1. ASRT Animation

2. Welcome

3. License Agreement

4. Objectives
After completing this module, you will be able to:

- Explain why quality control testing is important.
- Describe the quality control tests that are performed on photostimulable phosphor plates and flat-panel image receptors.
- Identify quality control tests that departments perform on image display monitors.
- Know the recommended frequency of quality control tests performed on components of a typical digital imaging system.

5. Introduction
In digital imaging, quality assurance is especially important for 2 reasons. First, human error happens with any system and it is important to differentiate between human error and equipment related issues. Second, breakdowns in the imaging chain generally happen slowly and subtly, not suddenly. Students, technologists, and managers are the first line of defense in ensuring that changes are identified and brought to the attention of QC technologists, medical physicists, and service engineers.

To fulfill this responsibility, technologists should understand the types of QC tests that are performed and recognize failure points in the imaging process. This knowledge helps assure that every patient receives the highest quality medical imaging examination possible. It is important to recognize that each facility’s protocol is the process that should be followed for all quality control testing.

6. Acceptance Testing
Like any type of radiographic equipment, a digital imaging system must be evaluated by a medical physicist before it can be put into daily use. This process is called “acceptance testing.” In the case of digital equipment, acceptance testing must be performed with the assistance of all personnel responsible for the equipment functioning properly. This group includes manufacturer representatives, biomedical engineers, the QC technologist, and the picture archiving and communications system, or PACS, administrator. Normal acceptance testing involves evaluating the tube, generator, and accessory equipment. Additional QC testing is required for photostimulable phosphor plate, or PSP, and digital radiography, or DR, systems.

7. QC Test Equipment
Quality control tests require a variety of testing equipment that allows medical physicists and quality control technologists to assess medical imaging equipment for image quality and exposure calibration. QC testing tools are necessary for providing an accepted baseline reference value to compare against test results for assuring an imaging system is operating appropriately. Quality control tests that are completed on PSP and DR systems include exposure indicator calibration, erasure and image retention, and detector uniformity testing. Additionally, scaling accuracy, distortion testing, and spatial and high contrast resolution quality control are tests that are performed to assure PSP and DR systems are functioning adequately.

8. Exposure Indicator Calibration
Exposure indicator, or EI, calibration is an important component of any digital imaging system. Although technologists might not be involved in calibrating ELs, they should understand the importance of maintaining an index of patient exposure that is accurate and standardized and the use of EI values to assess exposure and technique.
The medical physicist requires three things to complete an EI calibration. A calibrated x-ray source is required to ensure the accuracy of the dose delivered to the receptor. Assorted thicknesses of copper and aluminum filters are needed to create an optimal quality x-ray beam. The use of a timer is required when assessing PSP based systems in order to ensure the exposed plate is processed with the same delay time following exposure. Failure to process the plate in a timely fashion may result in test results that reflect a problem with the imaging system.

The exposure indicator must be calibrated to effectively monitor patient exposure. The PSP plate or DR detector is exposed to a specific radiation dose that produces a specific EI. All plate readers and DR detectors must be calibrated to accurately determine the EI value.

9. Exposure Indicator Linearity Test
Assessing the exposure indicator linearity response of the PSP plate reader requires a calibrated x-ray source to ensure the exposure accuracy to the PSP plate. The same PSP plate is used for each exposure to eliminate any variation in data that might be caused by differences among plates.

A PACS or other device is used to plot the exposure level and relative change in pixel density on an x-y axis. The pixel values from PACS are entered into a program such as Microsoft Excel and are used to construct the graph. Plotting pixel values compared with the exposure level for flat-panel image detectors also make it possible to assess linearity and slope. Manufacturers may use a logarithmic function to plot the performance of flat-panel receptors at varying levels of exposure. Linearity and slope assess pixel values. Pixel values can be plotted and compared to the plate exposure to determine whether there is a linear relationship between pixel density and exposure level. Pixel density should increase with increasing exposure levels.

10. Plate Erasure and Image Retention
The image erasure test confirms that a photostimulable phosphor plate is completely erased and that there is no image retention on DR systems. Improper erasure can be caused by loss of lamp intensity, burned out bulbs, or not enough time in the erasure chamber. Image retention with DR systems indicates possible failure of the calibration system or physical damage to the detector assembly.

First, the technologist makes an exposure of a lead block centered on a PSP plate and then processes the plate in the image reader. Using the same plate, the technologist makes another exposure without the lead block, collimating 5 cm on each side of the plate. The second image should not contain a “ghost image” of the lead block from the previous exposure. It should appear as a uniform, blank image.

PSP plates should be erased every 48 hours if they haven’t been used. Check with the manufacturer of your department’s particular plates for specific recommendations.

DR system testing involves producing two images with the detector. The first image is obtained using a predetermined set of exposure factors and the second image is produced by having the detector undergo image readout when no exposure has occurred. The second image may be obtained by setting a minimal tube output and covering the DR detector with a lead apron to prevent any radiation from reaching the detector. The termination of the exposure results in the detector undergoing the image readout process.

11. Image Uniformity
A final image assessment during acceptance testing is known as the shading test. It evaluates the brightness uniformity across the entire image. Brightness can be measured at the technologist’s workstation using QC software. The digital receptor should respond evenly to an exposure from an x-ray beam. A detector that fails to respond consistently causes poor image quality.

12. Evaluating the Measurement Tool
The phantom image test also can evaluate the accuracy of the measurement tool on a technologist’s workstation or a diagnostic workstation. Measurements can be performed on an anthropomorphic phantom or a digital imaging phantom. When using a digital imaging phantom, the measurement that the
workstation receives is compared to the known measurement of the test tool located inside the phantom. The calculations must adjust for magnification and the 2 measurements should match.

13. Image Scaling and Distortion
Workstations that take measurements must be evaluated to determine the accuracy of the built-in measurement tool. The assessment can be performed using an object with known dimensions. For example, the distance of 1 inch on a ruler is 25.4 mm.

Measurement calibration ensures that the dimensions of pathological findings are accurately documented in the radiology report. This precision is critical so that any change in measurements can be identified when patients return for follow-up studies.

In addition to the accuracy of distance measurement, the image should be free of distortion as evidenced by viewing a grid test pattern.

14. Distortion Assessment
Distortion for digital imaging equipment is evaluated with the same screen made from wire-mesh that is used to analyze film-screen contact for analog image receptors. Image distortion for flat-panel receptors also is assessed with the same wire-mesh. Remember that display monitors can distort images, so you should make sure the monitor isn’t causing the problem before you assess the capture device. Measuring the uniformity of grid spacing determines if the image capture process is distorting the final radiograph.

15. Spatial (High) Contrast Resolution
The assessment of spatial or high contrast resolution is critical to assure that the imaging system is demonstrating the minimum level of spatial resolution required for the imaging examination being performed. Spatial resolution is measured in units of line pairs per millimeter (lp/mm).

The testing process for spatial resolution is done using a resolution test pattern oriented 45 degrees to the laser scan direction or DR system TFT array pattern. The resulting image must demonstrate the minimum level of line pairs per millimeter required for the image procedures being performed.

16. Contrast and Noise
Specially designed testing tools can more precisely measure contrast and noise to demonstrate variations in the different levels of exposure. These tools can be used to evaluate which phantom image was produced at the higher exposure level. The image on the right was produced at a higher exposure level which is determined because the noise is lower than the image on the left. The noise should be more apparent in the image on the left. The visible objects in the test tool help to evaluate contrast resolution and spatial resolution on a finished digital image.

17. PSP Visual Inspection
Acceptance testing of digital equipment also includes a visual check. If the system is equipped with PSP plates, all of the plates must be examined for cracks and scratches to ensure that no artifacts will appear on a processed image. Also, technologists should examine where PSP plates are stored to identify possible sources of scatter radiation. Cassette-based units should be inspected to guarantee that nothing interferes with the smooth loading and unloading of cassettes in the plate readers and imaging equipment. In addition to normal acceptance testing of digital imaging equipment, the PACS and laser printers also must undergo acceptance testing.

18. PACS Acceptance Testing
PACS doesn’t require a great deal of acceptance testing or QC checks. System failures usually are noticeable and have far-reaching effects serious enough to immediately call the PACS administrator or service engineers. However, a very important check should be performed during acceptance testing of PACS equipment.

Before implementing PACS, staff should test the modality work list to ensure that all required patient data transfers correctly from the radiology information system, referred to as RIS, or the hospital information
system, or HIS. This information includes data such as the patient’s date of birth, referring physician, medical record number, and the exam accession number.

19. Laser Printer Acceptance Testing
Laser printers that produce digital images require initial calibration and ongoing QC tests. A range of densities resembling the film used in sensitometry is printed from the laser printer. A densitometer then is used to measure the darkness of different densities.

When using a laser printer for the first time, look-up tables might need to be adjusted by the manufacturer’s service representative until the image displays properly. Look-up tables differ based on the manufacturer, modality and anatomical region.

20. Acceptance Testing Summary
Imaging equipment must be evaluated for exposure indicator calibration or accuracy, image erasure and retention, and the detector uniformity response. Additionally, scaling or measurement accuracy and the minimum spatial resolution are calculated for precision.

These imaging equipment acceptance tests mostly focus on the PSP image receptor, but they also can be adapted for flat-panel detectors. Keep in mind that tests included in acceptance testing also should be performed at least once a year or whenever image quality is questioned.

21. Knowledge Check

22. Knowledge Check

23. Quality Control
Several components of a digital imaging system require routine evaluation which includes the display monitor, the technologist workstation, and the PACS workstation. The photostimulable phosphor plate, the PSP reading device, and the flat-panel detector also need regular assessments to assure they are always functioning properly. When any of these components don’t operate appropriately, the quality of the final image suffers, regardless if all other components are working efficiently.

24. Display Monitor
The display monitor is critical in digital imaging because monitor characteristics and calibration affect image data. The monitor is one of the most important and most often neglected aspects of the digital imaging chain. Monitors are divided into 2 categories. Primary monitors are used by radiologists to interpret images, so the display must be of very high quality. The primary monitor matrix size should be 2,048 x 2,560 or greater.

Secondary monitors are for technologists to use at the equipment workstation and don’t have to meet the same quality standards as primary workstations. A secondary monitor can have a smaller matrix size, but it should be at least 1,024 x 1,280.

The difference in matrix sizes between primary and secondary monitors means that artifacts easily seen on a primary monitor may not be recognized on a secondary monitor. In fact, the image may look different on the 2 monitors because of different display characteristics. This is an important factor to remember when comparing images on a technologist’s workstation with those on a radiologist’s diagnostic workstation.

25. CRT and Flat-panel Monitors
Cathode ray tube, or CRT, and liquid crystal display, or LCD, are 2 types of display monitors. The type of monitor determines which QC tests are performed to ensure that the display functions within normal parameters.

CRT monitors provide a quality display when properly maintained. Though outdated and bulky, CRT monitors actually have some benefits over other devices, including wider viewing angles. Flat-panel or
LCD monitors are gradually replacing CRT monitors. LCD monitors consume less energy, generate less heat, and have superior luminance and greater resolution. In addition, they take up less space.

Because display devices are so important to the digital imaging process, department personnel should check diagnostic and workstation monitors daily to ensure they're functioning properly.

26. SMPTE and TG18QC
The daily monitor test is performed using the Society of Motion Picture and Television Engineers, or SMPTE, test pattern, or the TG18QC test pattern. The test can be conducted in a couple of minutes.

To perform either of these tests, first turn on the monitor using the manufacturer’s start-up procedure and allow the device to warm up. Then, check the screen for smudges and dirt and clean it when necessary. Most manufacturers recommend cleaning monitor screens with screen wipes that can be placed close by and used throughout the day.

Monitors used in diagnostic imaging tend to attract more dust, dirt and smudges than those used at home because medical personnel often touch the monitor to point out relevant anatomy or pathology. The smudges add up over the course of the day on a screen that displays many images.

27. SMPTE 4 Corners
The next step in daily monitor QC is to open the test pattern and check for geometric distortion. The lines of the test pattern are inspected to see if they appear straight or if they are distorted. This check can be performed quickly by looking at the center and the 4 corners of the image.

Looking closer at the SMPTE test pattern by enlarging the upper right-hand corner demonstrates how the lines appear blurry and somewhat distorted. This appearance indicates geometric distortion and could compromise the appearance of images.

28. SMPTE Numbers
Technologists look at the letters or numbers in the image to verify if they are clear. This check quickly determines the resolving capabilities of the monitor. If the letters or numbers look fuzzier or different on the monitor being tested compared with other monitors, call a service engineer and take the faulty monitor out of service until the problem is fixed.

29. SMPTE Contrast
Staff can quickly assess the luminance curve, or contrast, of a monitor by evaluating the 5% and 95% patches on the test pattern. The 5% patch is identified by the arrow on the left side of the image and the 95% patch is marked by the arrow on the right. Viewing the pattern on a monitor that works properly, should clearly reveal a gray square inside the black square on the 5% patch and a gray square inside the white square on the 95% patch. Enlarging the 95% patch shows the small gray square inside of the lighter square. Seeing this square verifies that the monitor being tested is displaying correctly.

30. SMPTE General Inspection
A final step in daily monitor QC is to look at the test pattern’s general appearance. The pattern is visually inspected to look for areas that don’t appear adequate which is the case when pixels are missing, areas of increased or decreased brightness are noticed, or image blur is present. Report any area that looks suspicious to a service engineer.

31. Knowledge Check

32. Knowledge Check

33. Monthly Monitor Tests
Comprehensive monitor QC tests are performed during acceptance testing or to isolate image display problems. In addition, departments should schedule a more extensive monthly monitor test that goes
beyond daily testing. Display monitors can fall out of calibration very quickly given how often they are used in diagnostic imaging.

CRT monitors might need to be adjusted periodically to correct the contrast, brightness, and sharpness of the display. Additionally, the department might need to replace the LCD monitor’s light source occasionally.

34. AAPM Recommended Evaluations
The American Association of Physicists in Medicine (AAPM) recommends the following assessments to evaluate monitor display performance include geometric distortion, display reflection, luminance response, luminance spatial and angular dependencies, display resolution, display noise, veiling glare and display chromaticity. Let’s talk about each of these tests in more detail.

35. Geometric Distortion
A display monitor can distort the geometric properties of an image. A TG18QC test helps to evaluate whether the size and shape of features in the displayed image are different from their actual size and shape. Technologists can evaluate geometric distortions by looking at the entire image on the display monitor, paying special attention to the white lines of the test pattern, and closely inspecting the 4 quadrants of the image.

If a monitor is malfunctioning the line pairs and shapes in the center of the pattern likely will appear blurry. All monitors used to interpret images must be assessed for geometric distortion.

36. Lighting
Another aspect of monitors is lighting. The TG18 AD test pattern is used to evaluate how ambient lighting affects the operator’s ability to see the structures shown on the screen. An indication of excessive ambient lighting is the inability of the viewer to distinguish the lines in the test pattern.

Ideally, the light intensity coming from a display monitor is the only light a monitor produces. However, ambient lighting conditions can add to the luminance levels of a displayed image, which can negatively affect image interpretation.

Ambient lighting is a critical quality issue for interpreting radiologists’ workstations, and an important consideration when placing a technologist workstation in an area with significant ambient light. The additional luminance degrades a technologist’s ability to evaluate images.

37. Display Luminance
The luminance response of a display monitor is assessed using the TG18CT test pattern at a perpendicular angle. This test shows that the monitor displays the same luminance level and contrast as other digital imaging monitors. When looking at the test pattern, the viewer should see definition in each square and be able to distinguish various shades of gray. An example of an unsatisfactory test pattern is one in which the gray squares in the center of the test pattern are not visible.

Spatial luminance is evaluated to identify any nonuniform areas of luminance due to the design of the display monitor. These tests require special meters, not just the human eye, to take measurements across the monitor display.

Angular luminance dependency refers to how the viewing angle affects display luminance, and must be assessed to determine the optimum viewing angle.

38. Display Resolution
The spatial resolution of a display monitor is measured in line pairs per millimeter and is assessed using the TG18QC test pattern or the TG18CX pattern. In either case, these test patterns allow technologists to evaluate a display monitor’s resolution. If a monitor doesn’t have the same level of resolution as the capture device, the level of detail is diminished, and the viewer will not see all the line pairs per millimeter.
39. Display Noise
Display noise is another issue associated with display monitors. The monitor makes it possible to detect small objects and objects in low-contrast areas within a displayed image. If the display device adds noise, it becomes difficult to see structures as required for image evaluation and interpretation. The TG18AFC test pattern is used to visually assess the noise a display monitor contributes to an image. In the lower right-hand quadrant of the test pattern there is a series of white dots. These dots are not visible on an unsatisfactory test pattern which indicates that the monitor being tested might be malfunctioning.

40. Veiling Glare
Veiling glare, which often is more of an issue with CRT devices, is light that is scattered inside the display monitor. This light scatter negatively affects image quality. Veiling glare can be assessed using the TG18GV test pattern.

The small circle in the lower right-hand corner of the test pattern actually is an enlarged view of the black dot in the center of the white circle on the test pattern. When comparing two TG18GV test patterns, the level of detail is noticeably different. The unsatisfactory pattern does not display the optimal degree of the gray scale.

41. Display Chromaticity
Display chromaticity determines whether a color monitor’s display is uniform based on the TG18UN80 test pattern. A colorimeter is used to measure system coordinates on a display monitor to help quantify color uniformity. In the instance of a gray-scale monitor, the TG18UN80 image must be uniformly gray across the entire test pattern.

42. Knowledge Check

43. Knowledge Check

44. Digital Fluoroscopy
Digital fluoroscopy units also must undergo acceptance testing and routine QA evaluations. Along with tests that evaluate fluoroscopy functions such as exposure rates and reproducibility, tests specific to digital fluoroscopy units assess spatial resolution, contrast performance, uniformity, linearity, radiation exposure, and artifacts. These tests are performed during acceptance testing, every 6 months after the unit is placed into service, or whenever the equipment receives significant maintenance. State regulations also may dictate QC test frequency.

45. Patient-equivalent Phantom
A patient-equivalent phantom, generally made of plastic, is used to test digital fluoroscopy units. An anthropomorphic phantom is not necessary because digital fluoroscopy units don’t have image processing codes based on anatomy.

The fluoroscopy phantom contains several stacked layers. One layer is a step wedge that simulates subject density differences. Other layers contain pieces of actual bone or bone-like substances that fluoroscopy can evaluate. Resolution patterns are inserted in the middle layers to evaluate spatial resolution. One layer contains hollowed-out tubes to simulate contrast-filled blood vessels. The tubes are filled with a mixture of iodinated contrast and epoxy. The entire phantom is approximately 8 inches long by 8 inches wide and 7 inches tall, or, 20.3 x 20.3 x 17.8 cm.

46. Spatial Uniformity and Resolution
On digital fluoroscopy units with subtraction capability, the technologist measures the subtracted image from a digital fluoroscopic phantom to determine spatial uniformity. The spatial uniformity is the amount of distortion on the fluoroscopic image.

Spatial resolution is measured at the diagnostic workstation or wherever radiologists interpret fluoroscopic images. Spatial resolution patterns embedded in the digital fluoroscopy phantom indicate spatial resolution.
47. Low Contrast Assessment
A digital fluoroscopic unit's low contrast can be tested by performing digital subtraction at 70 kVp using the phantom with and without the hollow tubes that simulate contrast-filled blood vessels. The staff member performing the test records the contrast reading from the smallest tube inside the phantom and compares it to the manufacturer's specifications or the last recorded test.

48. Contrast Linearity
Contrast linearity measures the average pixel value for the hollowed-out tubes that simulate contrast-filled blood vessels. Each black circle represents a different depth that was drilled in the plate. A region of interest, or ROI, measurement within a circle should be the same no matter where your ROI is. If you move to another circle that is supposed to have twice as much "iodine" contrast, the ROI value should double as well, meaning that it tracks linearly. The values should remain constant within a circle and double when the iodine content doubles from 1 circle to the next.

49. Radiation Exposure
A dosimeter measures radiation exposure in 3 places: entrance skin exposure to the patient, between the patient and the grid covering the image intensifier, and as scatter. The x-ray tube of most fluoroscopic units is located under the table, so the entrance skin exposure is taken below the phantom.

50. Artifact Evaluation
A digital subtraction image with nothing to subtract is used to evaluate artifacts produced by a digital fluoroscopic unit. In essence, the test result should be a blank image that displays any artifact caused by a problem with the digital subtraction software.

51. QC Programs
An effective digital imaging QC program has 2 essential characteristics. First, the QC program involves every aspect of the digital imaging procedure, from the storage conditions of PSP plates to the display characteristics of diagnostic monitors. Second, the QC program must be an organized, systematic process that evaluates the digital imaging systems regularly throughout the year – not just as system components break down.

Additional information for designing a comprehensive quality control program can be found by searching websites from organizations such as the American Association of Physicists in Medicine, commonly called the AAPM and the American College of Radiology, or ACR. Managers and technologists also can acquire information by talking to the medical physicist assigned to the department.

52. Daily Tests
In the radiology department radiologic technologists, QC technologists, or physicists perform daily tests, including visual inspection of digital imaging systems. The technologist should always physically examine digital equipment on a daily basis. A physical examination includes visually inspecting the receptor to make sure there aren't any cracks or breaks and that the cassettes operate correctly.

The PSP plate reader should be checked by erasing a plate. If a plate hasn't been used in the past 48 hours, it should be erased at this time. Some sources suggest erasing every plate daily to reduce the buildup of scatter radiation.

Departments equipped with laser printers should perform the daily QC check required by the specific manufacturer. Laser printer manufacturers typically recommend a testing schedule for their printers. A test pattern is printed regularly, usually daily, to ensure that a laser printer works properly. Most printers have a built-in test pattern generator that can be accessed from the control panel. A SMPTE test pattern from a laser printer can be measured for density, contrast, and base plus fog levels. Other test patterns may display a classic sensitometric step wedge.

Flat-panel detectors should be inspected regularly according to the manufacturer's recommendations. Daily monitor checks are performed with the SMPTE test pattern or a TG18QC test pattern.
53. Monthly Tests
Although PSP plates should be erased every 48 hours, some facilities also may choose to erase all the department’s plates monthly. This practice ensures that no plate goes for a month without being erased at least once. Some departments also may choose to inspect and clean all PSP plates at this time.

Another monthly test is to record the findings, based on manufacturer-specific guidelines, from a QC tool image. This test can be performed more frequently to monitor image quality changes. Many departments perform weekly phantom imaging studies.

Technologist and diagnostic workstations also must be calibrated monthly using a SMPTE test pattern or a TG18QC test pattern. CRT monitors fall out of calibration more easily and may require more attention, usually on a weekly basis.

54. PSP Cleaning
Cleaning PSP plates as needed is a recommended part of a QA program. A technologist should clean a plate when he or she sees artifacts on a radiographic image. Check the PSP plate instructions to ensure that the plates are cleaned properly.

In general, plates should be cleaned in the same way as the screen in a film-screen mammography cassette – very carefully with a camel-hair brush and lint-free gloves. PSP plates must be cleaned with a solution meeting the manufacturer’s specifications. Check with the manufacturer to verify that a cleaning solution is safe to use.

PSP plates should not be thrown away if they are cracked, scratched, or no longer serviceable. They contain trace amounts of barium and other substances that might be classified as hazardous materials and require proper disposal. Check with the facility’s waste disposal team to be certain PSP plates are properly discarded.

55. Quarterly Tests
Certain tests should be conducted every 3 months. Clean and inspect all cassettes and PSP plates. You may perform this test more or less frequently depending on plate usage, storage conditions, manufacturer recommendations, and departmental policies.

A more thorough QC image test should be performed quarterly. This test must evaluate, at a minimum, spatial resolution, low contrast resolution, noise, scaling accuracy, distortion, and exposure indicator accuracy. Furthermore, departments should determine the repeat rate quarterly, along with the causes of repeated exams.

56. Annual Tests
Annual tests are performed by the medical physicist who returns each year to conduct the tests completed during acceptance testing. These annual tests track changes in the equipment during the past year and show trends. The physicist also reviews all other test data from the past year, which includes service reports and patient exposure records. Supplied with this information, the physicist gives the facility a comprehensive assessment of the QC program and suggests improvements.

57. Closing
A sound QC program is essential not only to understand and safely operate digital radiography equipment but also to optimize image quality. As operators of digital imaging equipment, radiologic technologists often are the first staff members to recognize problems with a unit.

The digital imaging process differs from analog imaging. Breakdowns in digital imaging equipment can cause gradual changes that lead to image quality problems, so it’s important that technologists understand every aspect of digital imaging QA assessment.

58. Knowledge Check
59. Knowledge Check

60. Conclusion
This concludes Essentials of Digital Imaging Module 7 – Quality. You should now be able to:
- Explain why quality control testing is important.
- Describe the quality control tests that are performed on photostimulable phosphor plates and flat-panel image receptors.
- Identify quality control tests that departments perform on image display monitors.
- Know the recommended frequency of quality control tests performed on components of a typical digital imaging system.

61. References


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