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X-ray Time Delay Integration (TDI) CCD camera

Harrier

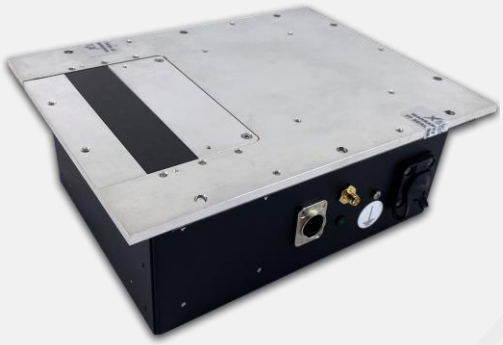
Time Delay Integration (TDI) is a special image acquisition method that is used for in-line inspection applications that require high-speed, high sensitivity and high resolution. XTI12848 TDI camera is designed for long life with a Fiber Optic Plate that separates the sensor from the X-Ray path. X-Scan Imaging can help users select the scintillator for specific applications. Pixels are 48 µm × 48 µm. Binning modes 48 µmX48 µm, 48X96 µm, 48X144 µm, etc. allow for imaging at higher speed with lower resolutions.

Key Features

High speed, resolution & sensitivity
Imaging with off-axis, fiber-optic design
User-select X-ray scintillating material GOS, CsI(Tl), CdWO4, etc.
A selection of lengths:

- 4 inches (2048 pixels)
- 9 inches (4608 pixels)
- 12 inches (6144 pixels)

Highly extended lifetimes
Camera Link (Base configuration) and GigE Vision interfaces
Flat field correction on Camera Link card
16-bit digitization and data output
100-240-V, 50-60-Hz power
Software development kit (SDK) with application programming interface (API)

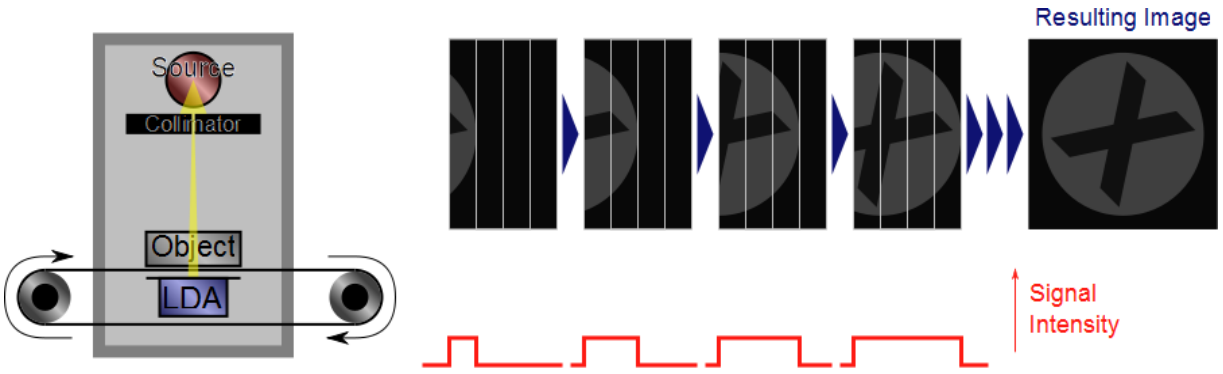


Applications

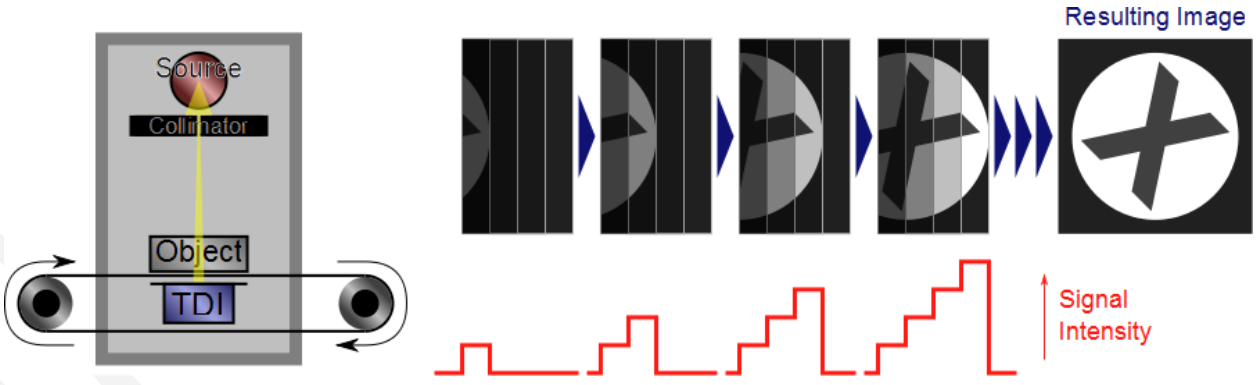
Battery Inspection
PCB/SMT inspection
Gauging
In-line Non-Destructive Testing (NDT)
High-energy x-ray, /160kV, /225kV, /320kV options available

Principal of operation

In the operation of both traditional Linear Diode Array (LDA) and TDI detectors, objects must be moving relative to the detectors. In an LDA, a single line of diodes collect signal. Once the object has past the diode line, no more signal is collected. A TDI device has multiple diode lines and the signal for each line can be passed to the next line. As the object passes over each line, each line collects signal and then passes the signal to the following line. After the object passes the final line, the full integrated signal is read out. When the TDI device is synchronized to the moving object, an image with higher resolution at lower light level is achieved. As a result, signal-to-noise ratio in TDI camera is much higher than that in a line-scan camera. Video LDA VS TDI



Traditional LDA Application



TDI Application

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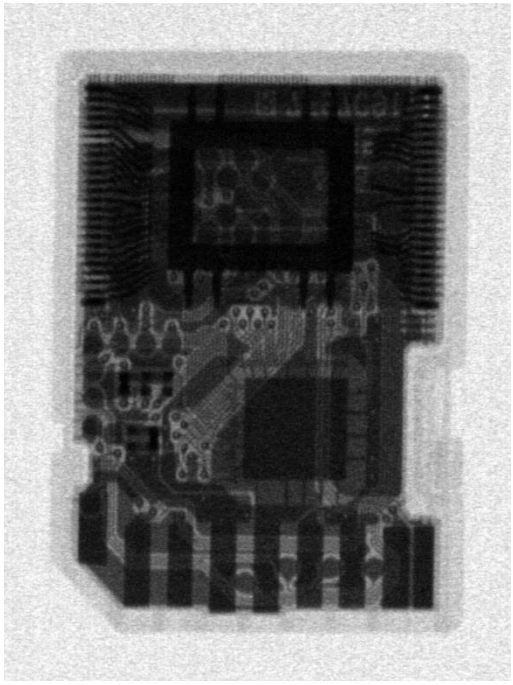
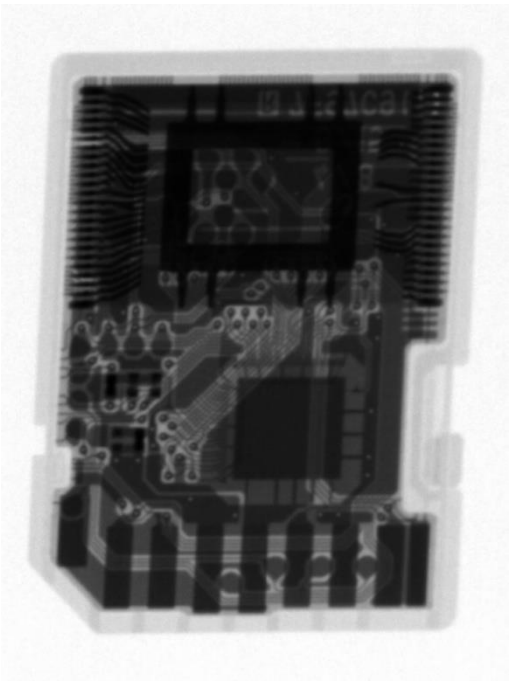
Comparison images

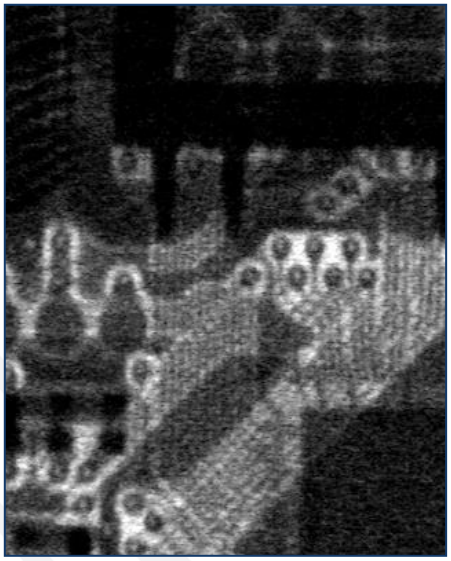
Radiographs of SD card using traditional LDA and XTI12848 TDI



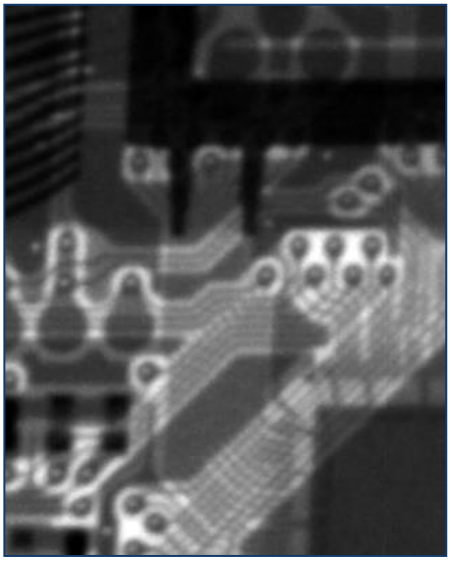
Traditional LDA (50um)



TDI (48um)



Traditional LDA zoomed-in view



TDI zoomed-in view (S/N improved 9X)

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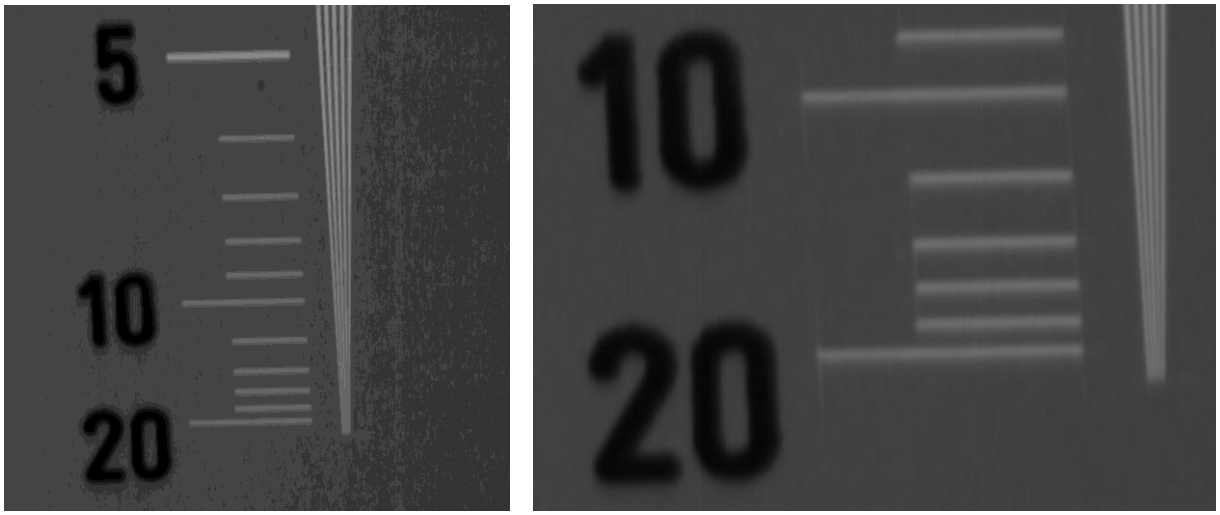
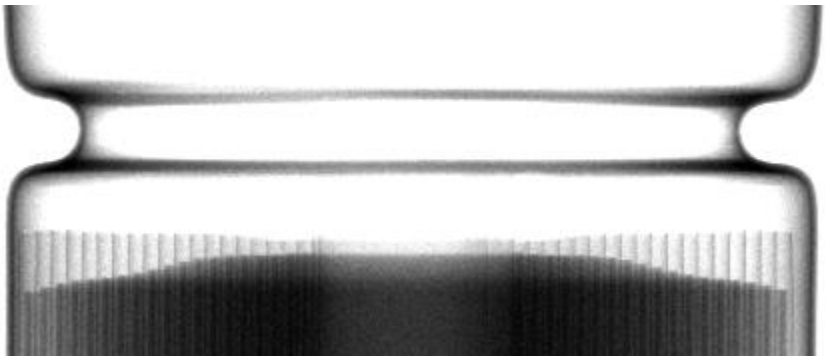
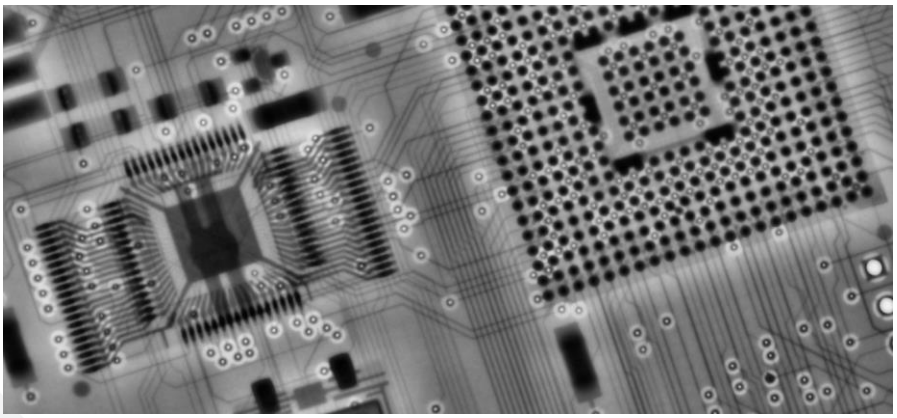
Resolution



TDI camera spatial resolution with 3.4× geometric magnification



Battery Cross Section



PCB Image

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Specifications

Model	XTI1H2848-004	XTIH12848-009	XTIH12848-012
TDI stages and number of pixels	2048 × 128	4608 x 128	6144 × 128
Pixel size	48 µm × 48 µm		
X-ray sensitive area	98 × 6.1 mm^2	221 × 6.1 mm2	295 × 6.1 mm^2
Maximum X-ray energy	320 kV		
CCD pixel clock	3 MHz		
TDI line rate	20kHz	20kHz	10kHz
A/D converter	16 bit		
Camera Link data rate	48 to 84 MHz[i]		
Power requirement	100–240 V, 50–60 Hz		
Power consumption	25 W	63 W	75 W
Readout direction	Bidirectional		
Selectable number of stages	32, 64, 96, 128		

[i] Camera Link data rate depends on exact camera configuration.

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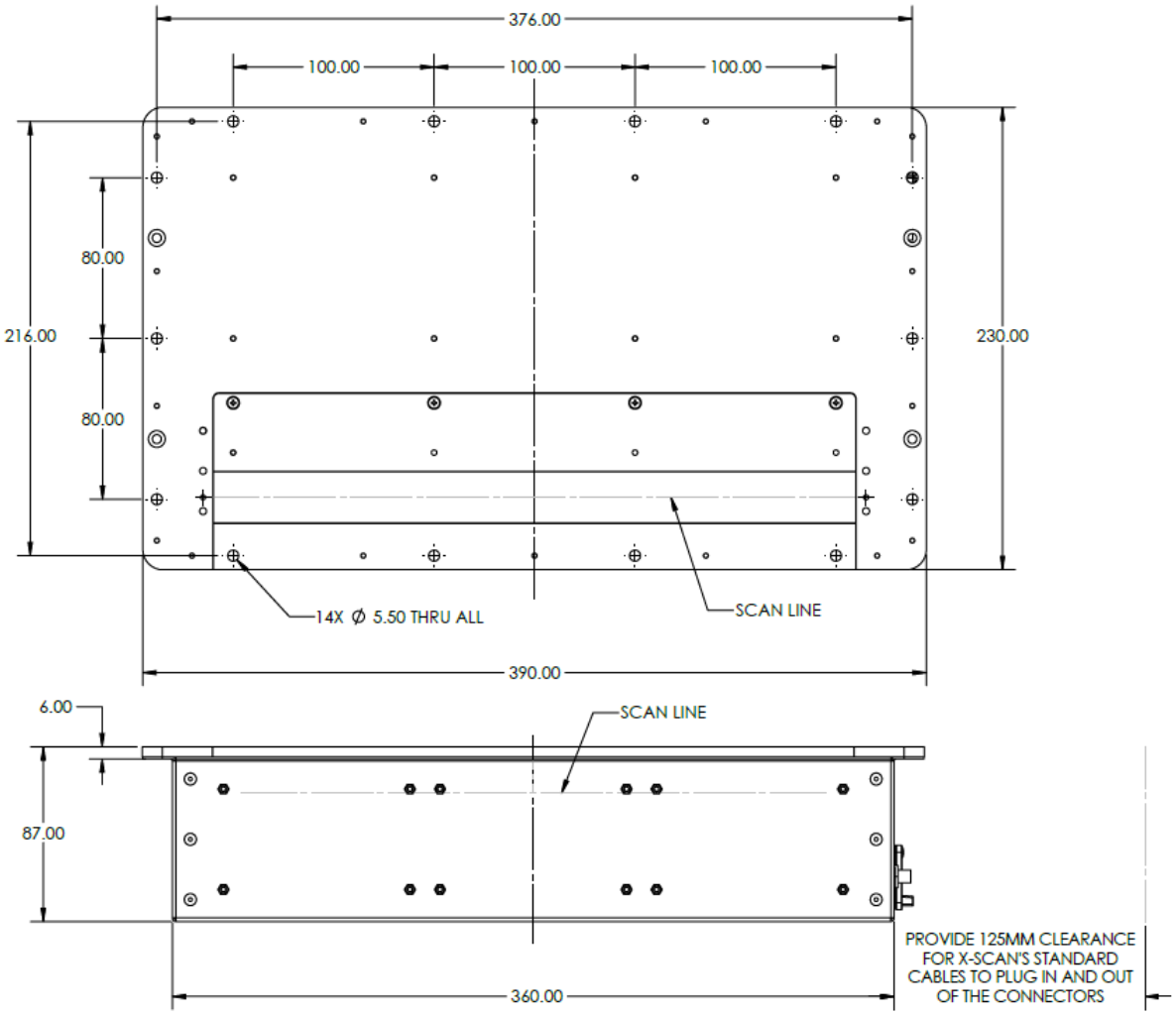
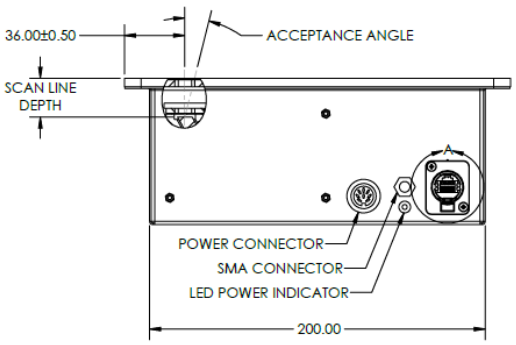
Mechanical Dimensions 12 Inch Detector (300mm)



Energy Rating (KV)	Scan Line Depth (mm)	Acceptance Angle
100	16.6 ± 0.4	23°
160	16.6 ± 0.4	23°
225	23.1 ± 0.6	15°
320	32.9 ± 0.9	11°



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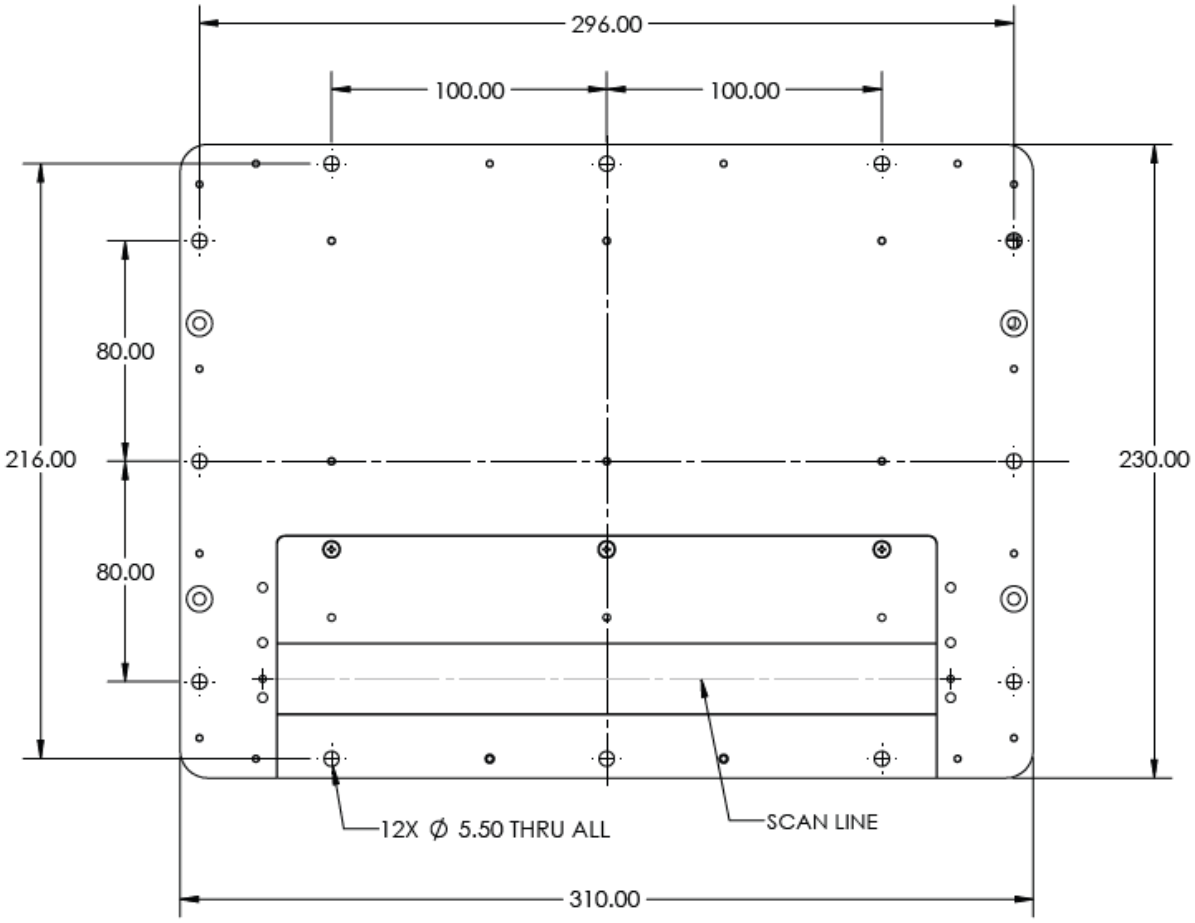
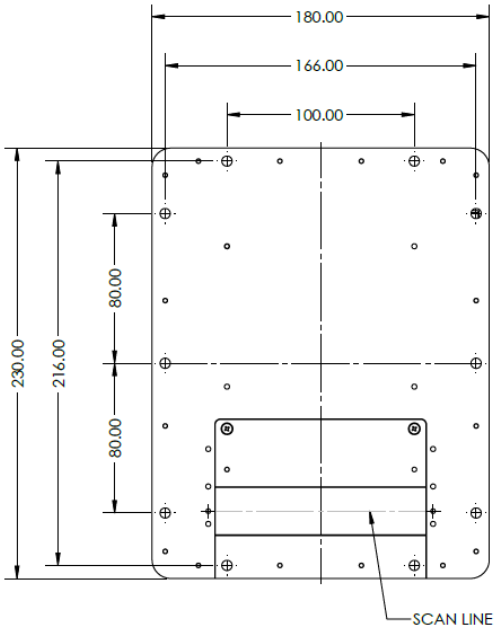
Mechanical Dimensions 9 inch and 4 Inch Detectors





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