DFW-SX900/X700

Application Notes

TENTATIVE

1. Abstract

This document contains information, which is necessary for creating application software, about DFW-SX900 and DFW-X700, 1394 based Digital camera.

2. Compliance

DFW-SX900/ X700 complies with “1394-based Digital Camera specification Version 1.20”. Please refer to this specification.

(http://www.1394ta.org/Download/Technology/Specifications/Camera120.pdf)

3. Base Address of the Camera CSR

Base Address of the Camera Control and Status register is described at the command_reg_base in the Unit Dependent Directory of the Configuration ROM as a quadlet offset value.

This value of the DFW-SX900/ X700 is 3C $0000_{16.}$
Base address = (Bus_ID - Node_ID) FFFF F0F0 0000_{16}

4. Video Format

Camera supports the following video Format / Mode / Frame rate.
(In the following charts, ‘X7’ means DFW-X700 has that video format, mode and frame rate. Also ‘S9’ means DFW-SX900 has.)

Format_0

Mode	Video Format	60fps	30fps	15fps	7.5fps	3.75fps	-
Mode_0	160x120 YUV(4:4:4)						
Mode_1	320x240 YUV(4:2:2)			X7	X7 / S9	S9	
Mode_2	640x480 YUV(4:1:1)						
Mode_3	640x480 YUV(4:2:2)			X7	X7 / S9	S9	
Mode_4	640x480 RGB						
Mode_5	640x480 Y (Mono)						
Mode_6							
Mode_7							

Format_1

Mode	Video Format	60fps	30fps	15fps	7.5fps	3.75fps	1.875fps
Mode_0	800x600 YUV(4:2:2)			X7	X7 / S9	S9	
Mode_1	800x600 RGB						
Mode_2	800x600 Y (Mono)						
Mode_3	1024x768 YUV(4:2:2)			X7	X7 / S9	S9	
Mode_4	1024x768 RGB						
Mode_5	1024x768 Y (Mono)						
Mode_6							
Mode_7							

Format_2

Mode	Video Format	60fps	30fps	15fps	7.5fps	3.75fps	1.875fps
Mode_0	1280x960 YUV(4:2:2)				S9	S9	
Mode_1	1280x960 RGB						
Mode_2	1280x960 Y (Mono)						
Mode_3	1600x1200 YUV(4:2:2)						
Mode_4	1600x1200 RGB						
Mode_5	1600x1200 Y (Mono)						
Mode_6							
Mode_7							

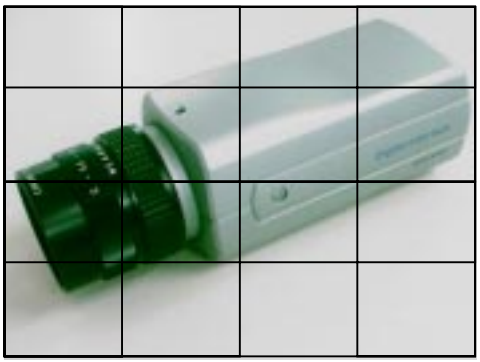
Format_7 (Capture of Scalable Image Size)

Scalable image per continuously unit cell is able to capture. But the scalable image is only square image.

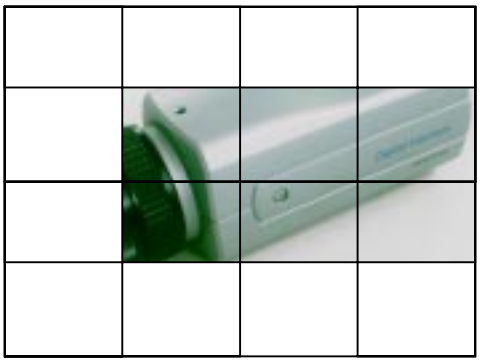
Unit Size (16piecies)

	SX900	X700
Horizontal Size	320	240
Vertical Size	256	192

Original Image



Capture Image



5. Basic function

Function	Implementation	Comments
Advanced feature CSR	**v**	Advanced feature CSR for “Paint” feature.
Camera Power control		Not supported
OneShot function	**v**	
MultiShot function		Not supported
User memory	2 channel	Factory setting (load only) and two user memory channels. Value and mode of following features will be saved and loaded. Brightness Exposure Sharpness White Balance Hue Saturation Gamma Shutter Gain Trigger Optical Filter If you save or load the memory channel, camera is initialized by this memory channel at next time of power-on.

6. Camera command function

Function	Mode	Factory setting	Range of value
Brightness	Manual When this value is increase, black level will be higher. When this value is decreased, black level will be lower.	0	0 to 255
Auto Exposure	Manual ON OFF When this value is increase, video output will be bright. When this value is decreased, video output will be dark. If Auto Exposure is set ON state, both Gain and Shutter will be Auto state. Also, either Gain or Shutter is set Auto state, Auto Exposure will be ON state. And if Auto Exposure is set OFF state, both Gain and Shutter will be Manual state. And value field of Auto Exposure register will be ignored.	OFF 128	0 to 255
Sharpness	Manual When this value is increase, video will be crispy. When this value is decreased, video will be soft.	8	0 to 15
White Balance	Auto(ATW) Manual One Push(AWB) When White Balance feature is set either Auto mode (ATW) or One Push mode (AWB), camera will adjust White Balance by itself with B_Value and R_Value. Auto state: Camera adjusts White Balance by itself continually. One Push state: Camera adjusts White Balance by itself only once. Then return to Manual state. Of course while camera is adjusting White Balance by itself, the values of B_Value and R_Value can be read the current value.	B_Value:128 R_Value:128 Manual	0 to 255
Hue	Manual Camera rotates the color balance. The value “128” means normal. And when the value is 128 or more, Red color will be magenta color. When the value is 128 or less, Red color will be yellow.	128	0 to 255

Function	Mode	Factory Setting	Range of value
Saturation	Manual When the value is increased, color will be deep. When the value is decreased, color will be pale.	32	0 to 127
Gamma	Manual Please choose gamma curve from three positions; OFF, ON1 and ON2.	129(ON1)	128(OFF), 129(ON1), 130(ON2)
Shutter	Auto Manual ON OFF Please refer table 6. about setting value. When the value is increased, video output will be dark. When the value is decreased, video output will be bright. When Shutter feature is Auto state, camera will adjust exposure level by itself with Shutter feature. If the current exposure level is less than the setting level of Auto Exposure feature, camera will decrease Shutter value. And if the current exposure level is more than the setting level of Auto Exposure feature, camera will increase Shutter value. OFF state: Shutter speed is fixed 1/30sec. If Auto Exposure is set ON state, both Gain and Shutter will be Auto state.	ON and Manual 2850(SX900) 2450(X700) Initial speed is 1/30sec.	2033 to 3119 (SX900) 2017 to 2850 (X700)
Gain	Auto Manual The value is set in 0.1dB. When the value is increased, video output will be bright. When the value is decreased, video output will be dark. When Gain feature is Auto state, camera will adjust exposure level by itself with Gain feature. If the current exposure level is less than the setting level of Auto Exposure feature, camera will decrease Gain value. And if the current exposure level is more than the setting level of Auto Exposure feature, camera will increase Gain value. If Auto Exposure is set ON state, both Gain and Shutter will be Auto state.	Manual 2048	2048 to 2228

Function	Mode	Factory Setting	Range of value
Trigger	ON OFF Trigger-Mode0 Trigger-Mode3 If Trigger feature is set ON state, this function will work. Trigger-Mode0: Camera detect the falling-edge of trigger input signal, camera will start integration. Trigger-Mode3: Set the value per 10ms. Camera will start integration per specified interval time.	OFF Trigger-Mode0	ON / OFF Trigger-Mode0/Mode3 1 to 4095 (Only Trigger-Mode3)
Optical Filter	Manual Camera has two positions which are adjusted the lighting condition 3200K and 5600K. Please choose the preset to suit the lighting condition.	1(5600K)	0(3200K) 1(5600K)

Table 6. Shutter speed

C.Scan mode DFW-SX900

value	Shutter speed 1/n
2048	n=7.49
2583	n=15.00
2850	n=30.03
2957	n=50.18
2984	n=60.42
3053	n=126.17
3085	n=254.74
3101	n=519.41
3109	n=1080.94
3113	n=2352.64
3114	n=3332.90
3115	n=5713.55
3116	n=10000.00
3117	n=20000.00
3118	n=50000.00
3119	n=100000.00

C.Scan mode DFW-X700

value	Shutter speed 1/n
2048	n=14.94
2450	n=30.02
2609	n=49.96
2649	n=59.98
2753	n=125.35
2801	n=252.20
2825	n=510.53
2837	n=1046.52
2842	n=1860.29
2843	n=2202.89
2845	n=3487.37
2846	n=4922.51
2847	n=8364.82
2848	n=20000.00
2849	n=50000.00
2850	n=100000.00

L.Exp mode DFW-SX900

value	Shutter speed
2047	0.134
2046	0.267
2045	0.401
2044	0.534
2043	0.668
2042	0.801
2041	0.935
2040	1.068
2039	1.202
2038	1.335
2037	1.469
2036	1.602
2035	1.736
2034	1.869
2033	2.003

L.Exp mode DFW-X700

value	Shutter speed
2047	0.067
2046	0.134
2044	0.268
2042	0.401
2040	0.535
2038	0.669
2036	0.803
2034	0.936
2032	1.070
2030	1.204
2028	1.338
2026	1.471
2024	1.605
2022	1.739
2020	1.873
2019	1.940
2018	2.006

7. RGB convert

Video format output by Camera is YUV (4:2:2). This video format is as follows.

U1	Y1	V1	Y2
U3	Y3	V3	Y4
….	….	….	….

Actually, U and V data is Kr and CB value. So, RGB value is able to calculate as follows.

B = 1.7710 * CB + Y
G = Y – 0.7144 * Kr – 0.3457 * CB
R = 1.4022 * Kr + Y

Thus, using above 4 bytes, RGB values of 2 pixels are able to calculate.

B_1 = 1.7710 * U1 + Y1
G_1 = Y1 – 0.7144 * V1 – 0.3457 * U1
R_1 = 1.4022 * V1 + Y1

B_2 = 1.7710 * U1 + Y2
G_2 = Y2 – 0.7144 * V1 – 0.3457 * U1
R_2 = 1.4022 * V1 + Y2