

# DIGITAL IMAGING: WHAT ARE YOUR OPTIONS?

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## PART 3: CCD DR

In Part 2 of this series, we discussed the advantages and disadvantages of CR systems as the modality utilized to make the transition to digital imaging. Part three will focus on CCD based DR (or CCD DR) as an imaging modality for digital imaging.

As explained in Part 2 of this series, there are several definitions used for the various modes of digital imaging. For this series, CR is used to describe digital imaging achieved by the use of photostimulable plates used in a cassette. The term DR will be used to describe digital imaging in which the image receptor is non cassette based. This may be DR that is either CCD based (“CCD DR”) or Flat Panel based (Panel DR). In either of these systems, the x-ray exposure is made directly to the image receptor and it is not necessary for the technologists to handle an imaging plate or cassette.

### CCD DR

CCD based DR systems utilize a scintillator (intensifying screen), CCD chip and an optical system to capture the image and convert a light signal to an electrical signal. The details of this conversion process are beyond the scope of this article.

Like CR systems, CCD DR imaging offer many advantages when compared to conventional analog film-screen radiography. They may also offer advantages when compared to CR systems. These benefits include but are not limited to:

1. **Improved Efficiency:** Since imaging plates/cassettes are not utilized with CCD based DR systems, workflow efficiency is improved. This may be particularly useful in high volume situations.
2. **Image Display:** Typically, images are displayed in 4 to 10 seconds and the unit is ready for the next image. This compares to a 45 to 85 second cycle for image display and subsequent erasure of the image plate for CR.

CCD DR systems also have some disadvantages when compared to CR imaging:

1. **Utilize Existing Equipment:** Although some CCD based receptors may be retrofit into existing equipment, this is not true in all cases. Some CCD DR systems do not work well with older technology analog x-ray equipment. Care must be taken if attempting to retrofit a CCD based system with existing equipment to assure a successful transition. Also, the optics of the CCD system generally require more space than traditional image receptors. This may cause logistical issues depending on the specific room layout.

2. **Positioning Flexibility:** In general, CCD DR systems are fixed position and do not allow for cross table or table top exposures.
3. **Dose:** Exams that are done on table top with analog or CR systems are done “bucky” on CCD DR systems. This generally results in a higher dose to both patient and operator.
4. **Increased Image Noise:** Due to the logistics of the signal transformation, in general, CCD DR systems exhibit greater image “noise” relative to CR or Flat Panel DR systems.
5. **Image Format:** Some CCD based systems save image file in JPEG format. It is desirable to have studies saved in DICOM format to assure integration with other PACS components.

**Summary:** CCD based DR systems are a desirable option for those wishing to transition from analog to digital radiography and speed of image acquisition is of major concern. CCD based systems are less expensive than Flat Panel based DR systems but generally do not demonstrate the resolution of Flat Panel DR systems or CR systems.

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