

Technical Note

Pixel Format Alignments for GigE Vision

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This technical note illustrates the alignment of pixel formats supported by JAI GigE Vision cameras.

This documentation is useful when decoding the RAW image file. For example, if you have saved a RAW image file using eBUS SDK, you will need to decode the RAW image file when loading the file again. To do so, you need the pixel format alignment information output from the JAI camera.

In this technical note, the following pixel format alignments are illustrated:

- **Monochrome:**

- Mono8, Mono10, Mono12, Mono10Packed, Mono12Packed

- **Color:**

- BayerRG8, BayerRG10, BayerRG12, BayerRG10Packed, BayerRG12Packed
- BayerGR8, BayerGR10, BayerGR12, BayerGR10Packed, BayerGR12Packed
- BayerGB8, BayerGB10, BayerGB12, BayerGB10Packed, BayerGB12Packed
- BayerBG8, BayerBG10, BayerBG12, BayerBG10Packed, BayerBG12Packed
- RGB8, RGB10, RGB12, RGB10V1Packed, RGB10p32, RGB12V1Packed
- YUV422_8_UYVY, YUV422_8



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1. Monochrome Pixel Formats

1.1 Mono8, Mono10, Mono12

Note: Y_{11} = Y on row 1, column 1; Y_{12} = Y on row 1, column 2; Y_{21} = Y on row 2, column 1.

Mono8		Mono10 and Mono12	
Byte 0		Byte 1	Byte 0
msb	lsb	msb	lsb
Y ₁₁		Y ₁₁	
Y ₁₂		Y ₁₂	
Y ₁₃		Y ₁₃	
Y ₁₄		Y ₁₄	
...		...	
Y ₂₁		Y ₂₁	
...		...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

1.2 Mono10Packed, Mono12Packed

Notes:

- Y1 and Y2: Two 12-bit or 10-bit components.
- Y_{11} = Y on row 1, column 1; Y_{12} = Y on row 1, column 2; Y_{21} = Y on row 2, column 1.

Mono10Packed			Mono12Packed		
Byte 2	Byte 1	Byte 0	Byte 2	Byte 1	Byte 0
msb		lsb	msb		lsb
9 8 7 6 5 4 3 2	x x 1 0 x x 1 0	9 8 7 6 5 4 3 2	11 10 9 8 7 6 5 4	3 2 1 0 3 2 1 0	11 10 9 8 7 6 5 4
Y2	Y2 Y1	Y1	Y2	Y2 Y1	Y1

Byte 2	Byte 1	Byte 0
msb		lsb
Y ₁₂ / Y ₁₁		
Y ₁₄ / Y ₁₃		
...		

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

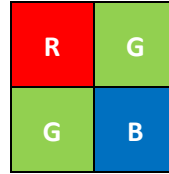


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2. Color Pixel Formats

2.1 BayerRG8, BayerRG10, BayerRG12



BayerRG 2x2 Tile

Note: R_{11} = R on row 1, column 1; G_{12} = G on row 1, column 2; G_{21} = G on row 2, column 1.

BayerRG8				BayerRG10 and BayerRG12			
Byte 0				Byte 1		Byte 0	
msb		lsb		msb		lsb	
		R ₁₁				R ₁₁	
		G ₁₂				G ₁₂	
		R ₁₃				R ₁₃	
		G ₁₄				G ₁₄	
		...				...	
		G ₂₁				G ₂₁	
		B ₂₂				B ₂₂	
		...				...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.2 BayerRG10Packed, BayerRG12Packed

Notes:

- C1 and C2: Two 12-bit or 10-bit color components.
- R_{11} = R on row 1, column 1; G_{12} = G on row 1, column 2; G_{21} = G on row 2, column 1.

BayerRG10Packed						BayerRG12Packed					
Byte 2		Byte 1		Byte 0		Byte 2		Byte 1		Byte 0	
msb				lsb		msb				lsb	
9 8 7 6 5 4 3 2		x x 1 0 x x 1 0		9 8 7 6 5 4 3 2		11 10 9 8 7 6 5 4		3 2 1 0 3 2 1 0		11 10 9 8 7 6 5 4	
C2		C2		C1		C2		C2		C1	

Byte 2		Byte 1		Byte 0	
msb				lsb	
				G ₁₂ / R ₁₁	
				G ₁₄ / R ₁₃	
				...	
				B ₂₂ / G ₂₁	
				...	

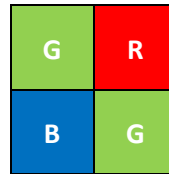
Source: AIA (2020). GigE Vision® Appendix – Pixel Formats



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2.3 BayerGR8, BayerGR10, BayerGR12



BayerGR 2x2 Tile

Note: G_{11} = G on row 1, column 1; R_{12} = R on row 1, column 2; B_{21} = B on row 2, column 1.

BayerGR8		BayerGR10 and BayerGR12	
Byte 0		Byte 1	Byte 0
msb	lsb	msb	lsb
G ₁₁		G ₁₁	
R ₁₂		R ₁₂	
G ₁₃		G ₁₃	
R ₁₄		R ₁₄	
...		...	
B ₂₁		B ₂₁	
G ₂₂		G ₂₂	
...		...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.4 BayerGR10Packed, BayerGR12Packed

Notes:

- C1 and C2: Two 12-bit or 10-bit color components.
- G_{11} = G on row 1, column 1; R_{12} = R on row 1, column 2; B_{21} = B on row 2, column 1.

BayerGR10Packed			BayerGR12Packed		
Byte 2	Byte 1	Byte 0	Byte 2	Byte 1	Byte 0
msb		lsb	msb		lsb
9 8 7 6 5 4 3 2	x x 1 0 x x 1 0	9 8 7 6 5 4 3 2	11 10 9 8 7 6 5 4	3 2 1 0 3 2 1 0	11 10 9 8 7 6 5 4
C2	C2 C1	C1	C2	C2 C1	C1

Byte 2	Byte 1	Byte 0
msb		lsb
R ₁₂ / G ₁₁		
R ₁₄ / G ₁₃		
...		
G ₂₂ / B ₂₁		
...		

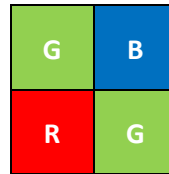
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2.5 BayerGB8, BayerGB10, BayerGB12



BayerGB 2x2 Tile

Note: G_{11} = G on row 1, column 1; B_{12} = B on row 1, column 2; R_{21} = R on row 2, column 1.

BayerGB8	BayerGB10 and BayerGB12	
Byte 0	Byte 1	Byte 0
msb	msb	lsb
G ₁₁	G ₁₁	G ₁₁
B ₁₂	B ₁₂	B ₁₂
G ₁₃	G ₁₃	G ₁₃
B ₁₄	B ₁₄	B ₁₄
...	...	...
R ₂₁	R ₂₁	R ₂₁
G ₂₂	G ₂₂	G ₂₂
...	...	...

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.6 BayerGB10Packed, BayerGB12Packed

Notes:

- C1 and C2: Two 12-bit or 10-bit color components.
- G_{11} = G on row 1, column 1; B_{12} = B on row 1, column 2; R_{21} = R on row 2, column 1.

BayerGB10Packed			BayerGB12Packed		
Byte 2	Byte 1	Byte 0	Byte 2	Byte 1	Byte 0
msb		lsb	msb		lsb
9 8 7 6 5 4 3 2	x x 1 0 x x 1 0	9 8 7 6 5 4 3 2	11 10 9 8 7 6 5 4	3 2 1 0 3 2 1 0	11 10 9 8 7 6 5 4
C2	C2 C1	C1	C2	C2 C1	C1

Byte 2	Byte 1	Byte 0
msb		lsb
B ₁₂ / G ₁₁		
B ₁₄ / G ₁₃		
...		
G ₂₂ / R ₂₁		
...		

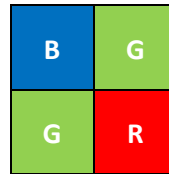
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2.7 BayerBG8, BayerBG10, BayerBG12



BayerBG 2x2 Tile

Note: B_{11} = B on row 1, column 1; G_{12} = G on row 1, column 2; G_{21} = G on row 2, column 1.

BayerBG8		BayerBG10 and BayerBG12	
Byte 0		Byte 1	Byte 0
msb	lsb	msb	lsb
B ₁₁		B ₁₁	
G ₁₂		G ₁₂	
B ₁₃		B ₁₃	
G ₁₄		G ₁₄	
...		...	
G ₂₁		G ₂₁	
R ₂₂		R ₂₂	
...		...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.8 BayerBG10Packed, BayerBG12Packed

Notes:

- C1 and C2: Two 12-bit or 10-bit color components.
- B_{11} = B on row 1, column 1; G_{12} = G on row 1, column 2; G_{21} = G on row 2, column 1.

BayerBG10Packed			BayerBG12Packed		
Byte 2	Byte 1	Byte 0	Byte 2	Byte 1	Byte 0
msb		lsb	msb		lsb
9 8 7 6 5 4 3 2	x x 1 0 x x 1 0	9 8 7 6 5 4 3 2	11 10 9 8 7 6 5 4	3 2 1 0 3 2 1 0	11 10 9 8 7 6 5 4
C2	C2 C1	C1	C2	C2 C1	C1

Byte 2	Byte 1	Byte 0
msb		lsb
G ₁₂ / B ₁₁		
G ₁₄ / B ₁₃		
...		
R ₂₂ / G ₂₁		
...		

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats



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2.9 RGB8, RGB10, RGB12

Note: R_{11} = R on row 1, column 1; G_{11} = G on row 1, column 1; R_{21} = R on row 2, column 1.

RGB8		RGB10 and RGB12	
Byte 0		Byte 1	Byte 0
msb	lsb	msb	lsb
R ₁₁		R ₁₁	
G ₁₁		G ₁₁	
B ₁₁		B ₁₁	
R ₁₂		R ₁₂	
G ₁₂		G ₁₂	
B ₁₂		B ₁₂	
...		...	
...		...	
R ₂₁		R ₂₁	
G ₂₁		G ₂₁	
B ₂₁		B ₂₁	
...		...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.10 RGB10V1Packed

Notes:

- R, G, B: 10-bit color components.
- R_{11} = R on row 1, column 1; G_{12} = G on row 1, column 2; R_{21} = R on row 2, column 1.

RGB10V1Packed			
Byte 3	Byte 2	Byte 1	Byte 0
msb			lsb
9 8 7 6 5 4 3 2	9 8 7 6 5 4 3 2	9 8 7 6 5 4 3 2	x x 1 0 1 0 1 0
R	G	B	B G R

Byte 3	Byte 2	Byte 1	Byte 0
msb			lsb
R ₁₁ / G ₁₁ / B ₁₁			
R ₁₂ / G ₁₂ / B ₁₂			
...			
R ₂₁ / G ₂₁ / B ₂₁			
...			

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats



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2.11 RGB10p32

Note: R_{11} = R on row 1, column 1; G_{12} = G on row 1, column 2; R_{21} = R on row 2, column 1.

RGB10p32			
Byte 3	Byte 2	Byte 1	Byte 0
msb			lsb
B ₁₁ / G ₁₁ / R ₁₁			
B ₁₂ / G ₁₂ / R ₁₂			
...			
B ₂₁ / G ₂₁ / R ₂₁			
...			

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

2.12 RGB12V1Packed

Notes:

- C1 and C2: Two 12-bit color components.
- R_{11} = R on row 1, column 1; G_{12} = G on row 1, column 2

RGB12V1Packed		
Byte 2	Byte 1	Byte 0
msb		lsb
11 10 9 8 7 6 5 4	3 2 1 0 3 2 1 0	11 10 9 8 7 6 5 4
C2	C2 C1	C1

Byte 2	Byte 1	Byte 0
msb		lsb
G ₁₁ / R ₁₁		
R ₁₂ / B ₁₁		
B ₁₂ / G ₁₂		
...		

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

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2.13 YUV422_8_UYVY, YUV422_8

Note: Y_{11} = Y on row 1, column 1; U_{11} = U on row 1, column 1; Y_{21} = Y on row 2, column 1.

YUV422_8_UYVY		YUV422_8	
Byte 0		Byte 0	
msb	lsb	msb	lsb
U ₁₁		Y ₁₁	
Y ₁₁		U ₁₁	
V ₁₁		Y ₁₂	
Y ₁₂		V ₁₁	
U ₁₃		Y ₁₃	
Y ₁₃		U ₁₃	
V ₁₃		Y ₁₄	
Y ₁₄		V ₁₃	
...		...	
U ₂₁		Y ₂₁	
Y ₂₁		U ₂₁	
V ₂₁		Y ₂₂	
Y ₂₂		V ₂₁	
...		...	

Source: AIA (2020). GigE Vision® Appendix – Pixel Formats

Revision History

Revision	Date	Changes
01	2023-12-26	Added RGB12V1Packed
00	2022-07-13	New release

