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Nuclear Associates 07-656

Cardiac Digital Imaging/Cine-Video Quality Control Phantom and Patient Identifier

Users Manual

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Section 1
General Information

1.1 Purpose

1. To assure the quality of cine and recorded video images, with regard to density (video brightness), contrast, resolution and focus (over the field), is consistent and optimum.
2. To provide appropriate patient identification and date on the beginning of each cine film segment.
3. To provide information about the equipment performance when less than ideal clinical results are obtained.

1.2 Equipment Needed

1. Cardiac Digital Imaging/Cine-Video Quality Control Phantom and Patient Identifier.*
2. Test stand about 12“ high for test tool, e.g., plastic bucket, cardboard box, etc., or an acrylic cylinder (approximately 12 x 8 in diameter) so the test took can be positioned close to the image intensifier input surface for over-table image intensifier systems.
3. Comparison cine film images of the test tool produced after the most recent system calibration.
4. A 10 to 12 magnifier.

IMPORTANT

This test should be carried out daily before any angiographic studies, to verify the condition of the imaging system and associated photographic processing. In addition, the test tool should be exposed at the beginning of each cine film roll and videotape segment before the patient is placed on the
examination table.

1.3 Procedure-Daily Test

Due to the variability in image quality for video recording systems, it is difficult to specify the resolution expected. After a service engineer has calibrated the system, data should be collected for five days and the average of the resolution determined. This should be the expected level of resolution in the future. The resolution should not decrease from the five-day average value by more than 0.2 c/mm. Measurements of the video signal levels should be carried out using a video waveform monitor and recorded in the control chart in a similar manner.

1. Carry out appropriate photographic processor quality control tests before proceeding, to assure that the photographic processor is operating properly.
2. Place the phantom on top of the test stand or acrylic cylinder and move the image intensifier as close a possible to the test tool.

**Designed by Joel E. Gray, Ph.D., Department of Radiology, Mayo Clinic, Rochester, MN 55905. Manufactured under licensing agreement with Mayo Foundation for Medical Education and Research*

3. Using fluoroscopy, position the test tools so that the resolution patter is at a 45° angle to the video scan lines of the fluoroscopic monitor. (Note that on some systems it is possible to rotate the image that usually results in rotating the video scan lines.) All test objects should be visible in the 9“ and 6“ mode.

NOTE

It is essential to position the test tool in the same location in the image field each time to assure that the brightness control adjusts the technique factors, and hence film density, the same.

4. Record (using automatic exposure control mode) on cine film, and videotape if available, about five seconds of images of the test tool.
5. Record the Kilovoltage selected by the automatic exposure control mode on the control chart.
6. Process the exposed cine film.
7. Using a 10 to 12 magnifier, determine the resolution of the cine film image from the resolution pattern. Observe the copper mesh over the entire image field to assure it is visible.

NOTE

Do not rely on the cine-projector to view the test film since these usually limit the observed resolution of the image, with differences being more significant between static and dynamic display of the images.

8. Using a 10 x 12 magnifier, not the highest frequency (number of cycles per millimeter) visible on the resolution pattern for the mode most frequently used, e.g., 6“ or 9“ mode. (Note: cycles per mm or c/mm are the same as line pairs per mm or 1p/mm.)
9. Measure the densities of the four density patches in the center of the cine film image (D1, D2, D3 and D4, for the lowest to highest densities, respectively).
10. Plot the low density (D1), mid-density (D3), and density difference (D4 minus D2) on the control chart.
11. For recorded video images, determine the resolution and record this data on the control chart. A waveform monitor should be used to determine the brightness levels in the video image with this data being recorded on the control chart.

1.4 Suggestions for Optimum Performance

The phantom must be placed as close to the image intensifier as possible. In addition, it must be positioned in the same manner each time, to assure the automatic brightness control adjusts the technique factors in the same manner each time.

The cine Film must be viewed with a 10 to12 magnifier, since most cine projectors limit the observable resolution.

Image contrast will be dependent on the kVp selected. Consequently, it is essential to allow the automatic exposure control system to select the kilovoltage and then record the kilovoltage used.

1.5 Acceptance Limits

1. The Kilovoltage should not be below 60 nor above 80 kVp for both fluoro and cine. After a five-day average Kilovoltage is determined, the fluoro and cine systems should be within ± 5 kVp of this average value on all future tests.
2. The low density should be with ± 0.08 of the five-day average value obtained with fresh developer and immediately after calibration. Likewise, the mid-density and density difference should be ± 0.10 of the initial five-day average values.
3. The resolution on cine film in the 6“ mode should be at least 2.8 c/mm. Resolution in the 9“ mode should be at least 2.4 c/mm and in the 4.5“ mode at least 3.3 c/mm. The resolution should not decrease from the initial five-day average value by more than 0.2 c/mm.
4. All mesh patterns should be visible at the edge of the image on 6“ mode cine film.

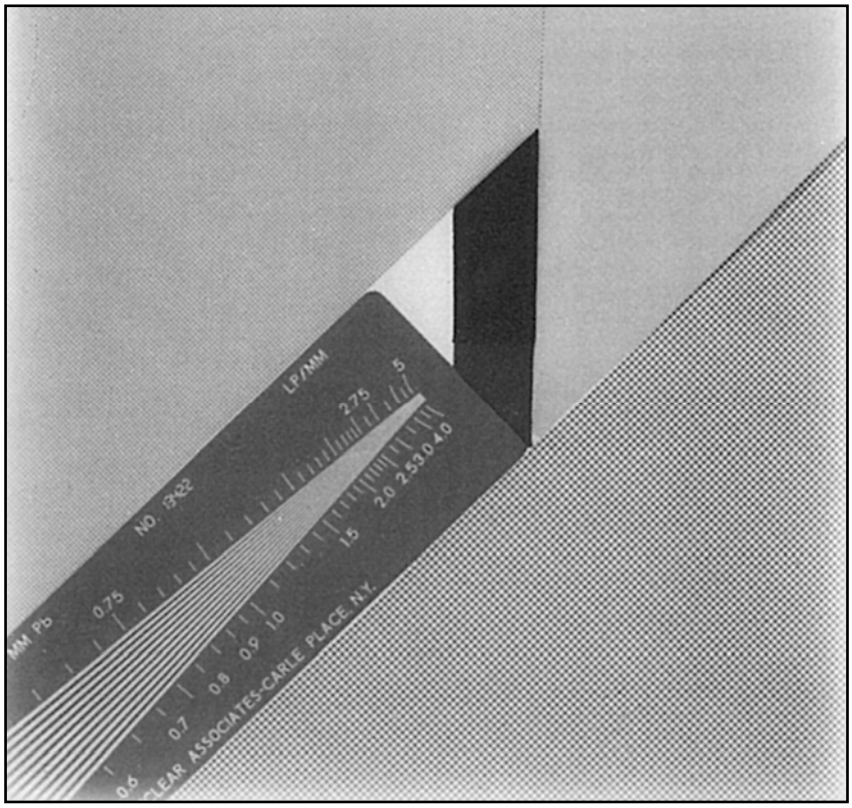

Figure 1-1.

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