Grass Valley
Power of Choice

The complete guide to Grass Valley Cameras

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IMAGING SOLUTIONS OPTIMIZED TO REQUIREMENTS

IMAGERS FOR HD AND UHD FORMAT SUPPORT

Camera imagers for live broadcast applications face a variety of challenges and the optimal solution depends on the specific requirements of the video format chosen.

Larger pixels - as used in native HD mode - offer the best possible light sensitivity and the largest dynamic range

Smaller pixels - as required for native UHD operation - offer more resolution and image sharpness

Support for high-speed formats - with or without high spatial resolution - affects the signal bandwidth requirements that the imager must support

Since no imager can provide an optimized solution for all different formats, several different versions are required to achieve the best result for all types of applications.

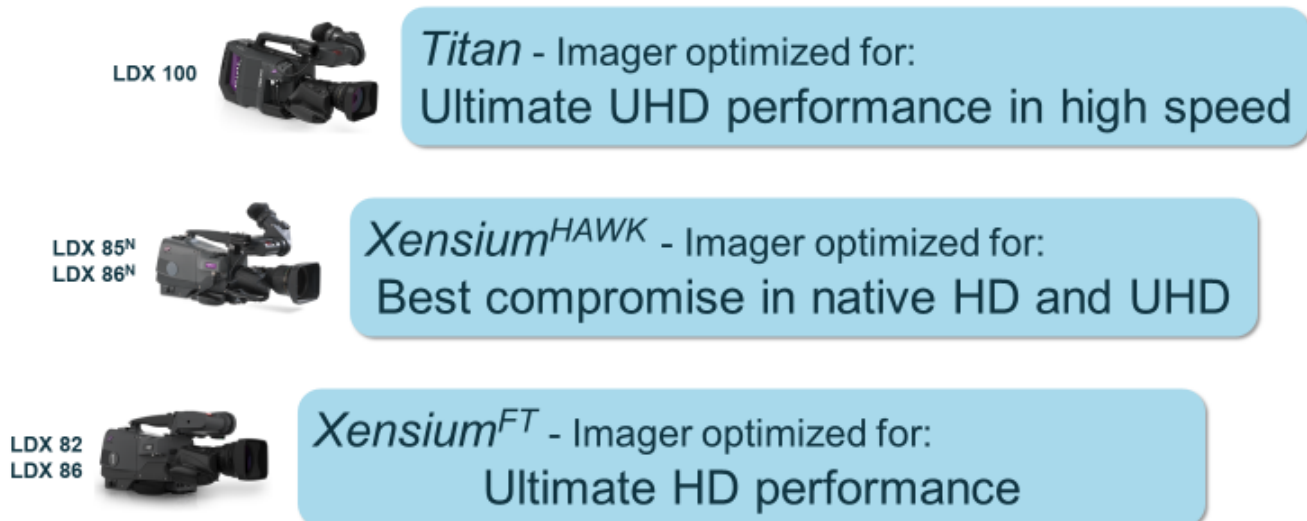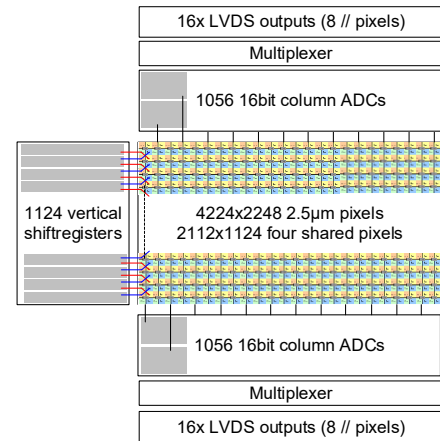Three different imagers are currently used in the cameras of the LDX series (Fig. 1).

Figure 1 – Imagers as used at the different LDX Series cameras

1. The Titan imager - used in the LDX 100 camera - supports native UHD resolution at up to three times the speed. As a result, a bandwidth of up to 58 Gbps must be supported, which requires many resources in the imager, all of which must be optimized in order to handle this excessive bandwidth.

| 16x LVDS outputs (8 // pixels) |
| Multiplexer |
| 1056 16bit column ADCs |

1124 vertical shiftregisters | 4224x2248 2.5µm pixels 2112x1124 four shared pixels

| 1056 16bit column ADCs |
| Multiplexer |
| 16x LVDS outputs (8 // pixels) |

2. The Xensium^{HAWK} imager - used in the LDX 85^N and LDX 86^N Series – is the only camera imager on the market that supports native UHD operation as well as native HD operation. A system called dynamic pixel management or DPM^{Ultra} enables the imager to combine the signal information of 4 UHD pixels into one HD pixel. This allows the camera to provide native UHD resolution when needed. However, it is also possible to use large HD pixels with the better sensitivity and dynamic range when only HD formats are required. In particular in HD high-speed operation, DPM^{Ultra} enables all native HD pixel information to be read out instead of having to skip 3 of 4 UHD pixels during the read out. Skipping over these pixels is required by other native UHD cameras.
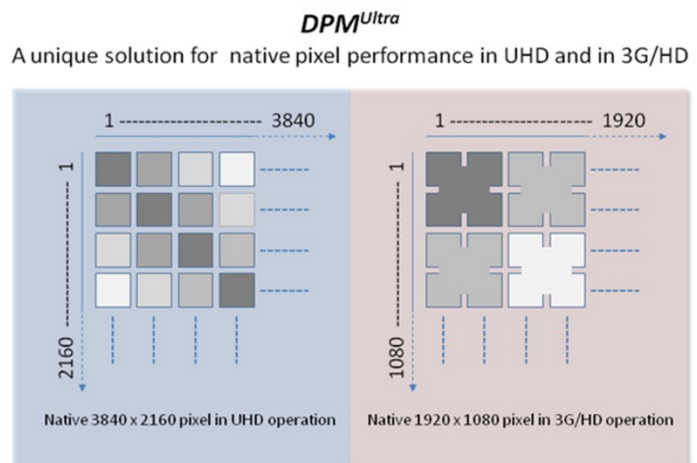

Figure 2 – DPM^{Ultra} for native UHD and native HD pixel operation

3. The Xensium^{FT} imager – used in the LDX 82 and LDX 86 Series – is optimized for both single-speed and high-speed HD applications. Their larger native HD pixels offer excellent sensitivity and a dynamic range greater than 15 stops, providing the best native HDR operation in all of today's industry standards.

FORMAT SUPPORT BY LDX SERIES CAMERAS

Depending on the video formats required and the possible high speed support, different cameras will offer the best solution. The following table (Fig. 3) shows the format and speed support of the various cameras in the LDX series.

	HD						UHD	
	720p	1080i	1080PsF	1080p	3x	6x	UHD	3x
LDX 82 Series								
LDX 82 Première	Native	Native	eLicense	eLicense	No	No	No	No
LDX 82 Elite	Native	Native	Native	eLicense	No	No	No	No
LDX 82 Worldcam*	Native	Native	Native	Native	No	No	No	No
LDX 86 Series								
LDX 86 Worldcam	Native	Native	Native	Native	eLicense	eLicense	eLicense	No
LDX 86 HighSpeed	Native	Native	Native	Native	Native	eLicense	eLicense	No
LDX 86 XtremeSpeed	Native	Native	Native	Native	Native	Native	eLicense	No
LDX 86 4K	Native	Native	Native	Native	eLicense	eLicense	Up-converted	No
LDX 86 Universe	Native	Native	Native	Native	Native	Native	Up-converted	No
LDX 85^N								
LDX 85^N	Down-converted	Down-converted	No	Down-converted	No	No	Native	No
LDX 86^N Series								
LDX 86^N Worldcam	Native	Native	Native	Native	eLicense	eLicense	eLicense	No
LDX 86^N HighSpeed	Native	Native	Native	Native	Native	eLicense	eLicense	No
LDX 86^N XtremeSpeed	Native	Native	Native	Native	Native	Native	eLicense	No
LDX 86^N 4K	Native	Native	Native	Native	eLicense	eLicense	Native	No
LDX 86^N Universe	Native	Native	Native	Native	Native	Native	Native	No
LDX 100 Series	LDX 100 Series format support depend on options loaded to the camera							
LDX 100	Down-converted	Down-converted	Down-converted	Down-converted	Down-converted	No	Native	Native

* Available as eLicense only

Figure 3 – Format support by the different LDX Series cameras

Note:

If a video format is supported as "Native":
> The best possible sensitivity and the best possible dynamic range with good resolution / image sharpness can be expected.

If a video format is supported as "Down-converted":
> The oversampling in the imager provides slightly improved resolution / sharpness, but the smaller pixels offer lower sensitivity and lower dynamic range

If a video format is supported as "Up-converted":
> The best possible sensitivity and dynamic range of the larger pixels can be achieved, but the resolution / image sharpness does not reach the same level as with the native support

FORMAT SUPPORT BY TRANSMISSION SYSTEMS

The various transmission solutions for the cameras of the LDX series support a large number of video formats as well as many different workflows and interfaces (Fig. 4).

	HD			UHD		I/O's	
	1.5G	**3G**	**3x/6x**	**12G**	**3x**	**Baseband**	**IP**
3G Transmission							
3G Triax XCU	Yes	Yes	No	No	No	Yes	No
3G Fiber XCU	Yes	Yes	No	No	No	Yes	No
XF Transmission							
XCU Universe XF	Yes	Yes	Yes	Yes	No	Yes	No
XCU Enterprise UXF	Yes	Yes	No	Yes	No	Yes	Yes
XCU Universe UXF	Yes	Yes	Yes	Yes	No	Yes	Yes
Operation with XF Transmission							
DirectIP							
DirectIP	Yes	Yes	Yes	Yes	No	XCU dependent	
DirectIP⁺	Yes	Yes	No	No	No	XCU dependent	
Operation without XCU							
NativeIP							
NativeIP	Yes	Yes	Yes	Yes	Yes	No	Yes

Figure 4 – Format and I/O support by the different transmission systems

Note:

All cameras of the LDX 8x series support all 3G and XF transmission solutions. The supported video formats depends on the capabilities of the camera head and the transmission system.

DirectIP and DirectIP⁺ are supported by every camera head in the LDX Series when used with XF transmission (Fig. 5).

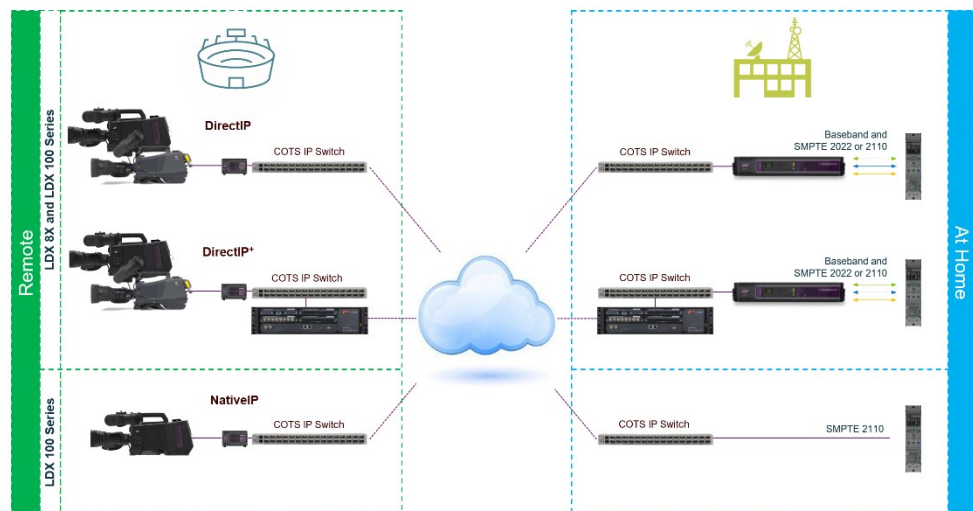NativeIP is only supported by LDX 100 Series cameras (Fig.5)

Figure 5 – DirectIP+ and NativeIP solutions

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LDX 86 Series								
LDX 86 Worldcam	Native	Native	Native	Native	eLicense	eLicense	eLicense	No
LDX 86 HighSpeed	Native	Native	Native	Native	Native	eLicense	eLicense	No
LDX 86 XtremeSpeed	Native	Native	Native	Native	Native	Native	eLicense	No
LDX 86 4K	Native	Native	Native	Native	eLicense	eLicense	Up-converted	No
LDX 86 Universe	Native	Native	Native	Native	Native	Native	Up-converted	No
LDX 85^N								
LDX 85^N	Down-converted	Down-converted	No	Down-converted	No	No	Native	No
LDX 86^N Series								
LDX 86^N Worldcam	Native	Native	Native	Native	eLicense	eLicense	eLicense	No
LDX 86^N HighSpeed	Native	Native	Native	Native	Native	eLicense	eLicense	No
LDX 86^N XtremeSpeed	Native	Native	Native	Native	Native	Native	eLicense	No
LDX 86^N 4K	Native	Native	Native	Native	eLicense	eLicense	Native	No
LDX 86^N Universe	Native	Native	Native	Native	Native	Native	Native	No
LDX 100 Series	LDX 100 Series format support depend on options loaded to the camera							
LDX 100	Down-converted	Down-converted	Down-converted	Down-converted	Down-converted	No	Native	Native

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FORMAT SUPPORT BY TRANSMISSION SYSTEMS

	HD			UHD		I/O's	
	1.5G	3G	3x/6x	12G	3x	Baseband	IP
3G Transmission							
3G Triax XCU	Yes	Yes	No	No	No	Yes	No
3G Fiber XCU	Yes	Yes	No	No	No	Yes	No
XF Transmission							
XCU Universe XF	Yes	Yes	Yes	Yes	No	Yes	No
XCU Enterprise UXF	Yes	Yes	No	Yes	No	Yes	Yes
XCU Universe UXF	Yes	Yes	Yes	Yes	No	Yes	Yes

Operation with XF Transmission

DirectIP

	1.5G	3G	3x/6x	12G	3x	Baseband	IP
DirectIP	Yes	Yes	Yes	Yes	No		XCU dependent
DirectIP+	Yes	Yes	No	No	No		XCU dependent

Operation without XCU

NativeIP

	1.5G	3G	3x/6x	12G	3x	Baseband	IP
NativeIP	Yes	Yes	Yes	Yes	Yes	No	Yes