

Wide Dynamic Range

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Introduction

Wide Dynamic Range (WDR) – what is it and how does it apply to everyday surveillance scenarios? In this web article, we're going to explain why dynamic range is a challenge and how it can be handled.

1. What is Dynamic Range?

Dynamic Range is the difference in light level between the darkest and the brightest spot in a given scene.



An overcast day with few shadows has a low dynamic range. No deep blacks and no extreme highlights. On a sunny day however, with really distinct shadows, there could be a big difference between the brightest and darkest areas, and this is called a wide dynamic range (WDR, also known as High Dynamic Range, or HDR.)



IP-camera without WDR capabilities



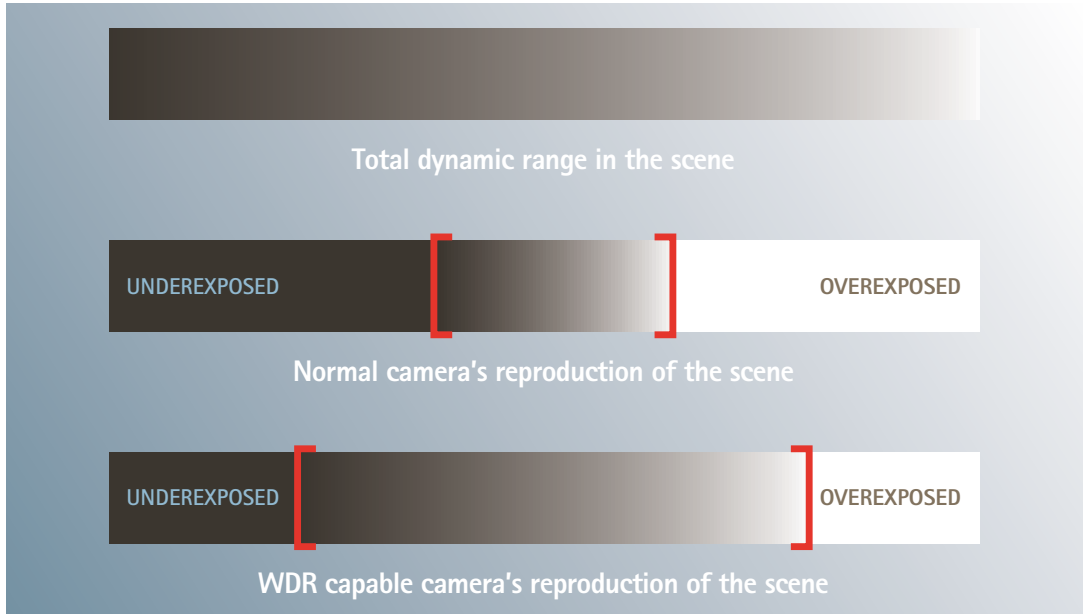
AXIS P3384-VE in WDR mode

In nature, there are dynamic ranges that extend further than the camera or the human eye can perceive. An example is when you take a photo of a person in front of a bright window. The camera could either expose the person properly, rendering the scene through the window all blown out, or prioritize showing what's outside the window leaving the person underexposed and dark. The dynamic range between the person and the scene outside is wider than the camera can handle.

2. WDR – Dynamic Contrast

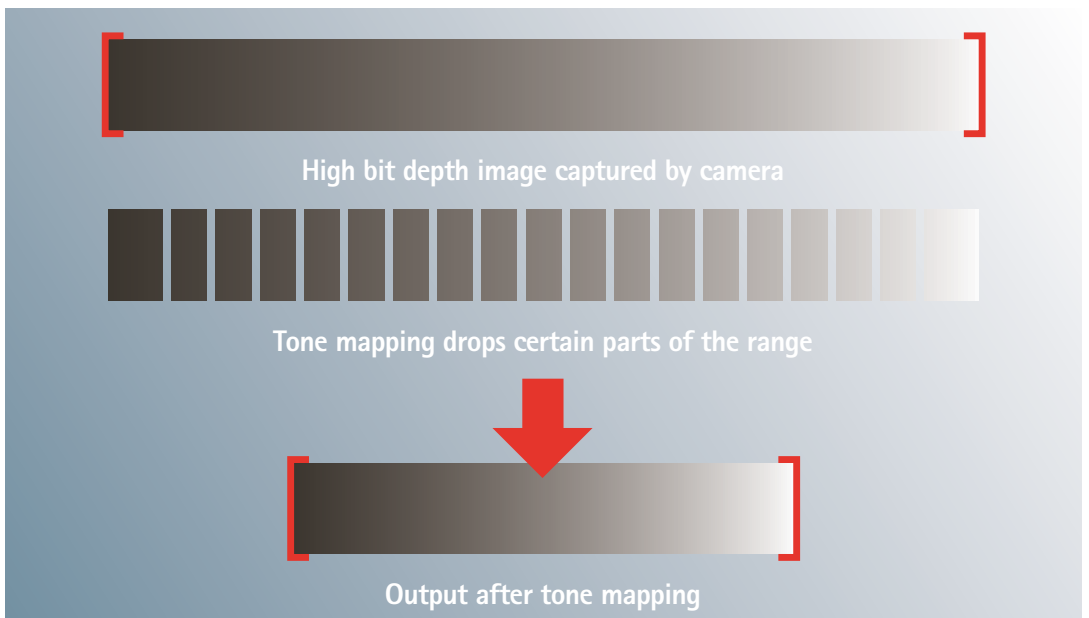
WDR (Wide Dynamic Range) is a technology where the camera's range is extended to cover a greater span between bright and dark areas in the image.

There are several ways to increase the dynamic range, and many solutions are used in combination to achieve the best result.



The simplest method is what we at Axis call Dynamic Contrast, a capability that is built-in in most of our cameras. By using Dynamic Contrast, the camera sensor captures an image with a higher bit depth, an internal property that translates to dynamic range, than what the camera ultimately can send out.

The camera then performs an advanced tone mapping, where some brightness levels are dropped to decrease the bit depth to a format that a computer screen can handle. In this tone mapping, both the darkest and the brightest parts are taken into account, resulting in more details on both ends.



There are two types of tone mapping. With Global Tone mapping, all pixels are handled in the same way, which means that the same levels are removed everywhere in the image. With Local Tone mapping, individual decisions are made for different regions in the image to decide which levels to remove. Local Tone mapping requires much more processor power, but gives a superior result.

3. WDR – Dynamic Capture

A totally different technology used to increase the range, is called Dynamic Capture.

Here, the camera takes several images in fast sequence with a different exposure level for each image. These pictures are then combined in a composite, where both the brightest and the darkest parts are kept.



This image has a much higher bit depth, higher than a computer screen can handle. Therefore, a tone mapping needs to be applied just as with Dynamic Contrast.

Shooting several images in the time span normally used for one image requires an extremely fast and sensitive sensor. The WDR output however is superior. This technology exists today in some Axis cameras.

4. WDR – Forensic Capture

WDR – Forensic Capture is Axis' most advanced imaging technology.

Many years of research and development for optimizing images for surveillance have now resulted in WDR – Forensic Capture, built-in in our latest and most advanced cameras. This method applies a set of advanced algorithms to lower noise levels and increase the image signal to display every single detail in the scene in the best possible way.

The result is video that is highly optimized for forensic purposes, ensuring all details are captured in dark and bright areas at the same time – even in scenes with very complex lighting conditions.

Furthermore, Axis cameras with WDR – Forensic Capture provide the ability to seamlessly transition between WDR and low-light mode. In comparison with current WDR technology used in the industry, this new technology makes it easier to detect and identify important details in a scene.

For better understanding, compare the level of detail in the two different images below.



Camera without WDR – Forensic Capture applied

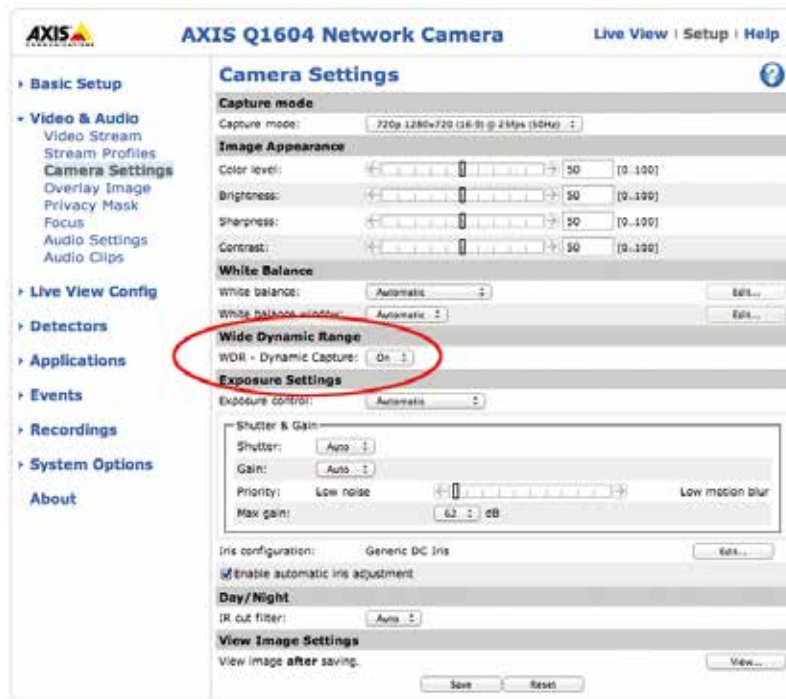


Camera with WDR – Forensic Capture applied

5. Summary

If you have scenes with big differences between brightness and darkness, make sure to check that you have activated the WDR capability in your camera.

This capability can make huge difference. For demanding scenarios you might have to use a camera with advanced WDR capability, such as Dynamic Capture or WDR – Forensic Capture.



The screenshot displays the web interface for an AXIS Q1604 Network Camera. The page title is "AXIS Q1604 Network Camera" and it includes links for "Live View", "Setup", and "Help". A left-hand navigation menu lists various settings categories: Basic Setup, Video & Audio, Camera Settings (highlighted), Live View Config, Detectors, Applications, Events, Recordings, System Options, and About. The main content area is titled "Camera Settings" and contains several sections: "Capture mode" (720p 1280x720 (16:9) @ 25fps (30Hz)), "Image Appearance" (Color level, Brightness, Sharpness, Contrast, all at 50), "White Balance" (Automatic), "Wide Dynamic Range" (WDR - Dynamic Capture: On), "Exposure Settings" (Automatic), "Shutter & Gain" (Shutter: Auto, Gain: Auto, Priority: Low noise, Max gain: 62 dB), "Iris configuration" (Generic DC Iris, Enable automatic iris adjustment checked), "Day/Night" (IR cut filter: Auto), and "View Image Settings" (View image after saving). A red circle highlights the "WDR - Dynamic Capture" dropdown menu, which is currently set to "On". At the bottom of the settings page are "Save" and "Reset" buttons.

About Axis Communications

As the market leader in network video, Axis is leading the way to a safer, smarter, more secure world — driving the shift from analog to digital video surveillance. Offering network video solutions for professional installations, Axis' products and solutions are based on an innovative, open technology platform.

Axis has more than 1,400 dedicated employees in 40 locations around the world and cooperates with partners covering 179 countries. Founded in 1984, Axis is a Sweden-based IT company listed on NASDAQ OMX Stockholm under the ticker AXIS. For more information about Axis, please visit our website www.axis.com.