

HD Resolution Solutions

The video surveillance industry is in full swing on changing over from traditional analog video systems to IP video systems. Once the decision is made to change to IP video, another decision point that is quickly apparent is whether to continue to use standard definition (SD) or high definition (HD) video cameras.

In the consumer market for TVs and digital cameras, this is an easy decision to make because very few, if any, Standard Definition products are even being offered any longer. But in the Video Surveillance world, this decision is not so obvious, as SD video has been the traditional choice as a carry-over from the analog days.

The benefits of using HD and Megapixel cameras over SD cameras in Video Surveillance applications has been a subject of debate, as the perceived price premium of the HD/Megapixel cameras cancelled out the benefits.

This white paper demonstrates these benefits to assist you in making an educated decision on this choice.

There are three general areas where HD has superior benefits over SD camera technology. These are:

- Reduce your total system equipment requirements – reducing overall costs,
- Improve the system's image quality and details – providing added performance and value, and
- Increase how far you can see – extending system capabilities.

CohuHD has designed our product line to leverage the characteristics of high definition imaging for short, medium, and ultra long-range surveillance applications. CohuHD's product line offers flexibility in very wide angle lens options and very powerful high magnification HD lenses and cameras.

Short Range Surveillance Solutions

One advantage of high definition cameras for short range surveillance is that you can use fewer cameras to cover the same area as compared to standard definition cameras, and still maintain equivalent image details. The result is to use fewer cameras without sacrificing conventional image detail and quality.

As a rule of thumb, you can generally use 66% fewer HD 1080p cameras as compared to standard definition cameras and cover the same area with the same amount of detail (with 720p HD cameras, it is approximately 50% fewer cameras). This has immediate benefits in reducing equipment requirements.

Below is an illustration of how a CohuHD 7500 Series 1080p HD camera can reduce the quantity of standard definition cameras required.

Let's assume the viewing requirement is to cover an area 120 ft. wide at a distance of 100 ft. from the camera. The image detail requirement is 16 pixels per foot (regarded as general surveillance detail).

For a standard definition camera, the horizontal resolution is 640 pixels. The requirement is 16 pixels to cover one foot of area (at 100 ft. from camera).

To calculate the horizontal field of view that will provide 16 pixels per foot is simple. Divide the camera resolution by the pixels per foot you require. This will result in a number that is the horizontal field of view in feet, 40 ft. in this example.

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Using a standard definition camera, a lens that provides a 40 ft. HFOV at 100 ft. from the camera is required. When using a standard 1/3" sensor camera, this results in a 12mm lens (refer to a CCTV calculator to determine this).

One standard definition camera will cover 40 ft. I need to cover 120 ft., so three standard definition cameras, properly aimed, will cover the 120 ft. wide area, providing the 16 pixels per foot required for the desired detail resolution.

Consider an HD 1080p camera approach. Using the same concept, divide the horizontal resolution (1920 pixels) by the detail requirement (16 pixels per foot), which returns a value 120 ft.). Use a CCTV calculator to determine which lens provides a 120 ft. field of view at 100 ft. The result is a 4mm lens.

This example shows that a single 1080p HD camera covers the same area as three standard definition cameras, and provides the same level of detail.

Refer to the images below to see what the view from a single HD camera is compared to that from three standard definition cameras. Notice that the level of detail is similar between the HD and SD images, so this maintains image detail quality.

One (1) HD 1920 x 1080 camera with 4mm View

9960HD-30X 3.820 FT
12/21/12 08:06:52 AM



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Three (3) SD 640x480 cameras with 12mm view



CohuHD - HD Resolution for Short-Range Applications

CohuHD's video solutions for short-range viewing can produce up to 66% reduction in number of cameras compared to designs using standard definition cameras. This saves money in equipment, installation, and system programming costs, while improving system flexibility.

The performance standards of the 7500HD series are ideal for the requirements of security and traffic surveillance applications. Features include full HD resolution video of 1080p30 (1920x1080), H.264 and MJPEG video compression codecs, on-board SDHC recording, configurable image settings, and powerful event management processing. Designed with the installer in mind, an analog video output, along with remote back focus, makes installation easy. CohuHD's 7500^{HD} series of fixed position cameras have aesthetically pleasing packaging designs, and are available in box, indoor/outdoor dome, and outdoor housing formats, to address the most demanding video surveillance applications.

7500^{HD} Features

- HDTV 1080p30 Image Quality
- H.264 Base/Main Profile Video Compression
- RTP/RTSP Streaming Protocol
- Sensitive Day/Night Technology
- Pre-Post Event On-Board Recording using SDHC
- Flexible Event Management Programming
- Digital I/O Connections
- Power-over-Ethernet 802.3af Support
- Transmit Snapshots and Video to FTP Site
- Automated Event Timer with Snapshot Capture
- Web Configuration, Viewing and Control

Long-Range, High Resolution Solutions

CohuHD's product line offers the most advanced HD long-range surveillance capability on the market today. By combining HD resolution image sensors with powerful HD zoom optics, the ability to see farther is dramatically increased as compared to standard definition long-range camera systems. CohuHD's high resolution imaging technology is combined with high magnification HD zoom lenses that provide narrow angular fields of view.

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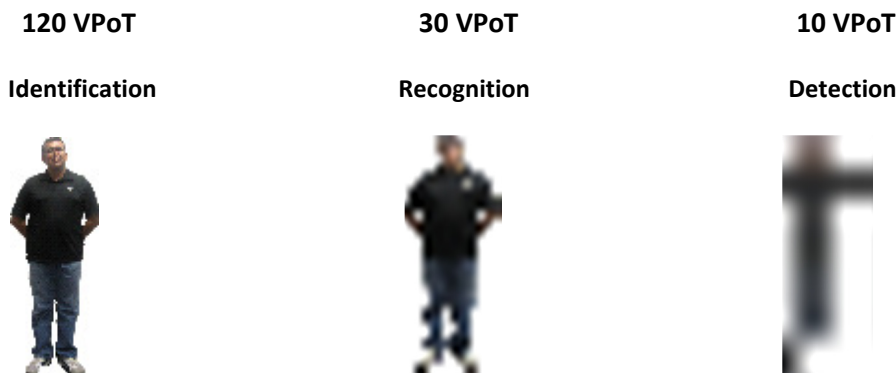
By comparison, CohuHD’s 8800HD Series delivers up to 6 times the pixel resolution and detail of traditional standard-definition long-range camera systems. With this exceptional resolution advantage, CohuHD video solutions achieve unprecedented viewing distances, unavailable at commercial prices until now. Refer to Chart 1 below for a comparison of various camera and lens system DRI values, to see the dramatic effects of high resolution long distance surveillance capabilities.

Chart 1. Detection, Recognition and Identification Distances

CohuHD Camera Solution	Image Resolution	Sensor Format	Zoom Optics	DRI Levels		
				ID	REC	DET
				120	30	10
3920SD, 3960SD	SD 480p	1/4"	35x (119mm)	1,060 ft	4,270 ft	13,650 ft
3920HD, 3960HD	HD 720p	1/3"	18x (84mm)	1,130 ft	4,560 ft	14,560 ft
3920HD, 3960HD	HD 720p	1/3"	30x (132mm)	1,770 ft	7,120 ft	22,730 ft
3920HD, 3960HD	HD 1080p	1/3"	20x (94mm)	1,850 ft	7,440 ft	23,760 ft
8800	SD 480p	1/2"	60x (750mm)	3,760 ft	15,150 ft	48,387 ft
8800HD	HD 720p	1/3"	55x (660mm)	7,310 ft	29,450 ft	94,050 ft
8800HD	HD 1080p	1/3"	55x (660mm)	10,960 ft	44,180 ft	141,000 ft
*8800HD	HD 1080p	1/3"	137.5x (1650mm)	27,895 ft	112,100 ft	358,721 ft

*Lens 2.5x extender inserted

The images below represent the amount of detail on a human target you could expect to observe under best case atmospheric conditions based on the Vertical Pixels on Target (VPoT) values indicated in the [chart 1](#). Chart 1.



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The POWER of HD resolution and High Magnification Zoom Lenses

A result that is clear from Chart 1 above is that cameras with **only** higher magnification lenses can not necessarily see farther. When comparing the SD 35x camera with the HD 720p 18x camera, you can see that, in fact, the 720p 18x camera, with almost half the optical zoom power, can actually see farther than the SD 35x camera.

Comparing the HD 720p 30x camera with the SD 35x camera, you can see that the higher resolution camera can see more than 1.5 times farther despite having less optical zoom power. Again, considering **only** optical zoom power would lead you to the wrong conclusion.

Ultra Long-Range Solutions

Now let's look at ultra long-range camera systems. When using 1080p image resolution and powerful 55x MP optics, the results are astounding, resulting in viewing distances almost 10 times farther than traditional standard definition 35x camera systems.

When comparing the 1080p 55x with standard definition 60x camera systems, the HD advantage still produces DRI distances 3 times farther than standard definition cameras fitted with a more powerful zoom lens. The benefits of seeing farther by using HD image resolution and powerful HD optical magnifications become obvious when looking at the DRI chart above.

Below is a comparison of HD cameras with 18x, 30x, 55x and 137.5x zoom optics at full zoom looking at a radio tower 5.1 miles from the camera location. Refer to the door in the bottom right image to gauge how a human would appear at 5.1 miles.

720p 18x Full Zoom



720p 30x Full Zoom



1080p 55x Full Zoom



1080p 55x Full Zoom with 2.5x Extender On



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Comparing the calculated DRI values in Chart 1 to the actual images captured above provides a reference point for subjective validation of the calculated distances.

How Far Can I Read a 3" Character?

The images below were captured by our 8800HD camera at a distance of 5,110 ft. from the camera. The letters on the red pole are 3" high, faded, worn and peeling (D O N A T I O N). The 8800HD camera was at full zoom 660mm with the 2.5x optical extender inserted (effective 1650mm focal length). This provides a field of view of approximately 18' (w) x 10' (h) at the sign post, as calculated by a lens FOV calculator. By calculation, a 3" character will have approximately 18 vertical pixels landing on it, which is in the range of general surveillance details. The answer to the question "How Far Can I Read a 3" Character?" using CohuHD's 8800HD camera system is 5,110 ft. This is just one example of what HD imaging combined with powerful HD zoom optics is capable of achieving.



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About Helios 8800HD Series : Ultra Long-Range HD Camera and Positioning System

CohuHD's 8800^{HD} Series combines full high-definition (HD) image resolution with high-powered HD performance lens optics for delivering unprecedented image quality and detail for ultra long-range surveillance applications in the visible spectrum.

In addition, the 8800^{HD} system delivers its high detail HD video across standard digital network infrastructures using H.264 image compression, requiring far less bandwidth than traditional MPEG4 or MJPEG requires. CohuHD's 8800^{HD} Series delivers up to 6 times the resolution and detail of traditional standard-definition long-range camera systems. With this exceptional performance, the 8800^{HD} is ideal for perimeter security, border patrol, and protecting airports, ports, and military, maritime, and other critical infrastructure environments.

8800^{HD} Features

- First ultra long-range high-definition, IP-connected positioner camera
- Powerful HD zoom magnification, up to 137x
- Industry's narrowest HAFOV with HD resolution, as low as 0.2 degrees
- Bore-sighted optics with programmable day/night focusing
- Greatest detection distances on the market, human-sized objects detected at up to 30 miles
- First long-range HD positioner camera with built-in H.264 compression and web server, operating over standard digital networks
- Precision positioning with speed range of 0.05 to 450 and with built-in brakes for stability
- Highest environmental standards: IP67, ASTM-B117, TS-2 Shock & Vibe, and MIL-STD-810F for salt/fog, immersion and sand/dust

CohuHD Product Line Philosophy

With decades of experience in design, manufacturing and deployment of tens of thousands of installed camera systems, CohuHD has proven its leadership in producing the highest quality ruggedized products, operating for years in the rigorous environments endured by camera systems used in critical infrastructure applications.

In addition to offering ruggedized and reliable products, CohuHD has extended its core focus to include many more capabilities in our overall solutions:

- High definition imaging
- Short range surveillance
- Ultra long-range surveillance
- Network/IP video streaming
- Hybrid/IP video and analog support
- Low light performance
- Image enhancement features
- End to end system solutions, including cameras, recording, control, and management
- 3rd party interoperability integration

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CohuHD is a leading manufacturer of video surveillance camera systems for use in mission-critical, sensitive environments. Integrating the latest video compression and High Definition IP technology into its innovative, rugged video cameras systems, CohuHD's line of high quality HD cameras, transmission equipment and management software can be found on the international space station, monitoring the busiest freeways and ports, military bases, U.S. Navy ships, oil refineries, nuclear reactors, mines, high value manufacturing sites, and other critical installations around the globe. For more information on CohuHD's products, please visit www.CohuHD.com.