41	Horizontal Mirror ON	
0x42	Horizontal Mirror ON/OFF Change	Changes from “OFF” to “ON” if current selection is “OFF” Changes from “ON” to “OFF” if current selection is “ON”
0x43-0x47	No Function	
0x48	Manual White Balance	
0x49	Auto White Balance	
0x4A	Push to Set White Balance	
0x4B	Auto/Manual White Balance Change	Changes from “Auto” to “Manual” if current selection is “Auto” Changes from “Manual” to “Auto” if current selection is “Manual”
0x4C	ALC OFF	
0x4D	ALC ON	
0x4E	ALC ON/OFF Change	Changes from “OFF” to “ON” if current selection is “OFF” Changes from “ON” to “OFF” if current selection is “ON”
0x4F	No Function	
0x50	Fixed Shutter	
0x51	Auto Shutter	
0x52	Auto/Fixed Shutter Change	Changes from “Auto” to “Fixed” if current selection is “Auto” Changes from “Fixed” to “Auto” if current selection is “Fixed”
0x53	No Function	
0x54	Fixed Gain	
0x55	AGC ON	
0x56	AGC ON/Fixed Gain Change	Changes from “AGC” to “Fixed” if current selection is “AGC” Changes from “Fixed” to “AGC” if current selection is “Fixed”
0x57-0x5F	No Function	
0x60	Undisplay marker (Line marker and shadow mask)	
0x61	Display marker (Line marker and shadow mask)	
0x62	Display/Undisplay (Line marker and shadow mask)	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x63	No Function	
0x64	Undisplay Line Marker	
0x65	Display Line Marker	
0x66	Display/Undisplay Line Marker	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x67	No Function	
0x68	Undisplay shadow mask	
0x69	Display shadow mask	
0x6A	Display/Undisplay shadow mask	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x6B-0x7F	No Function	
0x80	Horizontal Mirror OFF save to EEPROM	
0x81	Horizontal Mirror ON save to EEPROM	
0x82	Horizontal Mirror ON/OFF save to EEPROM	
0x83-0x87	No Function	
0x88	Manual white balance save to EEPROM	
0x89	Auto white balance save to EEPROM	
0x8A	Push to Set white balance save to EEPROM	
0x8B	Auto/Manual white balance change save to EEPROM	Changes from “Auto” to “Manual” if current selection is “Auto” Changes from “Manual” to “Auto” if current selection is “Manual”
0x8C-0x8F	No Function	
0x90	Undisplay Marker (Line marker and shadow mask)	

	save to EEPROM	

Value	Function	Function Description
0x91	Display Line Marker	
0x92	Display/Undisplay Line Marker	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x93	No Function	
0x94	Undisplay shadow mask	
0x95	Display shadow mask	
0x96	Display/Undisplay shadow mask	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x97	No Function	
0x98	Undisplay shadow mask save to EEPROM	
0x99	Display shadow mask save to EEPROM	
0x9A	Display/Undisplay shadow mask save to EEPROM	Changes from “Display” to “Undisplay” if current selection is “Display” Changes from “Undisplay” to “Display” if current selection is “Undisplay”
0x9B-0xBF	No Function	
0xC0	Horizontal Mirror ON/OFF change	When held, it changes to “ON” When released, it changes to “OFF” This function is only available as a press button function
0xC1	Auto/Manual white balance change	When held, it changes to “Auto” When released, it changes to “Manual” This function is only available as a press button function
0xC2	Display/Undisplay marker (Line marker and shadow mask)	When held, it changes to “Display” When released, it changes to “Undisplay” This function is only available as a press button function
0xC3	Display/Undisplay line marker	When held, it changes to “Display” When released, it changes to “Undisplay” This function is only available as a press button function
0xC4	Display/Undisplay shadow mask	When held, it changes to “Display” When released, it changes to “Undisplay” This function is only available as a press button function
0xC5-0xCF	No Function	

Address	7	6	5	4	3	2	1	0	Details	Initial data
054	X	X	X	X	X	X	X	X	Shadow mask minimum shading level for the push button	0
055	X	X	X	X	X	X	X	X	Shadow mask maximum shading level for the push button	255
056	X	X	X	X	X	X	X	X	Minimum horizontal line maker position for the push button	0
057	0	0	0	0	0	X	X	X		
058	X	X	X	X	X	X	X	X	Maximum horizontal line maker position for the push button	1280
059	0	0	0	0	0	X	X	X		
05A	X	X	X	X	X	X	X	X	Minimum horizontal line maker size for the push button	0
05B	0	0	0	0	0	X	X	X		
05C	X	X	X	X	X	X	X	X	Maximum horizontal line maker size for the push button	1280
05D	0	0	0	0	0	X	X	X		
05E	X	X	X	X	X	X	X	X	Minimum vertical line maker position for the push button	0
05F	0	0	0	0	0	X	X	X		
060	X	X	X	X	X	X	X	X	Maximum vertical line maker position for the push button	720
061	0	0	0	0	0	X	X	X		
062	X	X	X	X	X	X	X	X	Minimum vertical line maker size for the push button	0
063	0	0	0	0	0	X	X	X		
064	X	X	X	X	X	X	X	X	Maximum vertical line maker size for the push button	720
065	0	0	0	0	0	X	X	X		
066	X	X	X	X	X	X	X	X	Minimum contrast for the push button	0
067	X	X	X	X	X	X	X	X	Maximum contrast for the push button	128
068	0	0	0	X	X	X	X	X	Minimum number of DSP Preset for the push button	0
069	0	0	0	X	X	X	X	X	Maximum number of DSP Preset for the push button	27
06A - 0FF	X	X	X	X	X	X	X	X	Reserved	
100								X	Character size for OSD function 0: Large 1: Small	0
	X	X	X	X	X	X	X		Reserved	
101	X	X	X	X	X	X	X		Reserved	
102	X	X	X	X	X	X	X	X	OSD horizontal display position 0: Left 255: Right	0
103	X	X	X	X	X	X	X	X	Reserved	
104	X	X	X	X	X	X	X	X	OSD vertical display position 0: Top 255: Bottom	0
105 - 111	X	X	X	X	X	X	X	X	Reserved	
112	0	0	0	0	0	0	X	X	50 / 59.94 / 60 Hz selection 0: 59.94 Hz 1: 60 Hz 2: 50 Hz * Power off / on the camera after save to the EEPROM when change this.	0
113 - 1DD	X	X	X	X	X	X	X	X	Reserved	
1DE	0	0	0	0	0	0	X	X	Test pattern 0: Off (Video out) 1: On (Gray scale) 2: On (Color bar) 3: On (Color bar and gray scale)	0
1DF	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial data
1E0								X	Pixel blemish auto detection 0: Off (Manual detection) 1: On (Auto detection) * Change "Off" to "On" after shield the camera. Start pixel blemish detection automatically when change "Off" to "On". Change "On" to "Off" autocamatically when finish the auto detection. Pixel blemish detection starts from upper left corner to bottom right corner. (From left to right and top to bottom) Auto detect maximum 64 pixel blemishess. Pixel blemish detection is stopped when detect 64 pixel blemishess halfway.	0
					X	X	X		Reserved	
				X					Pixel blemish correction 0: Off 1: On * Please set the address for the pixel blemish correction from 200 to 2FF address.	1
	X	X	X						Reserved	
1E1								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	
1E2	X	X	X	X	X	X	X	X	White pixel blemish threshold for the pixel blemish auto detection * Greater then this value is the pixel blemish when run the pixel blemish auto detection.	200
1E3	0	0	0	0	0	0	X	X		
1E4	X	X	X	X	X	X	X	X	Black pixel blemish threshold for the pixel blemish auto detection * Smaller then this value is the pixel blemish when run the pixel blemish auto detection.	0
1E5	0	0	0	0	0	0	X	X		
1E6 - 1FF	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial data
200	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 00	Factory
201	0	0	0	0	0	X	X	X	* Please set the position for the most upper and left pixel blemish.	default
202	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 00	Factory
203	0	0	0	0	0	X	X	X	* Please set the position for the most upper and left pixel blemish.	default
204	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 01	Factory
205	0	0	0	0	0	X	X	X		default
206	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 01	Factory
207	0	0	0	0	0	X	X	X		default
208	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 02	Factory
209	0	0	0	0	0	X	X	X		default
20A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 02	Factory
20B	0	0	0	0	0	X	X	X		default
20C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 03	Factory
20D	0	0	0	0	0	X	X	X		default
20E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 03	Factory
20F	0	0	0	0	0	X	X	X		default
210	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 04	Factory
211	0	0	0	0	0	X	X	X		default
212	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 04	Factory
213	0	0	0	0	0	X	X	X		default
214	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 05	Factory
215	0	0	0	0	0	X	X	X		default
216	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 05	Factory
217	0	0	0	0	0	X	X	X		default
218	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 06	Factory
219	0	0	0	0	0	X	X	X		default
21A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 06	Factory
21B	0	0	0	0	0	X	X	X		default
21C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 07	Factory
21D	0	0	0	0	0	X	X	X		default
21E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 07	Factory
21F	0	0	0	0	0	X	X	X		default
220	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 08	Factory
221	0	0	0	0	0	X	X	X		default
222	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 08	Factory
223	0	0	0	0	0	X	X	X		default
224	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 09	Factory
225	0	0	0	0	0	X	X	X		default
226	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 09	Factory
227	0	0	0	0	0	X	X	X		default
228	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 10	Factory
229	0	0	0	0	0	X	X	X		default
22A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 10	Factory
22B	0	0	0	0	0	X	X	X		default
22C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 11	Factory
22D	0	0	0	0	0	X	X	X		default
22E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 11	Factory
22F	0	0	0	0	0	X	X	X		default

Address	7	6	5	4	3	2	1	0	Details	Initial data
230	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 12	Factory default
231	0	0	0	0	0	X	X	X		
232	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 12	Factory default
233	0	0	0	0	0	X	X	X		
234	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 13	Factory default
235	0	0	0	0	0	X	X	X		
236	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 13	Factory default
237	0	0	0	0	0	X	X	X		
238	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 14	Factory default
239	0	0	0	0	0	X	X	X		
23A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 14	Factory default
23B	0	0	0	0	0	X	X	X		
23C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 15	Factory default
23D	0	0	0	0	0	X	X	X		
23E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 15	Factory default
23F	0	0	0	0	0	X	X	X		
240	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 16	Factory default
241	0	0	0	0	0	X	X	X		
242	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 16	Factory default
243	0	0	0	0	0	X	X	X		
244	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 17	Factory default
245	0	0	0	0	0	X	X	X		
246	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 17	Factory default
247	0	0	0	0	0	X	X	X		
248	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 18	Factory default
249	0	0	0	0	0	X	X	X		
24A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 18	Factory default
24B	0	0	0	0	0	X	X	X		
24C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 19	Factory default
24D	0	0	0	0	0	X	X	X		
24E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 19	Factory default
24F	0	0	0	0	0	X	X	X		
250	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 20	Factory default
251	0	0	0	0	0	X	X	X		
252	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 20	Factory default
253	0	0	0	0	0	X	X	X		
254	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 21	Factory default
255	0	0	0	0	0	X	X	X		
256	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 21	Factory default
257	0	0	0	0	0	X	X	X		
258	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 22	Factory default
259	0	0	0	0	0	X	X	X		
25A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 22	Factory default
25B	0	0	0	0	0	X	X	X		
25C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 23	Factory default
25D	0	0	0	0	0	X	X	X		
25E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 23	Factory default
25F	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial data
260	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 24	Factory default
261	0	0	0	0	0	X	X	X		
262	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 24	Factory default
263	0	0	0	0	0	X	X	X		
264	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 25	Factory default
265	0	0	0	0	0	X	X	X		
266	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 25	Factory default
267	0	0	0	0	0	X	X	X		
268	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 26	Factory default
269	0	0	0	0	0	X	X	X		
26A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 26	Factory default
26B	0	0	0	0	0	X	X	X		
26C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 27	Factory default
26D	0	0	0	0	0	X	X	X		
26E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 27	Factory default
26F	0	0	0	0	0	X	X	X		
270	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 28	Factory default
271	0	0	0	0	0	X	X	X		
272	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 28	Factory default
273	0	0	0	0	0	X	X	X		
274	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 29	Factory default
275	0	0	0	0	0	X	X	X		
276	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 29	Factory default
277	0	0	0	0	0	X	X	X		
278	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 30	Factory default
279	0	0	0	0	0	X	X	X		
27A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 30	Factory default
27B	0	0	0	0	0	X	X	X		
27C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 31	Factory default
27D	0	0	0	0	0	X	X	X		
27E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 31	Factory default
27F	0	0	0	0	0	X	X	X		
280	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 32	Factory default
281	0	0	0	0	0	X	X	X		
282	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 32	Factory default
283	0	0	0	0	0	X	X	X		
284	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 33	Factory default
285	0	0	0	0	0	X	X	X		
286	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 33	Factory default
287	0	0	0	0	0	X	X	X		
288	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 34	Factory default
289	0	0	0	0	0	X	X	X		
28A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 34	Factory default
28B	0	0	0	0	0	X	X	X		
28C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 35	Factory default
26D	0	0	0	0	0	X	X	X		
28E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 35	Factory default
28F	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial data
290	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 36	Factory default
291	0	0	0	0	0	X	X	X		
292	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 36	Factory default
293	0	0	0	0	0	X	X	X		
294	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 37	Factory default
295	0	0	0	0	0	X	X	X		
296	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 37	Factory default
297	0	0	0	0	0	X	X	X		
298	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 38	Factory default
299	0	0	0	0	0	X	X	X		
29A	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 38	Factory default
29B	0	0	0	0	0	X	X	X		
29C	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 39	Factory default
29D	0	0	0	0	0	X	X	X		
29E	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 39	Factory default
29F	0	0	0	0	0	X	X	X		
2A0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 40	Factory default
2A1	0	0	0	0	0	X	X	X		
2A2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 40	Factory default
2A3	0	0	0	0	0	X	X	X		
2A4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 41	Factory default
2A5	0	0	0	0	0	X	X	X		
2A6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 41	Factory default
2A7	0	0	0	0	0	X	X	X		
2A8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 42	Factory default
2A9	0	0	0	0	0	X	X	X		
2AA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 42	Factory default
2AB	0	0	0	0	0	X	X	X		
2AC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 43	Factory default
2AD	0	0	0	0	0	X	X	X		
2AE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 43	Factory default
2AF	0	0	0	0	0	X	X	X		
2B0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 44	Factory default
2B1	0	0	0	0	0	X	X	X		
2B2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 44	Factory default
2B3	0	0	0	0	0	X	X	X		
2B4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 45	Factory default
2B5	0	0	0	0	0	X	X	X		
2B6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 45	Factory default
2B7	0	0	0	0	0	X	X	X		
2B8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 46	Factory default
2B9	0	0	0	0	0	X	X	X		
2BA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 46	Factory default
2BB	0	0	0	0	0	X	X	X		
2BC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 47	Factory default
2BD	0	0	0	0	0	X	X	X		
2BE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 47	Factory default
2BF	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial data
2C0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 48	Factory default
2C1	0	0	0	0	0	X	X	X		
2C2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 48	Factory default
2C3	0	0	0	0	0	X	X	X		
2C4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 49	Factory default
2C5	0	0	0	0	0	X	X	X		
2C6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 49	Factory default
2C7	0	0	0	0	0	X	X	X		
2C8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 50	Factory default
2C9	0	0	0	0	0	X	X	X		
2CA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 50	Factory default
2CB	0	0	0	0	0	X	X	X		
2CC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 51	Factory default
2CD	0	0	0	0	0	X	X	X		
2CE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 51	Factory default
2CF	0	0	0	0	0	X	X	X		
2D0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 52	Factory default
2D1	0	0	0	0	0	X	X	X		
2D2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 52	Factory default
2D3	0	0	0	0	0	X	X	X		
2D4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 53	Factory default
2D5	0	0	0	0	0	X	X	X		
2D6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 53	Factory default
2D7	0	0	0	0	0	X	X	X		
2D8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 54	Factory default
2D9	0	0	0	0	0	X	X	X		
2DA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 54	Factory default
2DB	0	0	0	0	0	X	X	X		
2DC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 55	Factory default
2DD	0	0	0	0	0	X	X	X		
2DE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 55	Factory default
2DF	0	0	0	0	0	X	X	X		
2E0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 56	Factory default
2E1	0	0	0	0	0	X	X	X		
2E2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 56	Factory default
2E3	0	0	0	0	0	X	X	X		
2E4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 57	Factory default
2E5	0	0	0	0	0	X	X	X		
2E6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 57	Factory default
2E7	0	0	0	0	0	X	X	X		
2E8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 58	Factory default
2E9	0	0	0	0	0	X	X	X		
2EA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 58	Factory default
2EB	0	0	0	0	0	X	X	X		
2EC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 59	Factory default
2ED	0	0	0	0	0	X	X	X		
2EE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 59	Factory default
2EF	0	0	0	0	0	X	X	X		

Address	7	6	5	4	3	2	1	0	Details	Initial data
2F0	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 60	Factory default
2F1	0	0	0	0	0	X	X	X		
2F2	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 60	Factory default
2F3	0	0	0	0	0	X	X	X		
2F4	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 61	Factory default
2F5	0	0	0	0	0	X	X	X		
2F6	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 61	Factory default
2F7	0	0	0	0	0	X	X	X		
2F8	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 62	Factory default
2F9	0	0	0	0	0	X	X	X		
2FA	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 62	Factory default
2FB	0	0	0	0	0	X	X	X		
2FC	X	X	X	X	X	X	X	X	Horizontal position of the pixel blemish 63	Factory default
2FD	0	0	0	0	0	X	X	X		
2FE	X	X	X	X	X	X	X	X	Vertical position of the pixel blemish 63	Factory default
2FF	0	0	0	0	0	X	X	X		

Note:
Factory default: The address of the below condition pixel while the factory inspection.
Exposure time: 1/2
Gain: 200
White pixel blemish threshold for the pixel blemish auto detection: 150

Address	7	6	5	4	3	2	1	0	Details	Initial data
300 - 3FF	X	X	X	X	X	X	X	X	Reserved	

VI. The DSP Register Mapping List

Address	7	6	5	4	3	2	1	0	Details	Initial Data
000					X	X	X	X	Reserved	
				X					ALC 0: OFF 1: ON * When OFF is selected, the camera works with fixed shutter and fixed gain. * When ON is selected, the setting for Exposure control and Gain contal are en	1
			X						Reserved	
		X							Exposure control 0: Fixed shutter 1: AEE (Auto shutter)	1
	X								Gain control 0: Fixed gain control 1: AGC (Auto Gain Control)	1
001	X	X	X	X	X	X	X	X	Reserved	
002	X	X	X	X	X	X	X	X	Brightness target for ALC	65
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	5
005					X	X	X	X	Maximum ALC weight	1
	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 * Calculates the 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: 1,024 frames 11: 2,048 frames 12: 4,096 frames 13: 8,191 frames 14: 16,384 frames 15: 32,768 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 * Calculated the average of the brightness with these frames for fast ALC contr when the camera is powered-on or the color mode is changed. 0: 1 (No average) 1: 1 frame 2: 2 frames 3: 4 frames 4: 8 frames 5: 16 frames 6: 32 frames 7: 64 frames 8: 128 frames 9: 256 frames 10: 512 frames 11: 1,024 frames 12: 2,048 frames 13: 4,096 frames 14: 8,191 frames 15: 16,384 frames	0
00B - 00F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
010	X	X	X	X	X	X	X	X	Exposure time [little-endian]	0
011	0	0	0	0	0	X	X	X	Range is 0 to 690. Please see exposure time table. * Please check the exposure time table.	
012	X	X	X	X	X	X	X	X	AEE minimum exposure time	690
013	0	0	0	0	0	X	X	X	Range is 0 to 690. * Please check the exposure time table.	
014	X	X	X	X	X	X	X	X	AEE middle exposure time (Minimum side)	0
015	0	0	0	0	0	X	X	X	Range is 0 to 690. * Please check the exposure time table.	
016	X	X	X	X	X	X	X	X	AEE maximum exposure time	0
017	0	0	0	0	0	X	X	X	Range is 0 to 690. * Please check the exposure time table.	
018	X	X	X	X	X	X	X	X	AEE torelance * AEE control is stopped when "Target brightness - current brightness" is less than this value.	6
019	X	X	X	X	X	X	X	X	AEE theshold * AEE control is start when "Target brightness - current brightness" is bigger than "Tolerance + threshold".	6
01A	X	X	X	X	X	X	X	X	AEE speed * AEE control speed, which is the maximum change at one step.	24
01B - 01F	X	X	X	X	X	X	X	X	Reserved	

ALC Function

Object	Exposure time	Gain
Bright	Minimum	Minimum
	Change	
	Middle	Change
	Change	Middle
	Maximum	Change
Dark		Maximum

Exposure Setting

At 60Hz

Value	Exposure time	
0	16.7ms	1/60s
64	8.33ms	1/120s
128	4.17ms	1/240s
192	2.08ms	1/480s
256	1.04ms	1/960s
320	520.8us	1/1,920s
384	260.4us	1/3,840s
448	130.2us	1/7,680s
512	65.1us	1/15,360s
576	32.6us	1/30,720s
640	16.3us	1/61,440s
690	10.0us	1/100,000s

At 50Hz

Value	Exposure time	
0	20.0ms	1/50s
64	10.0ms	1/100s
128	5.00ms	1/200s
192	2.50ms	1/400s
256	1.25ms	1/800s
320	625.0us	1/1,600s
384	312.5us	1/3,200s
448	156.25us	1/6,400s
512	78.13us	1/12,800s
576	39.06us	1/25,600s
640	19.53us	1/51,200s
690	12.0us	1/83,947s

Address	7	6	5	4	3	2	1	0	Details	Initial Data
020	X	X	X	X	X	X	X	X	Gain [little-endian]	0
021	0	0	0	0	0	0	0	X	* Gain [dB] = 0.0359 x Value	
022	X	X	X	X	X	X	X	X	Mimimum gain for AGC	0
023	0	0	0	0	0	0	0	X	* Gain [dB] = 0.0359 x Value	
024	X	X	X	X	X	X	X	X	Middle gain for AGC	255
025	X	X	X	X	X	X	X	X	* Gain [dB] = 0.0359 x Value	
026	X	X	X	X	X	X	X	X	Maximum gain for AGC	511
027	0	0	0	0	0	0	0	X	* Gain [dB] = 0.0359 x Value	
028	X	X	X	X	X	X	X	X	AGC Tolerance * AGC control stops whenever "Target brightness - current brightness" is less than this value.	6
029	X	X	X	X	X	X	X	X	AGC theshold * AGC control starts whenever "Target brightness - current brightness" is larger than "Tolerance + threshold".	6
02A	X	X	X	X	X	X	X	X	AGC speed * AGC control speed, which is the maximum change at one step.	48
02B - 02F	X	X	X	X	X	X	X	X	Reserved	
030								X	White balance mode 0: Manual white balance 1: Auto white balance	1
		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
031	X	X	X	X	X	X	X	X	Reserved	
032	X	X	X	X	X	X	X	X	White balance R gain [little-endian]	305
033	0	0	0	0	0	0	X	X	* Magnification = (Value + 256) / 256	
034	X	X	X	X	X	X	X	X	White balance G gain [little-endian]	0
035	0	0	0	0	0	0	X	X	* Magnification = (Value + 256) / 256	
036	X	X	X	X	X	X	X	X	White balance B gain [little-endian]	455
037	0	0	0	0	0	0	X	X	* Magnification = (Value + 256) / 256	
038 - 03B	X	X	X	X	X	X	X	X	Reserved	
03C	X	X	X	X	X	X	X	X	Auto white balance torelance * Auto white balance control stops whenever "Target brightness - current brightness" is less than this value.	3
03D	X	X	X	X	X	X	X	X	Auto white balance theshold * Auto white balance control starts whenever "Target brightness - current brightness" is larger than "Tolerance + threshold".	3
03E - 03F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
040	0	0	0	0	X	X	X	X	Auto white balance average integral frames * Calculates the average of the gain with these frames for auto white balance c 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: 1,024 frames 11: 2,048 frames 12: 4,096 frames 13: 8,191 frames 14: 16,384 frames 15: 32,768 frames	1
041	X	X	X	X	X	X	X	X	Reserved	
042	0	0	0	0	X	X	X	X	Auto white balance single-frame process quantity * Calculates the average of the brightness with these frames for fast auto white balance control when the camera is powered-on or the color mode changes. 0: 1 (No average) 1: 1 frame 2: 2 frames 3: 4 frames 4: 8 frames 5: 16 frames 6: 32 frames 7: 64 frames 8: 128 frames 9: 256 frames 10: 512 frames 11: 1,024 frames 12: 2,048 frames 13: 4,096 frames 14: 8,191 frames 15: 16,384 frames	0
043	X	X	X	X	X	X	X	X	Reserved	
044	X	X	X	X	X	X	X	X	Auto white balance R change limit Adjust R control speed for auto white balance. * When a large value is set for this, the R control speed becomes slow.	4
045	X	X	X	X	X	X	X	X	Auto white balance B change limit Adjust B control speed for auto white balance. * When a large value is set for this, the B control speed becomes slow.	4
046 - 04F	X	X	X	X	X	X	X	X	Reserved	0
050								X	Pseudo color mode 0: OFF 1: ON	0
	X	X	X	X	X	X	X		Reserved	
051					X	X	X	X	Pseudo color background color code * Please check the color code list.	1
	X	X	X	X					Pseudo color foreground color code * Please check the color code list.	0
052	X	X	X	X	X	X	X	X	Binary process threshold * This defines the threshold level to create a binary signal.	48
053	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 value is set as "0", the binaryprocess does not occur at all and it keeps full gray scale representation. * When a greater number is set, pixel flickering may occur at the edge of the le	16
054 - 057	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial data
058	X	X	X	X	X	X	X	X	Shadow mask shading level 0: No masking (or invisible) 255: Black * This changes the depth (or contrast) of the shadow mask. * The shadow mask does NOT appear when this is set to 0.	0
059					X	X	X	X	Horizontal line marker color * Please check the color code list.	0
	X	X	X	X					Vertical line marker color * Please check the color code list.	0
05A - 05E	X	X	X	X	X	X	X	X	Reserved	
05F								X	Line marker 0: OFF 1: ON	1
							X		Shadow mask 0: OFF 1: ON	1
	X	X	X	X	X	X			Reserved	
060	X	X	X	X	X	X	X	X	Horizontal shadow mask upper part position (Top to xxx) [little-endian]	0
061	0	0	0	0	0	X	X	X	0: Top 2047: Buttom	
062	X	X	X	X	X	X	X	X	Horizontal shadow mask lower part position (Bottom to xxx) [little-endian]	720
063	0	0	0	0	0	X	X	X	0: Top 2047: Buttom	
064	X	X	X	X	X	X	X	X	Vertical shadow mask left part position (Left to xxx) [little-endian]	0
065	0	0	0	0	0	X	X	X	0: Left 2047: Right	
066	X	X	X	X	X	X	X	X	ow mask right part position (Right to xxx) [little-endian]	1280
067	0	0	0	0	0	X	X	X	0: Left 2047: Right	
068	X	X	X	X	X	X	X	X	Horizontal line marker position [little-endian]	0
069	0	0	0	0	0	0	0	X	0: Top 2047: Buttom	
06A	X	X	X	X	X	X	X	X	Horizontal line marker size [little-endian]	0
06B	0	0	0	0	0	0	0	X	0: No line (or invisible) 2047: Thickest line * The line marker does NOT appear when this setup is 0.	
06C	X	X	X	X	X	X	X	X	Vertical line marker position [little-endian]	0
06D	0	0	0	0	0	0	0	X	0: Left 2047: Right	
06E	X	X	X	X	X	X	X	X	Vertical line marker size [little-endian]	0
06F	0	0	0	0	0	0	0	X	0: No line (or invisible) 2047: Thickest line * The line marker does NOT appear when this setup is 0.	
070 - 07F	X	X	X	X	X	X	X	X	Reserved	

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
080								X	Horizontal mirror image 0: Off (Normal image) 1: On (Horizontal mirror image)	1
	X	X	X	X	X	X	X		Reserved	
081 - 087	X	X	X	X	X	X	X	X	Reserved	
088	X	X	X	X	X	X	X	X	Digital gain	128
089 - 08F	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
090						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	4
		X	X	X	X				Reserved	
	X								Gamma mode 0: Preset Gamma 1: Manual gamma	1
091	X	X	X	X	X	X	X	X	Reserved	
092	X	X	X	X	X	X	X	X	Control point 0 for manual gamma [little-endian]	0
093	0	0	0	0	0	0	X	X	* Two's complement	
094	X	X	X	X	X	X	X	X	Control point 1 for manual gamma [little-endian]	39
095	0	0	0	0	0	0	X	X	* Two's complement	
096	X	X	X	X	X	X	X	X	Control point 2 for manual gamma [little-endian]	104
097	0	0	0	0	0	0	X	X	* Two's complement	
098	X	X	X	X	X	X	X	X	Control point 3 for manual gamma [little-endian]	153
099	0	0	0	0	0	0	X	X	* Two's complement	
09A	X	X	X	X	X	X	X	X	Control point 4 for manual gamma [little-endian]	194
09B	0	0	0	0	0	0	X	X	* Two's complement	
09C	X	X	X	X	X	X	X	X	Control point 5 for manual gamma [little-endian]	222
09D	0	0	0	0	0	0	X	X	* Two's complement	
09E	X	X	X	X	X	X	X	X	Control point 6 for manual gamma [little-endian]	236
09F	0	0	0	0	0	0	X	X	* Two's complement	
0A0	X	X	X	X	X	X	X	X	Control point 7 for manual gamma [little-endian]	244
0A1	0	0	0	0	0	0	X	X	* Two's complement	
0A2	X	X	X	X	X	X	X	X	Control point 8 for manual gamma [little-endian]	251
0A3	0	0	0	0	0	0	X	X	* Two's complement	
0A4	X	X	X	X	X	X	X	X	Control point 9 for manual gamma [little-endian]	256
0A5	0	0	0	0	0	0	X	X	* Two's complement	
0A6 - 0C3	X	X	X	X	X	X	X	X	Reserved	

Address	7	6	5	4	3	2	1	0	Details	Initial Data
0C4	X	X	X	X	X	X	X	X	Contrast * Adjusts the gain for the output Magnification = value / 128	128
0C5	X	X	X	X	X	X	X	X	Reserved	
0C6	0	X	X	X	X	X	X	X	RGB offset	0
0C7 - 0D5	X	X	X	X	X	X	X	X	Reserved	
0D6	0	X	X	X	X	X	X	X	R-Y gain	62
0D7	X	X	X	X	X	X	X	X	Reserved	
0D8	0	X	X	X	X	X	X	X	B-Y gain	64
0D9	X	X	X	X	X	X	X	X	Reserved	
0DA	X	X	X	X	X	X	X	X	R-Y hue * Two complement	-20
0DB	X	X	X	X	X	X	X	X	Reserved	
0DC	X	X	X	X	X	X	X	X	B-Y hue * Two complement	-36
0DD - 0DF	X	X	X	X	X	X	X	X	Reserved	
0E0	X	X	X	X	X	X	X	X	High luminance chroma suppress threshold	255
0E1	X	X	X	X	X	X	X	X	Reserved	
0E2	X	X	X	X	X	X	X	X	High luminance chroma suppress slope	0
0E3 - 0E7	X	X	X	X	X	X	X	X	Reserved	
0E8	0	0	0	0	X	X	X	X	Gain for the front-end edge enhancement (horizontal) process	2
0E9	0	0	0	0	X	X	X	X	Gain for the front-end edge enhancement (vertical) process	2
0EA	0	0	0	0	X	X	X	X	Coring for the front-end edge enhancement process	0
0EB	X	X	X	X	X	X	X	X	Reserved	
0EC	0	0	0	0	X	X	X	X	Gain for the back-end edge enhancement (horizontal) process	4
0ED	0	0	0	0	X	X	X	X	Gain for the back-end edge enhancement (vertical) process	6
0EE	0	0	0	0	X	X	X	X	Coring for the back-end edge enhancement process	3
0EF - 3FF	X	X	X	X	X	X	X	X	Reserved	

VII. OSCD (On Screen Character Display) command

One byte command

Function	D7	D6	D5	D4	D3	D2	D1	D0
Cancel all video RAM	0	0	0	0	0	0	0	0
Display control	0	0	0	1	D0	1	BL1	BL0
Background and hemming color contro	0	0	1	0	R	G	B	BFC
RGB / Vc1 display ON/OFF	0	1	1	1	0	DOA	DOB	0
Reverse character color 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

Clearing the Video RAM

Clear all character data (12 rows, 28 columns) from the video RAM bt 0xFE.
When using this command, Display control set off and the address of the Video RAM set (0,0).

Display control

D0: Display switch (0: Display off, 1: Display on)
BL1 & 0: Blinking frequency (00: blinking off, 01: blinking 2Hz, 10: 1Hz, 11: 0.5Hz)

Background and hemming color control

RGB: Character hemming color for RGB character (0: Black, 1: White)
BFC: Background color for RGB character
(0: Black, 1: Blue, 2: Green, 3: Cyan, 4: Red, 5: Magenta, 6: Yellow, 7: White)

RGB / Vc1 display ON/OFF

DOA: Display the RGB character (0: OFF, 1: ON)
DOB: Display the Vc1 character (0: OFF, 1: ON)

Reverse character color ON/OFF

BCRE: Reverse character color (0: OFF, 1: ON)

Blue back ON/OFF

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

Change character address bank

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

Two bytes command
Note: 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
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
Background control for RGB / Vc1	1	0	1	1	0	0	1	BA1	BA0	BFA	BB1	BB0	BFB	0	0	0
Initial setting	1	0	1	1	0	1	0	0	0	BR	RS	0	0	0	VST	1

Write address control
Assign the address to write characters.
AR3, 2 and 1: Assign the number of the row (0000 to 1011)
AC4, 3, 2 and 1: Assign the number of the column (00000 to 11011)

Character size control
Assign the character size for each row.
SV1 and 0: The height of the character (00: Standard, 01: 2times, 10: 3times, 11: 4times)
SH1 and 0: The width of the character (00: Standard, 01: 2times, 10: 3times, 11: 4times)
AR3, 2, 1 and 0: The number of the rows (0000 to 1011)

Background control for RGB / Vc1
Assign the background color for RGB / Vc1.
BA1 and 0: Background color for RGB character
(0: No background, 1: Outlined, 2: Prohibit setting (DO NOT use), 3: Solid)
BFA: Character hemming color for RGB character (0: OFF, 1: ON)
BB1 and 0: Background color for Vc1 character
(0: No background, 1: Outlined, 2: Prohibit setting (DO NOT use), 3: Solid)
BFB: Character hemming color for Vc1 character (0: OFF, 1: ON)

Initial setting
Assign the initial setting. This setting has to change when the character display is OFF.
BR: Select function (0: Character blinking, 1: Character horizontal mirror)
RS: Reverse character color (0: Black character without hemming, 1: White character with hemming)
VST: Vertical start display position (0: Start from tree line, 1: Start from nine line)

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
Character Display Control	1	1	0	0	0	0	BL	0	C7	C6	C5	C4	C3	C2	C1	C0

Display Character Control
This command writes characters into the current address of the video RAM.
After writing the character, the address will automatically increment of the next location.
After this command, the data being sent will be received as C7-C0 automatically.
To finish the display character control, send the command “0xFF”.

BL: Blinking Status (0: blink off, 1: blink on)
C7-C0: The character code (Please check below table)

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

Note: Please refer to the “RENESAS uPD6467” data sheet when requiring additional characters to the ones listed above.

Revisions

Rev	Date	Changes	Notes
1.0	Feb 8, 2011	New Document	
1.1	March 1, 2011	Added the 59.94 Hz	
1.2	July 6, 2011	Change the initial data for 030H of uCOM Add the Initial press function for SW A to E (03A to 03F) of uCOM Add the Initial hold function for SW A to E (04A to 04F) of uCOM	
1.3	July 6, 2011	Revise the factory default setting for the pixel blemish inspection	

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