GV-Fisheye Camera Integration Notes

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1. Applied to

GV-Fisheye Camera: GV-FE110, GV-FE111, GV-FE2301, GV-FE420, GV-FE421, GV-FE520, GV-FE521 and GV-FER521

2. System Requirements

Operating System	**32-bit**	Windows XP / Vista / 7 / Server 2008
	64-bit	Windows 7 / Server 2008 R2
GV-System Version		GV-System V8.5.6.0 or later
Note: To support GPU dewarping of fisheye views, the graphics card must support DirectX 10 or later.		

3. Total Frame Rate Supported by GV-System

Starting from GV-System V8.5.6.0, **GPU (Graphics Processing Unit) dewarping** is added to enhance fisheye dewarping. When fisheye dewarping is processed by GPU instead of CPU, the total frame rate supported for fisheye views is increased due to lower CPU loading. In addition, when the GV-System is using an additional graphics card, its performance of GPU dewarping surpasses that by an onboard graphics card.

The following tables list the total frame rate supported by GV-System V8.5.6.0 based on CPU capacity. The total frame rate supported by GV-System V8.5.0.0 using CPU dewarping is also listed for comparison purposes.

GV-FE110 / GV-FE111: 1280 x 1024 (1.3 MP)

Codec	V8.5.6.0 (GPU Dewarping)				V8.5.0.0 (CPU Dewarping)	
	OS	CPU	Total FPS supported		CPU	Total FPS supported
			Built-in VGA	External VGA		
H.264	64-bit	i7 - 3770k	210	345	Core i7 - 860	150
		i5 - 3570k	210	270		
		i3 - 2120K	150	180	Core 2 Quad - Q9400	50
	32-bit	i7 - 3770k	210	285		
		i5 - 3570k	210	270	Core 2 Duo - E6400	25
		i3 - 2120K	150	180		
MJPEG	64-bit	i7 - 3770k	240	360	Core i7 - 860	165
		i5 - 3570k	225	285		
		i3 - 2120K	165	210	Core 2 Quad - Q9400	50
	32-bit	i7 - 3770k	240	315		
		i5 - 3570k	225	285	Core 2 Duo - E6400	25
		i3 - 2120K	165	210		
MPEG4	64-bit	i7 - 3770k	240	375	Core i7 - 860	170
		i5 - 3570k	225	315		
		i3 - 2120K	195	255	Core 2 Quad - Q9400	50
	32-bit	i7 - 3770k	240	285		
		i5 - 3570k	225	285	Core 2 Duo - E6400	30
		i3 - 2120K	195	255		

GV-FE2301: 1440 x 1376 (2 MP)

Codec	V8.5.6.0 (GPU Dewarping)				V8.5.0.0
	OS	CPU	Total FPS supported		
			Built-in VGA	External VGA	
H.264	64-bit	i7 - 3770k	120	240	GV-FE2301 is not supported in V8.5.0.0
		i5 - 3570k	135	180	
		i3 - 2120K	105	120	
	32-bit	i7 - 3770k	120	225	
		i5 - 3570k	135	180	
		i3 - 2120K	105	120	
MJPEG	64-bit	i7 - 3770k	165	285	
		i5 - 3570k	150	195	
		i3 - 2120K	120	150	
	32-bit	i7 - 3770k	165	255	
		i5 - 3570k	150	195	
		i3 - 2120K	120	150	

GV-FE420 / GV-FE421: 2048 x 1944 (4 MP)

Codec	V8.5.6.0 (GPU Dewarping)				V8.5.0.0 (CPU Dewarping)	
	OS	CPU	Total FPS supported		CPU	Total FPS supported
			Built-in VGA	External VGA		
H.264	64-bit	i7 - 3770k	75	120	Core i7 - 860	45
		i5 - 3570k	60	90		
		i3 - 2120K	45	60	Core 2 Quad - Q9400	20
	32-bit	i7 - 3770k	75	120		
		i5 - 3570k	60	90	Core 2 Duo - E6400	10
		I3 - 2120K	45	60		
MJPEG	64-bit	i7 - 3770k	90	150	Core i7 - 860	65
		i5 - 3570k	75	105		
		I3 - 2120K	60	75	Core 2 Quad - Q9400	25
	32-bit	i7 - 3770k	90	150		
		i5 - 3570k	75	105	Core 2 Duo - E6400	10
		i3 - 2120K	60	75		

GV-FE520 / GV-FE521 / GV-FER521: 2560 x 1920 (5 MP)

Codec	V8.5.6.0 (GPU Dewarping)				V8.5.0.0 (CPU Dewarping)	
	OS	CPU	Total FPS supported		CPU	Total FPS supported
			Built-in VGA	External VGA		
H.264	64-bit	i7 - 3770k	70	100	Core i7 - 860	30
		i5 - 3570k	50	70		
		i3 - 2120K	40	50		
	32-bit	i7 - 3770k	70	80	Core 2 Quad - Q9400	15
		i5 - 3570k	50	70		
		i3 - 2120K	40	50		
MJPEG	64-bit	i7 - 3770k	70	110	Core i7 - 860	30
		i5 - 3570k	60	80		
		i3 - 2120K	50	60		
	32-bit	i7 - 3770k	70	100	Core 2 Quad - Q9400	5
		i5 - 3570k	60	80		
		i3 - 2120K	50	60		

Note:

1. The test data for both V8.5.6.0 and V8.5.0.0 is obtained using the following conditions:
   - CPU usage at around 70%
   - 360 Degree view mode with “Auto Pan” function disabled
   - 32-screen divisions with GV-System’s panel resolution set to 1600 x 1200
2. With GPU dewarping, the total frame rate supported by GV-System V8.5.6.0 does not differ when using different view modes or mounting positions. For V8.5.0.0, the CPU usage required to process fisheye images varies with different mounting positions and view modes. Here we only list the V8.5.0.0 data obtained with 360 Degree Mode, Wall Mount for comparison.

The maximum total frame rate is limited by the capacity of the CPU and VGA card. As shown in the tables above, the number of frames supported GV-System V8.5.6.0 is increased when an external graphics card and a high-end CPU such as Core i7 are used. When comparing the data for GV-System V8.5.6.0 and V8.5.0.0, we can see that the total frame rate supported by GV-System V8.5.6.0 is much higher.

4. Maximum Number of Channels Supported by GV-System V8.5.6.0

The Windows operating system has memory limits for programs running under it. Different memory limits on 32-bit and 64-bit Windows will restrict the number of IP cameras you can connect to the GV-System.

The following table lists the maximum number of fisheye channels that can be supported by GV-System V8.5.6.0 based on memory limitation.

Resolution	Codec	OS	Total channels supported (CH)	
			Built-in VGA	External VGA
1.3 MP (1280 x 1024)	H.264	64-bit	20	32
		32-bit	19	
	MJPEG	64-bit	32	
		32-bit	21	
	MPEG4	64-bit	32	
		32-bit	19	
2 MP (1440 x 1376)	H.264	64-bit	10	32
		32-bit	15	
	MJPEG	64-bit	32	
		32-bit	17	
4 MP (2048 x 1944)	H.264	64-bit	21	
		32-bit	9	
	MJPEG	64-bit	25	
		32-bit	12	
5 MP (2560 x 1920)	H.264	64-bit	18	
		32-bit	8	
	MJPEG	64-bit	23	
		32-bit	10	

Note: The test data is obtained using the following conditions:

- Frame rate limited to 2 fps per channel
- 360 Degree view mode with “Auto Pan” function disabled
- 32-screen divisions with GV-System’s panel resolution set to 1600 x 1200

The total channel supported by GV-System V8.5.6.0 is separated into built-in VGA and external VGA, because **GPU decoding** is enabled when using a built-in VGA card, H.264 codec and 1.3 / 2 MP resolution. Although GPU decoding enhances performance and reduces CPU usage, it requires more memory and thus decreases the number of channels supported based on memory limitation. When using an external VGA card, GPU decoding is not supported and GV-System can dewarp more fisheye channels.

Note: From GV-System V8.5 or later, **GPU decoding** is introduced to process the video, which lowers the CPU loading and increases the total frame rate supported. However, GPU video decoding is only supported by Intel Sandy Bridge and Ivy Bridge chipsets, and does not support external VGA cards and resolution higher than 4 MP.

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5. Conclusion

The GV-System can support higher frame rate for fisheye dewarping when using higher-end CPUs, 64-bit Windows and external VGA cards. With GPU dewarping, GV-System V8.5.6.0 can process more frames per second than GV-System V8.5.0.0. To increase the number of fisheye channels supported, you can lower the frame rate per channel to avoid overloading the CPU. On the other hand, if you wish to increase the frame rate for each fisheye channel, you can decrease the number of GV-Fisheye Cameras connected.

6. Testing Environment

The PC specifications used for testing GV-System V8.5.6.0 are listed below:

Core i7 – 3770k

OS	64-bit or 32-bit Windows 7
Motherboard	MSI ZH77A-G43
CPU	i7 3770K 3.9GHz
Chipset	Intel P43
RAM	DDR3 4GB x 2
Built-in VGA & Driver	Intel HD4000, Driver: 8.15.10.2696
External VGA & Driver	NVIDIA GTS 250, Driver: 306.97
GV-System Version	V8.5.6.0

Core i5 – 3570k

OS	64-bit or 32-bit Windows 7
Motherboard	ASUS P8Z77-V-LX
CPU	i5 3570K 3.8GHz
Chipset	Intel H61
RAM	DDR3 4GB x 2
Built-in VGA & Driver	Intel HD4000, Driver: 8.15.10.2696
External VGA & Driver	NVIDIA GTS 250, Driver: 306.97
GV-System Version	V8.5.6.0

Core i3 – 2120k

OS	64-bit or 32-bit Windows 7
Motherboard	Gigabyte GA-H61M-USB3-B3
CPU	i3 2120K 3.3GHz
Chipset	Intel H61
RAM	DDR3 4GB x 2
Built-in VGA & Driver	Intel HD2000, Driver: 8.15.10.2696
External VGA & Driver	NVIDIA GTS 250, Driver: 306.97
GV-System Version	V8.5.6.0