

Digital Radiography FAQ

How does DR Digital work?

Direct digital radiography (DR) is based on CCD (Charge Couple Device) technology, but it is much faster. Like CCD, DR systems rely on a phosphor-like material, also known as a scintillator, to capture the x-rays. Rather than forming a latent image, DR images light up immediately. An extremely sensitive camera, more like the Hubble space telescope than your digital camera, records the light, digitizes it and sends it to the computer in seconds.

Why Choose DR over CR digital technology?

1. Workflow
2. Durability
3. Image Quality

1. Workflow

The difference is workflow. The workflow for CR is very similar to traditional film x-rays. To take a CR image, you must load a cassette, take it to the patient, expose the film, remove the film, return film to the processor and wait for the image to appear. CR processing is actually a bit slower than film processing. Many practitioners cite the slower workflow as a reason for choosing DR over CR technology.

DR workflow is completely different. Rather than the 6 steps mentioned above, the DR workflow only requires patient positioning, exposure, and viewing the film on the computer. Veterinarians don't need to let go of the patient to take an x-ray.

2. Durability

CR systems are fairly reliable, but their mechanical systems are very sensitive to contamination in a veterinary practice.

The most common and costly item to replace is the PSP plate that the CR system uses to capture the x-ray flux. These plates are especially sensitive to contamination from animal hair, meaning their lifespan is even shorter for veterinarians. Replacement plates cost roughly \$1,000 each. CR systems also rely on a plate reader that moves a scanning laser across the PSP plate. Precision is very important to accurate image collection and clogging of the reader is a common cause for service calls.

DR systems have no moving parts other than a cooling fan, which rarely comes into contact with patient or user. DR systems do rely heavily on a computer. Like all computers, data should be backed up regularly to avoid data loss.

3. Image Quality

In general, DR systems offer greater bit of depth, digitizing the image at 14 bits (16,384 shades of grey) or more. CR is often limited to 10 bits (1,024 shades of grey).

What is DICOM?

DICOM (or Digital Imaging and Communications in Medicine) is a standard developed by the American College of Radiology and the National Electrical Manufacturers Association. The standard was established

to meet the needs of manufacturers and users in the medical imaging equipment for the exchange of data on standard networks. Already accepted across all medical fields, DICOM simplifies the development for all types of medical imaging. “DICOM-compatibility” simply means that different users of different imaging devices will be able to smoothly exchange information. (More info at <http://medical.nema.org>)

What is a PACS system?

PACS (or Picture Archive and Communications System) is used by the radiology and diagnostic imaging industry to manage information and images electronically. The system is responsible for acquiring, transmitting, storing, retrieving, and displaying digital images and related patient information from a variety of imaging sources, and communicating the information over a network.

Do I need a PACS system?

This will depend on your clinic set-up. If you have a multi-doctor clinic with multiple viewing stations, it is best to have a PACS environment. Not only will the PACS help manage all of the patients’ files for the multiple doctors, it will also act as your image storage facility.

Do I need additional networking brought in my X-ray room?

You will need a network connection in your x-ray room for the “acquisition station” computer. This computer needs to be networked into the “Virtual Viewbox” workstation computer. This can be done as an independent connection that does not link in with any other networking or it can be linked in with an existing network. The main goal is for the two computers to communicate without interruption.

What about x-ray dose with digital imaging?

Digital images shown on many comparisons may appear to be excellent, but the dose used to create the image should be considered. In many cases the dose is outside of normal levels. In an image quality comparison by an independent reporting service, the InnoVet’s CCD receptor had one of the lowest dose requirements in the industry. With the Versa DR, you do not need an excessive dose to obtain a quality image.

Image Quality FAQ

What are the factors contributing to image quality?

Many veterinary professionals assume that picture quality is a function of the X-ray system alone. In fact, there are many contributing factors that determine image quality at every stage of the process.

Patient	X-Ray System	Technique	Camera	Processing	Display
Size	Waveform	KV	Resolution	Vendor Differences	Contrast Ratio
Density	Calibration	mAs	Sensitivity	Operator	Brightness
	Power	Focal Spot			Resolution
	Grid	Positioning			Size
	Attenuation				Grade
	Filtration				

What is Bit Depth?

Bit depth is a computer graphics term describing the number of bits used to represent the color of a single pixel in a bitmapped image or video frame buffer. This concept is also known as bits per pixel (bpp), particularly when specified along with the number of bits used. Higher color depth gives a broader range of distinct colors.

Bit Depth	Shades of Grey
0	1
1	2
2	4
3	8
4	16
5	32
6	64
8	128
10	256
12	512
14	1024
16	2048

What must an x-ray user do to achieve good, consistent radiographs?

To achieve good radiographs, the equipment must be used properly and consistently.

The correct body part and patient size is selected prior to exposure.

- SID is confirmed, as the position of the x-ray tube must change between table top and grid cabinet exposures.
- Placement of cassette (on table top or inside grid cabinet) is consistent with APR console display recommendations.
 - Exposure factors are very different when the grid is in the beam.

What impact does the APR console have on image consistency?

The APR console is designed so that exposure factors can be changed by the equipment user.

- To change the techniques, a record must be kept to determine what changes need to be made.
 - As images are taken, record the view, patient size, kVp, mAs and a description of resulting image (aka good/light/dark).
 - Once it is determined which images are good and which need adjustment, it can be determined what the technique changes should be.