Nuclear Associates is pleased to offer four Service & QC Kits that will help you do your job faster and easier...saving you time and money.

**SERVICE & QUALITY CONTROL KITS**

Each complete kit (Radiography/Fluoroscopy, Mammography, Cardiac Cath/Special Procedures, and Dental) contains the essential instruments that service personnel, physicists and QC technicians rely on to check and calibrate today’s most vital equipment. Every Nuclear Associates instrument selected for inclusion in our Service/QC Kits was chosen for its reliability, accuracy and ease-of-use. These qualities are critically important when others are depending on you to get the job done, and get it done right!

Each Service/QC Kit includes an easy-to-carry, durable, insulated carrying/storage case, to keep your equipment safe, wherever you go.

*Save Time and Money!*
*Ensure Patient Safety!*
*Reduce Equipment Down-Time... with Nuclear Associates’ Service & Quality Control Kits.*

(Continued on the next page)
MAMMOGRAPHY QC KIT

Helps make compliance with MQSA regulations easy!

Contents:
- Rad-Check™ Mammo X-Ray Exposure Meter (Model 06-526-5290)
- Mammographic Digital kVp Meter II (Model 07-492)
- Digital X-Ray Pulse-Counter/Timer (Model 07-453)
- Remote Sensor (Model 07-453-2000) for use with 07-453
- Mammographic Ionization Chamber (Model 06-529)
- Carrying/Storage Case (Model 89-426)

Model 18-526-1000
Weight of Kit (Approximate): 15.5 lbs (7 kg)
(See page 14 for individual product specifications)

CARDIAC CATH/SPECIAL PROCEDURES QC KIT

This comprehensive kit contains the essential noninvasive test tools for cardiac cath and special procedures. Now you can quickly and easily read micro-R, obtain dose per frame, and determine entrance and exit dose.

Contents:
- Rad-Check™ Micro-R (Model 06-526-5240)
- Wide-Range Digital kVp Meter (Model 07-494)
- Digital X-Ray Pulse Counter/Timer (Model 07-453)
- Remote Sensor (Model 07-453-2000) for use with 07-453
- Image Intensifier Ion Chamber (Model 06-524-3000)
- Carrying/Storage Case (Model 89-426)

Model 18-526-3000
Weight of Kit (Approximate): 15.5 lbs (7 kg)
(See page 14 for individual product specifications)
Features the noninvasive test devices that are necessary to perform QC in radiographic and fluoroscopic suites.

Contents:
- Rad-Check™ Plus X-Ray Exposure Meter (Model 06-526)
- Wide-Range Digital kVp Meter (Model 07-494)
- Digital X-Ray Pulse-Counter/Timer (Model 07-453)
- Remote Sensor (Model 07-453-2000) for use with 07-453
- Remote Ionization Chamber (Model 06-528)
- Carrying/Storage Case (Model 89-426)

Service and QC of dental units will be easier and more cost-effective than ever, with this comprehensive kit.

Contents:
- Rad-Check Plus X-Ray Exposure Meter (Model 06-526)
- Dental kVp Meter (Model 07-479)
- Digital X-Ray Pulse-Counter/Timer (Model 07-453)
- Remote Sensor (Model 07-453-2000) for use with 07-453
- Remote Ionization Chamber (Model 06-528)
- Carrying/Storage Case (Model 89-426)
### MODEL 06-526-5290 RAD-CHECK™ MAMMO

**SPECIFICATIONS:**

- **Ranges:** 0.001 to 2 R, 0.01 to 2 R/min
- **Standard Calibration:** At 23, 28, 30, and 35 kVp (Mo/Mo) at 22°C and one atmosphere using model 06-526-519 chamber (chamber optional)
- **Reproducibility:** Within 2% short-term over 100 mR to 2 R range (1 mGy to 20 mGy)
- **Electrometer Drift:** 10 mR/minute typical, 60 mR/minute max (10 µGy/minute max)
- **Maximum Exposure Rate:** Min. 90% collection at 20 R/second
- **Manual Reset:** Resets display to zero
- **Operating Conditions:** 10-40°C, max. 90% relative humidity
- **Display:** 3½ digit LED, 1/2 inch high, low battery indicator
- **Controls:** Reset button, dose or dose rate output selector, on/off switch
- **Power:** 9V battery, Mallory MN1604 or equal, greater than 50 hour life
- **Size:** 2.75” high x 6” wide x 6.25” deep (7 cm x 15.25 cm x 15.9 cm)
- **Net Weight:** 18 oz. (0.51 kg.)

### MODEL 06-526-5240 RAD-CHECK™ MICRO-R

**SPECIFICATIONS:**

- **Ranges:** Low: 0.01 to 19.99 mR; 0.1 to 199.9 mR/min
- **High:** 0.01 to 19.99 R; 0.1 to 1999 R/min
- **Standard Calibration:** At 75 kVp with 4 mm Al filtration at 22°C and one atmosphere using model 06-524-1000 chamber (chamber optional)
- **Reproducibility:** Within 2% short-term over 100 mR to 2 R range (1 mGy to 20 mGy)
- **Electrometer Drift:** Low: 1 mR/minute typical, 6 mR/minute max
- **High: 10 µR/min typical, 60 µR/min max**
- **Maximum Exposure Rate:** Min. 90% collection at 20 R/second
- **Manual Reset:** Resets display to zero
- **Operating Conditions:** 10-40°C, max. 90% relative humidity
- **Display:** 3 ½ digit LCD, 1/2” high, low battery indicator
- **Controls:** Reset button, dose or dose rate output selector, on/off switch
- **Power:** 9V battery, Mallory MN1604 or equal, greater than 50 hour life
- **Size:** 2.75” high x 6” wide x 6.25” deep (7 cm x 15.25 cm x 15.9 cm)
- **Net Weight:** 18 oz. (0.51 kg.)

### MODEL 06-526-5240 IMAGE INTENSIFIER ION CHAMBER

**Specifications:**

- **Dimensions:** Includes: 15 foot (4.5 meter) cable
- **Handle Length:** 21” (53.34 cm)
- **Cable Length:** 10.2 cm x 10.2 x 1.4 cm thick

### MODEL 06-526-5240 IMAGE INTENSIFIER ION CHAMBER

**Specifications:**

- **Dimensions:** Includes: 15 foot (4.5 meter) cable
- **Handle Length:** 21” (53.34 cm)
- **Cable Length:** 10.2 cm x 10.2 x 1.4 cm thick

### MODEL 07-453 DIGITAL X-RAY PULSE-COUNTER/TIMER

**SPECIFICATIONS:**

- **Accuracy:**
  - AC Input: ±1 Count
  - DC Input: ±2%, ±1% Count
  - X-Ray Detection: ±1 Count
- **Sensitivity:**
  - AC Input: 65 VAC minimum
  - DC Input: 200 to 300 volts DC
- **Range:**
  - 100 pulses
  - 9999 milliseconds
- **Display:**
  - 0.4” liquid crystal
  - Power:
    - 9-volt battery, alkaline or equivalent
- **Battery Life:**
  - 24 hours continuous; typically 6 months of normal use
- **AC Input Jacks:**
  - 130 volts AC maximum
  - 65 volts AC minimum
  - Input circuit not affected by reversed polarity
- **Controls/Indicators:**
  - Three-position switch: pulse, off, milliseconds
  - 4-digit liquid crystal display: 0.4” character
  - Low battery indicator; “Low Batt” appears in display when battery voltage reaches 4.8 volts ±0.5 volts
  - Power-on: LED (green)
  - Oscilloscope output

### MODEL 07-453-2000 REMOTE SENSOR

For use with Model 07-453 Digital X-Ray Pulse-Counter/Timer

Includes: 3-meter cable

### MODEL 06-529 MAMMOGRAPHIC IONIZATION CHAMBER

**SPECIFICATIONS:**

- **Volume:** 3.3 cc
- **Energy Response:** Within 5% from 0.2 to 5.0 mm Al HVL (16 to 90 kVp)
- **Includes:** 15 foot (4.5 meter) cable
- **Dimensions:** 4 cm diameter x 1.5 cm thick

### MODEL 06-528 REMOTE IONIZATION CHAMBER

**SPECIFICATIONS:**

- **Volume:** 30 cc
- **Energy Response:** Within 7% from 30 to 150 kVp (15-65 kVp)
- **Includes:** 15 foot (4.5 meter) cable
- **Dimensions:** 10.2 cm x 10.2 x 1.4 cm thick
RAD-CHECK™ PLUS “THE ORIGINAL”
X-RAY EXPOSURE METER

Proven Rad-Check technology specifically designed to provide you with the ultimate in versatility and cost-effective operation.

- Fast and easy to use! Battery operation and built-in detector eliminate setup time.
- Measures dose up to 2 R; dose rate up to 20 R/min.
- Energy response is ±5% from 30 to 150 kVp for the RAD-CHECK PLUS internal chamber.
- Optional remote chambers for mammographic and cine imaging systems.
- Extremely compact...6” x 6¼” x 2¾” high; weighs only 18 oz.

RAD-CHECK PLUS can perform:
- Entrance skin exposure measurements (ESE).
- Fluoroscopy exposure measurements.
- Exposure checks; radiographic (mR/mAs).
- Beam quality; Half Value Layer (HVL).
- mAs reciprocity; mA Station Checks...
- Plus many others, depending on the remote external chambers used.

What makes RAD-CHECK PLUS the premiere x-ray exposure meter?

**Automatic Reset After Exposure**: There are no long cables (when the internal ionization chamber is used) or remote reset switches. Data accumulated during a prior measurement can be included in or eliminated from the next measurement. In addition, the unit can be reset manually. This precision electrometer features a tilt-stand for convenient positioning of the unit.

**Fast and Easy to Use**: Battery operation and built-in detector virtually eliminate setup time. Just place RAD-CHECK PLUS or external ion chamber on x-ray table; collimate, shoot and read the result.

**Accurate**: Precision ion chamber and digital display ensure accuracy plus easy readability.

**Accurate, lightweight, portable...this “industry standard” enables you to gain the critical edge in your QC program.**

The American College of Radiology recommends this type of product in their quality assurance program.
**RAD-CHECK™ MAMMO X-RAY EXPOSURE METER**

*Proven RAD-CHECK performance designed specifically for use in mammography.*

- Fast and easy to use!
- Measures dose: 0.001 to 20 mGy; 0.01 to 20 mGy/min.
- Extremely compact...6" x 6 1/4" x 2 3/4"; weighs only 18 oz.
- Specifically designed and calibrated for use with the model 06-529 Mammography Ionization Chamber.

**RAD-CHECK MAMMO can perform:**
- Entrance Skin Exposure Measurements (ESE).
- Exposure checks; radiographic (mR/mAs).
- Beam quality; Half Value Layer (HVL).
- mAs reciprocity; mA Station Checks...Plus many others, depending on the remote external chambers used.

RAD-CHECK MAMMO is built on the same proven technology as the RAD-CHECK PLUS, but is optimized to provide accurate dose and dose rate readings in the mammography range. It’s economical, since you don’t pay for features you can’t use. Our mammography chamber (required for use with this electrometer), has been thoroughly tested and will match the performance of any other parallel-plate mammography chamber available. Accurate readings can also be made with a different volume ionization chamber using correction factors. Precise, reliable, proven technology that economically answers your specific needs and requirements, RAD-CHECK MAMMO will help elevate your QC program to new heights.

**SPECIFICATIONS:**

- **Ranges:** .001 to 2 R; .001 to 2 R/min (.001 to 2 mGy; .001 to 2 mGy/min)
- **Standard Calibration:** At 23, 28, 30 and 35 kVp (Mo/Mo) at 22° C and one atmosphere using model 06-529 chamber (optional)
- **Reproducibility:** Within 2% short-term over 100 mR to 2 R range (1mGy to 20 mGy)
- **Electrometer Drift:** 10 mR/minute typical; 60 mR/minute max (10 µGy; 60 µGy/minute max)
- **Maximum Exposure Rate:** Min. 90% collection at 20 R/second
- **Manual Reset:** Resets display to zero
- **Operating Conditions:** 10-40° C, max; 90% relative humidity
- **Display:** 3 1/2" x 1/2" LCD, low battery indicator
- **Controls:** Reset button. Dose or dose rate output selector. On/off switch
- **Power:** 9V battery, Mallory MN1604 or equal, greater than 50 hour life
- **Dimensions:** 2.75" high x 6" wide x 6.25" deep (7 cm x 15.25 cm x 15.9 cm)
- **Weight:** 18 oz (0.51 kg)

**ACCESSORIES:**

- **06-529 Mammographic Ionization Chamber:** 3.3 cc volume; energy response: within 5% from 0.2 to 5.0 mm AI HVL (16 to 90 kVp); 15 foot (4.5 meter) cable; 4 cm diameter x 1.5 cm thick
- **89-525 Carrying/Storage Case:** Holds RAD-CHECK MAMMO and Accessories

**IMPORTANT NOTE:** MQSA requires exposure readings with the Mammography Accreditation Phantom...the RAD-CHECK MAMMO is ideal! Small and portable, it will accurately provide the mid-glandular dose readings required by MQSA.

**See Also...**

**MAMMOGRAPHIC ACCREDITATION PHANTOM**

*Helps ensure optimum image quality and peak performance of the mammographic system!*

See Mammography Section, Page 121.
RAD-CHECK™ MICRO-R X-RAY EXPOSURE METER

Nuclear Associates’ RAD-CHECK MICRO-R technology gives you the ability to measure dose and rate in fluoroscopy with the accuracy and reliability of equipment that costs two or three times more.

- Fast and easy to use!
- Dual-range for high and low dose rate fluoroscopy.
- Optimized for use with Nuclear Associates’ 100 cc Image Intensifier Ion Chamber model (06-524-3000).
- Portable, no AC power cords.

RAD-CHECK MICRO-R can perform:

- Entrance Skin Exposure Measurements (ESE).
- Fluoroscopy exposure examinations.
- Exposure checks; radiographic (mR/mAs).
- Beam quality; Half Value Layer (HVL).
- mAs reciprocity; mA Station Checks...
- Plus many others, depending on the remote external chambers used.

This state-of-the-art electrometer is designed for measuring dose and rate under high and low dose rate conditions. It is excellent for cardiac cath and fluoroscopy and the perfect choice for tight budgets.

With the RAD-CHECK MICRO-R, measurements are easy to perform and highly accurate. Incorporate RAD-CHECK MICRO-R into your routine QC program for fluoroscopy now, and accurately measure what your patient exposures actually are from fluoroscopically-guided procedures. This precision electrometer also features a tilt-stand for convenient adjustment of display visibility.

SPECIFICATIONS:

Ranges:
- Low: 0.01 to 19.99 mR; 0.1 to 199.9 R/min
- High: 0.01 to 19.99 R; 0.1 to 1999 R/min

Standard Calibration: At 75 kVp with 4 mm Al filtration at 22° C and one atmosphere using model 06-524-3000 chamber (optional)

Reproducibility: Within 2% short-term over 100 mR to 2 R range (1mGy to 20 mGy)

Electrometer Drift:
- Low Range: 1 mR/minute typical; 6 mR/minute max
- High Range: 10 µR/minute typical; 60 µR/minute max

Maximum Exposure Rate:
- Min. 90% collection at 20 R/second

Manual Reset: Resets display to zero

Operating Conditions: 10-40° C, max; 90% relative humidity

Display: 3½” x 1½” LCD, low battery indicator

Controls: Reset button. Dose or dose rate output selector. High or low range selector. On/off switch

Power: 9 V battery, Mallory MN 1604 or equal, greater than 50 hour life

Dimensions: 2.75” high x 6” wide x 6.25” deep
(7 cm x 15.25 cm x 15.9 cm)

Weight: 18 oz (0.51 kg)

The American College of Radiology recommends this type of product in their quality assurance program.
**IMAGE INTENSIFIER ION CHAMBER**

*Designed to measure diagnostic x-rays.*

- It’s low attenuation permits virtually no interference with automatic brightness systems.
- Optimized for use with our RAD-CHECK™ MICRO-R (See page 17).
- Can be used with virtually any other commercially available electrometer.

This 100 cc low profile ion chamber is designed specifically for measuring exposure rate at the input phosphor of fluoroscopic image intensifier tubes. Its extremely thin envelope enclosure allows for the most accurate results possible! Its unique size and shape allow it to be inserted into the spot film tray of typical image intensifier systems. A 21” long detachable handle allows for easy insertion and removal.

When used with the RAD-CHECK MICRO-R, it is possible to measure exposure rates as low as 10 micro Roentgens per second.

**SPECIFICATIONS:**

- **Volume:** 100 cc
- **Nominal Sensitivity:** 30 nC/R @ M75
- **Rate:** 10µR/s
- **Exposure:** 100µR in 10 seconds
- **Max. Exposure Rate:** Min. 90% collection at 20R/Sec
- **Total Attenuation:** 0.275 (mm Al) equivalent @ 30 KeV
- **Operating Voltage:** 200 to 300 volts DC
- **Cable Length:** 10’ (3 m), Cable Termination, BNC/Banana
- **Window Thickness:** .110” (2.79 mm)
- **Housing Material:** Acrylic
- **Housing Color:** Clear
- **Housing Dimensions:** 5.5” diameter (14.0 cm diameter)
- **Surface Area:** 100 cm², 4.5” diameter
- **Thickness:** 0.720” (18.3 mm)
- **Weight:** 30 oz (840 g)

---

**Extremely accurate...increased sensitivity!**

**SHADOW-FREE, LARGE-VOLUME IMAGE INTENSIFIER IONIZATION CHAMBER**

This 150 cc ionization chamber is designed primarily for measuring exposure rate at the image intensifier input phosphor. It’s extremely thin envelope enclosure allows for the most accurate results possible! Because of its unique size and shape, it can be inserted into the spot film tray. A 16 1/2” long threaded handle allows for easy insertion and removal. And its low attenuation means virtually no interference with automatic brightness systems.

Nuclear Associates’ Shadow-Free Large-Volume Ion Chamber is compatible with the RAD-CHECK MICRO-R and most commercially available electrometers.

**SPECIFICATIONS:**

- **Volume:** 150 cc
- **Energy Response:** +/-10% from 1.8 to 10 mm Al HVL
- **Dimensions:** 6.26” x 8” x 0.63” (15.9 cm x 20.6 cm x 1.6 cm)
- **Weight:** 1.10 lbs (.50 kg)

---

Model 06-524-3000 Energy Response

<table>
<thead>
<tr>
<th>KVCP</th>
<th>NIST Technique</th>
<th>Approx. HVL (mm Al)</th>
<th>Coul/µR x10^-14</th>
<th>Correction Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>M60</td>
<td>1.68</td>
<td>3.32</td>
<td>0.95</td>
</tr>
<tr>
<td>75</td>
<td>M75</td>
<td>4.1</td>
<td>3.49</td>
<td>1.00</td>
</tr>
<tr>
<td>100</td>
<td>M100</td>
<td>5.1</td>
<td>3.72</td>
<td>1.06</td>
</tr>
<tr>
<td>150</td>
<td>M150</td>
<td>10.2</td>
<td>3.94</td>
<td>1.12</td>
</tr>
</tbody>
</table>

06-524-3000 Image Intensifier Ion Chamber

---

06-524-1000 Shadow-Free, Large Volume Image Intensifier Ionization Chamber, with 10-foot (3-meter) Cable
RAD-CHECK™ REMOTE X-RAY EXPOSURE METER

- Specifically designed for use with the external 30 cc remote ion chamber (Model 06-528).
- Dose: 0.001 to 2R; 0.01 to 20 R/min.
- Easy setup puts the display close to you when it's difficult to see into the room.

RAD-CHECK REMOTE can perform:
- Entrance Skin Exposure Measurements (ESE).
- Fluoroscopy exposure measurements.
- Exposure checks; radiographic (mR/mAs).
- Beam quality; Half Value Layer (HVL).
- mAs reciprocity; mA Station Checks...
  Plus many others, depending on the remote external chambers used.

The RAD-CHECK REMOTE works specifically with an external remote chamber, so it's extremely versatile. It's the ideal quality control device for a variety of applications and situations, since it gives you the opportunity to place the chamber in any orientation! And it's perfect for phantom testing, fluoroscopy or when using an external ion chamber. (External ion chambers other than 06-528 may be used, but require system recalibration.)

The RAD-CHECK REMOTE is easy to set up and use. Its versatility makes it the perfect addition to your QC test equipment. In those cases where it's inconvenient to have the display in the x-ray room, or visibility is difficult, RAD-CHECK REMOTE puts the display next to you.

**SPECIFICATIONS:**

Ranges: 0.001 to 2 R; 0.01 to 20 R/min
Standard Calibration: At 75 kVp with 4 mm Al filtration at 22° C and one atmosphere using model 06-528 chamber (optional)
Reproducibility: Within 2% short-term over 100 mR to 2 R range (1 mGy to 20 mGy)
Electrometer Drift: 0.5 to 1 mR/minute typical; 6 mR/minute max. (5 µGy to 10 µGy; 60 µGy/minute max)
Maximum Exposure Rate: Min. 90% collection at 20 R/second
Manual Reset: Resets display to zero
Operating Conditions: 10-40° C, max; 90% relative humidity
Display: 3½” x ½” LCD, low battery indicator
Controls: Reset button. Dose or dose rate output selector. On/off switch. Tilt stand to adjust display visibility
Power: 9V battery, Mallory MN1604 or equal, greater than 50 hour life
Dimensions: 2.75” high x 6” wide x 6.25” deep (7 cm x 15.25 cm x 15.9 cm)
Weight: 18 oz (0.51 kg)

ACCESSORIES:

06-528 Remote Ionization Chamber:
30 cc volume; energy response: within 7% from 15-65 keV (30-150 kVp filtered); 15 foot (4.5 meter) cable; 4” x 4” x 0.54” thick (10.2 cm x 10.2 cm x 1.4 cm thick); 4 oz. (0.11 kg.)

89-525 Carrying/Storage Case:
Holds RAD-CHECK REMOTE and Accessories
RADIATION DOSIMETER PROBE POSITIONING STAND

Allows a dosimeter ion chamber probe, or similar device, to be easily positioned for making exposure measurements on all types of x-ray equipment.

- Universal: Compatible with all dosimeter probes. No additional probe supports required.
- Easily adjustable on all three axes.
- Allows for vertical pivoting of horizontal probe support rod.
- Rock-solid, heavy-duty, non-skid support stand.
- Infinitely variable height adjustment facilitates rapid and accurate positioning.
- Ideal for service use...compact, easy to set up and use.

*Developed by Jerome Taubel, R.T., Mayo Clinic.
The Radiation Dosimeter Probe Positioning Stand is a convenient device that allows a dosimeter ion chamber probe, or similar instrument, to be easily positioned for making exposure measurements on all types of x-ray equipment.

The unique positioning flexibility of the device makes it particularly useful for making exposure measurements within CT gantrys, in front of upright film holders, or on c-arm-type fluoroscopes.

The Radiation Dosimeter Probe Positioning Stand is adjustable in all three axes. It also allows for vertical pivoting of the horizontal probe support rod. The aluminum base-plate of the stand provides a stable non-skid support for the stand and the dosimeter probe when they are placed on the examination table. The demarcations on the vertical support rod and the infinitely variable height adjustment allows rapid and accurate positioning of the dosimeter probe.

The ability to detach the vertical support from the aluminum base-plate and attach it to any standard camera c-mount (e.g., photographic tripod) allows the probe to be placed at virtually any height or angle. The probe positioning stand will support all dosimeter probes, by virtue of its universal adapter probe holder.

The complete unit can be easily dismantled for convenience of storage and transport.

**SPECIFICATIONS:**

- **Dimensions:** Base-plate: 10 1/2" x 7"
  
  (26.5 cm x 17 cm)

- **Vertical Support Rod:** 13 3/4" High (38 cm)

- **Probe Support Rod:** 14" Long (36 cm)

- **Weight:** 4 lbs

30-370  Radiation Dosimeter Probe Positioning Stand
WIDE-RANGE, MAMMOGRAPHIC, AND DENTAL DIGITAL KVP METERS

- Automatic display reset.
- No remote control cables.
- Scope output for waveform analysis.
- Compact, lightweight, and battery-operated.

Whether you choose the Wide-Range, Mammographic or the Dental Digital kVp Meter, you will get quick and accurate measurements of your diagnostic x-ray generator tube potential. The instrument needs no connection to the x-ray generator.

These lightweight, rugged units are extremely easy to use: Simply place on the x-ray table, with the detector facing the x-ray source. With the beam’s central ray centered on the detector, an exposure is made, and the reading appears immediately on the large, easy-to-read liquid crystal display.

Unique features are provided to ensure maximum efficiency and accuracy. Readings remain on display until the next exposure is made, at which time the reading is automatically updated. Automatic display indicators tell you when adjustment of exposure factors or battery replacement is necessary. Neither remote-control cables nor time-consuming manual re-zeroing are needed.

A BNC connector is provided for radiation waveform display on a storage oscilloscope.

**SPECIFICATIONS:**

**Ranges:**

- **Wide-Range:** Low: 50-90 kVp, 0.1 kVp resolution
  - High: 80-150 kVp, 0.1 kVp resolution
- **Mammographic:** 24-40 kVp, 0.1 kVp resolution
- **Dental:** 45-90 kVp, 0.1 kVp resolution

**Accuracy:**

- **Wide-Range:** ±3% or 3 kVp, whichever is greater
- **Mammographic:** ±3% or 1.5 kVp, whichever is greater
- **Dental:** ±3% or 3 kVp, whichever is greater

**MAs Requirements:**

- **Wide-Range:** (45.7cm SDD) 18 mAs at 120 kVp; 50 mAs at 60 kVp, single phase. Minimum exposure time 1/20 (0.05) sec
- **Mammographic:** (25 cm SDD) 100 mAs at 24 kVp
  - Minimum exposure time 1/20 (0.05) sec
- **Dental:** 8.5 mAs at 45 kVp; .026 mAs at 90 kVp

**Controls:**

- **Wide-Range:** On/off, single/three-phase and range selection switch
- **Mammographic:** On/off and Moly/Tungsten Selector Switches
- **Dental:** On/off and single/three-phase selector switches

**Operating Conditions:** 50°F to 104°F (10°C to 40°C)
- Maximum relative humidity 90%
- **Power:** Single 9V alkaline battery. Life > 150 hrs
- **Display:** 3½" x ⅛" LCD. Automatic indication of (a) low battery condition, (b) need to adjust exposure factors
- **Output Signal:** BNC connector for waveform analysis
- **Dimensions:** 8" wide x 6" deep x 2½" high
  - (20 cm x 15 cm x 6 cm)
- **Weight:** 2 lbs (0.9 kg)

07-494 Wide-Range Digital kVp Meter
07-492 Mammographic Digital kVp Meter
07-479 Dental Digital kVp Meter
89-473 Carrying/Storage Case

The American College of Radiology recommends this type of product in their quality assurance program.
DIGITAL X-RAY PULSE COUNTER/TIMER

Measures timer accuracy of half-wave, full-wave and three-phase generators.

- Measures duration of radiation output produced by x-ray generators.
- Measures AC or DC x-rays.
- Gives direct readings (time or pulses).
- Can be used for medical or dental x-ray systems.
- Designed specifically to allow service personnel to accurately and easily assess the performance of x-ray generators, timers and controls.
- Reduces repeat examinations; saves time and money.
- Easy-to-read digital display.
- Automatic reset; holds a reading until the next exposure.
- Battery-operated, light weight; fits easily into tool box or pocket.
- Output connector (included) allows a radiation output waveform to be viewed on an oscilloscope.
- For added operator convenience, the remote sensor is available as an option.

Poor or inconsistent quality of x-ray images is often caused by inaccuracy or inconsistency of the generator’s timer. This results in repeat examinations, which cost time and money. A poorly maintained system is also a hazard to the patient; when a malfunction in the timer occurs, the patient may receive unnecessary radiation doses. It is for important reasons such as these, that regular monitoring of x-ray systems and timers is an essential part of a good quality assurance program.

The Digital X-ray Pulse Counter/Timer from Nuclear Associates is a noninvasive, solid-state instrument that can be used to measure the exposure time of either AC or DC x-rays. It can also measure the duration of radiation output produced by a wide variety of medical and dental x-ray systems. A sensitive x-ray detector in the instrument allows direct measurement of exposure from the x-ray head. Pulses produced by half-wave and full-wave x-rays are measured as 60 or 120 pulses per second. For DC, capacitor discharge and three-phase x-rays, the Digital X-ray Pulse Counter/Timer measures the exposure time in milliseconds. When testing x-ray timers and controls, the time of relay contact closure can be measured using the AC input feature.

An output connector on the side of the Digital X-ray Pulse Counter/Timer allows the user to view a radiation output waveform on an oscilloscope. Using this feature, technicians can diagnose and troubleshoot problems with x-ray generators.

REMOTE SENSOR

The optional Remote Sensor can be used when the user would like to have the unit in their hand, so that readings can be seen without having to walk back-and-forth from the x-ray table to the control room after each exposure. The Remote Sensor can also be used when placement of the Digital X-ray Pulse Counter/Timer in the beam is questionable, such as in a Panorex dental x-ray unit.

SPECIFICATIONS:

- **Accuracy:** AC Input: ±1 Count; DC Input: 2%, ±1 Count; X-ray Detection: ±1 Count
- **Sensitivity:** AC Input: 65 VAC minimum; X-ray Input: 50 kVp, 5 mA at 5 cm from top surface of case, pointed to target on case
- **Range:** 9999 pulses; 9999 milliseconds
- **Display:** 0.4” liquid crystal
- **Power:** 9-volt battery; alkaline or equivalent
- **Battery Life:** 24 hours continuous; typically 6 months of normal use
- **AC Input Jacks:** 130 volts AC maximum; 65 volts AC minimum; Input circuit not affected by reversed polarity.
- **Controls/Indicators:** Three-position switch: pulse, Off, Milliseconds; Four-digit liquid crystal display (0.4” character); Low battery indicator; “Low Batt” appears in display when battery voltage reaches 4.8 volts ±0.5 volts; Power-on: LED (green); Oscilloscope output
- **Connections:** None required for direct exposure measurement
- **Dimensions:** 3.15” x 5.8” x 1.6” (80 mm x 147 mm x 40 mm)
- **Weight:** .5 lbs (.21 kg)

07-453 Digital X-ray Pulse Counter/Timer
07-453-2000 Remote Sensor with 10-foot Cable
89-453 Leather Carrying Case
88-453 Optional Oscilloscope Leads
DIGITAL mAs METERS

Accurately measure x-ray generator mAs values.

- Meets today’s QC needs for accuracy and dependability.
- Used for calibration of high current and phototiming accuracy.
- Easy to use; calibrated directly in mAs; no calculations required.
- Hand-held, battery-operated, lightweight; can be carried in pocket or tool kit.

These Digital mAs Meters allow service personnel to check and adjust the mA settings of x-ray generators. These easy-to-use instruments are calibrated directly in mAs, thus eliminating the need for the calculations typically required with more complicated and expensive equipment.

The **Dual-Range mAs Meter** (07-487) is very sensitive. It can measure increments of 0.1 mAs. It has a low range of 0-199.9 mAs; push a button and the range expands to 0-1999 mAs. The **Single-Range mAs Meter** (07-472) measures from 0-1999 mAs in increments of 1 mAs.

The greatest use for these meters is in calibrating the high-current, short-time station where a conventional mAs meter is precluded by tube ratings. The instruments can be used (after verifying the generator accuracy) to set all mA stations and check that phototiming error does not exceed the limits of good practice. To use, simply connect the cable to the x-ray generator and make the required exposure. The mAs reading appears instantaneously on the four-digit LCD. A display indicator warns of the need for battery replacement.

**SPECIFICATIONS:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dual-Range mAs Meter (07-487)</th>
<th>Single-Range mAs Meter (07-472)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>0-199.9 mAs (+“ overrange indicator above 160 mAs)</td>
<td>0-1999 mAs (+“ overrange indicator above 1600 mAs)</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 2% of reading</td>
<td>± 2% of reading</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>25 to 1000 mA</td>
<td>25 to 1000 mA</td>
</tr>
<tr>
<td><strong>Drift</strong></td>
<td>Zero</td>
<td>Zero</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>50° - 100° F (15° - 30° C)</td>
<td>50° - 100° F (15° - 30° C)</td>
</tr>
<tr>
<td><strong>Input Jack</strong></td>
<td>Uses 2 banana jacks</td>
<td>Uses a 3.5 mm phone jack</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>(07-487) Power (on/off), Range (high-low), Reset</td>
<td>(07-472) Power (on/off), Reset</td>
</tr>
<tr>
<td><strong>Accessories Supplied</strong></td>
<td>(07-487) 24” cable with banana plugs on one end and insulated alligator clips on the other</td>
<td>(07-472) 24” cable with a 3.5 mm phone plug on one end and a 1/4” phone plug on the other</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>Single 9V alkaline battery; typical life 80 hours</td>
<td>Single 9V alkaline battery; typical life 80 hours</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>3½” x 5½” x 1½” H</td>
<td>3½” x 5½” x 1½” H</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>7 oz</td>
<td>7 oz</td>
</tr>
</tbody>
</table>

**07-487** Dual-Range mAs Meter
**07-472** Single-Range mAs Meter
THE WAVE PRECISION HIGH-VOLTAGE DIVIDER

The Wave offers quality craftsmanship, accuracy and reliability...everything you would expect from Nuclear Associates, the leading supplier of test instruments and accessories for quality control.

- Frequency response is within 2 dB DC, to 100 kHz.
- Voltage rating anode to cathode: 160 kVp.
- Includes frequency compensation circuit.
- Conservative design.
- Generous insulation.

The concept behind The Wave is similar to that of a voltage-dividing oscilloscope probe. The circuit is frequency compensated by factory adjustment so that the capacitive ratio matches the resistive ratio.

It's easy to use The Wave! Remove the tube cables from the tube and connect them to The Wave. Short high-voltage cables are connected from The Wave to the tube. The Wave can also be used near the high-voltage transformer by connecting short high-voltage cables between the transformer and The Wave. It is optimized for use with a two-channel storage oscilloscope that displays both anode and cathode waveforms and their sums.

The Wave from Nuclear Associates views the anode and cathode waveforms of x-ray tubes at levels up to 150 kVp. Its frequency response is above 100 kHz. The circuit requires no external power and has a ratio of 100,000:1, 100 kVp = 1.0 vp.

APPLICATIONS

- Views anode and cathode voltage “wave” forms of x-ray tubes up to 150 kVp.
- Absolute voltage calibration.
- Verifying kVp versus mA compensation.
- Verifying equal outputs of rectifiers of polyphase machines.
- Monitoring of waveforms to check rectifier output.
- Checking for arcing or corona.
- Looking for intermittent or short circuits within an x-ray tube.
- Checking the waveform flatness in cine or photofluoroscopy imaging.
- Observing the discharge waveform of capacitive mobile x-ray machines.
- Examining the voltage compensation of falling load machines.
- Checking mammography voltage smoothing.
- Checking for defective contactors.
- Checking for spiking at leading edge of waveforms (cable killers).
- Checking voltage commutation of energy switchers (bone cancelling DSA).
- Checking the operation of series tube controls.

SPECIFICATIONS:

Voltage Rating: Anode to cathode: 160 kVp; Anode to ground: 80 kVp; Cathode to ground: 80 kVp
Ratio: 100,000: 1, 2% or better
Accuracy: ± 2% or better
Frequency Response: Within 2 dB DC, to 100 kHz
Output Impedance: 1,000 ohms, 1%
Connector: Federal Standard
Output: Anode-Cathode BNC type
Insulation: Oil
Dimensions: 11” diameter x 12” high
Weight: 35 lbs

07-470 The Wave Precision High-Voltage Divider
07-478 High-Voltage Cable, 5 ft. (Two are required)
89-476 Carrying Case
TOMOGRAPHIC PHANTOM

- Aperture plate allows evaluation of fulcrum and bearing conditions.
- Lead numerals over a 12 mm depth check accuracy of cut.
- Copper mesh measures in-depth resolution.

This device permits the determination of exposure uniformity, cut-level accuracy and fulcrum stability (pivot-bearing tolerances). It consists of a plastic phantom, a steel aperture plate, and a set of metal spacers 10 and 15 cm long. The spacer set provides precise and reproducible placement of the phantom when evaluating different x-ray systems. The phantom may be used with a Patient Phantom (Model 07-706, on page 30) or an equivalent attenuating medium.

SPECIFICATIONS:
The phantom portion contains a helix of 12 lead numbers mounted from 1 to 12 mm above the base, and four copper mesh strips (1.2 x 5 cm each with 0.8, 1.2, 1.6, and 2.0 holes/mm), all embedded in a 15 x 15 x 2.2 cm plastic plate. The aperture plate (15 x 15 x 1 mm) has a 3.0-mm diameter central hole.

Weight: 2 lbs

ULTRA-HIGH PURITY HVL ATTENUATORS

- Permit accurate half-value layer determinations.

Because type-1100 aluminum is only 99.0% pure, it has some impurities that can give a HVL value which is 7.5% lower than those measured with pure aluminum. When doing HVL measurements with a mammography unit, it is recommended that the highest purity aluminum be used. This set of six attenuators satisfies this recommendation, because they are 99.99% pure.

Dimensions: 10 cm x 10 cm x 0.1 mm
Weight: 15 lb (.06 kg)
07-434 Ultra-High Purity HVL Attenuators,
Set of Six Packaged in a Plastic Storage Case

HVL ATTENUATORS

- Permit accurate half-value layer determinations.

ALUMINUM
For HVL determinations of mid-range x-ray generators (80 to 140 kVp). Set of 11 filters (10 cm x 10 cm) includes five of 1.0 mm thickness, two of 0.5 mm, and four of 0.1 mm. Type-1100 aluminum. Weight: 15 lb (.06 kg)
07-430 Aluminum HVL Attenuators, Set of 11
07-431 Copper HVL Attenuators, Set of 10

Because type-1100 aluminum is only 99.0% pure, it has some impurities that can give a HVL value which is 7.5% lower than those measured with pure aluminum. When doing HVL measurements with a mammography unit, it is recommended that the highest purity aluminum be used. This set of six attenuators satisfies this recommendation, because they are 99.99% pure.

Dimensions: 10 cm x 10 cm x 0.1 mm
Weight: 15 lb (.06 kg)
07-434 Ultra-High Purity HVL Attenuators,
Set of Six Packaged in a Plastic Storage Case

COPPER
For HVL determinations of high-range x-ray generators (140 to 400 kVp). Set of 10 filters (10 cm x 10 cm) includes four of 1.0 mm thickness, two of 0.5 mm, and four of 0.1 mm. Weight: 1.25 lb (.36 kg)
07-430 Aluminum HVL Attenuators, Set of 11
07-431 Copper HVL Attenuators, Set of 10

07-430 Aluminum HVL Attenuators, Set of 11
07-431 Copper HVL Attenuators, Set of 10

FILM-BIN-ALERT

Helps prevent accidental waste of film.

- Emits warning when film bin is open.

Film-Bin-Alert helps prevent accidental white light exposure to x-ray film by emitting a “beep” tone whenever the film bin is open. The volume of the tone can be heard over the noise of automatic film processors without being annoyingly loud. This lightweight, compact unit attaches to your film bin in seconds, with the pressure-sensitive adhesive-foam backing.

SPECIFICATIONS:
Power: One 9V transistor battery
Dimensions: 2 3/16” wide x 2 11/16” high x 1 7/8” deep
Weight: Approx. 2 oz

07-409 Film-Bin-Alert
COLLIMATOR TEST TOOL

Verification of the proper alignment of the collimator light field with the x-ray field is essential in radiographic quality control. This test tool readily indicates a 1% or 2% misalignment at a 40" focal-film distance (FFD), but it may be used at any FFD. It consists of a flat 8" x 10" plate with a 14 cm x 18 cm pattern etched on its surface. It can also be used to check fluoroscopy alignment and collimation.

Weight: 6.50 oz
07-661 Collimator Test Tool

BEAM ALIGNMENT TEST TOOL

Improper central ray alignment will distort a radiographic image. When used with the 07-661 Collimator Test Tool, this device provides a simple means of determining if the x-ray beam is perpendicular to the image receptor and centered with respect to the light field. A steel ball is mounted in the center of a disc at each end of the 15-cm-high clear plastic cylinder. When the balls are positioned over one another and at a right angle to the film, their images will appear as one if the central ray is truly perpendicular to the film. The approximate degree of improper angulation can also be determined.

SPECIFICATIONS:
Dimensions: 5.9" high x 2.5" outside diam. (15 cm x 006.3 cm)
Weight: .54 lb (.24 kg)
07-662 Beam Alignment Test Tool

MULTI-TEST OVERLAY

Provides a rapid, easy-to-use means of defining alignment of collimator light and x-ray field.

This is an easy-to-use, practical means of determining the alignment accuracy of the collimator light and the x-ray field. In use, the tool is placed over an 8" x 10" cassette with mammographic film. A lead-outlined target area on the plastic plate facilitates alignment of the collimator light field. The collimator light is aligned to the marker lines. Lead dots on either side of the lead lines define increases or decreases in the field size equivalent to 1% and 2% of SID.

SPECIFICATIONS:
Dimensions: 9" x 11" x 1/8" thick
Weight: 5 oz
07-603 Multi-Test Overlay

FLUOROSCOPIC BEAM ALIGNMENT DEVICE

- Reduces exposure to the patient.

In misaligned fluoroscopic image intensifier systems, the portion of the field that falls outside the visible area of the image receptor does not contribute to the useful fluoroscopic image and can result in unnecessary exposure to the patient.

If corrective measures are required, this device will provide a measurement of optimum beam alignment. It consists of an aluminum plate with four sliding brass strips set in recessed channels. The strips define the visible area of the image receptor and are adjustable with respect to the center of the measurement plate. A transparent plastic overlay on the aluminum plate prevents the vertical displacement of the brass strips. Holes drilled at 1/2" intervals through the center of each channel are filled with high density plugs. The visibility of the plugs in the fluoroscopic image permits their use as a means of centering the device.

SPECIFICATIONS:
Dimensions: 9" x 9" x 5/8" thick
Weight: 5 lbs
07-600 Fluoroscopic Beam Alignment Device

X-ray film of Beam Alignment Device taken by a misaligned fluoroscope machine with a defective collimator.
FLUOROSCOPIC SYSTEM RESOLUTION TEST TOOLS

For resolution checks of fluoroscopic imaging systems.

These 7/2" square plastic plates each have a 7" square area containing eight groups of copper or brass mesh screening in the following mesh-size ranges: 16 to 60 lines/inch, 30 to 100 lines/inch or 60 to 150 lines/inch. The screens are arranged in an irregular rotation to permit discrete visualization of groups. They can also be used to optimize television system focus as well as mirror optics and image intensifier settings.

SPECIFICATIONS:
Dimensions: 7½" x 7½" x 0.35" thick (19 cm x 19 cm x 0.3 cm)
Weight: 8 oz (225 gm)
07-601 Fluoroscopic Resolution Tool, 16-60 mesh
07-619 Fluoroscopic Resolution Tool, 30-100 mesh
07-618 Fluoroscopic Resolution Tool, 60-150 mesh

FOCAL SPOT TEST TOOL

Provides a simple “pass-fail” test to determine if an x-ray tube focal spot has been damaged. Consists of a 6" high stand with an eleven-group test pattern. Each group has six bars, three of which are positioned at right angles to the adjacent set. The groups diminish in size from 0.66 line pairs/mm (1.75 mm) to 2.88 line pairs/mm (0.3 mm). By observing the radiograph and using the supplied chart, showing resolution vs. focal spot size, the nominal focal spot dimension (in mm) can be determined.

SPECIFICATIONS:
Dimensions (Stand): 2½" diam. x 6" high
Weight: .25 lb
07-591 Focal Spot Test Tool
07-800-5007 Flex Film Cassette, 5" x 7"
**DELUXE FOCAL SPOT TEST TOOL**

- Accurately determines tube focal spot size.
- If a tube is damaged, the change is readily apparent on the test film.

The Test Tool consists of a Star Test Pattern and a Test Jig Fixture. The set is placed on a film cassette, the collimator is lowered to the face of the jig, and a radiograph is taken. The resulting film displays the focal spot size by yielding an interference image of the star pattern. A simple measurement of the location of the broken radial pattern correlates directly to the focal spot size. The system allows measurement of focal spots as small as 1 mm and up.

**SPECIFICATIONS:**

- **Dimensions:** 6'' x 6'' (15 cm x 15 cm) at base x 12'' (30 cm) high, and 2½'' x 4½'' (6.4 cm x 11 cm) at top
- **Weight:** .50 lb (225 gm)
- 07-590 Test Jig Fixture
- 07-509-2000 Star Test Pattern

---

**GRID ALIGNMENT TEST TOOL**

Increased patient radiation dose and reduced image contrast can result from lateral decentering or tilting of a focused grid used in a Bucky apparatus. The Grid Alignment Test Tool is used to check whether a focused grid is aligned properly with the central ray and the center of the film cassette. It consists of a set of three plastic-covered, 1/16''-thick lead plates: one 9½'' x 3½'' test plate, and two 3½'' x 2½'' blocker plates. The large test plate contains five 3/4'' test holes and five 1/16'' orientation holes.

**It's easy to use!** The test tool is centered on the x-ray table and fixed in position perpendicular to the grid lines. Five exposures are made, with the x-ray beam sequentially centered on each of five holes, and the optical densities of the hole images are compared. A properly centered and leveled grid will result in equal density changes in the hole images on either side of the central hole. Unequal density changes indicate the need for corrective action.

**SPECIFICATIONS:**

- **Weight:** 1.5 lbs
- 07-644 Grid Alignment Test Tool, Including Three Lead Plates

---

**STOP WATCH**

Recommended whenever precision timing is required. Records up to 15 minutes in 1/10-second divisions. Time-out feature. Start-stop-start with crown, and reset with side button.

**Weight:** .20 lb (.10 kg)
- 07-707 Stop Watch

---

**BEAM SIZE RULER**

- For measuring the beam size on tabletops, wall cassettes or other holders of large-size films.

The folding Beam Size Ruler will fluoresce when exposed to x-rays. To simplify measurements, the ruler is calibrated in various beam sizes (inches).

**Weight:** .10 lb (.04 kg)
- 07-606 Beam Size Ruler
X-RAY OUTPUT DETECTOR
For measuring x-ray generator parameters.

Measures:
- Timer calibration (single-phase, three-phase or CP units).
- Loading characteristics.
- Rectifier malfunctions.
- Contactor problems.
- Cable or connector arcing.
- Shutter calibration, etc.

This low-cost X-Ray Output Detector offers a dynamic means of demonstrating x-ray generator performance. It is used with a storage or camera oscilloscope to display the intensity-time relationship of an x-ray beam. To use, the detector is placed in the x-ray beam, and the output cable is connected to the oscilloscope input. The resulting wave-shape patterns are used to calibrate and/or diagnose malfunctions in the x-ray generator.

The detector supplies a crisp 200 mV signal at standard diagnostic conditions (80 kVp, 100 mA). This extremely high output permits the simple interpretation of oscilloscope displays. Since the detector rise time is better than 1 microsecond, no alteration of the true x-ray output pulse shape is introduced.

SPECIFICATIONS:
- Shock-resistant, solid-state diode detector.
- Power Source: none required.
- Rise Time: Less than 1 µsec.
- Dimensions: 1 1/4'' x 1 1/4'' x 1/2''
- Weight: .58 oz (16.6 g)

07-451 X-Ray Output Detector, Includes BNC Output Connector
88-222 Cable, 20 ft., BNC to BNC

PATIENT PHANTOM/ PENETROMETER SYSTEM
To check the tabletop output of image-intensified fluoroscopic equipment properly, a simulated body or phantom should be placed between the x-ray output meter and the input phosphor. The phantom protects the phosphor from the direct beam and provides the simulated attenuation needed to check the performance of image-intensifier systems. A penetrometer permits the determination of system contrast gradient under simulated operating conditions.

Consists of:
(a) Two 7'' x 7'' x 3/4'' blocks of high-purity aluminum, which represent the equivalent absorption of 26 cms of water and simulate a thick or heavy-set patient at 90 kVp. A single block is the equivalent of a child or adult chest. Aluminum simulates the scatter characteristics of the human body.
(b) One 7'' x 7'' x 1/8'' lead beam-stop plate. When placed in the beam, this plate allows automatic brightness-control machines to deliver maximum output.
(c) One 7'' x 7'' x 1/32'' aluminum penetrometer plate with 1/4'', 0.176'', 1/8'', 0.088'', 1/16'' holes. Place this plate between the two aluminum blocks and ascertain the contrast gradient of the penetrometer on image-amplified systems.
(d) Two sets of legs: one 11/4'' long, one 103/8'' long.

SPECIFICATIONS:
- Dimensions: 7'' x 7'' x 1 7/8'' high (17.8 cm x 17.8 cm x 4.7 cm)
- Weight: 9.5 lbs (4.3 kg)

07-706 Patient Phantom/Penetrometer System
07-629-1000 Aluminum Blocks (two), Type-1100 Al 71/8'' x 71/8'' x 3/4'' thick

ORDERS, QUOTATIONS, CUSTOMER SERVICE:
Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360 Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days), E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com

Scope Tracing Examples of Typical X-Ray Generator Diagnostics.

SPECIFICATIONS:
- Shock-resistant, solid-state diode detector.
- Power Source: none required.
- Rise Time: Less than 1 µsec.
- Dimensions: 1 1/4'' x 1 1/4'' x 1/2''
- Weight: .58 oz (16.6 g)

07-451 X-Ray Output Detector, Includes BNC Output Connector
88-222 Cable, 20 ft., BNC to BNC
TIMING AND mAs TEST TOOL

Measures timer accuracy.

- For single-phase, three-phase and CP machines.
- Copper step wedge checks mAs uniformity.

This synchronous rotating-slit timer provides a simple means of checking x-ray timer accuracy and mAs uniformity. A precision 1-rps motor assures accurate timer phasing. Single-phase measurements are performed by counting the “dot” pattern generated. Three-phase timing is achieved by measuring the included angle of the projected arc on the film by the rotating slit.

To use, the unit is positioned on a 14” x 17” cassette. By masking the blank cassette area, four exposures may be taken on one film. Exposures are made at four technique values (1/5-sec at 50mA, 1/10-sec at 100mA, 1/20-sec at 200mA and 1/30-sec at 300mA), and the film is developed. The copper step wedge indicates the mAs uniformity while the four time values are measured on the film. The timer accurately measures single-phase machines to 1/120 of a second and three-phase machines to 1/150-sec.

SPECIFICATIONS:

- Power: 110V, 60 Hz
- Dimensions: 3½” x 6¼” x 2½” deep
- Weight: 2 lbs

07-465 Timing and mAs Test Tool, 110V, 60Hz
07-465-2200 Timing and mAs Test Tool, 220V, 50Hz

SPIN TOP

- Measures timer accuracy of single-phase radiographic equipment.

The Spin Top is a brass disc with a spindle at its center and a small hole near its edge. The disc rests on the brass base and is free to rotate.

SPECIFICATIONS:

- Dimensions: 2.5” diameter (6.3 cm)
- Weight: .35 lbs (.16 kg)

07-452 Spin Top

SCREEN/FILM CONTACT MESH

Identifies cassette contact problems.

The film/screen contact in a cassette determines the clarity of the focused image. This device allows problems to be identified so that image clarity can be restored. It consists of a 14” x 17” (35.6 cm x 43 cm) copper screen, with 1/8” (0.3 cm) mesh, embedded in durable plastic for long life. To use, simply lay the unit over the cassette, radiograph, and develop the film. Look for screen image clarity across the film. Blurring or distortion indicates poor film/screen contact.

SPECIFICATIONS:

- Dimensions: 15” x 18” x 1/8” thick
- Weight: 1.5 lbs

07-608 Screen/Film Contact Mesh
X-RAY TEST PATTERNS

Nuclear Associates’ extensive line of High-Precision and Ultra-High Precision X-ray Test Patterns are compatible with all x-ray machines and are widely used by physicists and the leading manufacturers of radiography equipment. They consist of lead-foil screens (rasters) that are sandwiched between two plastic plates.

STAR X-RAY TEST PATTERNS FOR MEASURING FOCAL SPOT SIZE

Focal spot size can be determined by observing the regions of blurring which occur when the pattern is radiographed by an x-ray source of finite dimensions. Radiation from different areas of the focal spot will cause a periodic blurring of the pattern due to penumbra effects. Knowledge of the geometric factors, and the distance from the center of the pattern to the region where blurring occurs, will permit the calculation of the focal spot size with the same accuracy as measurements made with a pinhole camera.

<table>
<thead>
<tr>
<th>Pattern Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-503-2</td>
<td>High-Precision Star X-Ray Test Pattern, 55 mm diameter. For measuring focal spots from 0.1 to 0.3 mm. Has four 15° patterned sectors with a 0.5° angle of a single line within a sector. Lead-foil thickness .03 mm</td>
</tr>
<tr>
<td>07-503-1</td>
<td>Ultra-High Precision Star X-Ray Test Pattern. (Same specifications as 07-503-2)</td>
</tr>
<tr>
<td>07-509-2</td>
<td>High-Precision Star X-Ray Test Pattern, 55 mm diameter, for measuring focal spots from 1 mm and up. Has four 45° sectors with a 2° angle of a single line within a sector. Lead-foil thickness .05 mm</td>
</tr>
<tr>
<td>07-509-1</td>
<td>Ultra-High Precision Star X-Ray Test Pattern. (Same specifications as 07-509-2)</td>
</tr>
<tr>
<td>07-542-2</td>
<td>Precision Star X-Ray Test Pattern, 55 mm diameter. For measuring focal spots from 0.3 to 0.6 mm. Has four 28 patterned sectors with a 1° angle of a single line within a sector. Lead-foil thickness .03 mm</td>
</tr>
<tr>
<td>07-542-1</td>
<td>Ultra-High Precision Star X-Ray Test Pattern. (Same specifications as 07-542-2)</td>
</tr>
<tr>
<td>07-543-2</td>
<td>High-Precision Star X-Ray Test Pattern, 55 mm diameter. For measuring focal spots from .8 mm to 1.5 mm. Has four 35° patterned sectors with a 1.5° angle of a single line within a sector. Lead-foil thickness .03 mm</td>
</tr>
<tr>
<td>07-543-1</td>
<td>Ultra-High Precision Star X-Ray Patterns. (Same specifications as 07-543-2)</td>
</tr>
<tr>
<td>07-550</td>
<td>Ultra-High Precision Star X-Ray Patterns. (Same as 07-503-2 except it has four 45° patterned sectors, for easier interpretation). Lead-foil thickness .03 mm</td>
</tr>
<tr>
<td>07-551</td>
<td>Ultra-High Precision Star X-Ray Patterns. (Same as 07-503-2 except it has four 15° patterned sectors with a 0.25° angle). Lead-foil thickness .03 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pattern Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-510-2</td>
<td>High-Precision Star X-Ray Test Pattern, 55 mm diameter, for measuring focal spots from 1 mm and up. Has one 360° pattern sector with a 2° angle of a single line within a sector. Lead-foil thickness .05 mm</td>
</tr>
<tr>
<td>07-510-1</td>
<td>Ultra-High Precision Star X-Ray Test Pattern. (Same specifications as 07-510-2)</td>
</tr>
</tbody>
</table>

ULTRA-HIGH PRECISION TEST PATTERN FOR MEASURING MODULATION TRANSFER FUNCTION

The Ultra-High Precision Test Pattern was developed especially for determining the modulation transfer function. It utilizes 22 groups of line pairs. Each group is indicated by the extended line above the pattern. The resolution of the individual groups can be taken from the table. Lead thickness is 0.05 mm. Pattern size is 71 x 44 mm.

<table>
<thead>
<tr>
<th>Group</th>
<th>LP/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Group</td>
<td>LP/mm</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>2.9</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pattern Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-553</td>
<td>Ultra-High Precision X-Ray Test Pattern for Measuring Modulation Transfer Function</td>
</tr>
</tbody>
</table>

(Continued on the next page)
X-Ray Test Patterns
FOR MEASURING RESOLUTION

The choice of pattern depends on the specific application. The sector test patterns are 0.4°, and the group test patterns have varying numbers of line pair groups. Lead thicknesses are limited by the resolution, with a maximum thickness of 0.1 mm for test patterns up to 5 LP/mm. Radiopaque numbers indicate the resolution (in LP/mm) of each group.

<table>
<thead>
<tr>
<th>Model</th>
<th>Range of resolution in LP/mm</th>
<th>Number of groups</th>
<th>Lead-foil thickness in mm</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-501-2</td>
<td>1.0-4.8</td>
<td>16</td>
<td>0.1</td>
<td>110 x 40</td>
</tr>
<tr>
<td>07-501-1</td>
<td>Ultra-High Precision pattern (same specifications as 07-501-2 above)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07-521</td>
<td>2.0-10.0</td>
<td>15</td>
<td>0.05</td>
<td>94 x 50</td>
</tr>
<tr>
<td>07-525</td>
<td>3.15-16.6</td>
<td>15</td>
<td>0.03</td>
<td>94 x 50</td>
</tr>
<tr>
<td>07-547</td>
<td>3.15-16.6</td>
<td>15</td>
<td>0.01</td>
<td>94 x 50</td>
</tr>
<tr>
<td>07-555</td>
<td>5.0-20.0</td>
<td>13</td>
<td>0.02**</td>
<td>25 x 10</td>
</tr>
</tbody>
</table>

**Gold-foil thickness in mm. (See page 34 for additional details.)

Shown is Model 07-501-2

<table>
<thead>
<tr>
<th>Model</th>
<th>Range of resolution in LP/mm</th>
<th>Number of groups</th>
<th>Lead-foil thickness in mm</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-515</td>
<td>1.0-10.0</td>
<td>1</td>
<td>0.05</td>
<td>80 x 40</td>
</tr>
<tr>
<td>07-523-2</td>
<td>0.5-5.0</td>
<td>1</td>
<td>0.1</td>
<td>157 x 50</td>
</tr>
<tr>
<td>07-523-1</td>
<td>Ultra-High Precision pattern (same specifications as 07-523-2 above)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07-539</td>
<td>1.5-20.0</td>
<td>1</td>
<td>0.025</td>
<td>60 x 30</td>
</tr>
</tbody>
</table>

Shown is Model 07-515

<table>
<thead>
<tr>
<th>Model</th>
<th>Range of resolution in LP/mm</th>
<th>Number of groups</th>
<th>Lead-foil thickness in mm</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-526</td>
<td>0.6-10.0</td>
<td>26</td>
<td>0.05</td>
<td>65 x 55</td>
</tr>
<tr>
<td>07-527</td>
<td>0.6-5.0</td>
<td>20</td>
<td>0.01</td>
<td>50 x 50</td>
</tr>
<tr>
<td>07-535</td>
<td>0.6-5.0</td>
<td>20</td>
<td>0.05</td>
<td>50 x 50</td>
</tr>
<tr>
<td>07-538-2</td>
<td>0.6-5.0</td>
<td>20</td>
<td>0.1</td>
<td>50 x 50</td>
</tr>
<tr>
<td>07-538-1</td>
<td>Ultra-High Precision pattern (same specifications as 07-538-2 above)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shown is Model 07-527

<table>
<thead>
<tr>
<th>Model</th>
<th>Range of resolution in LP/mm</th>
<th>Number of groups</th>
<th>Lead-foil thickness in mm</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-541-2</td>
<td>0.6-3.4</td>
<td>2 x 15</td>
<td>0.1</td>
<td>50 x 50</td>
</tr>
<tr>
<td>07-541-1</td>
<td>Ultra-High Precision pattern (same specifications as 07-541-2 above)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07-548</td>
<td>2.0-6.0</td>
<td>2 x 14</td>
<td>0.08</td>
<td>50 x 50</td>
</tr>
</tbody>
</table>

Shown is Model 07-541-2

X-Ray Test Patterns
FOR MEASURING RESOLUTION OF IMAGE INTENSIFIERS AND VIDEO SYSTEMS

These Ultra-High Precision patterns contain two line groups of each resolution value; the groups are perpendicular to each other. The patterns are recommended when screen image or video intensifiers are to be tested. They are ideal to place in various locations covering the entire area of an image intensifier.

<table>
<thead>
<tr>
<th>Model</th>
<th>Range of resolution in LP/mm</th>
<th>Number of groups</th>
<th>Lead-foil thickness in mm</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-506</td>
<td>1.0-2.0</td>
<td>2 x 6</td>
<td>0.1</td>
<td>32</td>
</tr>
<tr>
<td>07-507</td>
<td>3.0-4.0</td>
<td>2 x 6</td>
<td>0.1</td>
<td>32</td>
</tr>
<tr>
<td>07-511</td>
<td>2.0-3.0</td>
<td>2 x 6</td>
<td>0.1</td>
<td>32</td>
</tr>
<tr>
<td>07-519</td>
<td>1.8-3.15</td>
<td>2 x 6</td>
<td>0.1</td>
<td>32</td>
</tr>
<tr>
<td>07-529</td>
<td>2.8-5.0</td>
<td>2 x 6</td>
<td>0.1</td>
<td>32</td>
</tr>
<tr>
<td>07-532</td>
<td>5.0-6.0</td>
<td>2 x 6</td>
<td>0.05</td>
<td>32</td>
</tr>
<tr>
<td>07-537</td>
<td>5.0-7.0</td>
<td>2 x 6</td>
<td>0.05</td>
<td>32</td>
</tr>
</tbody>
</table>

(Continued on the next page)
RADIOLOGY/FLUOROSCOPY

SE SERIES
SILVER “EAGLE” X-RAY TEST PATTERNS

• 100% Silver.
• Excellent Quality.
• Cost-Effective.
• Totally Lead-Free...
Environmentally-Friendly.

We’ve been listening to you... You asked for high-quality, reliable high-performance Test Patterns at more cost-effective pricing, and here they are!

New breakthrough manufacturing technology. New, advanced processes enable us to provide you with the precision x-ray test patterns you require to meet the quality control demands of today, and tomorrow. Our Silver “Eagle” X-Ray Test Patterns are designed to satisfy the industry’s most requested x-ray test pattern specification and configuration requirements.

SPECIFICATIONS:
Range of Resolution: 0.5 to 5.0 LP/mm
Number of Sectors: 1
Thickness in 100% Silver: 0.1 mm
Dimensions: 157 mm x 50 mm
07-523-3000 SE Series Silver “Eagle” X-Ray Test Pattern

SPECIFICATIONS:
Range of Resolution: 0.6 to 5.0 LP/mm
Number of Groups: 20
Thickness in 100% Silver: 0.01 mm
Dimensions: 50 mm x 50 mm
07-527-3000 SE Series Silver “Eagle” X-Ray Test Pattern

RADIOPAQUE RULERS

07-533 Radiopaque Ruler, 30 cm long,
2 mm divisions, Weight: .05 lb (.04 kg)

07-533-1000 Radiopaque Ruler, 100 cm long,
2 mm divisions, Weight: .5 lb (.24 kg)

07-533-3600 Radiopaque Ruler, 36 cm long,
2 mm divisions, Weight: .05 lb (.04 kg)

See Also...

Single-Exposure High Contrast Resolution Phantom
• Meets ACR Guidelines
• Perform QC inspections of mammography system resolution with just one exposure.

See Mammography Section, Page 131

RESOLUTION X-RAY TEST PATTERN

Specifically designed for evaluation of focal spot performance.

It is suggested that a resolution test pattern with a range of 5 to 20 LP/mm be used to evaluate the condition of the focal spot. An accurate determination of the x-ray tube’s resolution ability can be measured by using this test pattern. This test pattern is manufactured from a gold-nickel alloy which is .0175 mm thick (equivalent to 0.025 mm of lead or 2.6 mm of aluminum at 20 keV).

Weight: Less than one pound
07-555 Resolution X-Ray Test Pattern:
25 mm Long x 12.5 mm Wide
SLIT CAMERAS
Three precision slit cameras are available for the evaluation of:
• Focal Spot Size  • Modular Transfer Function  • Blooming

DOUBLE SLIT CAMERA
Designed to permit testing in compliance with IEC Standard 336...
With a single image!
• With two slits, you benefit from increased camera versatility and ease-of-use.

Like our other two slit cameras, our unique Double Slit Camera is manufactured to the highest quality and performance standards. It is designed with two slits positioned perpendicular to each other, so you get increased camera versatility, ease of use, convenience and time-savings. The new Double Slit Camera incorporates tungsten slit material and may be repaired if dropped and damaged. Each slit camera comes with a solid oak storage case.

SPECIFICATIONS:
Number of Slits: Two, perpendicular
Slit Width: 10 µm ± 1 µm, with 4° relief angles on each jaw
Slit Length: 5.5 mm (± .1 mm)
Slit Material/Thickness: Tungsten; 1.5 mm
Weight: .35 lb (.16 kg)

07-624-2222  Double Slit Camera, with Storage Case
89-624  Solid Oak Slit Camera Storage Case

SINGLE SLIT CAMERA
A major breakthrough in slit camera manufacturing technology.

Here is a versatile slit camera manufactured to the highest-quality standards and offered at a cost-effective price. It provides exceptional performance, accuracy, quality and reliability. For added cost-effectiveness and convenience, the slit camera can be repaired to its original specification, in the event it is dropped and damaged. This Nuclear Associates Slit Camera is ideal for use by equipment manufacturers, service engineers and physicists. Each Slit Camera comes with a solid oak storage case.

SPECIFICATIONS:
Number of Slits: One
Slit Width: 10 µm ± 1 µm, with 4° relief angles on each jaw
Slit Length: 5.5 mm (± .1 mm)
Slit Material/Thickness: Tungsten; 1.5 mm
Weight: .35 lb (.16 kg)

07-624-1000  Single Slit Camera, with Storage Case
89-624  Solid Oak Slit Camera Storage Case

INDUSTRY STANDARD SINGLE SLIT CAMERA
The gold-standard of slit cameras.

Professionals in facilities worldwide rely on this dependable, hand-crafted state-of-the-art device. Manufactured using the highest quality materials, it is guaranteed to provide you with unsurpassed performance. It is not repairable. Each slit camera comes with a solid oak storage case.

SPECIFICATIONS:
Number of Slits: One
Slit Width: 10 µm ± 1 µm, with 4° relief angles on each jaw
Slit Length: 7 mm (± .1 mm)
Slit Material/Thickness: Tantalum; 1.5 mm
Weight: .35 lb (.16 kg)

07-624  Industry Standard Single Slit Camera, with Storage Case
89-624  Solid Oak Slit Camera Storage Case
USE YOUR SLIT CAMERA WITH A NUCLEAR ASSOCIATES FOCAL SPOT TEST STAND!

• Provides a uniform method for the accurate, reproducible measurement of focal spots.

• Designed to accept a slit camera, a pinhole assembly or a star resolution pattern.

• Nuclear Associates carries a comprehensive line of Test Patterns. (See page 32.)

MAMMOGRAPHY FOCAL SPOT TEST STAND*

Specifically designed for mammography.

• Includes a magnification insert, alignment device, and fluorescent alignment screen.

It is particularly important to verify the size of the focal spot during acceptance testing of new mammographic equipment or when a new x-ray tube is installed. This test stand is designed to make these important procedures easy to perform, and ensures accurate results.

SPECIFICATIONS:
Dimensions: 9″ x 111/2″ at base; 4″ x 6″ at top
Height: Adjustable from 9″ to 18″
Weight: 11 lbs

07-623 Mammography Focal Spot Test Stand
89-622 Carrying Case
07-611 Pinhole Assembly, 0.100 mm

MULTIPURPOSE FOCAL SPOT/HVL TEST STAND*

• Can be used for half value layer measurements.

• Designed for both over-table and under-table x-ray tube measurements.

This versatile stand features extendible legs that provide the enlargement factors required by the NEMA standard. Long leveling screws allow the positioning of a screen-film cassette under the base.

SPECIFICATIONS:
Dimensions: 12″ x 12″ at base; 6.15″ x 6.15″ at top
Height: Adjustable from 1619/16″ to 313/8″
Weight: 11 lbs

07-622 Multipurpose Focal Spot/HVL Test Stand
89-622 Carrying Case
07-633 Pinhole Assembly, 0.010 mm
07-617 Pinhole Assembly, 0.075 mm
07-613 Pinhole Assembly, 0.030 mm
07-611 Pinhole Assembly, 0.100 mm

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

- Supplied with the slit camera of your choice.
- Accurate, reproducible focal spot measurements.
- Accepts pinhole and star patterns.

Slit Cameras, when used with our Focal Spot Test Stands, allow equipment manufacturers, biomedical engineers, service engineers and medical physicists to comply with IEC, NEMA and Federal Regulatory Standards (i.e., MQSA) as they relate to focal spot measurements on radiographic equipment.

Each of these convenient kits consists of one slit camera and either the Mammography Focal Spot Test Stand or the Multipurpose Focal Spot/HVL Test Stand, plus a rugged carrying case. Choose the kit that best meets your performance and budgetary needs.

MAMMOGRAPHY FOCAL SPOT MEASUREMENT TEST KITS

These Nuclear Associates kits include your choice of either the Industry Standard Single Slit Camera, Single Slit Camera, or Double Slit Camera, the Mammography Focal Spot Test Stand, plus a convenient carrying case...all at special kit pricing.

Weight (Approximate): 21 lbs (9.34 kg)

07-623-6240 Mammography Focal Spot Measurement Test Kit with Industry Standard Single Slit Camera, Mammography Focal Spot Test Stand, and Carrying Case

07-623-6241 Mammography Focal Spot Measurement Test Kit with Single Slit Camera, Mammography Focal Spot Test Stand, and Carrying Case

07-623-6242 Mammography Focal Spot Measurement Test Kit with Double Slit Camera, Mammography Focal Spot Test Stand, and Carrying Case

MULTIPURPOSE FOCAL SPOT MEASUREMENT TEST KITS

These kits include your choice of either the Industry standard Single Slit Camera, Single Slit Camera, or Double Slit Camera, the Multipurpose Focal Spot/HVL Test Stand, plus a convenient carrying case...all at special kit pricing.

Weight (Approximate): 21 lb (9.34 kg)

07-622-6240 Multipurpose Focal Spot Measurement Test Kit with Industry Standard Single Slit Camera, Multipurpose Focal Spot/HVL Test Stand, and Carrying Case

07-622-6241 Multipurpose Focal Spot Measurement Test Kit with Single Slit Camera, Multipurpose Focal Spot/HVL Test Stand, and Carrying Case

07-622-6242 Multipurpose Focal Spot Measurement Test Kit with Double Slit Camera, Multipurpose Focal Spot/HVL Test Stand, and Carrying Case

ORDERS, QUOTATIONS, CUSTOMER SERVICE:
Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360
Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days),
E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com
X-RAY PINHOLE ASSEMBLIES

For measuring the dimensions of focal spots of x-ray tubes.

One of the specifications and chief features of an x-ray tube is its focal spot size, a very important factor in the resolution to be achieved during a radiologic examination. A small focal spot size will provide the maximum resolution. However, there are other factors in the construction of an x-ray tube, such as the heat dissipation within the target, which limits the minimum size of the target.

In order to determine the focal spot size of an x-ray tube, a small and precise pinhole is often used. Its size must be very small compared to the focal spot to be measured. Any of four precision pinholes can be used with our 07-623 and 07-622 Test Stands (see page 36). The test stand height is adjustable in order to maintain the minimum magnification factor of two. A fluoroscopic screen is part of the test stand and is used for centering the focal spot before exposing the film.

The 0.010 mm pinhole diameter is for focal spot sizes from 0.5 to 0.10 mm; the 0.030 mm pinhole diameter is for focal spot sizes below 1.0 mm; the 0.075 mm diameter is for focal spots from 1.0 mm to 2.5 mm; the 0.1000 mm diameter is for sizes above 2.5 mm.

The pinhole diaphragm is made from a 90:10 gold-platinum alloy in accordance with the table and figure.

All Pinhole Assemblies weigh less than one pound.

07-617  Pinhole Assembly, 0.075 mm
07-633  Pinhole Assembly, 0.010 mm
07-613  Pinhole Assembly, 0.030 mm
07-611  Pinhole Assembly, 0.100 mm

HIGH-QUALITY COMPARATORS

For magnification and measuring focal spot sizes.

• Magnification 7X.

Supplied with its own leather case. Fits in the palm of your hand. Transparent body allows illumination to fall on magnified area. Accurate, easy to use, versatile, and truly portable!

Weight: .05 lb (.04 kg)

07-620  Comparator, 7X Magnification

• Magnification 25X.

Supplied with a 0-5 reticle. Features a knurled ring which adjusts the focal point to personal preference. Transparent body allows illumination to fall on magnified area. Supplied with protective storage case. An excellent, high-quality precision magnifier!

Weight: .20 lb (.10 kg)

07-635  Comparator, 25X Magnification
R/F MODULAR MINI TEST STAND
WITH TEST OBJECT

The Most Versatile, Easy to Use, Portable Unit on the Market!

- Lightweight, compact and extremely portable.
- Ideal for field service and in-house QC.
- Basic Test Object (included) for routine QC.
- Deluxe Test Object (optional) can be used for routine QC and for assessing low contrast and high contrast resolution.
- Replaces the bulky, high-cost CDRH Test Stand and numerous other test tools.
- Designed for use with any type of stationary or portable radiographic or R/F unit in either the AP or lateral configuration.
- Comes with a bracket for attaching an external ion chamber at any of the three levels of the device.
- Nuclear Associates' aluminum and copper HVL filters (not included) can be placed in the beam in either the AP or lateral configuration.
- May be used with extension legs (included) for additional applications.

Nuclear Associates’ highly versatile Radiographic/Fluoroscopic Modular Mini Test Stand with either the Basic Test Object or the Deluxe Test Object can be used in the routine performance of all quality assurance tests and image quality evaluations conducted by physicists and technologists. Service engineers will find it useful for making beam centering and image focusing adjustments, and for correcting collimator misalignment. Its unique, compact design allows for unparalleled portability and ease of set up for most quality assurance tests.

With a suitable external ion chamber attached to the R/F Modular Mini Test Stand, it can also be used for the accurate measurement of:

- Exposure reproducibility.
- Entrance skin exposures.
- Effective dose equivalents.
- Half value layer.
- Tabletop exposure rate/MA as a function of kVp.
- Maximum tabletop exposure rates.
- Input exposure rate to the image intensifier.

(Continued on the next page)
The R/F Modular Mini Test Stand with the Basic Test Object or the Deluxe Test Object enables the routine monitoring of the following parameters by making just a few radiographs.

- Light beam and radiation beam congruence.
- Field size indicator accuracy.
- Beam centering with respect to the image receptor.
- Automatic collimator performance.
- Darkroom film fog compliance.
- Phototimer performance (semi-quantitatively).
- mA linearity (semi-quantitatively).
- Exposure reproducibility (semi-quantitatively).
- kVp accuracy (semi-quantitatively).*
- Focal spot size accuracy.
- High-contrast resolution.*
- Low-contrast resolution as a function of kVp.*
- Image noise (semi-quantitatively).
- Image distortion, symmetry and vignetting.
- Beam extension beyond the image receptor.
- Source-to-tabletop distance.

* With Optional Deluxe Test Object, only.

TEST STAND COMPONENTS
A Probe-Holder Bracket (included) enables an external ion chamber to be attached to any of the three plates. Nuclear Associates’ standard 4" x 4" aluminum and copper filters can be inserted into the Test Stand at any level. Extension Legs (included) increase the overall height of the Test Stand. They are recommended for applications such as checking beam extension beyond the image receptor of fluoroscopic units and for measuring the entrance skin exposure rate of C-arm units at 30 cm from the image intensifier.

TWO TEST OBJECTS ARE AVAILABLE:

Basic Test Object (Supplied, see Figure 1 on page 41.) It consists of three 1/8" thick acrylic discs, 4", 3" and 2" respectively, in diameter. This Test Object is used for the routine monitoring of all quality-control-related parameters of radiographic and fluoroscopic units, except high and low contrast resolutions and kVp accuracy. Our Deluxe Test Object (optional) can be used for these procedures as well.

Deluxe Test Object (Optional, see Figure 2 on page 41.) It consists of a circular aluminum disk (1/4" thick and 4" in diameter). At the outer edge of the disk are low contrast details, divided into two groups. The inner group is composed of 20 drilled holes ranging in depth from 1 thousandth of an inch, to 20 thousandths of an inch. The outer group is composed of 20 drilled holes ranging in depth from 10 thousandths of an inch, to 200 thousandths of an inch. An annular copper ring covers the outer holes. These holes are for the assessment of low contrast resolution as a function of kVp. Six wire mesh patterns (20, 30, 40, 60, 80, 100 mesh) are located in the center of the test object for the assessment of high contrast resolution.

With radiographic units, kVp accuracy can be monitored by counting the number of holes visualized in the inner and the outer groups of low contrast details. As the kVp goes up, the number of holes seen in the inner group decreases due to decreasing subject contrast, while the number of holes seen in the outer group increases, due to increased beam penetration through the annular copper ring.

(Continued on the next page)
**SPECIFICATIONS:**

- **Dimensions:**
  - **Test Stand** without extension legs: 6'' x 6'' x 10'' high
  - **Extension Legs:** 2½ cm (closed), 40 cm (open);
    8 ⅞'' (closed), 15 ⅞'' (open)

- **Weight:**
  - **Test Stand:** 3.65 lbs (1.66 kg)
  - **Extension Legs:** .95 lb (.44 kg)

**07-625** R/F Modular Mini Test Stand;
Includes Basic Test Object, One Test Object Assembly, Four Extension Legs, One HVL Filter Holder, One MDH Probe-Holder Bracket, One Chamber Holder (for Nuclear Associates’ Model 06-528), and One Bubble Level

**07-625-1000** Deluxe Test Object
**07-625-1998** Basic Test Object
**07-623-5000** Extension Legs, Set of Four
**07-430** Aluminum Filter Set (11) 10 cm x 10 cm; 4 are 0.1 mm, 2 are 0.5 mm, 5 are 1.0 mm
**07-431** Copper Filter Set (10) 10 cm x 10 cm; 4 are 0.1 mm, 2 are 0.5 mm, 4 are 1.0 mm
**07-434** High-Purity Aluminum Filter Set (5)
  100 mm x 100 mm x 0.1 mm thick
**07-800-5007** Flex Film Cassette; 5'' x 7''
**07-800-8010** Flex Film Cassette; 8'' x 10''
**07-800-1012** Flex Film Cassette; 10'' x 12''

**Also Available: Flex Film Cassettes**

These flexible vinyl film holders are ideal for focal spot measurements and any other resolution test. See page 53 for details!

---

**ORDERS, QUOTATIONS, CUSTOMER SERVICE:**
Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360 Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days), E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com
R/F QC PHANTOM

Now you can get vital quality control information for standard radiographic and fluoroscopic imaging systems in 5 minutes or less!

- Designed specifically with the radiologic technologist in mind.
- Provides an accurate overall evaluation of image quality consistency.
- For QC of phototimer and automatic brightness control consistency.
- Ideal for use in determining subtle degradation in imaging performance.
- Fast, easy to use; average test time is less than 5 minutes per unit.
- For use with radiography, fluoroscopy, and spot films, too.
- Verifies fluoroscopic monitor contrast and brightness adjustment.

The R/F QC Phantom is designed to provide the diagnostic radiologic technologist with an accurate, easy-to-use tool for evaluating the image quality and performance of standard diagnostic radiographic and fluoroscopic imaging systems.

For fine-tuning of radiographic and fluoroscopic imaging systems, it is recommended that the phantom be imaged at least monthly on all radiographic and fluoroscopic equipment. To attain the most accurate, up-to-date quality control information, a daily or weekly frequency is preferable. When used daily, the R/F QC Phantom will allow the technologist to quickly determine whether the equipment is functioning correctly. This easy-to-use phantom allows the user to complete the suggested protocol in approximately 5 minutes or less, when used on a standard R/F system. Once the phantom is imaged, simply graph the results to determine any trends that may indicate a degradation of imaging system performance, such as a steady but slow change in the fluoro kVp or in the radiographic mAs.

- At the center of the phantom are pie-shaped wedges of varying mesh sizes: 20#, 30#, 40#, 60#, 80# and 100# L/in, for evaluating high-contrast performance.
- Surrounding the mesh are four low contrast “masses” of different diameters: 2 mm, 4 mm, 6 mm and 8 mm.
- At one edge of the phantom is a small “density difference” patch, for a measure of contrast on the films.
- At the opposite edge of the phantom are two monitor adjustment squares, each having a low contrast square insert.
- The phantom contains a 2 mm copper attenuator which allows it to simulate the attenuation of an average adult.
- At the corners of the test tool are lines for aligning the light field.
- QC charts are provided for plotting both the radiographic and fluoroscopic results.
- Along the sides of the test tool are beads 1 cm inside and outside of the lines started in the corners.

**SPECIFICATIONS:**

Dimensions: 7” x 7” x 9/16” thick
Weight: 1.1 lbs

07-647 R/F QC Phantom
DIAGNOSTIC X-RAY PHANTOMS

- Patient-equivalent acrylic and aluminum phantoms provide the necessary attenuation between the source and AEC or ABC detectors.
- Helps you comply with JCAHO requirements for radiographic exposure measurements.
- Easy-to-use.

JCAHO requires that x-ray exposure measurements be determined for commonly used projections in all radiographic suites. In order to provide this information when using Automatic Exposure Control (AEC) or Automatic Brightness Control (ABC) systems, specially designed phantoms must be used. Attenuating material must be used between the source and AEC or ABC detectors. Since these detectors are energy dependent, measurement of skin entrance exposure requires the use of patient-equivalent phantoms for meaningful results.

AAPM Report #31 recommends the use of four special phantoms for use in diagnostic x-rays. These acrylic and aluminum phantoms are patient-equivalent, and are specifically designed to conform to the AAPM recommendations.

CHEST X-RAY PHANTOM (Model 76-211)
The Chest Phantom consists of four sheets of 25 cm x 25 cm x 2.54 cm clear acrylic, one sheet of 25 cm x 25 cm x 1 mm and one sheet of 25 cm x 25 cm x 2 mm type-1100 high-purity aluminum, and spacers to provide a 5.08 cm air gap. Clinical testing of the phantom has shown it to be equivalent to a 23 cm patient for the PA chest projection.

Weight: 17.5 lbs (8 kg)

ABDOMEN/LUMBAR SPINE PHANTOM (Model 72-212)
The Phantom consists of five sheets of 25 cm x 25 cm x 2.54 cm and one sheet of 25 cm x 25 cm x 5.08 cm clear acrylic to achieve a 17.78 cm thick phantom. In order to provide additional attenuation in the spinal region, a 7 cm x 25 cm x 4.5 mm thick piece of high-purity alloy aluminum is included.

Weight: 37 lbs (17 kg)

SKULL X-RAY PHANTOM (Model 76-213)
The Skull Phantom has the same configuration as the Chest Phantom, but without the air gap. It consists of four sheets of 25 cm x 25 cm x 2.54 cm clear acrylic, one sheet of 25 cm x 25 cm x 1 mm and one sheet of 25 cm x 25 cm x 2 mm high-purity alloy aluminum, and a center sheet of 25 cm x 25 cm x 5.08 cm clear acrylic.

Weight: 26.5 lbs (12 kg)

EXTREMIT Y X-RAY PHANTOM (Model 76-214)
The Extremity Phantom consists of one 25 cm x 25 cm x 2 cm piece of high-purity alloy aluminum sandwiched between two sheets of 25 cm x 25 cm x 2.54 cm clear acrylic.

Weight: 10 lbs (4.5 kg)

MAKE-YOUR-OWN-PHANTOM MODULAR KIT (Model 76-215)
This kit contains all the components needed to make any one of the phantoms on this page. Includes:

- Five sheets 25 cm x 25 cm x 2.54 cm thick acrylic
- One sheet 25 cm x 25 cm x 5.08 cm thick acrylic
- One sheet 25 cm x 25 cm x 1 mm thick aluminum
- One sheet 25 cm x 25 cm x 2 mm thick aluminum
- One sheet 7 cm x 25 cm x 4.5 mm thick aluminum
- Spacers for a 5.08 cm air gap

Weight: 34 lbs (15.3 kg)

76-211 Chest X-Ray Phantom
76-212 Abdomen/Lumbar Spine Phantom
76-213 Skull X-Ray Phantom
76-214 Extremity X-Ray Phantom
76-215 Make-Your-Own-Phantom Modular Kit

These Phantoms are Recommended in AAPM Report #60, “Instrumentation Requirements of Diagnostic Radiological Physicists.”
Nuclear Associates Diagnostic Radiology and Radiation Therapy Catalog

**FLUOROSCOPIC PHANTOM**

*Designed to meet the requirements for the NEXT* protocols.

This Phantom is now required in order to comply with QC tests recommended in the ACR’s Barium Enema QC Manual.

In a survey of fluoroscopic facilities for the Nationwide Evaluation of X-Ray Trends program, it was determined that a substantial proportion of facilities could not visualize low-contrast test objects; this strongly suggests image quality problems. Measurements for this survey were performed using the CDRH Fluoroscopic Phantom. In addition to air kerma rate measurements, imaging performance was assessed using the Fluoroscopic Image Quality Test Object (included with phantom). The phantom also contains a lead stop plate and copper attenuation plate.

Upper gastrointestinal (GI) tract fluoroscopy is the most frequently conducted fluoroscopic procedure in the United States and contributes the highest effective dose to the U.S. population. The dose that an individual may receive not only is a function of the equipment, it also depends on the length of the examination and the actual number of images obtained during the examination. Therefore, it is important to ensure that equipment is functioning properly, so that appropriate corrective action can be taken in an effort to reduce patient dose.

* The Conference of Radiation Control Program Directors (CRCPD), the professional organization of state and local radiation control agencies, along with the Food and Drug Administration (FDA) of the federal government, conducts the Nationwide Evaluation of X-Ray Trends (NEXT) survey program.

(Continued on the next page)
The NEXT survey concluded that although the assessment of radiation dose to patients during fluoroscopy is difficult because of the dynamic nature of fluoroscopy, the use of a standard phantom to measure the fluoroscopic air kerma rate and the radiographic air kerma allows a facility to compare the performance of their fluoroscopic system and selected techniques with national averages. The assessment of imaging performance with a standard imaging test object also provides a relative measure of imaging performance with which to compare different fluoroscopic systems.

By using the CDRH Fluoroscopic Phantom from Nuclear Associates, doses at fluoroscopy can be reduced, and fluoroscopic image quality can be improved.

**SPECIFICATIONS:**
This patient-equivalent phantom of uniform thickness consists of a 7" thick acrylic block, one Fluoroscopic Image Quality Test Object, one Lead Stop Plate and one Copper Attenuation Plate. The base of the phantom is comprised of two type-1100 aluminum plates, each 2.3 mm thick. The phantom has four lead beads embedded on top, to be used as collimation orientation points. It stands on two legs, approximately 4" off the tabletop. One leg is specially designed as a probe holder.

**Fluoroscopic Image Quality Test Object:** This is comprised of eight low-contrast test holes (each 0.375" diameter, and ranging in depth from 0.0063" to 0.068") and eight wire meshes (ranging from 12 to 60 lines per inch). The test object is used for the assessment of spatial resolution, and can easily be taken on and off the phantom.

**Lead Stop Plate:** This 3.2 mm (1/8") plate simulates maximum attenuation, and can be used to measure the maximum air kerma rate (free in air).

**Copper Attenuation Plate:** This 1.6 mm (1/16") copper filter simulates the presence of a 2 mm thick layer of barium sulfate, and can be used to measure the air kerma rate (free in air).

**Dimensions:** 7" x 7" x 8" high
(17.78 x 17.78 x 19.30 cm)

**Weight:** 21 lbs

***Diagram of the Fluoroscopic Image Quality Test Object used for the upper GI tract fluoroscopic survey illustrates the high-contrast wire-mesh patterns and the aluminum (Al) disk with holes for low-contrast evaluation.***

07-649 CDRH Fluoroscopic Phantom, Including One Fluoroscopic Image Quality Test Object, One Lead Stop Plate and One Copper Attenuation Plate
07-649-1169 Fluoroscopic Image Quality Test Object
89-649 Carrying/Storage Case

**FREE STUDY REPRINT AVAILABLE ON REQUEST**

**ROTATABLE SPOKE TEST PATTERN**

*For quality control testing of fluoroscopic imaging systems.*

- Demonstrates image lag or smearing.
- Tests for the highest image quality found in cardiac fluoroscopic systems.
- Provides motion, contrast, and noise levels comparable to those encountered in actual patient studies.
- Supplied with a water phantom (plastic canister) to simulate patient.
- Extremely accurate, yet so easy to use, anyone can do the testing!
- Optional aluminum attenuator blocks available.

Percutaneous transluminal coronary angioplasty (PTCA) and various other cardiac cath lab procedures, require fluoroscopic systems of the highest image quality...the ability to see a 0.014” moving guide wire. Most of the available test objects are inadequate for testing this kind of image quality because the potential for motion is not incorporated.

The Rotatable Spoke Test Pattern and Plastic Canister have been designed to accurately and quickly evaluate the overall performance of a fluoroscopic imaging system. It is a vital tool for every cardiac cath lab because it will provide a new QC standard for visualizing moving steel wires at contrast and noise levels comparable to those encountered in patient studies. The plastic canister (water phantom) simulates body thickness via imaging through different depths of water...another useful indicator of system performance!

**COMPONENTS**

The Rotatable Spoke Test Pattern consists of six 5” long steel wires of varying diameters, arranged at 30 degree intervals like spokes in a wheel, sandwiched between two circular pieces of 1/8” thick acrylic. The test pattern is mounted on a synchronous motor with a speed of 30 RPM. A 10 1/2” high plastic canister is also included.

The wire diameters are 0.022”, 0.017”, 0.013”, 0.010”, 0.007”, and 0.005” (the smallest is equivalent to the diameter of a human hair). The sequence of wire sizes was selected so that some wires are larger than the standard (one wire 0.013”, is close to today’s standard 0.014” guide wire used during PTCA) and a number of smaller diameters wires are included to challenge the best systems encountered. If your imaging system can visualize the 0.013” or smaller wire, then you are getting optimum performance!

**Optional aluminum attenuator blocks:** These blocks consist of two attenuators made of type 1100 aluminum 7 1/8” x 7 1/8” x 3/4” thick. Stacking two blocks provide the user with the attenuation of an adult abdomen. Using one block provides pediatric abdominal attenuation. The blocks give the user a more convenient and easier means of obtaining the necessary attenuation needed to perform these procedures.

**TESTING IS EASY!**

The plastic canister is filled to different depths (6”, 8” and 10”) to simulate small to large sized patients. The Rotatable Spoke Test Pattern is imaged through different water depths to create TV monitor images at clinical levels of contrast and noise. The test pattern is viewed in both stationary and rotating modes.

The number of wires visualized in its entirety across the TV monitor is recorded. A reference chart for comparison and rating of the fluoroscopic system is supplied. If a system has less wire visibility than expected, a complete analysis of the imaging system will be required in order to return the system to optimum performance.

**SPECIFICATIONS:**

- **Spoke Test Pattern:** 5 1/2” diam. x 1 1/8” high
- **Power:** 115V/60 Hz
- **Plastic Canister with Lid:** 9” diam. x 10 1/2” high
- **Weight:** 2 lbs

07-629 Rotatable Spoke Test Pattern and Plastic Canister with Lid
07-629-1000 Set of Two type-1100 Aluminum Blocks, each 7 1/8” x 7 1/8” x 3/4” thick

*Designed and developed by Dr. Robert J. Moore, Dept. of Radiology, Loma Linda University Medical Center, Loma Linda, CA.*
CINE-VIDEO QUALITY CONTROL PHANTOM AND PATIENT IDENTIFIER

Provides an easy way to monitor image quality of high-dose cine film and videotape examinations.

• Ideal for quality control tests for resolution, density, contrast, uniformity of focus.
• Provides patient identification information at the beginning of a cine or video study.

This single, patient-equivalent phantom provides patient identification information, as well as quality control checks when exposed on the cine film or video tape at the beginning of the study, before the patient is placed on the table. The density of the step wedge can be measured with a densitometer to determine the average density and contrast, while one can quickly check the resolution and uniformity of focus. If the quality of the study is in question, the images of the phantom will immediately indicate whether there was an equipment problem, or if the lower quality of the images was due to the large size of the patient, or technique selected for the patient study, or both (elimination of unnecessary service calls will result in an immediate savings in operating costs).

The phantom consists of the following components all mounted in a single plate: a high contrast resolution test pattern, a three-step density contrast test section, and a mesh screen (20, 30, 40 mesh) to test for uniformity of focus.

SPECIFICATIONS:
Dimensions: 8⅛" x 8⅛" x ⅛" thick (21.5 cm x 21.5 cm x 1 cm)
Weight: 1.4 lb (.60 kg)

CARDIAC DIGITAL IMAGING/CINE-VIDEO QUALITY CONTROL PHANTOM AND PATIENT IDENTIFIER

• Recommended as part of the Image Compression Study being conducted by the American College of Cardiology (ACC) DICOM Committee.
• Selected by the ACC as the image quality criteria for digital imaging.

This device provides:
• Patient identification information at the beginning of a cine or video study.
• Quality control test of resolution.
• Quality control tests of density and contrast.
• Quality control test of uniformity of focus.

This patient-equivalent phantom provides permanent patient identification information (required by the ACC), as well as quality control checks for digital imaging (when exposed on the cine film or videotape at the beginning of the study, before the patient is placed on the table).

SPECIFICATIONS:
The phantom consists of the following components, all mounted in a single plate:
• High contrast resolution test pattern (model 07-523).
• Four-step density contrast test section.
• Mesh screen (20, 30, 40 mesh), to test for uniformity of focus.
• Copper Plate: .0937" thick.
Dimensions: 8⅛" x 8⅛" x ⅛" thick (21.5 cm x 21.5 cm x 1.2 cm)
Weight: 3 lb (1.3 kg)

07-656 Cardiac Digital Imaging/Cine-Video QC Phantom and Patient Identifier, with Four-Step Density Contrast Test Section and Copper Plate

* Both instruments were designed by Joel E. Gray, Ph.D., Professor Emeritus, Department of Diagnostic Radiology, Mayo Clinic®, Rochester, MN 55905. Manufactured under licensing agreement with Mayo Foundation for Medical Education and Research.
**FLUOROSCOPIC QUALITY CONTROL TEST TOOL**

*For fast operational checks of...*
- Fluoroscopic system resolution.
- Proper brightness and contrast adjustment of video monitor (both permanent and mobile).
- Off-center image sharpness.
- Spot film image density, uniformity, and resolution.
- Resolution of video tape recorder, or last-image-hold system.

A major problem in most fluoroscopic systems is the misadjustment of the contrast and brightness controls of the fluoroscopic or video monitor. The Fluoroscopic QC Test Tool provides a precise, accurate, easy-to-use means of quickly checking the image quality of permanent and mobile systems, including videotape recorders and last-image-hold systems, which are becoming widely used in fluoroscopic imaging.

*The test tool consists of:* light and dark low contrast test objects for monitor adjustment, copper mesh for image sharpness, and a resolution pattern 0.5 to 5.0 LP/mm (cycle/mm) for system resolution, all mounted in a single plate. It can also be used to evaluate fluoroscopic resolution and off-center image sharpness, as well as the density, uniformity, contrast, and resolution of spot film images (conventional spots, 105 mm spots, or digital spots).

**SPECIFICATIONS:**

- **Dimensions:** 24 cm x 24 cm
- **Weight:** 38 oz

07-637  Fluoroscopic Quality Control Test Tool

---

**FLUORO-TEST™ TOOL** *(1)*

*Designed to yield a quantitative assessment of fluoroscopic threshold contrast.*

Nuclear Associates’ Fluoro-Test Tool is a fluoroscopic contrast resolution device that employs a target arrangement designed to reduce ambiguity and difficulty associated with employing a sequential array of targets with small differences in contrast between adjacent targets.

With the Fluoro-Test target plates, the user focuses on a subset of three targets at a given time. In each subset or column, large differences (≥3%) are present between adjacent targets and it is easy to decide if a target is visualized or not. The threshold contrast for a plate is the lowest of the values observed for the three columns of targets, and a contrast resolution precision of 0.5% is obtained by the sequential use of the two plates. When imaged at 80 kVp with 2.0 mm of Cu beam attenuation, the targets of Plate A range in contrast from 1 to 8% in 1% increments. Likewise, the targets of Plate B range from 0.5% to 7.5%. Tables of target contrast versus kVp permit the user to determine target contrast (and therefore threshold contrast resolution) at other fluoroscopic tube potentials.

The development of the Fluoro-Test Tool is based on the work of Wagner, Barnes and Wu.

**SPECIFICATIONS:**

- **Dimensions:** 24 cm x 24 cm
- **Weight:** 3.15 lbs (1.42 kg)

07-645  Fluoro-Test Tool

---

*(1)* Manufactured under licensing agreement with UAB Research Foundation, University of Alabama at Birmingham, Alabama.


*Nuclear Associates*
CINE ATTENUATORS

*Help measure fluoro input radiation levels.*

- Available in adult and pediatric thicknesses.

The input radiation level of a fluoroscopic unit can be measured directly by placing an x-ray ion chamber behind the antiscatter grid and then imaging the appropriate Cine Attenuator. The adult model has a 2.4 mm copper plate sandwiched between 1/8” thick acrylic sheets; the pediatric version is a 0.9 mm copper plate between the acrylic sheets.

The attenuators are designed to simulate an average adult or pediatric patient in regard to the exposure factors required by the ABC system. The final optical density on the processed frames is controlled by the size of the aperture in the diaphragm, which is located directly in front of the cine camera lens. To determine the optimal on-frame optical density, a series of cine runs are made using different sized apertures, with either the adult or pediatric cine attenuator in the beam.

**SPECIFICATIONS:**
- **Dimensions:** 7” x 7”
- **Weight:** 2 lbs (0.9 kg)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-614</td>
<td>Adult Cine Attenuator</td>
</tr>
<tr>
<td>07-630</td>
<td>Pediatric Cine Attenuator</td>
</tr>
<tr>
<td>07-614-8080</td>
<td>Adult Cine Attenuator, 8” x 8”</td>
</tr>
</tbody>
</table>

FLUORO CONTRAST TEST DISKS AND LEAD CONTRAST STRIPS

*Designed specifically for monitoring the percent contrast of the image-intensifier tube/lens system.*

- For quality control testing of the cine imaging chain.
- Testing can easily be performed by the in-house technical staff.

Measuring the percent contrast using either the Fluoro Contrast Test Disks or Lead Contrast Strips can be performed annually and/or whenever a new image-intensifier tube is installed. This test should be part of the QC testing program of the cine imaging chain. Fluoro Contrast Test Disks and Lead Contrast Strips make performing all required measurements easy. The disks satisfy NEMA (National Electrical Manufacturers Association) requirements for image intensifiers and facilitate compliance with NEMA Standard XR-16.

To measure percent contrast, a disk or strip is taped to the center of the fluoro grid during a 2 to 3-second cine run, using the Adult Cine Attenuator (model 07-614) in the beam. The resulting optical densities to the side and behind the image of the disk (on the developed cine frames) are then measured with a calibrated densitometer, such as Nuclear Associates’ Deluxe Clamshell Densitometer (see page 379).

**FLUORO CONTRAST TEST DISK SPECIFICATIONS:**
- **Disk Thickness:** 1/8” thick lead, sandwiched between two 1/8”-thick white acrylic plates
- **Each set consists of six disks, one each of the following diameters:** 1⅞”, 2⅝”, 2⅜”, 2⅝”, 2⅜”, 3⅞”
- **Weight of Set:** 1.84 lbs (.83 kg)

**LEAD CONTRAST STRIP SPECIFICATIONS:**
- The strips have a thickness of 1/8” and a width equal to 1/10 of the active diameter of the input phosphor. Three strips are provided for 4”, 6” and 9” input phosphors.
- **Weight of Set:** 3 lbs (1.4 kg)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-638</td>
<td>Fluoro Contrast Test Disks, Set of Six</td>
</tr>
<tr>
<td>07-615</td>
<td>Lead Contrast Strips, Set of Three</td>
</tr>
<tr>
<td>07-614</td>
<td>Adult Cine Attenuator</td>
</tr>
<tr>
<td>07-638-6140</td>
<td>Fluoro Contrast Test Set</td>
</tr>
<tr>
<td></td>
<td>(Includes all three models listed above)</td>
</tr>
<tr>
<td>07-443</td>
<td>Deluxe Clamshell Densitometer</td>
</tr>
</tbody>
</table>
HIGH-PURITY ALUMINUM
STEP WEDGES

Built to U.S. Federal Specification GG-X-635C.

Nuclear Associates’ Step Wedges can be used to determine:
• mAs linearity.
• Contrast vs. kVp.

They can also be used for:
• Darkroom fog testing.
• Film comparison.
• Screen comparison.
• Technique chart development.

On these high-purity aluminum step wedges, even-numbered steps are identified with lead numerals.

11 Steps!

• 11 steps.

Dimensions: Step Wedge: 2 1/2” x 5 1/2” x 1 3/8”
Each Step: 0.5” surface; 3 mm rise
Weight: 1.10 lbs (.50 kg)

07-456 11 Step Wedge, Type-2024 Aluminum
07-456-1100 11 Step Wedge, Type-1100 Aluminum

21 Steps!

• 21 steps.

Dimensions: Step Wedge: 10.3” long x 3” wide x 1.85” high
(262.5 mm x 76 mm x 46.8 mm)
Each Step: 2.1 mm deep surface; 12 mm rise
Weight: 3.20 lbs (1.45 kg)

07-456-2100 21 Step Wedge Type-2024 Aluminum
07-456-2111 21 Step Wedge Type-1100 Aluminum

DENTAL ALUMINUM
STEP WEDGE

Specially designed for evaluating darkroom fog and consistency testing. The step wedge has two slots, one for exposing a film pack and one for evaluating darkroom fog. The film slot also ensures easy, reproducible placement of the film for consistent imaging.

SPECIFICATIONS:
Material: Type 1100 aluminum
Dimensions: 12.7 cm L x 5.1 cm W x 1.3 cm H
Weight: 6 oz (165 g)

76-025-4000 Dental Aluminum Step Wedge

See Also...

CDRH DENTAL IMAGE QUALITY TEST TOOL
Designed to meet the specifications for the Nationwide Evaluation of X-ray Trends (NEXT) Dental Survey Protocol.

• Provides a means of reproducible setup, ensuring a consistent test protocol.
• Cost-effective; reduces the need for repeat films.
• Easy-to-use; reduces setup time.
• Increases patient safety.

See Radiology/Fluoroscopy Section, Page 62
**DENTAL QC STEP WEDGE**

- **Simulates clinical densities.**

The Dental QC Step Wedge will aid in evaluating the factors that affect the quality of your x-rays and help eliminate any unnecessary patient exposure due to generator malfunction. Because the “steps” absorb different amounts of photons from the x-ray beam, radiographing this aluminum test tool will produce sharply delineated areas and equally graded exposure levels on the film. Any increase or decrease in overall density of corresponding steps is an indication that corrective measures are needed.

**Dimensions:**
- Step Wedge: 9 1/2 in L x 1 1/4 in W x 5/8 in H
- Each Step: 1/2” wide x 1/4” long x 0.4 mm high

**Weight:** 1.2 oz (.04 kg)

18-242 Dental QC Step Wedge

---

**CONSTANT-THICKNESS STEP WEDGE FOR MAMMOGRAPHY**

- **Use with a densitometer to monitor system performance quantitatively.**

Includes the following materials:
- Water-equivalent (Bolus on each end)
- 100% glandular-equivalent (Pure gland)
- 70% glandular-equivalent
- 64% glandular-equivalent acrylic (PMMA), with wax insert
- 50% glandular-equivalent
- 45% glandular-equivalent (BR-12)
- 30% glandular-equivalent
- 0% glandular-equivalent (Pure adipose)

**Dimensions:**
- 10 cm x 10 cm x 4 cm thick
- Weight: 1.1 lb

18-240 Constant Thickness Step Wedge

---

**GLANDULAR-EQUIVALENT MAMMOGRAPHIC STEP WEDGE**

- **10 steps.**
- **Standard materials composition is 50% glandular and 50% adipose tissue.**
- **Other glandular equivalencies available.**

This Nuclear Associates step wedge is manufactured from glandular-simulating materials which have been specially formulated to maximize simulation properties in the mammographic energy range. It can be used with standard densitometers to monitor system performance under changing exposure parameters.

**Dimensions:**
- Step Wedge: 4 1/2" long x 4 1/4" wide
  - (.12 cm x .12 cm)
  - .4 cm initial thickness decremented in 10 steps.
- Each Step: .25 cm

**Weight:** .86 lb (.39 kg)

18-242 Glandular-Equivalent Mammographic Step Wedge

---

**MAMMOGRAPHIC STEP WEDGE**

*Ideal for monitoring the imaging speed and contrast of a mammographic system.*

- **15 steps.**
- **Designed in accordance with AAPM Report No. 29, “Performance Specifications and Equipment Requirements for Mammography.”**

Made of high-purity aluminum, this step wedge provides a useful means of comparing the characteristic curve of various screen-film combinations, mAs reciprocity, and sensitometry. It ranges from 0.4 mm to 6 mm thick in 15 steps.

**Dimensions:**
- Step Wedge: 9 1/2” long x 1 1/4” cm wide
  - Each Step: 1/2” wide x 1/4” long x 0.4 mm high
- Weight: 36 oz (10.4 kg)

18-239 Mammographic Step Wedge
WHO YOU RELY ON FOR RADIATION PROTECTION IS AS IMPORTANT AS THE PRODUCT YOU CHOOSE!

Your patients have chosen you as their healthcare provider based on your years of experience, expertise and reputation. It stands to reason then, that you should demand the same qualities from your radiation protection product supplier...after all, your health depends on it.

At Nuclear Associates, we take radiation protection seriously. For more than three decades, medical imaging professionals have relied on our exceptional product quality and selection, clinical experience, technical expertise and professional service. Our outstanding reputation is the result of our ongoing commitment to maintaining the high standards you expect.

When it comes to your health and safety, consider us your radiation protection specialist...Only the safest, most effective and durable products are incorporated into our product line. You can count on us to understand your individual radiation protection requirements and stand behind every product we sell...before, during and after the sale.

Nuclear Associates...A Name You Can Rely On... Products You Can Trust.
AEC TEST TOOL
For performing quick checks of automatic exposure control.

- Easy to use.
- Low cost.

Performance capability refers to the ability of an AEC (Automatic Exposure Control) system to maintain a constant optical density over a broad range of imaging techniques and patient variables. The AEC Test Tool is designed to assess the ability of a given radiographic system to achieve this goal, as well as to determine the range of conditions over which the system will not perform adequately. More specifically, this high-quality test tool allows the user to assess the performance of the radiographic unit's automatic exposure control system, with regard to performance capability and density control selector function.

An automatic exposure control system with appropriate compensation circuits is functioning properly if it can maintain constant film optical density. The AEC Test Tool consists of a set of four acrylic sheets, each 25 cm x 25 cm x 5.08 cm thick. By placing varying thicknesses of acrylic in front of the photocells, and imaging under clinical conditions, the test films will show the AEC system's capability to produce constant and uniformly-exposed radiographs.

Nuclear Associates’ AEC Test Tool provides an easy and inexpensive way to determine the performance of all radiographic phototiming systems. There is no need to go into the generator circuitry to evaluate the system. By using the AEC Test Tool in conjunction with film, a quick determination of the AEC capability can be made.

SPECIFICATIONS:
Test Tool Material: Acrylic
Dimensions (each sheet): 25 cm x 25 cm x 5.08 cm thick
Weight per sheet: (3.2 lbs) 1500 g
07-733 AEC Test Tool, Set of Four Sheets

FLEX FILM CASSETTES
The x-ray QC standard for more than 40 years.

- Three popular sizes are available for your convenience: 5" x 7", 8" x 10" and 10" x 12".

Nuclear Associates is pleased to offer Flex Film Cassettes, the flexible vinyl x-ray film holders that provide unsurpassed detail and resolution. Unlike conventional cassettes, Flex Film Cassettes contain no screen, so you get direct exposure of the x-ray film and a better image. Flex Film Cassettes offer an ideal combination of firmness and flexibility for a variety of medical and industrial applications; that's why they are the most widely used flexible film cassettes in the industry.

Flex Film Cassettes are:
- Convenient to use; an alignment grid is printed on one side.
- Easy-to-load; they fit easily around contoured items.
- Durable; use them again and again.
- Resistant to moisture and dirt; they're easy to clean.
- Available in custom sizes; cassettes have been manufactured in sizes up to 68 inches long. Metric sizes are also available on special order.

Flex Film Cassettes are the best choice for QC testing of imaging equipment. They are ideal for use with such Nuclear Associates test tools as: the Mini CT QC Phantom (see page 160), all Nuclear Associates X-Ray Test Patterns, all Slit Cameras and all Focal Spot Imaging Test Tools, as well as many others. If you are currently using, or plan to purchase, any of the above test tools, then you need Nuclear Associates' Flex Film Cassettes.

Weight: Less than 1 pound.
07-800-5007 Flex Film Cassette; 5" x 7"
07-800-8010 Flex Film Cassette; 8" x 10"
07-800-1012 Flex Film Cassette; 10" x 12"
AEC TEST CASSETTE

Reduces film costs and saves time when testing automatic exposure controls.

- Reduces test time.
- Saves money. uses only one 8" x 10" film rather than four films for the test series.
- 8" x 10" film conveniently fits into a written test report.
- Easy to use.
- Fits most vertical cassette holders.
- Ideal for use by physicists and individuals responsible for installing and testing vertical cassette holders.
- Test films produced using the AEC Test Cassette provide an obvious indication of system performance.

Illustrates typical machine operation. May indicate need for machine adjustment.

(Continued on the next page)
The Problem:
When testing AEC systems, the usual way is to use a 10" x 12" cassette and either expose four films or tape lead plates to mask a single film for the four exposures needed. These methods are costly, time-consuming and tedious.

Most simple vertical cassette holders or “chest boards” are capable of using the three common chest film sizes: 14" x 17" (both axes), 11" x 14" and 10" x 12." The cost of film and the convenience of using 8" x 10" films to fit within the dimensions of a written test report, supports the use of an 8" x 10" film exposed within a 10" x 12" cassette.

The Solution:
Nuclear Associates’ AEC Test Cassette. The AEC Test Cassette is a lightweight, easy to use 10" x 12" cassette which allows four test exposures to be taken on a single 8" x 10" film. The four exposures are made at two kVp settings and two phantom thicknesses. The test film can then be conveniently placed in the QC report.

This time-saving cassette features a 5 mm thick brass disk that is simply rotated to mask the film for the four exposures...no taping is required and all images are taken on one piece of film, saving time and money. The small screw on the cassette appears in the image, allowing the user to easily differentiate one image from another by orienting the film. The shape of the brass disk and the design of the recessed hub of the center bearing means that the disk does not rub against the grid used in vertical cassettes. Comparison of performance from year-to-year is of particular value in determining whether or not a system needs recalibration. The AEC Test Cassette from Nuclear Associates makes performing such tests easy and cost-effective.

The **AEC Test Cassette** procedure to test the automatic exposure control uses four exposures at two different values of kVp and two different values of phantom attenuations. The attenuation phantom consists of one 7" x 7" sheet of copper, 1 mm thick, sandwiched between two 7" x 7" x 3/4" thick sheets of high purity aluminum.

**SPECIFICATIONS:**
- Dimensions: 10" x 12" (28 mm x 33 mm)
- Weight: 5.62 lbs (2.55 kg)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-664</td>
<td>AEC Test Cassette</td>
</tr>
<tr>
<td>07-664-7061</td>
<td>AEC Test Cassette Kit, Includes 07-664 Cassette, 07-706 Phantom/Penetrometer System and 07-614 Copper Attenuator</td>
</tr>
<tr>
<td>07-706</td>
<td>Patient Phantom/Penetrometer System, Includes Two Blocks of High-Purity Aluminum, One Lead Beam-Stop Plate, One Aluminum Penetrometer Plate</td>
</tr>
<tr>
<td>07-614</td>
<td>Copper Plate; 7&quot; x 7&quot; x 1.0 mm</td>
</tr>
</tbody>
</table>

**ORDERS, QUOTATIONS, CUSTOMER SERVICE:**
- Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360 Monday thru Friday, from 8:30 AM to 5:00 PM EST,
- FAX: (516) 741-5414 (24 hours/7 days),
- E-mail: sales@nucl.com,
- visit us at: http://www.inovision.com and http://www.nucl.com
Now, you can evaluate Digital Subtraction Angiography Systems using all three concentrations of iodine found in diagnostic imaging!

**DIGITAL SUBTRACTION ANGIOGRAPHY PHANTOM**

- Evaluates digital functions of DSA systems.
- Checks contrast range, resolution, linearity, and subtraction effectiveness.
- Easy-to-use modular format. Easy-to-interpret results.

This unique QC test tool provides a reliable, easy means of evaluating the digital functions of DSA equipment. Important performance parameters are measured by a system of five clear-acrylic building blocks: 1 step wedge, 1 bone block, 1 resolution block, 1 artery block, and 1 slot block. Each has a specific function. However, some of the modules can be combined to perform additional tests. For example, the step wedge has two functions: (1) It serves as a contrast measurement wedge, and (2) it “folds” on itself to become a 3” thick solid body block. This system versatility assures maximum performance with minimal effort and cost.

**SYSTEM COMPONENTS:**

**Slot Block:** The center of this 20 x 20 x 7.5 cm thick module has a slot that holds and positions the resolution and artery sections. The block is also used to increase “body” thickness by 7.5 cm.

**Blank Block:** This is not a separate module, but part of the elongated artery block. The blank portion can be positioned in the slot block to make the mask image.

**Step Wedge:** This module tests a machine’s contrast range by its ability to subtract all steps. The six acrylic steps are each 2.5 cm high. The top three steps can be “folded” over the bottom three to form a solid block, 20 x 20 x 7.5 cm thick. When used with the slot block it simulates the patient’s body.

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

† Non-digital functions of DSA systems are checked with conventional fluoroscopy equipment.
Bone Block: This 20 x 20 x 2.5 cm thick piece contains simulated calcium bones (20 cm x 2.5 cm) in three thicknesses: 0.5, 1.0 and 1.5 cm. When the bone block is positioned over the other blocks, the subtraction function can be tested by the degree to which the simulated bones remain visible in the final subtracted images.

Resolution Block: There are two precision test patterns in this 15 x 20 x 2.5 cm module. The patterns have line-pair groups, from 0.6 to 5.0 LP/mm, with a 0.01 mm lead thickness.

Artery Block: This 15 x 45 x 2.5 cm piece contains three iodine-filled simulated arteries whose width and depth are 1, 2 and 4 mm respectively. Each artery includes simulated stenoses and aneurysms that are one-fourth, one-half, and three-fourths of the individual artery’s width. Three concentrations of iodine span the range typically found in diagnostic imaging. Consequently, it is necessary to evaluate digital subtraction angiography systems using all three concentrations. The extremely low concentrations stress the low contrast imaging characteristics of the system, i.e., place an emphasis on the noise in the system. The medium and high concentration inserts stress the dynamic range of the system.

15 mg/cm³ concentration simulates the arterial concentration of iodine from an intravenous injection, i.e., after dilution and mixing of the contrast material with blood in the heart and lungs.

150 mg/cm³ concentration of iodine represents the amount of iodine from an arterial injection which has been diluted approximately 1:1 with blood in the artery.

300 mg/cm³ concentration is similar to the iodine contrast media as it is injected, i.e., with no dilution from the blood. Such concentrations would be found in the small coronary arteries with selective injections. Such high concentrations may also be found in the other arteries where a selective injection technique is utilized.

SPECIFICATIONS:

Dimensions: 20 x 20 x 15 cm high
Weight: 30 lbs
76-700 Digital Subtraction Angiography Phantom, with Artery Block, 15 mg per ML venous concentration
76-705 Artery Block (from 76-700 phantom), with 15 mg per ML venous concentration
76-700-1150 Digital Subtraction Angiography Phantom, with Artery Block, 150 mg per ML arterial concentration
76-705-1150 Artery Block (from 76-700-1150 phantom), with 150 mg per ML arterial concentration
76-700-1300 Digital Subtraction Angiography Phantom, with Artery Block, 300 mg per ML arterial concentration
76-705-1300 Artery Block (from 76-700-1300 phantom), with 300 mg per ML arterial concentration
**DSA PHANTOM**

*Available with three concentrations of iodine!*

- Quantitatively measures high- and low-contrast spatial resolution.
- Checks linearity, uniformity, amplifier dynamic range, subtraction effectiveness and registration accuracy.
- Easy-to-use modular format. Buy only the components you need.

Every important digital image parameter of a DSA system is easy to evaluate with this QC test tool. Its modular format allows you to purchase only the parts needed to test particular parameters. If your needs change, other components of the system can always be added.

The phantom consists of nine components. When some of them are combined, additional functions can be evaluated. For example, the two-piece step wedge serves as a dynamic range measurement tool. However, when “folded” on itself, it becomes a solid, 3" thick, body block. When used with the slot block, it forms a 6" thick plastic mass that simulates body x-ray absorption during tests.

Five inserts are available:
- (1) Low-Contrast Artery Insert has vessels with varying diameters and iodine concentrations.
- (2) Low Contrast Iodine Line-Pair Insert is used for quantitative resolution measurements.
- (3) Resolution High-Contrast Pattern Insert accepts lead line-pair test patterns of two different lead thicknesses.
- (4) Linearity Insert has six regions, each with a different iodine thickness.
- (5) Blank Insert is used to make the mask images for the others. Also available is a Registration Plate with an all-over hole pattern that detects changes in pixel position between the test image and the mask image.

This phantom conforms to the recommendations in Report #15 by the American Association of Physicists in Medicine (AAPM)—Performance Evaluation and Quality Assurance in Digital Subtraction Angiography.

(Continued on the next page)
CHOOSE FROM THE FOLLOWING SYSTEM COMPONENTS:

(A) Slot Block (76-712): This 20 x 20 x 7.5 cm acrylic block has an opening that holds and positions the insert sections. Weight: 6 lbs.

(B) Bone Block (76-713): For checking the effectiveness of the subtraction process and its resistance to the formation of subtraction artifacts. Measures 20 x 20 x 2.5 cm and contains three simulated bones (0.5, 1 and 1.5 cm thick respectively and 2.5 cm wide). Weight: 3 lbs.

(C) Step Wedge (76-711): Tests a machine’s dynamic range by its ability to subtract all steps. Six acrylic steps, each 2.5 cm high, form a wedge whose total dynamic range is approximately 40:1 depending on the kVp setting. When the upper three steps are “folded” over the lower three, the wedge becomes a solid block, 20 x 20 x 7.5 cm thick. This, together with the slot block, simulates a patient’s body attenuation. Weight: 7 lbs.

(D) Blank Insert (76-714): Simulates body tissue before iodine injection when making a mask image. Dimensions: 15 x 20 x 2.5 cm. Weight: 2 lbs.

(E) High-Contrast Resolution Pattern Insert (76-717): This 15 x 20 x 2.5 cm acrylic insert has recesses for holding up to three square lead test patterns. Test patterns are not included with the insert. Weight: 2 lbs.

(F) Linearity Insert (76-719): Six regions, each with a different iodine thickness, are arranged in a circle on a 15 x 20 x 2.5 cm block. Iodine values are 0.5, 1, 2, 4, 10 and 20 mg/cm². Weight: 2 lbs.

(G) Low-Contrast Artery Insert (76-715): Iodine-filled channels in this 15 x 20 x 2.5 cm block simulate three sets of vessels (0.5, 1, 2 and 4 mm diameter). Each set has a different iodine concentration: 2.5, 5 and 10 mg/cc. Weight: 2 lbs.

(H) Low-Contrast Iodine Line-Pair Insert (76-716): Contains two sets of line-pair groups: 1, 0.7, 0.5, 0.35, 0.25, 0.175, and 0.125 LP/mm. One set has an iodine area density of 0.5 mg/cm², the other is 1.0 mg/cm². Dimensions: 15 x 20 x 2.5 cm. Weight: 2 lbs.

X-Ray Test Patterns for High-Contrast Insert. Resolution range is 0.6 to 5.0 LP/mm. Insert accepts up to three test patterns. Choice of lead thickness: 0.01 mm (07-527) or 0.1 mm (07-538-1000 or 07-538-2000).

Registration Plate (76-718): Made of aluminum, 20 x 20 x 1.6 mm, with an overall pattern of 3 mm holes. When x-rayed twice, and one image is subtracted from the other, the resulting picture shows any pixel misregistration that may have taken place between x-rays. Misregistration correction is easily tested. Weight: 4 oz.
DIB™ DIGITAL INSTANT-BOLUS FILTERS

The quick, easy way to bolus in DSA (Digital Subtraction Angiography).

- Lightweight, Clear-Pb® Lead-Plastic filters replace bags of flour, grease, gel and other materials used in digital subtraction angiography.
- Mount on the collimator; they never touch the patient.
- Provide optimum image quality.
- Quick-stik magnetic mounting system permits instantaneous filter positioning and adjustments.

Now you can discard the conventional bolus bags and other makeshift materials normally used in digital subtraction angiography. There’s a much easier, faster and more effective way to bolus patients...DIB Digital Instant-Bolus Filters.

DIB Filters from Nuclear Associates are made of CLEAR-Pb, a lightweight, lead-plastic material. The filters are designed to mount on the collimator, not on the patient. By means of quick-stik magnetic strips on the filters, plus a Filter Holder Assembly that slips into your collimator’s accessory tray, the filters can be held firmly in place or repositioned instantly. The edges of the filters are tapered so that the filtering is gradual. After subtraction, the filter edge is invisible, sometimes even if minor re-registration is necessary due to motion.

For maximum filtration versatility, DIB filters are available in three thicknesses: thin, standard, and thick. This range allows the appropriate degree of filtration to be applied to every part of the diagnostic field. Where light, low-density areas must be matched to somewhat heavier, denser regions, the thin filter is recommended. An area without a target may be imaged with the thick filter to match heavy bone. The standard filter is used to match areas of average tissue density to moderately heavy bony areas. The tapered edges allow the filters to be placed adjacent to each other, thus providing the same uniform and continuous filtration that would be available from a single large filter.

A small area to be filtered can easily be “filled” by using the narrow filters. The bridge filter replaces the conventional (and previously necessary) bolus bag positioned under the patient’s neck. Because of its limited length, the bridge filter doesn’t interfere with the standard or thick filters used laterally to the patient’s head.

If they are purchased individually, a Filter Holder Assembly (Model 57-420) is required for using the filters with collimator accessory trays. If purchased as a set, the Filter Holder Assembly is included at no extra charge. For multiple x-ray installations, we recommend one Filter Holder Assembly per machine.

SPECIFICATIONS:

- **Thin Filters:** 3/16" long x 27/16" wide x 0.125" thick, tapered on two edges. Magnetic mounting strip
- **Standard Filters:** 3/16" long x 27/16" wide x 0.2" thick, tapered on two edges. Magnetic mounting strip
- **Standard Narrow Filters:** 3/16" long x 1" wide x 0.2" thick, tapered on three edges. Magnetic mounting strip
- **Thick Filters:** 3/16" long x 27/16" wide x 0.3" thick, tapered on two edges. Magnetic mounting strip
- **Bridge Filter:** 2" long x 1" wide, tapered on all four edges. Mounted on the center of an acrylic bar, 6½" long x 1" wide x 0.125" thick, with magnetic strips at each end

**Filter Holder Assembly:** Consists of a filter holder and two mounting plates. A 1½"-wide steel rim around the perimeter of the 6½" x 6½" x 1¾" holder attracts the filters’ magnetic strips and holds them firmly. Two clear-acrylic mounting plates, 9" x 9" x 1/16", are attached to the filter holder by 8 screws. The plates can be cut easily to fit collimator accessory trays

**Weight:** Model 57-421 Filter Set, 2 lbs. Model 57-420 Filter Holder Assembly, 19 oz.

- 57-422 Thin Filter Pair (one left, one right)
- 57-417 Standard Filter Pair (one left, one right)
- 57-418 Standard Narrow Filter Pair (one left, one right)
- 57-423 Thick Filter Pair (one left, one right)
- 57-419 Bridge Filter
- 57-420 Filter Holder Assembly
- 57-411 Replacement Mounting Plates (set of two)
- 57-421 DIB Digital Instant-Bolus Filter Set, Includes 1 Thin Filter Pair (57-422), 2 Standard Filter Pairs (57-417), 1 Standard Narrow Filter Pair (57-418), 1 Thick Filter Pair (57-423), 1 Bridge Filter (57-419), and 1 Filter Holder Assembly (57-420)
DENTAL RADIOGRAPHIC NORMALIZING
AND MONITORING DEVICE

A time-saving, effective and inexpensive tool that will ensure the best possible intraoral radiographs with the least amount of patient exposure!

- Proven effectiveness.
- Reduces department costs and time commitment.
- Includes simple, clear instructions...Troubleshooting Guide printed on device holder.
- Minimizes patient exposure.

Good quality control results in fewer retakes, which means cost savings in materials, fewer wasted working hours, less inconvenience to patients, and reduced radiation exposure to staff and patients.

The Troubleshooting Guide, printed on the device holder, identifies possible causes of change in film density and suggests corrective actions.

Advantages of Normalizing:
- Minimizes patient exposure.
- Ensures consistent radiographic quality.
- Educates dental personnel about good radiation practices.
- Provides reliable estimate of skin exposure.
- Assists in calculating intraoral exposure times.
- Provides baseline exposure for periodic monitoring.

Advantages of Monitoring:
- Reduces number of retakes...Saving money on film and chemistry expenses.
- Tracks skin exposure per film.
- Minimizes disruptions in radiographic services.
- Signals need to change processing solutions.
- Detects deficiencies before film quality is degraded.

State X-ray Regulations May Affect Your Practice!

State regulations may require you to implement x-ray quality control programs to ensure the diagnostic quality of x-ray images and reduce radiation exposure to patients. This device will help you comply with such requirements!

DENTAL BEAM-DIAMETER GAUGE

Measures the beam diameter of dental beam restricting cones.

This handy, easy to use device is placed on a flat surface, and the cone of the x-ray tube is positioned directly against the center of the screen. The room is darkened and the longest possible exposure is made. The operator stands in a safe area and observes the exposed area of the fluorescent screen.

The National Council on Radiation Protection and Measurements states in NCRP Report #35 (2.1 2a), “For intraoral radiography, the useful beam shall be restricted to the diameter of not more than 3” at the end of the cone.” Nuclear Associates’ Beam-Diameter Gauge helps satisfy this recommendation.

SPECIFICATIONS:

Scribed circles displayed are 2”, 2.36” (5 cm), 2.75” (6 cm), 3” and 4” respectively.

Dimensions: 5” x 5” (12.6 cm x 12.6 cm)
Weight: Less than 1 pound
CDRH DENTAL IMAGE QUALITY TEST TOOL

**Designed to meet the specifications for the Nationwide Evaluation of X-ray Trends (NEXT)* Dental Survey Protocol.**

- Provides a means of reproducible setup, ensuring a consistent test protocol.
- Cost-effective; reduces the need for repeat films.
- Reduces setup time.
- Increases patient safety.
- Minimizes chance of misdiagnosis.
- Ideal for dental service engineers and inspectors.

The JCAHO requires certain standards to be met regarding radiographic quality control. Nuclear Associates’ Dental Image Quality Test Tool facilitates compliance with these standards, since the standards were compiled using a prototype of this phantom.

The Dental Image Quality Test Tool from Nuclear Associates is designed specifically for testing the functionality of dental x-ray units, and provides a means of evaluating half value layer, determination of kVp, and assessing overall image quality. *It is the only dental test tool designed with dental service personnel and inspectors in mind.* The test tool will significantly improve the ability of service personnel to quickly and accurately survey the image quality of the x-ray unit. The Dental Image Quality Test Tool can also be used as a constancy check for x-ray film processing, making it the most versatile and cost-effective dental test tool available today.

Clinical imaging involves diagnosis of tooth pathology. In order to permit an accurate simulated clinical image evaluation, the test tool contains a human tooth encased in its center. The Dental Image Quality Test Tool consists of a wooden cradle (to hold the test tool body), built-in slots (for attenuation filters), a film slot, an exposure chamber holder, and a mounting screw (for use with a tripod). The test tool comes with an aluminum step wedge, that is designed for evaluating darkroom fog and consistency testing. The step wedge has two slots, one for exposing a film pack and one for evaluating darkroom fog. The film slot also ensures easy, reproducible placement of the film for consistent imaging.

To use the Dental Image Quality Test Tool, it is necessary to establish an acceptable baseline or standard for the x-ray unit performance. The test tool should be imaged using the same technical factors that were used to establish the baseline. These images, when compared to the baseline, will allow the user to determine if image quality degradation is occurring, so appropriate corrective action can be taken.

*NEXT (Nationwide Evaluation of X-Ray Trends) is a committee of the Conference of Radiation Control Program Directors (CRCPD) that oversees quality control procedures for diagnostic radiology. They issue procedure protocols and guidelines for imaging modalities.*

(Continued on the next page)
Dental Image Quality Test Tool set up for half value layer measurement.

Diagram of aluminum Step Wedge used for darkroom fog and consistency testing.

**SPECIFICATIONS:**

The test tool includes:
- Four different copper wire meshes that have the following lines-per-inch ratios: 100, 120, 150 and 200.
- Four air steps for contrast and density measurements.
- One human tooth encased in the phantom material.

**Material:** Wood base; Acrylic test tool; Type 1100 Aluminum Step Wedge

**Dimensions:**
- Base: 20 cm L x 10 cm W x 4.9 cm H
- Test Tool: 5.5 cm L x 7.6 cm diameter
- Step Wedge: 12.7 cm L x 5.1 cm W x 1.3 cm

**Weight:** 2 lbs, 1 oz (883g)

76-025 Dental Image Quality Test Tool,
Includes Aluminum Step Wedge
76-025-6661 Dental Image Quality Test Tool, with Decayed Tooth, Includes Aluminum Step Wedge
76-025-4000 Aluminum Step Wedge
THREE-DIMENSIONAL HEEL PHANTOM FOR DXA SCANNERS

Tissue-equivalent; variable calcaneal densities.

Features:
- Soft tissue which simulates muscle.
- Five calcaneal inserts which simulate water.
- Five calcaneal inserts which simulate 200 mg/cm³ density in water matrix.

This Nuclear Associates phantom includes 10 calcaneal inserts of varying mineral densities, which permit examination of the calcaneous. The foot itself is made of epoxy resin to simulate muscle soft-tissue. The phantom is tissue-equivalent at diagnostic x-ray energies.

SPECIFICATIONS:

Material: Epoxy resin
Area of Insert Sole Projection: 9.35 ± .1 cm²
Thickness of Each Insert: 5 mm
Bone Insert Density: 200 mg/cm³
Weight: 2.20 lb (1.00 kg)

76-627 Three-Dimensional Heel Phantom for DXA Scanners

The Phantom Can Accommodate Five Inserts:

<table>
<thead>
<tr>
<th>Number of Inserts</th>
<th>Bone</th>
<th>H₂O</th>
<th>BMD mg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

ORDERS, QUOTATIONS, CUSTOMER SERVICE:

Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360 Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days), E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com
PACS TEST PATTERN IN DIGITAL AND FILM FORMATS

Nuclear Associates' PACS Test Pattern, in both Digital and Film Formats, evaluates important benchmarks of radiographic image quality, including:

- High contrast resolution
- Low contrast discrimination
- Linearity of gray scale response
- Geometric distortion
- Reproduction of continuous fine lines
- Digitizer noise.

Digital Format:
- For evaluating and calibrating monitors.
- For testing film printers.

Film Format:
- Detects two common problems associated with digitizing film: light leakage and film slippage.

A regular quality control procedure is mandatory to ensure a diagnostic level of image quality with PACS and teleradiology. A quick, objective and reproducible QC test is needed to ensure optimization of the film digitizer and display system.

The PACS Test Pattern from Nuclear Associates provides a simple, objective approach to system evaluation and quality control, allowing for quick, objective testing of image quality by a single observer. Simply digitize the PACS Test Pattern film or load the test image from the disk and display it at full resolution on your display monitor. Then, using your systems controls, magnify and view different areas of the test pattern.

As an integral part of your regular QC for a laser scanner or CCD digitizer, the Film Format PACS Test Pattern will provide you with an easy method to detect, identify and quantify changes in digital image quality. The Digital Format PACS Test Pattern will prove itself as an invaluable QC tool for testing image display systems and film printers.

“A teleradiology/PACS quality control test pattern may help identify problems that should be addressed to optimize printer quality. Regular interval testing of paper printers with a dedicated test pattern should be recommended as a part of the quality control program for all teleradiology/PACS systems.”

* A.D. Maidment, Ph.D; M, Albert, Ph.D; and E.J. Halpern, M.D., “A Quality Control Program for Paper Printers Used with Teleradiology/PACS,” Radiology, 205 (P) (November 1997), 307.
The following images demonstrate several examples of digitizer quality problems which have been detected by the PACS Test Pattern.

1. The fine line pattern in the PACS Test Pattern consists of a solid white line embedded within a black background. A high quality digitized image of this pattern should maintain both the integrity of the line and the level of contrast between the line and its background. This figure demonstrates a digitized image in which the fine line is interrupted at regular intervals, due to a cyclical problem in the digitizer. This type of quality control problem might make it difficult to detect fine lines such as those seen with a pneumothorax.

2. The margins along the side of the PACS Test Pattern are homogeneously dark. This figure demonstrates a problem with light-leak in the digitizer, which is manifested as lighter areas along one margin of the digitized image.

3. White blocks embedded within a black background and black blocks within a white background are present within the PACS Test Pattern. These blocks for blooming and smearing from light areas in the digitized image. This figure demonstrates smearing of high-intensity light from the inner light block into the black margin, on one side only. The artifact is probably related to saturation of detector circuits, and may result in loss of sharp boundaries along very light areas in a film.

(Continued on the next page)
The Easiest Method for Identifying and Quantifying Changes in Digital Image Quality!

Nuclear Associates’ PACS/Teleradiology Test Pattern is Superior to the SMPTE Test Pattern for PACS/Teleradiology Quality Control, and here’s why...

The PACS/Teleradiology Test Pattern tests:
- The ability to discriminate between 16 different gray scale levels from its lowest to its highest optical density, which is a greater number of gray scale levels than is tested by the SMPTE Test Pattern.
- For low contrast discrimination with a rose-hole-type pattern which is not available on the SMPTE Pattern.
- The ability to discriminate between different gray levels on both sides of the pattern, as well as in the center of the pattern. These features, designed specifically for QC in teleradiology systems, provide a more superior test of gray scale reproduction than the SMPTE Pattern.
- High contrast resolution in horizontal, vertical and diagonal axes, while the SMPTE Pattern test only horizontal and vertical axes.
- For specific artifacts which are important to digitization of radiographs, such as the ability to reproduce fine lines, blooming from bright areas, and light-leakage along the sides of the image.

Routinely using Nuclear Associates’ Digital or Film Format PACS Test Patterns ensures optimized digitizer performance!

SPECIFICATIONS FOR DIGITAL FORMAT PACS TEST PATTERN

Horizontal, Vertical and Diagonal High Contrast Line Pairs: Tests resolution up to 6 lp/mm when printed on 14" x 17" film
Gray Scale: Tests full range of your printer or display
Low Contrast Pattern: Digital values of low contrast squares differ from the background density by 9%
Weight: Less than 1 pound

SPECIFICATIONS FOR FILM FORMAT PACS TEST PATTERN

Horizontal and Vertical High Contrast Line Pairs:
Range: 0.6 - 3.5 lp/mm
6 Sets: 0.6, 0.7, 0.9, 1.2, 1.8, 3.5 lp/mm (along top and sides of the pattern)
Diagonal Line Pairs:
Range: 0.6 - 2.61 lp/mm
8 Sets: 0.6, 0.7, 0.85, 1.0, 1.3, 1.7, 2.6, 5.0* lp/mm (at the top-center of the pattern)
5 Sets: 1.0, 1.3, 1.7, 2.6, 5.0* lp/mm (along the sides of the pattern)

* The 5 lp/mm diagonal line pairs were not actually present. This area is visible as a matrix of fine dots, rather than true line pairs, due to the limitations of the laser printer.

Gray Scale: Range: 0.20 - 3.00 Optical Density (OD) Units
Low Contrast Pattern: Low contrast squares differ from the background density by 9% for the larger embedded squares.
Resolution is specified to the closest tenth of a line pair per mm. Optical density may vary slightly from film to film, but remains within a 0.03 OD of the specified value.
Weight: Less than 1 pound

07-450 PACS Film Test Pattern
Buy Three or More
07-450-1024 PACS Digital Test Pattern (1024 x 768)
07-450-4000 PACS Digital Test Pattern (4K x 5K)
07-450-1480 Additional Copies of PACS Digital Test Pattern (Additional copies at same site)

Note: Digital PACS Test Pattern supplied on a single, 3.5" floppy disk.

FREE TECHNICAL PAPER REPRINTS AVAILABLE ON REQUEST


PORTABLE MULTIFORMAT TEST PATTERN GENERATOR

Quickly and easily ensure optimum performance of your video display and hard-copy cameras.

The test pattern produced by Nuclear Associates’ Portable Multiformat Test Pattern Generator is used for quality control and acceptance testing of video displays and hard-copy cameras in accordance with the SMPTE recommendations.

This important instrument will help you pinpoint and diagnose problems and ensures optimum image quality!

Accurately Evaluates...

- Resolution
- Geometry
- Aspect Ratio
- Contrast
- Gray Scale
- Size
- Uniformity
- Brightness
- Aspect Ratio
- Uniformity

The Portable Multiformat Test Pattern Generator produces a test pattern designed by the Society of Motion Picture and Television Engineers (SMPTE) which is considered the “gold” standard for testing television monitors and hard-copy recording cameras, in accordance with SMPTE Recommended Practice RP-133-1986, “Medical Diagnostic Imaging Test Pattern for Television Monitors and Hard-Copy Recording Cameras.” *

The Portable Multiformat Test Pattern Generator is a precision, lightweight, portable video test pattern generator. The unit is programmed to provide the SMPTE test pattern at two scan rates: 525 lines and 1024 lines @ 60 Hz, providing the technician with the right tool to ensure that the medical displays are at optimum settings for working on the next diagnosis. Aspect ratios of 4:3, 1:1, or 1.1:1 can be selected with a pixel clock up to 135 MHz.

SPECIFICATIONS:

Resolution:
Standard: 525 lines @ 60 Hz and 1024 @ 60 Hz
Clock up to 135 MHz.

Aspect Ratios:
4:3, 1:1, 1.1:1

Standard Patterns:
SMPTE with characters per SMPTE Recommended practice RP-133-1986, plus circle superimposed for visual size, aspect ratio and linearity reference from a video display device.

Front Panel Controls/Outputs:
“CHARGE/OFF/ON” Rotary Switch
“RESET” Push-button
“STEP” Push-button
“PATTERN/FORMAT” Rotary Switch
“SYNC” Switch (Sync on Green, H&V or Composite)
“POWER/CHARGE/LOW BATTERY” LED Indicators

Outputs:
RED, GREEN & BLUE BNCs
HORIZ/COMP SYNC BNC
VERT SYNC BNC
NTSC

Power:
110 VAC power-cube with rechargeable battery

Dimensions (not including handle): 8.5” L x 3.57” H x 9.25” Deep
Weight: 3 lbs, 4 oz

07-499 Portable Multiformat Test Pattern Generator

* SMPTE Recommended Practice RP-133-1986, is available from the Society of Motion Picture and Television Engineers (SMPTE), 862 Scarsdale Ave., Scarsdale, NY 10583.
ENSURE VIDEO PERFORMANCE!

PROGRAMMABLE VIDEO TEST PATTERN GENERATOR

APPLICATIONS:
- Hard copy camera maintenance and proof of performance.
- Monochrome display test and setup.
- Monochrome and RGB (Red, Green, Blue) color video printer test.
- Video recorder test.
- Video system performance analysis.
- Precision substitute video signal source.
- Computer RGB color display test and setup.

BASIC FEATURES:
- Easy-to-use. Completely user-programmable to virtually any video scan rate and format.
- Both monochrome and RGB color complete test capability.
- Complete pattern set and features for thorough and precise video performance analysis.

FEATURES
- Accurately evaluates . . .
  - Resolution - Contrast - Size
  - Geometry - Gray Scale - Brightness
  - Aspect Ratio - Uniformity
- Stand-alone test pattern generator. Precision, real time base for all relevant raster and pattern parameters.
- Either custom or autobuild raster and pattern programming with full edit. Internal storage of up to 99 formats.
- Both analog (composite) video and TTL video outputs to match virtually any system or display requirements.
- Horizontal, vertical, and composite sync pulse outputs with individual pulse polarity selection at front panel. Rear panel selection of synchronizing pulse format, either separate H and V or composite sync to match various computer display input formats.
- All elements of the SMPTE pattern, individually presented, for precise display performance evaluation.

- Unique resolution calibration.
- Low-cost, yet high quality.
- Compact for ease of portability to test sites.
- Universal power input, for worldwide application.

TTL VIDEO AND SYNC HV/SYNC
TTL video and synchronizing signals are provided at the rear panel type DB15 multipin receptacle. These signals are provided at connector pins most commonly used for video display equipment. Cabling and connector adapters must be obtained locally to connect these outputs to the device under test. All lines should be terminated at 75 ohms at the point of utilization. If the TTL outputs are not used, a terminating plug should be installed on the DB15 TTL signal connector.

RS-232
Interface connector (type DB9 multipin receptacle) used for communication with an external computer to program, load, or review information stored within the on-board (internal) computer. Use a commonly available computer cable, with appropriate adapters, to connect this receptacle to an external computer's port.

(Continued on the next page)
PATTERNS

Nuclear Associates' Programmable Video Test Pattern Generator provides a set of practical and proven test patterns for convenient, yet thorough, evaluation of monochrome and color displays.

- **BLACK LEVEL**, which must be set so as not to obscure detail in darker areas of the displayed image. The “Whiter-than-black,” “Black”, and “Blacker-than-black” segment of the VIDEO pattern is used for this adjustment.
- **CONTRAST**, the difference in brightness between black and white areas in the displayed image, is evaluated by the GRAY SCALE pattern.
- **GRAY SCALE**, the proper presentation of all gray levels between black and white, is checked with the GRAY SCALE pattern.
- **RESOLUTION**, the ability to present the finest detail possible in the displayed image, can be evaluated by use of the various RESOLUTION patterns or the Resolution Multiburst portion of the VIDEO pattern.
- **FOCUS**, providing a sharp, clear image over the entire viewing area, is evaluated with either the BARS or DOTS pattern.
- **COLOR**, if employed, must be presented accurately to correctly portray colors contained within the displayed image. Colors are checked by selection of separate Red, Green, Blue, Magenta (Red and Blue), Cyan (Blue and Green), Yellow (Red and Green) color combinations.

COLOR Simultaneous presentation of Red, Green, Blue primaries creates a white image element in an RGB color video system. User selection of individual color channels by front-panel controls permits complete testing of color display capabilities, providing Red, Green, Blue, Magenta (Red and Blue), Cyan (Blue and Green), Yellow (Red and Green) color combinations.

VIDEO QUALITY ASSURANCE

Because radiology images produced by electronic systems are generated in a video “raster” format, the quality of the image is of utmost importance. The patterns produced by the Video Test Pattern Generator are comprehensive, and provide the capabilities necessary to evaluate many important video performance parameters.

**Programmable Video Test Pattern Generator:**
- Serves as a reference standard for proof of video performance.
- Serves as a uniform reference for setup of displays and imagers.
- Can be used to check the record mode of the VCR.
- Is the ideal instrument for ensuring that displays are at optimum settings before working on the next diagnosis.

**Quality of a video display is dependent upon the following parameters:**
- **GEOMETRY**, which includes SIZE, CENTERING, and LINEARITY in both the horizontal and vertical planes of the display. The BAR and DOT patterns are used to evaluate these qualities.
- **BRIGHTNESS**, which must develop an image sufficiently bright to be readily interpreted in the viewing environment, and uniform over the entire viewing area, is evaluated with the FLAT FIELD pattern.
- **BLACK LEVEL**, which must be set so as not to obscure detail in darker areas of the displayed image. The “Whiter-than-black,” “Black”, and “Blacker-than-black” segment of the VIDEO pattern is used for this adjustment.
- **CONTRAST**, the difference in brightness between black and white areas in the displayed image, is evaluated by the GRAY SCALE pattern.
- **GRAY SCALE**, the proper presentation of all gray levels between black and white, is checked with the GRAY SCALE pattern.
- **RESOLUTION**, the ability to present the finest detail possible in the displayed image, can be evaluated by use of the various RESOLUTION patterns or the Resolution Multiburst portion of the VIDEO pattern.
- **FOCUS**, providing a sharp, clear image over the entire viewing area, is evaluated with either the BARS or DOTS pattern.
- **COLOR**, if employed, must be presented accurately to correctly portray colors contained within the displayed image. Colors are checked by selection of separate Red, Green and Blue channels, using a front panel selection switch.

The need to test these important parameters has led to development of the reference patterns provided in the Programmable Video Test Pattern Generator to serve as the basis for performance evaluation.
OUTPUT SIGNALS, TEST PATTERN GENERATOR SECTION

Three individual video channels for red, green and blue components of an RGB color television system:

- **Analog Video**
  
  **Type:** Composite
  **Level:** Video. Adjustable 0 to 1.0 V. Selection of
  standard level control
  **Blanking:** Adjustable 0 to 0.125 V, internal control
  **Impedance:** 75 ohm source terminated
  **Risetime:** 8 nsec nominal rise and fall time in video
  portion of signal (equivalent to 125 MHz video bandwidth)
  **Coupling:** DC (direct coupled) with video Blanking level
  at ground (0 V) with video going positive, sync going negative
  **Polarity:** White positive, sync negative

- **TTL Video**
  
  **Connectors:** DB-15 per VGA computer standards
  **Type:** Video only, without blanking “setup” or sync
  **Level:** TTL compatible; nominal 1.0 V maximum
  terminated, 2.0 V unterminated
  **Impedance:** Nominal 75 ohms source terminated
  **Coupling:** DC (direct coupled)
  **Risetime:** Nominal 8 nsec rise and fall times
  (equivalent to 125 MHz video bandwidth)
  **Format:** R,G,B video and synchronizing pulses
  selectable, either separate H and V or
  Composite Sync

OUTPUT SIGNALS, PROGRAMMABLE SYNC GENERATOR SECTION

- **TTL Video Format**
  
  **Type:** H Sync, V Sync, and Composite Sync
  **Level:** TTL compatible, nominal 4.0 V unterminated,
  or 1.8 V terminated
  **Polarity:** Individually selectable at front panel for each
  function, negative-going or positive-going pulse
  **Impedance:** 74128 line driver; optional 7433 TTL open
  collector or 7428 TTL output buffer upon request
  **Coupling:** DC (direct coupled)
  **Risetime:** Nominal 50 nsec

**Scan Rates**

This instrument is programmed by the operator for use at
various scan rates, including EIA “standard” 525, 675, 729,
875, 945, 1023/60 Hz field rates, 625/50 Hz field rate, all
2:1 interlace; and various computer rates, interlaced and
non-interlaced, at various aspect ratios. “Non-standard”
rates may be programmed by selection of the proper
horizontal line time and scan lines per field by keypad entry.
It is designed for use with horizontal line times from 10 to
100 µsec, and up to 2048 lines per display field.

**Storage**

Up to 99 separate rasters; access by two digit code.

**Power Requirements**

- **Voltage:** Universal Input, 90 V to 260 VAC. Cooling fan
  must be selected for voltage used
- **Current:** Nominally 1/2 amp at 120 V
- **Power:** Approximately 60 watts
- **Frequency:** 47 to 63 Hz
- **Fuse Rating:** 1 amp slo-blo

**Mechanical Characteristics**

- **Enclosure:** Heavy-duty lightweight metal cabinet for
  bench-top use
- **Cabinet Size:** 6’’ high x 8.75’’ wide x 11.5” deep
  (15.5 cm high x 22.5 cm wide x 29.5 cm deep)
- **Weight:** Approximately 10 lb (7 kg)
- **Humidity:** Up to 95%
- **Connectors:** BNC series

07-891 Programmable Video Test Pattern Generator

Other Test Pattern Generators are Available,
Call for Information.
Accurately Evaluates:

- Resolution
- Contrast
- Size
- Geometry
- Gray Scale
- Brightness
- Aspect Ratio
- Uniformity

Nuclear Associates’ Medical Imaging Test Pattern Generator produces a test pattern designed by the Society of Motion Picture and Television Engineers (SMPTE) which is considered the “gold” standard for testing television monitors and hardcopy recording cameras, in accordance with SMPTE Recommended Practice RP-133-1986, “Medical Diagnostic Imaging Test Pattern for Television Monitors and Hardcopy Cameras.”

The Society for Cardiac Angiography and Intervention has an Interim Standard: “Videotape Records for Transferring Cardiac Cinefluoroscopic Studies,” which uses the SMPTE test pattern as the transfer standard.

The electronic signal produced is of the highest quality possible from a video pattern generator. The video scan signal is at the 525/60 scan rate with a display aspect ratio of 4:3. The pattern produced is comprehensive and provides the capabilities to evaluate many important video performance parameters. It will serve as a reference standard for proof of video performance and for setup of displays and imagers. The Medical Imaging Test Pattern Generator can also check the record mode of the VCR.

FREE TECHNICAL PAPER REPRINT AVAILABLE
“Test Pattern for Video Displays and Hardcopy Cameras,”
Request reprint #458E.

SPECIFICATIONS:

OUTPUT:
- Composite Video Signal: Per EIA Standard RS-170;
  525/60 scan rate
- Monochrome:
  - Polarity: Sync negative, video positive
  - Level: 1.0 V (0.7 V video + 0.3 V sync)
  - Impedance: 75 ohm, source terminated
- Coupling: Direct, ground reference at sync tip
- Video Pattern: Per SMPTE Recommended Practice RP-133 1986, plus circle superimposed for visual size, aspect ratio and linearity reference from a video display device, 640 x 480 pixel format. Pattern aspect ratio is 4:3

CONTROLS AND INDICATORS:

One 3-Position Switch: OFF to positively disconnect the battery when the generator is not in use. BATTERY SAVER, a standby mode which allows the generator to be turned ON by the momentary pushbutton for a short duration (approx. 2 minutes). The video signal will be turned off automatically, preserving battery life. When ON, the pattern is always being produced. This mode is intended for use with an external 9V regulated power supply, 450 mA-DC minimum.

Power Input: Front jack for connecting an auxiliary source of DC power, 9 V, minimum 450 mA, or conventional 9 V battery (access through rear panel)

Video Output: Standard BNC coaxial connector

Low Batt: An indicator to alert the user to low battery voltage. The battery should be replaced when this indicator lights during generator operation

Case: Molded plastic with metal front and rear panels

Dimensions: 6½” L x 3½” W x 1½” H

Weight: Approximately 12 oz

07-495 Medical Imaging Test Pattern Generator
QC PHANTOM FOR DIGITAL AND CONVENTIONAL CHEST RADIOGRAPHY

**Designed for performing complete, full-system quality control on digital and conventional radiography systems in routine operating mode.**

*There is increasing regulatory pressure to demonstrate safe and effective chest imaging practices. The QC Phantom for Digital and Conventional Chest Radiography can satisfy such requirements.*

- Radiograph resembles chest (spatially and in histogram).
- Allows visual, quantitative assessment of image quality.
- Promotes early detection of system changes and problems.
- Yields reproducible images.
- Parallax-free.
- Easy to use.
- Conveniently portable.
- Saves time spent performing quality control.

A digital chest radiograph differs from a standard chest radiograph, in that the sophisticated acquisition and processing details of digital radiography can alter the appearance of the image in subtle and substantial ways. Therefore, digital radiography systems require a special quality control phantom because: Image processing varies with the type of examination (chest, head, etc.), image content (histogram) affects image processing, and a variety of critical system problems can be masked by image processing.

Until now, only limited attention has been given to objective testing of digital image quality in clinical radiographs. This innovative phantom was developed in response to such problems, and to provide quantitative measurements for an evaluation of image quality and performance of the complete, integrated digital system, as it is used in a clinical setting.

Nuclear Associates’ QC Phantom for Digital and Conventional Chest Radiography is unique in that it yields an image that is similar enough to an actual chest radiograph to cause the imaging system to respond normally (i.e., as if the system were processing a true chest image). It also contains image components that can be visually evaluated to provide a quantitative assessment of clinical image quality.

Results of validation tests of the phantom show it to be useful in:

- QC testing of photostimulable storage phosphor CR systems.
- Digital thoracic radiography systems based on a selenium detector.
- Conventional screen-film systems.
- Routine testing of phototimer performance in all chest imaging systems.

The QC Phantom for Digital and Conventional Chest Radiography Ensures Consistency in:

- Image pre-processing
- Film optical densities
- Detector speed (S value) and latitude (L value)
- Contrast detail
- Spatial resolution.

*Developed at the Department of Radiology, Duke University Medical Center.*

(Continued on the next page)
A True Original...The Only Phantom on the Market that can Accurately Assess and Ensure Digital Chest Image Quality.

Phantom Construction
The phantom is constructed from sheets of copper and aluminum (See Figure 1a), which are cut into shapes resembling frontal radiographic projections of human thoracic structures (e.g., lungs, heart, ribs, abdomen, etc.) (See Figure 1b.)

These components are oriented and arranged to simulate a projection of a complete thorax, and are then sandwiched between additional sheets of aluminum and acrylic. The top two corners of the phantom form “shoulders,” which provide a region for direct x-ray exposure of the image receptor. This rugged constructed phantom features a handle for easy transport.

Figure 1a. Illustration of side-view of phantom layers.

Figure 1b. Illustration of front-view of phantom layers simulating thoracic structures.

Figure 2a. Regional test objects for quantitative assessment of image quality.

(Continued on the next page)
**SPECIFICATIONS:**

**Regional Test Objects** (Figures 2a and 2b) are incorporated into the chest phantom for quantitative image quality assessment in the lung-, heart-, and subdiaphragm-equivalent image areas. Each test object contains a defined site for measurement of optical density and a matrix of low-contrast objects for contrast detail assessment. The phantom is designed such that no irregular structures (e.g., ribs or wire mesh) obscure the regional test sites.

**Contrast Detail Test Pattern**

The contrast detail test pattern in each regional test object is comprised of a 5 by 5 matrix of copper disks of decreasing size and thickness. The copper disks in each column of the matrix, are of uniform thickness and decreasing size, ranging from 6 mm to 0.5 mm in diameter. In each same-size row of the matrix, the copper disks vary in thickness, with the range of thicknesses selected appropriately for each of the three chest regions, to yield radiographic contrast spanning the perceptible range in each region (See Figure 2b).

<table>
<thead>
<tr>
<th>Copper Disk Thicknesses (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column:</td>
</tr>
<tr>
<td>Lung:</td>
</tr>
<tr>
<td>Heart:</td>
</tr>
<tr>
<td>Abdomen:</td>
</tr>
</tbody>
</table>

**Line-Pair Test Pattern:** (0.1 mm-thick lead-foil). This component is included in the lung-equivalent region for assessment of spatial resolution. The line pairs are oriented diagonally in the phantom to avoid coincidence with the raster lines in the acquired and displayed images. Line Spacings (in LP/mm): 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.0, 4.0, 5.0.

**Stainless Steel Wire Mesh:** (0.4 mm thick; 8 wires/cm) overlays the entire chest area except at the regional test object sites.

**Dimensions:** 17” L x 14” W x 2.5” Thick (43 cm x 36 cm x 6 cm)

**Weight:** 30 lbs (13.6 kg)

Figure 2b. Regional Test Objects are positioned in three chest-equivalent areas for quantitative assessment of image quality. Each test object includes a designated location for optical density measurement and a component for contrast detail assessment. The lung-equivalent region also contains a lead line-pair phantom for evaluation of spatial resolution.

---

FREE REPRINT AVAILABLE ON REQUEST

CDRAD CONTRAST DETAIL DIGITAL/CONVENTIONAL RADIOGRAPHY PHANTOM

Optimized for evaluation of digital systems.

• For quality control of radiological system and observer performance.
• Improves diagnostic accuracy.
• Can also be used for conventional radiography systems.

Most definitions of image quality in radiology are based on characterizing the physical properties of the image chain. However, medical diagnosis is not made by the image alone; observer perception greatly affects the result.

A test of image quality and the observer’s perception is possible using Contrast Detail (CD) Phantoms. With the CDRAD Phantom from Nuclear Associates, it is possible to quantify both detail and contrast, as observed by the radiologist.

Digital Radiography

The CDRAD Phantom from Nuclear Associates is an excellent tool for evaluating the imaging characteristics of digital radiographic systems, including stimulable phosphor computed radiography systems and teleradiography systems.

One of the principle concerns with the use of digital radiography, is the potential reduction in the visibility of detail due to the blurring introduced at various places within the system, such as the film digitizers, display monitors, and the sampling of the image into discrete pixels. Loss of detail is the image characteristic which can have an adverse affect on diagnosis. Resolution (bar phantom) test objects which are used to evaluate conventional x-ray imaging systems are generally not appropriate for evaluating digital systems. The CDRAD Phantom provides a reliable and objective evaluation of the loss of detail from blurring at any point within the system.

The CDRAD Phantom can be used to evaluate loss of detail in:

• Film digitizers
• Computed radiography (CR) systems
• Display monitors
• Laser printers

The CDRAD Phantom can be used to adjust and optimize:

• Image processing parameters
• Viewing conditions

(Continued on the next page)
Image Evaluation

- To evaluate the phantom image, the observer indicates the location of the second spot in each square. Correct indication proves that a contrast is actually seen.

- At the transition from visible to invisible, it is difficult to decide in which corner the second spot is located, and the response equals pure chance.

- The line connecting the central spots with the smallest visible diameter and contrast is called the Contrast Detail (CD) Curve.

- For comparison of the imaging performance of different systems, phantom images are made under identical conditions and evaluated by the same observer at the same time. The better system will produce an image in which smaller contrasts and details are visible. This results in a shift of the CD curve to the lower left part of the image. (See figure 2.)

- In the detail (vertical) direction, the diameter of the holes increases stepwise and logarithmically from 0.3 mm to 8.0 mm. The image shows 15 rows of spots with increasing detail.

Phantom Specifications

- The CDRAD Phantom consists of a Plexiglas tablet with cylindrical holes of exact diameter and depth (tolerances: 0.02 mm).

- The radiographic image of the phantom provides information about the imaging performance of the whole system.

- The image shows 225 squares: 15 rows and 15 columns.

- In each square, either one or two spots (the images of the holes) are present. The first three rows show only one spot, while the other rows have two identical spots; one in the middle and one in a randomly chosen corner. (See figure 1.)

- The optical densities of the spots are higher than the uniform background.

- In the contrast (horizontal) direction, the depth of the holes increases logarithmically, and the image shows 15 columns of spots with increasing contrast.

- Comparison of the performance of several observers is also possible. The better performing observer produces a CD curve more to the lower left part of the image.

SPECIFICATIONS:

Dimensions: 10.4" x 10.4 x .3" thick (265 mm x 265 mm x 10 mm)

Weight: 3 lbs (1.34 kg)

07-652 CDRAD Contrast Detail Digital/Conventional Radiography Phantom

For Additional Information on the Use of this Phantom, See:
http://www.emory.edu/X-RAYS/Sprawls/technology

Figure 2: Contrast detail lines of monitor image (●) and the hard copy image (▲) from the same digital equipment.
BOSTON CR (COMPUTED RADIOGRAPHY) TEST TOOL™

Now available for the first time... a test tool designed specifically for comparing a conventional x-ray image and a computed radiography (digital) image of the same object.

With the Boston CR Test Tool you can:

Get the best results: This highly-accurate phantom helps ensure computed radiography image quality, so you won't have to worry about missing a subtle shadow or fine detail that might be seen on conventional film.

Standardize your films: Adjust computed radiography settings for different anatomical views using the Thin Body (Extremity), Lung and Thick Body sections.

Calibrate your CR system: The computed radiography system can be adjusted to match the density, contrast and sharpness seen on conventional films.

Keep images consistent: This reliable tool enables the implementation of a quality control program for computed radiography equipment, as well as digital and film-based imaging systems.

Nuclear Associates' Boston CR Test Tool is ideal for the assessment of computed radiography (digital) image quality and calibration of computed radiography equipment.

The Boston CR Test Tool was developed in response to the widespread need for a method of selection optimal CR processing parameters that will provide CR images comparable to conventional film-screen images. The result is a reliable, convenient phantom that makes setting up and maintaining an effective computed radiography quality control program easy. The Boston CR Test Tool is specifically designed to facilitate the comparison of conventional film-screen images to computed radiology images of the same object using the same exposure values.

In effect, it is a comparison tool that is ideal for verifying image quality of a digital radiograph. This visual comparison is easy and fast. If desired, measurements of density and contrast can be accomplished using a densitometer.

The Boston CR Test Tool is comprised of components (patterns and indicators) that cover the range of contrast, resolution, sharpness, density and detail used in medical radiography.

Three kVp ranges are included in the test tool:
- Low: 50 to 65 kVp
- Medium: 70 to 90 kVp
- High: 100 to 130 kVp

The geometric center of each section is marked, and each is designed for imaging with a kVp range typical for the selected section.

In using this innovative test tool, an optimum conventional radiograph is made for each kVp range being used. Several varied exposures may be needed to produce an optimum radiograph. Only one radiograph is needed for each kVp range. A digital image is then made using the same exposure values. The digital image should be adjusted using the processing parameters in the digital equipment, to match the image quality of the conventional radiograph. Matching the optimum radiograph ensures that the digital image contains all the information seen on the conventional radiograph. Customizing images for a particular “look” also can be done.

Images of the Boston CR Test Tool can be transmitted over a teleradiography network and printed on a remote printer to validate the integrity of image transfer. The unique size of the test tool (14” W x 17” L) satisfies the requirements of computed radiography users who expose full-size imaging plates, as well as those using smaller cassettes.
Typical Applications:

High kVp: Barium studies and grid chests.
Medium kVp: Abdomen, spine, skull and extremities requiring grid (femur, knee, shoulder, hip) and non-grid chests.
Low kVp: Non-grid extremities and neonatal.

To ensure the selection of optimal CR image processing parameters and quality CR images, you need the Boston CR Test Tool from Nuclear Associates.

SPECIFICATIONS:

Section Specifications:

- **Medium kVp**: Imaging area, 13” W x 5” L, for kVp values between 70 and 90
- **High kVp**: Imaging area, 13” W x 5” L, for kVp values between 100 and 130
- **Low kVp**: Imaging area, 12” W x 5” L, for kVp values between 50 and 65

Dimensions: 14” W x 17” L

Weight: 20 lbs

07-602  Boston CR Test Tool
89-602  Storage/Carrying Case

* U.S. Patent No. 5, 416, 816 & 5, 544, 157

Recommended as part of a daily quality control program.

"ONE TEST TOOL DOES IT ALL! ELIMINATE THE NEED FOR MULTIPLE TEST TOOLS. THE **BOSTON CR TEST TOOL** IS DESIGNED TO TEST ALL RANGES OF kVp AND MAS. COMPLETE AND EASY TO USE INSTRUCTIONS INCLUDED WITH EACH TEST TOOL”. 
EZ CR TEST TOOL

*Designed to provide technologists, radiologists and physicists with an easy means of performing quick, reliable daily assessments of CR systems.*

- Reduce equipment down-time.
- Dramatically reduce repeat patient exams, thus preventing unnecessary patient exposure due to problems related to the image acquisition chain and poor image quality.
- Lightweight; durable.
- Easy to use; no moving parts.
- Cost-effective.

The increase in the number of radiology departments converting to digital radiography systems has resulted in the need for a reliable test tool that can help ensure that optimal image quality is achieved and maintained by these complex systems. The EZ CR Test Tool from Nuclear Associates is a timely and valuable solution to the image quality maintenance problem.

Today’s new image acquisition chains are much more complicated than conventional screen/film systems. Computed Radiography (CR) systems involve special processing for each body part. This is controlled by computers rather than chemical processors, and soft copy displays which are calibrated using light meters rather than visual inspection. CR systems also incorporate laser beams, photo-multiplier tubes, network gateways, and laser printers. The EZ CR Test Tool is designed specifically for evaluating the entire CR image acquisition chain.

Ideal for use as a preventive maintenance quality control test tool, the EZ CR Test Tool can also be used to take regularly scheduled measured data points from the image, such as line pair resolution measurements, ROIs (regions of interest) and geometry symmetry. Measurements/angle can be used to evaluate monitor, as well as printed film image quality.

By performing daily quality control checks, both before the first patient is examined and at the end of the day, equipment problems can be accurately and easily pinpointed and corrected. By performing such checks, equipment down-time will be significantly reduced, resulting in increased patient throughput. Use of this test tool also helps ensure that patients won’t need to endure repeat exams due to poor image quality.

Specifications:

**Dimensions:** 17” L x 14” W x .5” Thick
(43.4 cm L x 35.6 cm W x 1.4 cm Thick)

**Weight:** 7.05 lbs (3.20 kg)

07-605-2000 EZ CR Test Tool

The easy way to document and ensure that your CR System and network is delivering quality images.

Custom Versions of the EZ CR Test Tool are Available on Special Order.
ALVIM STATISTICAL PHANTOMS*

Now there are three phantoms to help you determine the probability of true-positive/true-negative and false-positive/false-negative answers.

ALVIM Phantoms:

- Enable you to randomly change the position of the test elements within the phantoms.
- Use simple and rapid statistical methodology to determine the probability of detail detection.
- Deliver reliable, unbiased quality control results.
- Help achieve and maintain excellent image quality.
- Are ideal for teaching and training.
- Are particularly useful for testing digital imaging systems.

BUY AS A COMPLETE SET AND SAVE!

07-651 Set of three ALVIM Statistical Phantoms; one each of model 07-750, 07-650 and 18-209

* Israeli Patent 109063; U.S. patent pending.

(Continued on the next page)
ALVIM Statistical Phantoms will help you improve image quality and reduce patient exposure, without spending extra time or effort.

**With ALVIM Statistical Phantoms you can:**
- Ensure correct technical settings.
- Accurately adjust the radiation dose per image for digital systems.
- Test the complete imaging chain.
- Select optimum monitor viewing distance.
- Accurately adjust contrast and brightness.
- Check distance to the video-control display.
- Properly adjust exam room illumination.

**ALVIM Statistical Phantoms Help Ensure Unsurpassed Image Quality.**
Diagnostic x-ray systems have been designed to detect the slightest of differences in internal structures. To best evaluate your imaging system, top-quality phantoms should be used for monitoring image quality and system performance. By distinguishing various test elements on the output image of your system, you will be ensuring the best image quality at minimum dose.

Nuclear Associates’ ALVIM Statistical Phantoms will give you the ability to quantitatively evaluate the quality of detail detection of radiographic, fluoroscopic and mammographic imaging systems.

**What Makes ALVIM Statistical Phantoms So Unique?**
These innovative phantoms allow you to evaluate your radiographic, fluoroscopic, or mammographic systems’ contrast and detail threshold. By simulating low contrast elements, you will easily be able to quantitatively determine the true probability of detection. The problem with most other phantoms that perform similar tests, is that the low contrast elements are fixed; the more you use the phantom’s test images, the more familiar they become. With time, the user begins to predict or expect certain results. This can lead to a false evaluation of the system.

**ALVIM RADIOGRAPHIC STATISTICAL PHANTOM TRG**
The base of this phantom is a plastic plate with numbered sockets. The bone substitute (PVC) and the muscle substitute (Plexiglas) disks are arranged in columns. Each column contains 10 disks; five with a test element (holes of identical diameter) and five without a test element. Size and contrast of test elements are the same within each column, but do increase with column number. The location of disks with and without test elements are easily changed by placing the phantom on a flat surface and opening the velcro-attached cover. This phantom is supplied with a filter of copper and aluminum, which is attached to the bottom of the phantom with Velcro.

**SPECIFICATIONS:**
- **Dimensions:** 160 mm x 140 mm x 9 mm (without filter)
- **Weight of Phantom:** 11.29 oz (320 g)
- **Weight of Composite Filter:** 7.05 oz (200 g)

07-750 ALVIM Radiographic Statistical Phantom TRG

<table>
<thead>
<tr>
<th>Column Number (mm)</th>
<th>Disk Material</th>
<th>Disk Color</th>
<th>Diameter of Test Element (mm)</th>
<th>Depth of Test Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>bone</td>
<td>gray/blue</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>substitute</td>
<td>white/red</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>gray/red</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>white/yellow</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>gray/yellow</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>white/green</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>7</td>
<td>muscle</td>
<td>pink</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>8</td>
<td>substitute</td>
<td>red</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>yellow</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>green</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>black</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>blue</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

(Continued on the next page)
**ALVIM Statistical Phantoms are random in nature, designed so that the location of the elements within the phantom can be changed for every new use.** This means that the person evaluating the test results never knows exactly where the test elements will appear. Every evaluation will produce objective results. This helps prevent false evaluations and ensures optimum image quality of your system.

**ALVIM Statistical Phantoms Provide Reliable, Unbiased Results.**

Unlike other phantoms, ALVIM Statistical Phantoms from Nuclear Associates take into consideration the principles of signal detection theory, which “was shown to furnish a solution to...the problem of distinguishing between a measure of sensitivity and a measure of the criterion adopted by the observer.”

These unique phantoms eliminate subjective observer attitude from detectability tests by applying a signal detection test. Evaluation with this test is simple and easily performed.

**ALVIM FLUOROSCOPIC STATISTICAL PHANTOM TRS**

This phantom consists of a plastic plate and a rotatable disk. The plate is divided by x-ray-opaque material into 10 sectors and six concentric rings. The disk, made from tissue-equivalent plastic, is fastened on the axis, which passes through the center of the rings located on the plate. The disk has a total of 30 non-uniformly-spaced test elements (holes), which vary in size in different rings, but are identical within each ring. There are five identical test elements within each ring, but no more than one in each sector of the same ring. The diameter of the test elements is equal to their depth and noted within each ring. This phantom is supplied with a replaceable filter of copper and aluminum, which is attached to the bottom of the phantom with Velcro.

**SPECIFICATIONS:**

- **Dimensions:** 160 mm x 140 mm x 10 mm (without filter)
- **Weight of Phantom:** 12.0 oz (340 g)
- **Weight of Composite Filter:** 7.05 oz (200 g)

<table>
<thead>
<tr>
<th>Ring Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of Test Element (mm)</td>
<td>2.6</td>
<td>2.3</td>
<td>2.0</td>
<td>1.7</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Depth of Test Element (mm)</td>
<td>2.6</td>
<td>2.3</td>
<td>2.0</td>
<td>1.7</td>
<td>1.4</td>
<td>1.2</td>
</tr>
</tbody>
</table>

The percentage of true negative and true positive response is calculated in just a few seconds and an index of detectability can be obtained for the detail in question.

With ALVIM Statistical Phantoms you’ll be able to do more than check the precision of your x-ray equipment...you will be able to accurately make diagnoses in terms of accuracy of your evaluation ability. The result? Simple, rapid, statistical data, excellent image quality and minimum patient exposure.

---

**ALVIM Mammographic Statistical Phantom TRM**

The phantom is divided into two compartments. Each compartment has five columns of test disks; each column has 10 disks within it. One side of the phantom uses aluminum oxide specks (microlcification simulators) as test elements, the other side uses nylon fibers (fibrous structure simulators) as test elements. Test element size increases as you go across the columns, (from left to right). Within a column, five disks have a test element (inserted in wax) and five are blank, so that a random order can be defined by the user. The location of the disks are easily changed by placing the phantom on a flat surface and opening the Velcro-attached cover. The phantom is supplied with three Plexiglas filters, each 9 mm thick.

**SPECIFICATIONS:**

- **Dimensions:** 142 mm x 135 mm x 15 mm (without filters)
- **Weight of Phantom:** 17.6 oz (500 g)
- **Weight of Filters:** 270 g each

<table>
<thead>
<tr>
<th>Column Number</th>
<th>Test Element</th>
<th>Test Element/Jacket Color</th>
<th>Test Element Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$\text{Al}_2\text{O}_3$ specks</td>
<td>red/yellow</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>$\text{Al}_2\text{O}_3$ specks</td>
<td>yellow/yellow</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>$\text{Al}_2\text{O}_3$ specks</td>
<td>green/yellow</td>
<td>0.32</td>
</tr>
<tr>
<td>4</td>
<td>$\text{Al}_2\text{O}_3$ specks</td>
<td>blue/yellow</td>
<td>0.40</td>
</tr>
<tr>
<td>5</td>
<td>$\text{Al}_2\text{O}_3$ specks</td>
<td>black/yellow</td>
<td>0.55</td>
</tr>
<tr>
<td>6</td>
<td>nylon fiber</td>
<td>red/green</td>
<td>0.45</td>
</tr>
<tr>
<td>7</td>
<td>nylon fiber</td>
<td>yellow/green</td>
<td>0.60</td>
</tr>
<tr>
<td>8</td>
<td>nylon fiber</td>
<td>green/green</td>
<td>0.80</td>
</tr>
<tr>
<td>9</td>
<td>nylon fiber</td>
<td>blue/green</td>
<td>1.00</td>
</tr>
<tr>
<td>10</td>
<td>nylon fiber</td>
<td>black/green</td>
<td>1.35</td>
</tr>
</tbody>
</table>

18-209 ALVIM Mammographic Statistical Phantom TRM

**FREE WHITE PAPER AVAILABLE ON REQUEST**


Request paper #538B.

**ORDERS, QUOTATIONS, CUSTOMER SERVICE:**

Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360

Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days),

E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com
PEDICATRIC POSITIONING CHAIR*
Solves positioning problems in pediatric radiography.

- Ideal for performing chest and upright abdominal x-ray examinations.
- Designed for quick, safe and comfortable positioning of children up to five years old.
- Adjustable cassette height.
- Includes: Cushioned seat, lead drape, lateral cassette holder.
- Makes exams faster, easier and more precise.

The .50 mm lead-equivalent back panel of the chair, made from CLEAR-Pb® Lead-Plastic, protects the person holding the child from direct and scatter radiation. It also provides absorption of scatter radiation, thus preventing backflash exposure to the cassette, so a sharper and more defined image is produced.

**SPECIFICATIONS:**
Dimensions: 16” L x 12” W x 24” H
Weight: 20 lbs

17-551 Pediatric Positioning Chair

*C Designed by the Dept. of Diagnostic Radiology, Mayo Clinic®, Rochester, MN 55905. Manufactured under licensing agreement with Mayo Foundation for Medical Education and Research.

CROSS-TABLE LEG SUPPORT*
Allows the unaffected leg to be positioned so that a clear path for the central x-ray beam is achieved.

- Makes positioning faster, easier and more precise.
- Adjusts from 17” high to 21 1/2”, for improved patient comfort.
- No-slip, no-tip base.
- Saves time and money by eliminating repeat exams!

By removing the unaffected leg from the imaging plane, a good, detailed and evenly exposed hip and upper femur exam can be achieved.

**SPECIFICATIONS:**
Dimensions:
- Support pole extends from 17” to 27”
- Base: 16” H
Weight: 8 lbs., 7 oz

17-552 Cross-Table Leg Support

* Designed by Frances M. St. George, R.T. (R), RDMS, Dept. of Radiology, Mayo Clinic®, Jacksonville, FL 32224.

See Also...
HAND-FIX
Improves and simplifies the interpretation and localization of the carpal hot-spot on bone scintigram in patients, after wrist injury.
- For integration of radiology and nuclear medicine applications.

See Nuclear Medicine Section, Page 202
**POSI-TOT® INFANT IMMOBILIZER**

The **MOST ADVANCED** positioning system for infant and toddler chest and abdominal radiography!

- Rotates and slants to all erect, semi-erect and supine positions for PA, AP, lateral and oblique projections.
- Precise repositioning for multi-view studies is completed in seconds.
- All positioning is done by manipulating the equipment, **NOT** the child.

The state-of-the-art in pediatric positioning has taken a giant step forward with the Posi-Tot Infant Immobilizer. Posi-Tot eliminates the struggle to restrain very young patients for diagnostic radiography.

**NO MORE** tapes, buckles, props and gimmicks that don't always work.

**NO MORE** excessive exertion and fussing to position and restrain the child.

**NO MORE** letting a parent try to hold the child motionless and subjecting both to unnecessary radiation exposure.

**NO MORE** retakes because the child's movements distorted the film image.

**NO MORE** limitations on x-ray procedures because of inefficient restraint equipment or uncooperative children.

**Posi-Tot from Nuclear Associates** is the most advanced immobilizer for pediatric chest and abdominal x-rays, especially for children up to age **two**. It provides the only complete restraint of young children in ANY position, even for extended periods. Repositioning for multi-view studies is done in seconds, and all positions can be reproduced precisely.

Fields of view are unobstructed. An adjustable cassette-holder slides along the carriage frame and accepts cassettes up to 11" x 17". To eliminate magnification, the cassette holder can be positioned very close to the patient. The plastic tabletop can serve as a standard x-ray table, making the system ideal for procedures such as intravenous pyelography.

**Rapid, Easy Operation…**

This easy-to-use system frees the technologist from most of the ordeal associated with pediatric positioning. Only one to two minutes are needed to adjust the equipment so that the child is adequately restrained, which gives the operator full control. The child can be moved quickly to any x-ray position, for any period of time, with little effort. And, any view can be reproduced by recording and repeating the angle settings for that position.

**Safe…**

Infant safety is another important factor. The less the child moves, the less chance of injury. Once the infant has been immobilized, **all positioning is done by manipulating the equipment, not the child.** There are no sharp edges or points, and the locking devices can't come loose accidentally. The rugged steel frame and wide base provide balance and stability in all positions. The child cannot free himself from the nylon body net and Velcro restraints, but if he must be removed from the unit quickly, the technologist can do so in seconds.

**Comfortable…**

The system lessens the child's discomfort associated with the involuntary restraint of movement. Because the technologist is in control, the procedures are faster and less traumatic. Positive immobilization means fewer retakes and less radiation exposure.

(Continued on the next page)
How POSI-TOT Operates...

The system consists of a heavy-duty steel frame that supports a clear plastic tabletop, a series of arm, head and body restraints, and an adjustable cassette holder. Since the tabletop and restraints are radiolucent, artifacts are eliminated. Compression locks and indexers allow patients to be angled and rotated to any radiography position. Easy-rolling, lockable casters ensure maneuverability as well as immobility.

With the system in a horizontal plane, the child is placed on the table. The padded saddle-seat, located between the patient’s legs, is adjusted to the child’s size. It prevents horizontal movement and serves as a seat during erect positioning. A nylon-mesh body net, connected to one edge of the plastic table, is stretched over the patient and hooked to the opposite edge. There are no time-consuming belts, buckles or tying; the infant’s torso and legs are restrained in seconds. The child’s upper extremities are also quickly immobilized with padded, adjustable skull restraints and Velcro fasteners for the arms, forehead and chin. The reproductive organs can be protected using a gonad shield.

An adjustable cassette holder slides to any point parallel to the child. It can also be moved perpendicular to the body and positioned very close to the patient to eliminate magnification. Any cassette up to 11” x 17” is accepted.

The table can be angled and/or rotated for any erect, semi-erect or supine position. All PA, AP, oblique and lateral projections are easily set and each position is reproducible. The vertical rotation lock system is calibrated from 0-90° in 3° increments; the lateral rotation range is 0-360° in units of 3°.

ADDITIONAL SPECIFICATIONS:
Dimensions: 46” L x 23” W x 40” H
Shipping Weight: 120 lbs

17-550 Posi-Tot Infant Immobilizer and Positioner
Now, one technologist can attain high quality diagnostic images at bedside!

Portable bedside radiography is an important aspect in clinical radiographic imaging. However, being able to produce high quality diagnostic images has always been difficult. Now bedside radiography can be simplified by placing the film cassette under the mattress rather than under the patient, using our Bedside Radiography Film Cassette Holders.

Nuclear Associates’ portable Bedside Radiography Film Cassette Holders allow the patient to be x-rayed through the mattress (transculcitam). Using these devices can produce the highest quality films with greater ease and confidence!

SESAM®

For the correct positioning of anteroposterior views at bedside!

SESAM is used in obtaining the anteroposterior view by lifting the patient and the mattress so that a film cassette can be placed underneath. SESAM consists of an elongated tubular frame that is approximately 115 cm long. The narrow end can be easily inserted under the mattress and the patient, level with the middle of the area to be examined, and pushed all the way to the other side of the bed. The broader end of the device is then lifted about 10 cm until a support unfolds. This keeps the mattress and patient raised enough for the cassette to be inserted and finely adjusted in a calm and unhurried manner. SESAM is then withdrawn and the x-ray is taken.

Weight: 4.1 lbs (1.9 kg)

17-416  SESAM Bedside Radiography Film Cassette Holder

FREE DEMONSTRATION VIDEOTAPE

See Nuclear Associates’ Portable Bedside Radiography Accessories in Operation! Call, Fax or E-mail your videotape request.

(Continued on the next page)
**KNIGHT JR.®**

*Small, lightweight, easy-to-use.*

Ideal for:
- Small part radiography.
- Extremity work.
- Crosstable lateral cervical spine imaging.

KNIGHT JR. can be used when the mattress has to be compressed only slightly, or when the cassette is merely placed on top of the mattress, or on the radiography table. KNIGHT JR. can hold any cassette between 18 and 46 cm.

**Weight:** .50 lb (.22 kg)

17-414 KNIGHT JR. Bedside Radiography Film Cassette Holder

---

**KNIGHT SR.®**

*Perform lateral views without any anatomy cutoff!*

Prior to the introduction of KNIGHT SR., lateral views done portably were difficult for both the patient and the technologist. Now, when using KNIGHT SR., the lateral view is more easily obtained than the AP view. All portable chest examinations should include a lateral crosstable view because that view has shown to be of diagnostic importance in as many as 25% of all portable chest exams.

KNIGHT SR. is placed on the back of the film cassette and fastened with a hook. The hook is attached to the short end of the arc by a band. By placing the cassette at the patient’s side and simultaneously holding the lower leg of the device under the bedstead, enough resistance against the bottom is obtained so that the cassette can be pressed down into the mattress and placed in a vertical position.

**Weight:** 3 lbs (1.32 kg)

17-415 KNIGHT SR. Bedside Radiography Film Cassette Holder

---

**Buy as a Kit and Save!**

PORTABLE BEDSIDE RADIOGRAPHY KIT
Includes 17-414, 17-415 and 17-416

REQUEST KIT MODEL 17-417
CERVICAL TRACTION BOARD*(1)

An easy-to-use, unique device designed to ensure high quality lateral radiographs of all seven cervical vertebrae.

- Can be used with other restraining devices (cervical collars, head blocks, etc.).
- Effectively used on unconscious or incoherent patients.
- Reduces the risk of additional injury to patient during evaluation.
- Eliminates the risk of unnecessary exposure to attendant holding patient during x-ray.
- Promotes clear positioning of the cervical vertebrae for increased accuracy during radiation therapy treatments.

To use, simply secure the straps around the patient’s wrists and gently pull to move the shoulders down. Then attach the other end of the strap to the back of the board with the attached Velcro. The Cervical Traction Board totally eliminates the risk of unnecessary exposure or physical injury to the attendant during x-ray. It even eliminates the complications faced when examining an incoherent or unconscious patient, as correct positioning can be quickly obtained without the patient’s cooperation.

Using the Cervical Traction Board will eliminate frustrating and costly exams...saving you valuable time, effort and expense!

THE CERVICAL TRACTION BOARD ALSO HAS RADIATION THERAPY APPLICATION

The Cervical Traction Board is a restraining device that makes reproducible positioning of the patient fast and easy. By promoting precise placement of the head and neck without causing additional patient discomfort, lateral radiotherapy beams will have increased accuracy.

SPECIFICATIONS:

Dimensions: 20” x 14” x 9½”
Weight: 12 lbs., 7oz

17-430 Cervical Traction Board

*(1) Designed by Steven Schuellein, BBA, RT, Morton Plant Hospital, Clearwater, Florida

* U.S. Patent No. 5342290
TRANSmat® PATIENT TRANSFER MATTRESS

For increased efficiency of patient transfer procedures.

- **COMFORTABLE.** Laminated leatherette mat is padded with a 1” cushion of soft polyurethane foam. Patient can remain on mat at all times, reducing fatigue and possible ill effects from excessive movements.

- **RADIOLUCENT.** Patient stays on mat during x-ray and nuclear medicine procedures.

- **EASY-TO-USE.** Features eight plastic-lined grip-holes. Design minimizes physical exertion for technologist.

This lightweight, durable mat is designed to facilitate movement of patients to and from gurneys, stretchers, and examination tables. Except when going to and from the hospital bed, the patient never has to leave the mat...it travels with the patient! The mat’s 26” x 72” size makes it compatible with all stretchers, tables and beds. Its fully-washable surface permits easy removal of stains, including spilled contrast media.

**Weight:** 6.8 lbs (3.1 kg)

17-356 TRANSmat Patient Transfer Mattress

ORDERS, QUOTATIONS, CUSTOMER SERVICE:

Phone: Toll-free 1-888-466-8257 (1-888-GO-NUCLR) in the U.S. or (516) 741-6360
Monday thru Friday, from 8:30 AM to 5:00 PM EST, FAX: (516) 741-5414 (24 hours/7 days),
E-mail: sales@nucl.com, visit us at: http://www.inovision.com and http://www.nucl.com
Simulate human response to radiation in radiographic studies with...

**Simulated and Real Bone X-RAY SECTIONAL PHANTOMS**

- Eliminate unnecessary radiation exposure to human subjects.
- Teach students anatomy and positioning.
- May be used as qualitative QC standards.
- Are ideal for technique chart development.
- Are available in transparent and opaque models.

Nuclear Associates’ Real Bone X-Ray Sectional Phantoms are comprised of human skeletal parts embedded in anatomically accurate, tissue-equivalent material. The simulated X-Ray Sectional Phantoms consist of simulated bones embedded in transparent, non-granular plastic or opaque isocyanate rubber. The materials have the same absorption and secondary radiation-emitting characteristics as living tissue. They are homogeneous and cast shadows similar to those produced by tissue. There are no spongy portions in the phantoms. All bone marrow has been simulated with tissue-equivalent material, which permits critical detail study of bone structure and sharpness comparisons using x-rays. The user can get virtually the same response to radiation from an x-ray phantom as from a human subject. Experiments can be repeated (regardless of dosage) as often as necessary, with no danger of excess radiation.

Designed originally for determining optimum exposure techniques, the x-ray phantoms have become accepted tools in many laboratories, medical schools and hospitals.

**X-Ray Sectional Phantoms can be used for:**

1. Making studies which normally require radiation exposure to human beings. There are no variables with these phantoms and no danger of excess radiation.
2. Teaching skeletal anatomy and its relation to surface landmarks.
3. Determining optimum exposure techniques—especially cineradiographic, planigraphic, photofluorographic and serigraphic.
4. Determining and teaching preferred radiographic positions.
5. Testing x-ray apparatus and accessories, including grids, films, screens and processing equipment.

The phantoms are crafted with special attention to accuracy and completeness. The exterior of each phantom conforms closely to natural contours. All bones are positioned accurately in relation to each other and to surface landmarks.

---

**OPAQUE PHANTOMS**

(Available in simulated and real bone.)

<table>
<thead>
<tr>
<th>Sections</th>
<th>OPAQUE Model</th>
<th>OPAQUE Price</th>
<th>TRANSPARENT Model</th>
<th>TRANSPARENT Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>76-618-3000</td>
<td>76-018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td>76-634-3000</td>
<td>76-034</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pelvis</td>
<td>76-642-3000</td>
<td>76-042</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot/Ankle</td>
<td>76-659-3000</td>
<td>76-059</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>76-667-3000</td>
<td>76-067</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>76-675-3000</td>
<td>76-075</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>76-683-3000</td>
<td>76-083</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REAL BONE PHANTOMS (OPAQUE ONLY)**

*Human skeletal parts embedded in anatomically-accurate, tissue-equivalent material.*

<table>
<thead>
<tr>
<th>Real Bone Sections</th>
<th>Model</th>
<th>Weight*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>76-618-3000</td>
<td>18 lbs (8.3 kg)</td>
</tr>
<tr>
<td>Hand</td>
<td>76-634-3000</td>
<td>2 lbs (0.92 kg)</td>
</tr>
<tr>
<td>Pelvis</td>
<td>76-642-3000</td>
<td>4 lbs (1.8 kg)</td>
</tr>
<tr>
<td>Foot/Ankle</td>
<td>76-659-3000</td>
<td>2.7 lbs (1.22 kg)</td>
</tr>
<tr>
<td>Elbow</td>
<td>76-667-3000</td>
<td>4 lbs (1.8 kg)</td>
</tr>
<tr>
<td>Knee</td>
<td>76-675-3000</td>
<td>8.7 lbs (4 kg)</td>
</tr>
<tr>
<td>Chest</td>
<td>76-683-3000</td>
<td>50 lbs (22.6 kg)</td>
</tr>
</tbody>
</table>

*Weights are approximate, and apply to all Simulated and Real Bone Phantoms.
PIXY® ANTHROPOMORPHIC PATIENT PHANTOM

Ideal training aid for teaching the basic principles of radiography and positioning.

- Can be positioned for most views.
- Permits evaluation of student performance.
- Hollow organs accept contrast media.
- Available in opaque or transparent models.
- Tissue-equivalent materials simulate human attenuation characteristics over the full radiography range.

PIXY is a small, anthropomorphic phantom designed for training radiologic technologists. PIXY measures 5’1” tall and weighs 105 pounds. She is made of tissue-equivalent materials and has life-like articulations. Students will have no difficulty maneuvering PIXY into virtually all radiography positions. PIXY also permits unlimited exposures.

The versatile PIXY is designed to be used to demonstrate anatomy and evaluate positioning and imaging technique, including: kVp, mAs, contrast, optical density, OFD and TFD. Radiographs of PIXY are optically-equivalent in density and contrast to human patients.

The phantom is shipped in a rugged container which also serves as a permanent storage case.

PIXY ANATOMY

PIXY shoulders have ball-and-socket joints; elbows and knees flex 90° to 100°. Hips flex 130° with 30° hyperextension. A “frog position” is made possible by lateral flexion at the hips. The right hand is molded with fingers positioned for an AP view, while the left hand is in an oblique-lateral position. The left foot is in full plantarflexion; the right foot is in a neutral position.

C1, C2, C6 and C7 were converted to mechanical nylon joints because educators in the field prefer full positioning capabilities for the head. The design permits the remaining neck vertebrae to be fixed in a normal position, while assuring a full range of head motion.

PIXY contains the following abdominal and pelvic organs: stomach, gall bladder, urinary bladder, kidneys, rectum and sigmoid flexure. These accept air, water, or contrast media, and can be easily flushed after use.

PIXY MATERIALS

Soft Tissues

Pixy is available in opaque or transparent tissue-equivalent materials. The transparent PIXY has visible organs and skeleton at the hips, knees, and elbows, which are opaque. On both the transparent and the opaque PIXY, latex coverings are needed to retain tissue-equivalent gels for soft-tissue continuity at these articulations. Two-ply coverings protect against gel leakage.

Lungs

Standard PIXY lungs are tissue-equivalent foam with a mass density of inflated human lungs (0.30 g/cc). They are connected to the oro-nasal cavity by the stem bronchi and trachea. The oro-nasal pharynx is filled with a nearly air-equivalent foam.

Optional animal lungs, which duplicate the intricate detail of the vascular trees, are also available.

Skeletons

PIXY contains polymer skeletons which reproduce the shape, mass density and attenuation coefficients of the cortical bone and spongiosa. These skeletons, with trabecular patterns, fit precisely within the soft-tissue molds. The bones of a single individual, who matched PIXY molds very closely, were used in making these skeletal molds. Skeletons have a fixed chemical composition (no osteoporosis or contamination). The medullary cavities were reproduced, with only minor simplification, to make molds for the spongiosa, about which the cortical bone is molded. Both cortical bone and spongiosa are radio-equivalent to natural bone.

The matching of skeletons to soft-tissues permits external and bony landmarks to coincide. The position of bones within the soft tissues is anatomically correct.

PIXY Phantoms are unique in their sculptural detail. The skull, for example, has frontal and sphenoidal sinuses, ethmoidal and mastroid air cells, and the auditory ossicles. Bone sutures are radiographically visible.

ARTERIAL TREE (Optional)

A simplified, integral hollow network is included within the trunk, with ducts to the surface. Like the organs, the Arterial Tree may be eliminated from radiographs (with water filling) or made visible (with contrast media). This option is factory-installed and must be requested at time of purchase of PIXY.

Weight: 265 lbs (122 kg)

76-610  PIXY Opaque Patient Phantom, Includes Hollow Organs and Storage Case
76-010  PIXY Transparent Patient Phantom, Includes Hollow Organs and Storage Case
76-617  Arterial Tree (Factory-installed)
76-010-2000 Animal Lungs
Easily and Accurately Pinpoint Deficiencies that Cause Costly Repeat Films, with the
RADIOGRAPHIC REPEAT ANALYSIS SYSTEM

The Radiographic Repeat Analysis System Dramatically Improves and Simplifies the Repeat Analysis Process!
Start Reducing Department Expenses Today, with the Complete Radiographic Repeat Analysis Starter Kit!

By Improving the Accuracy of Radiographic Repeat Analysis You Get:

• Reduced radiation exposure to the patient.
• Decreased film and chemistry expenses.
• Reduced wear-and-tear on equipment.
• Increased patient throughput.
• Improved use of technologist time.
• Decreased workload and increased efficiency of the waiting room and support staffs.
• Increased department revenues.

Developed as part of a continuous Improvement Program.

Developed in cooperation with Mayo Clinic, Rochester, Minnesota 55905 ©1996 Mayo Clinic and Foundation

(Continued on the next page)
Radiographic Repeat Analysis is a method of determining the percent of radiographs that, for various reasons, need to be repeated. When performed properly, it is a highly cost-effective technique for identifying the most common problems that lead to costly repeat films.

Establishing a repeat analysis program that is complete, accurate and not subject to misleading results, is extremely difficult and time consuming. “Conventional” methods of monitoring the repeat film rate usually do not provide evidence indicating the cause of repeat films. Now the problem is solved!

**COMPONENTS:**

**COLOR-CODED LABELS**

Special color-coded labels are the key to the Radiographic Repeat Analysis System. During repeat analysis, quantification of repeated causes (as indicated by label color) will indicate equipment and procedural deficiencies.

The labels are placed on the repeat film to indicate the reason for the repeat and make films easier to sort through when performing repeat analysis. There are four main repeat “cause” categories, each represented by a different color label. The categories provide an important first step in determining the cause of repeat films. Each main category is subdivided into several detailed sub-categories. Each sub-category is listed as a “check-box” item on the label. A detailed description of the sub-categories is provided on the accompanying Category Definitions Chart.

*(For example, black films will now have explanations and supplementary information is typically provided for films that may have otherwise been categorized incorrectly.)*

The Four Repeat Cause Categories Are:

1. **Technologist-Related (Orange):** Includes under-or over-exposed films, foreign object, anatomy overlap.
2. **Patient-Related (Yellow):** Includes motion, etc.
3. **Equipment-Related (Pink):** A repeat due to equipment failure or malfunction, such as artifact, static. Includes the darkroom and processor.
4. **Non-repeated (White):** Any film that did not need to be repeated and did not result in additional patient exposure. Includes quality control or maintenance test films.

A sturdy wall-mountable label dispenser is included, so that the labels can be mounted near the processing area for easy accessibility. Immediately after a film has been rejected, the technologist responsible for the radiograph should determine the appropriate label, affix the label to the film, and mark the pertinent check box.

*(Continued on the next page)*
This comprehensive Radiographic Repeat Analysis System Starter Kit from Nuclear Associates includes everything needed to set up and maintain an effective program that will result in faster, more accurate and more cost-effective film review.

Implementation of this program will result in an immediate increase in savings and revenues for your department!

**REPEAT ANALYSIS FORMS**

- **One Processor Tally Sheet** to keep count of films that are not included in the program, such as mammography and ultrasound.

- **Four Repeat Cause Category Tally Sheets.** Using separate tally sheets for each main cause category helps keep data manageable and provides a degree of visual interpretation.

- **One Repeat Analysis Worksheet,** on which to record data from all tally sheets, and calculate repeat rates.

**Using the Repeat Analysis Worksheet, You Can Quickly and Easily Calculate Three Categories of Repeat Rates:**

1. **Overall Repeat Rate:** Total number of all repeated films divided by the number of films that could potentially need to be repeated.

2. **Relative Categorical Repeat Rate:** Useful for determining troublesome categories.

3. **Absolute Categorical Repeat Rate:** Useful for tracking the effectiveness of repeat reduction techniques that target a specific category.

**TWO WALL CHARTS**

1. **“Repeat Film Label Category Definitions”**
   This chart should be posted near the processing area, so it is readily available for reference by the technologists when completing a label.

2. **“Guidelines for Using the Repeat Labels”**
   This chart serves as a reminder of the basic steps that should be followed by the technologist, so that the repeat film information is as complete as possible.

**Order this Complete System for Only $189.00 and Permanently Reduce Department Expenses.**

(Continued on the next page)
This Unique, Easy-to-Implement and Cost-Effective System:

• Allows the quality of films to be critically and accurately evaluated.
• Eliminates the guesswork of deducing the cause of repeat films; may indicate equipment and procedural deficiencies.
• Indicates variables that may be contributing to repeat films, such as the number and cause of repeats related to: Exam type, time of day/day of week, adequacy of staffing levels with regard to patient load distribution throughout the day, etc.
• Adds consistency to the interpretation of repeat film causes.
• Heightens technologist awareness of common problems.

The need to repeat a radiograph results in increased dose to the patient, inefficient use of technologist time, increased film and chemistry expenses, and excessive equipment use. Start saving time and money now, with the Radiographic Repeat Analysis System from Nuclear Associates.

09-400 Radiographic Repeat Analysis System, includes:
1 Roll of Each of Four Color-Coded Labels, Label Dispenser,
Set of Two Wall Charts, and Instruction Manual, Weight: 10.5 lbs (5 kg)

LOW-COST SYSTEM REFILL/REPLACEMENT ITEMS

<table>
<thead>
<tr>
<th>All Refill Labels</th>
<th>250 per roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-401</td>
<td>Equipment-Related Repeat Film Label, (Pink)</td>
</tr>
<tr>
<td>09-402</td>
<td>Non-Repeat Film Label, (White)</td>
</tr>
<tr>
<td>09-403</td>
<td>Technologist-Related Repeat Film Label, (Orange)</td>
</tr>
<tr>
<td>09-404</td>
<td>Patient-Related Repeat Film Label, (Yellow)</td>
</tr>
</tbody>
</table>

09-405 Label Dispenser
09-407 Set of Two Wall Charts, Includes
“Guidelines for Using Repeat Labels” and “Repeat Film Labels Category Definitions”

09-409 Repeat Analysis Forms Package, Includes

09-409-1234 Labels and Repeat Analysis Forms Package, Only

09-411 Radiographic Repeat Analysis Instruction Manual
It Has Been Documented That 52% Of All Repeated X-Rays Are Due To Exposure Errors!

TECHNIQUE CHART SOFTWARE PROGRAM

Reduces errors in exposure technique, saving you time and money.

With the national radiography repeat rate an estimated 10% to 13%...it is increasingly possible that the government will impose regulations to protect the public from unnecessary exposure to ionizing radiation.

Reducing your repeat rates now will save you money, shorten exam time and reduce the chance of lawsuits brought by injured patients.

Nuclear Associates’ Technique Chart Software Program allows you to quickly, easily and accurately generate a customized radiographic technique chart for each situation normally encountered by your staff. These convenient, comprehensive charts should then be displayed for easy referral.

It is the responsibility of the medical imaging department to produce the highest quality image, so that accurate diagnoses can be made. Unfortunately, there are many variables that can compromise this goal, including: machine output, filtration, film screen combinations, processing chemicals, temperature and time, patient habitus, and the area of the anatomy being imaged. In the past, controlling and compensating for such variables required time-consuming calculations.

Now, with the Technique Chart Software Program from Nuclear Associates, you can quickly and easily create and store your own precise, reliable radiographic technique charts.

BENEFITS:
• Produce high-quality radiographs.
• Significantly reduce repeat rates.
• Minimize costs associated with repeat exposures, such as labor, processing, replacement tubes, and service.
• Eliminates time-consuming calculations.
• Increase efficiency and productivity of radiology department.
• Increase accuracy of diagnostic interpretations.
• Shorten exam time.
• Reduce patient exposure.
• Can be used by instructors to teach proper exposure technique.

The JCAHO requires technique charts for each radiographic x-ray machine in the department. The Technique Chart Software Program makes it quick, easy and cost-effective to satisfy this requirement!

• Charts comply with JCAHO Guidelines.
• Software applies to all body parts, and all types of x-ray machines (except mammography).
• Generate and print out your own chart for each situation.
• Can be calibrated to each piece of equipment.
• User-selectable mA and kV.
• Can be easily and quickly updated.
• Available in IBM™ PC-compatible Windows or DOS, on 3.5'' floppy disk.

(Continued on the next page)
Nuclear Associates’ Technique Chart Software is Easy to Use:

- Choose one of 38 common positions, such as skull lateral or AP shoulder.
- Input the mA and kVp for the chosen position. These can be changed in small increments. The software also provides suggested kV for the chosen position. As the mA is changed by the user, suggested kV also changes.
- After the mA and kVp are chosen, a technique chart is created for the chosen position.
- Technique charts can be displayed or printed in both textual and graphic format. When the text chart is displayed, the name of the position, kV, mA and correction factor are displayed.
- The total correction factor is comprised of: the machine correction factor and any additional correction factors caused by a change in distance, grid, filter and miscellaneous factors. For example: a machine correction factor is determined by taking an exposure of the small tubular penetrometer that is included with the software program kit (there are separate penetrometer tests for Rare Earth and Regular Screens). The resultant image is then compared to the supplied piece of master film that shows circles of various densities.

The density of the exposed film that is closest to a density on the master film is then noted. This is the first of the correction factors. It is suggested that a correction factor film be generated for each commonly used mA station. Separate technique charts can then be printed for each mA station.

For added convenience, this invaluable software program is available in IBM-PC compatible Windows and DOS. It requires a 386 or better computer, 4 MG RAM and 5 MB of hard disk space. The DOS version runs directly from the program disk and requires a minimum of 256K memory.

Nuclear Associates’ Comprehensive Technique Chart Software Program Kit Includes:

- Computer Diskette(s)
- Penetrometer
- Master Film
- Instruction Manual.

Weight: 2.1 lbs (.92 kg)

07-108-1350 Technique Chart Software Program, Windows Version 1.0, with Two 3.5'' Disks

07-108-2350 Technique Chart Software Program, DOS Version 2.0, With 3.5'' Disk

The test instruments described in this manual are designed for easy use. There is detailed information describing how each test is performed and why. Blank forms and charts for recording test results are also included.

This manual is organized so that each major section of the quality control program is easy to locate. Each section contains the tests necessary to complete QC in that area of diagnostic imaging.

Weight: 2.65 lbs (1.20 kg)

18-290-1000 “Radiographic Quality Control Manual”, 200 Pages
"RADIATION IN THE MEDICAL ENVIRONMENT" 
VIDEO TAPE AND MANUAL *

A unique and concise curriculum that can be used as part of a radiation safety course or as an independent education program.

This educational materials package is designed to aid hospitals and medical schools in educating students, lab workers, doctors, nursing staff and custodial/maintenance crews on radiation.

The Radiation in the Medical Environment videotape explores many aspects of radiation and radiation safety, using a combination of actual equipment in clinical settings and simulation. Basic concepts of radiation science are introduced using layman’s terms and easy-to-understand examples.

Unlike other videotapes on this subject, this comprehensive 21-minute videotape demonstrates the principles and presence of radiation with a unique device for “seeing and hearing” radiation. This device is called a Superheated Drop Detector (SDD) or sometimes “bubble” detector. The SSD is comprised of a liquid in droplet form surrounded by a gel. SDDs are prepared in different sensitivities to distinguish and measure different radiation types (x-rays, alpha and beta particles, and neutrons). When introduced to the right type and energy of radiation, the droplets boil into vapor bubbles and eventually burst, producing a popping sound. The bubbles can be visualized and the popping is audible through a microphone, thus allowing radiation to be “seen and heard” in the video’s illustrative examples. Incorporating the illustration of this type of technology into the education process helps to demystify radiation and makes its various concepts easy to understand.

Complementing the videotape, is an informative 25-page booklet titled “An Introductory Manual on Radiation in the Medical Environment.” The booklet provides a highly informative overview of radiation in the medical environment and supports the topics covered in the videotape.

The manual includes the following sections:
• An introduction to basic principles including radiation and radioactivity, radioactive decay, radiation in medicine, and measuring radiation exposure.
• Types of radiation, including photons and particles.
• Energy of radiation and penetration into tissue.
• Application of radiation, including diagnostic and therapeutic applications.
• Radiation safety.
• Frequently asked questions about radiation.
• A self-test on understanding the principles of radiation covered in the booklet.
• References and suggested readings.

It is essential that all radiation personnel are effectively educated about radiation in the workplace, and this important curriculum will help ensure they get the vital information they need.

Running Time: 21 minutes
Weight: .75 lbs (.34 kg)

49-140 Radiation in the Medical Environment
Videotape and Manual
49-140-2000 “An Introductory Manual on Radiation in the Medical Environment”

EARN CONTINUING EDUCATION CREDIT! 
This course has been approved by the ASRT Department of Education for .50 Category A Continuing Education Credit.

* Videotape and curriculum developed by Robert Apfel, Krystal Nakamura, Francesco d’Errico, and Michael Bohan.

(Continued on the next page)
Avoid fines for failure to provide your personnel with the required radiation safety training!

All Nuclear Associates’ educational videotapes are approved by the ASRT Department of Education for Category A Continuing Education Credit. Each tape is presented in an entertaining and informative format using layman’s terms. The tapes are an important step in educating employees about the general principles of ionizing radiation and provide education about methods of protection against exposure.

*R as a special service to our customers, Nuclear Associates will process all continuing education credit applications absolutely free! The necessary forms will be sent with each order.

†All videotapes weigh approximately .75 lb (.34 kg)

“RADIATION RISKS REVISITED”

Explains the risks from occupational radiation exposure, based on the NRC’s February 1996 Regulatory Guide 8.29 “Instruction Concerning Risks from Occupational Radiation Exposure.”

Radiation Risks Revisited from Nuclear Associates reviews the regulatory guide and explains occupational exposure risks, so personnel can make an informed decision regarding their own personal radiation exposure risk.

Radiation Risks Revisited is a “must see” for senior personnel, as well as new employees.

Topics Include:
- Somatic, genetic and teratogenic effects.
- Internal vs. external exposures.
- Background radiation.
- The linear no-threshold controversy.
- Occupational dose limits
- Cancer risk estimates.
- Prompt and delayed effects.
- The individual’s decision regarding radiation exposure risk acceptance.

It is crucial that all personnel working with radiation are knowledgeable about:
- The potential side-effects of routine occupational radiation exposure.
- Occupational dose limit for an adult.
- How occupational exposure is calculated for persons working with radiation.

Running Time: 24 minutes

49-153 Radiation Risks Revisited, VHS Format
49-153-2200 Radiation Risks Revisited, PAL Format

(Continued on the next page)
“HOSPITAL RADIATION PROTECTION PRACTICES”

A comprehensive videotape training program for all medical personnel.

- An essential training program, for all hospital personnel, that provides an excellent overview of radiation protection in a hospital setting.
- In-depth descriptions of current radiation protection procedures required by government regulations.
- A method of qualifying for continuing education credit and for obtaining in-service education.

This videotape training program provides hospital employees working in radiation areas with information on current radiation protection procedures required by government regulations for the medical use of radioactive materials.

The program consists of two segments. The subjects covered in the first segment are:

- General introduction to ionizing radiation.
- History of radiation use and protection.
- Biological effects of radiation.
- General principles of radiation protection such as: use of time, distance and shielding.
- Principle of maintaining as low as reasonably achievable low exposures (the ALARA principle). This information is ideally suited for general audiences. It will easily fit into a hospital's indoctrination program for non-radiology employees (such as nurses) who require general knowledge about radiation protection.

The second segment addresses the basics of a hospital radiation safety program required by government agencies in the area of teletherapy, brachytherapy and diagnostic and nuclear therapy medicine. This material offers an excellent review of what is required of a hospital radiation safety program. Additionally, it can be useful for a hospital radiation safety committee.

Hospital Radiation Protection Practices delivers well-prepared information that can offer your staff a higher level of radiation protection information and provide your technologists with continuing education credit.

Running Time: 58 minutes

49-150 Hospital Radiation Protection Practices, VHS Format
49-150-2200 Hospital Radiation Protection Practices, PAL Format

“RADIATION SAFETY AND COMMON SENSE”

The perfect educational training video for anyone concerned about radiation in the workplace.

Everything you need to know about radiation and safety, presented in an entertaining and informative format!

Topics Include:

- Energy as particles and rays.
- Background radiation.
- Irradiation and contamination.
- Time, distance and shielding.
- Techniques to minimize exposure.
- Risks associated with typical occupational exposures.

Radiation Safety and Common Sense is a videotape training program that explains the underlying concepts of radiation and safety in everyday, non-technical layman's terms. This comprehensive videotape tells the radiation/radiation safety story through basic concepts and everyday scenarios that everyone can relate to, making it easy to understand and enjoyable to watch.

The program has been designed to explain radiation safety to non-radiation workers with no prior radiation experience or knowledge. Everyone in your facility will gain insight and have a better understanding of the benefits and risks of radiation. Even the most experienced workers will benefit from the program as it offers a new perspective on potential radiation exposure in the workplace and its effects. It offers many suggestions on how all workers can take precautions to minimize exposure and risk.

This one-of-a-kind videotape is an invaluable educational training tool. By providing simple answers to complex questions, it will help all employees feel more comfortable about their work environment.

Running Time: 26 minutes

49-152 Radiation Safety and Common Sense, VHS Format
49-152-2200 Radiation Safety and Common Sense, PAL Format

EARN CONTINUING EDUCATION CREDIT!
This course has been approved by the ASRT Department of Education for 1 Category A Continuing Education Credit.

EARN CONTINUING EDUCATION CREDIT!
This course has been approved by the ASRT Department of Education for .50 Category A Continuing Education Credit.

(Continued on the next page)
“RADIATION PROTECTION STANDARDS”

Explains NRC 10CFR Part 20 Standards for Protection Against Radiation.

- An essential training program for all hospital personnel.
- Makes understanding and implementing the NRC 10CFR Part 20 Standards for Protection Against Radiation easy.
- Discover the details of the standards for protection against radiation and the impact these standards will have on the workplace.
- Targeted to general hospital audiences; radiology and non-radiology employees alike.
- Provides a method of qualifying for continuing education credit and obtaining in-service education.

Effective January 1994, the Nuclear Regulatory Commission’s 10CFR Part 20, Standards for Protection Against Radiation; Final Rule, became law. And with this law came the requirement that radiation workers be instructed in the details of these new regulations.

The Nuclear Regulatory Commission’s training requirement affects all users of radioactive material and radiation sources in the United States. Now hospitals are faced with the major task of not only implementing these rules, but also imparting these revised regulations to their workers in order to properly prepare them for the changes that will be forthcoming.

This comprehensive 39-minute videotape provides the mandatory new regulation training that is needed for all hospital employees working in radiation areas. For example, the new regulations:

- Contain major changes affecting dose limitations for adult workers.
- Establish explicit dose limits for the public, and for the female worker’s embryo/fetus.
- Re-examine assumptions regarding the linear nonthreshold dose effect relationship.
- Adopt an effective dose concept that requires combining external and internal dose to arrive at a total dose equivalent.
- Require management to develop, document and implement a radiation protection program that will ensure compliance with the new standards.
- Necessitate new record-keeping procedures.

This videotape program has been granted continuing education credit status by the American Society of Radiologic Technologists.

The vital information that is presented in “Radiation Protection Standards” makes this a “must have” videotape, one that will guarantee that hospital workers receive the information they require on these new standards for protection against radiation.

Running Time: 39 minutes

49-151 Radiation Protection Standards,
VHS Format
49-151-2200 Radiation Protection Standards,
PAL Format

See Also...

“BASICS OF X-RAY FILM PROCESSOR QUALITY CONTROL”

- An excellent aid in developing and monitoring a quality control program for radiographic film processing equipment.
- Helps you to comply with MQSA, ACR, JCAHO, and State QC guidelines.

See Film Processor QC Section, Page 386.
DARE TO COMPARE

Versatile CLEAR-Pb® Lead-Plastic Radiation Shielding

▲ CLEAR-Pb Lead-Plastic is shatter-resistant
▲ Provides a panoramic view of patient and room
▲ Rugged, lightweight lead-plastic provides unlimited design and application options
▲ 200 sizes and seven lead equivalencies available

CLEAR-Pb Lead-Plastic from Nuclear Associates is available in Modular Barriers (shown above), Windows, Mobile and Overhead Barriers, and many other radiation shielding products. See Radiation Protection Section page 265.

Call Today to Request a FREE Videotape Explaining the Many Benefits and Applications of CLEAR-Pb Lead-Plastic Radiation Shielding.

Old-Fashioned Lead-Glass

▲ Lead-glass is fragile and breakable
▲ Limits view of patient and room
▲ Fragile lead-glass limits design and application options
▲ Limited number of sizes and lead equivalencies available

FREE VIDEO AVAILABLE!
X-RAY ASSIST BAR

Optimize image quality and save money by virtually eliminating patient movement and providing comfort during x-ray.

Provider Benefits:
- Saves money on film by reducing costly repeat exposures.
- Virtually eliminates patient movement.
- Assures technician or doctor of accurate patient positioning.
- Ensures sharper images.
- Improves diagnostic accuracy, through sharper images.
- Improves patient flow by reducing re-takes.
- Easy to install, operate and adjust.

A significant amount of patient movement can occur when taking erect lateral thoracic, lateral lumbar, lateral chest and lateral abdomen plain film x-rays, which require longer exposure times. Such movement causes the x-ray image to be blurred. Furthermore, the desired image can move out of the field of the x-ray. The result is costly re-takes and additional radiation exposure to the patient. Patient discomfort is another problem that is common when taking the views stated above. Patients with acute lower back pain find it extremely difficult and painful to stand with their arms forward and outstretched, out of the way of the image. The X-Ray Assist Bar from Nuclear Associates provides a cost-effective and convenient solution to these problems.

To use the X-Ray Assist Bar, the grip bar is simply locked into position horizontally for the patient to hold onto. This versatile bar can be raised, lowered and moved left or right to accommodate various applications and patient heights.

The X-Ray Assist Bar can also be used with two sets of tracks; one on either side of the x-ray bucky.

By providing the patient with a means of support that can be easily and comfortably gripped, the X-Ray Assist Bar minimizes patient movement, increases patient comfort, improves the overall quality of patient care and ensures sharper image quality.

SPECIFICATIONS:

Material: Rugged aluminum alloy
Dimensions: Horizontal Track: 28 3/8" L x 6 1/2" W
             Height Adjustment Track: 24" L x 3" W
             Grip Bar: 22" long
Weight: 11 lbs

17-419 X-Ray Assist Bar

The X-Ray Assist Bar is Available in Custom Sizes! Call for Details!
PALPATION SPOONS*

Provides significantly improved anatomic detail during fluoroscopic examination of the gastrointestinal tract.

Compression and palpation is common in fluoroscopy of the GI tract, with the fluoroscopist using his lead-gloved hand. This results in an increase in image system factors of kVp and/or mA to compensate for the attenuation of the lead glove. The effect is increased exposure to the patient, plus the image of the lead glove can cover significant anatomic detail.

By using the Palpation Spoon, in most instances the fluoroscopist’s gloved hand is entirely outside the field. Since the spoon is radiolucent, a minimal to no increase in fluoroscopic factors is required, thus patient exposure is not increased.

**SPECIFICATIONS:**

- **Length:** 9 1/8"
- **Weight:** 5.8 oz
- 17-604 Palpation Spoon, Polyethylene
- 17-604-1000 Palpation Spoon, Wood

* Designed by N.T. Winkler, R.T. (R), Dept. of Radiology, Mayo Clinic®, Rochester, MN. Manufactured under licensing agreement with Mayo Foundation for Medical Education and Research.

---

FILM MARKER PENS

For identifying film negatives, transparencies, spot film holders, record file holders and all types of hard-to-mark surfaces.

Permanent, waterproof and smear-proof. This felt-tip marker pen contains quick-drying, water-proof black ink which adheres to surfaces that reject regular ink, pencil and ball-point pen marks. The fine point is ideal for writing directly on x-ray film, plastic spot-film holders and record file holders. It makes permanent, smear-proof markings on all types of surfaces... plastic, metal, glass, foil, paper, cloth, rubber.

**SPECIFICATIONS:**

- **Weight:** Less than 1 pound
- 07-980 Film Marker Pens, Box of 12
**SPOT-CHECK FILM HOLDERS**

Durable polyester holders provide the most efficient way to mount, view and file spot films, scintiphotos, echograms and CT scans.

- Polyester film holders take up less filing and storage space...reduced weight and bulk means savings on shipping and storage costs.
- Rugged, flexible, clear plastic makes viewing easier and facilitates handling. Films slip easily into holder.

Spot-Check Film Holders are made of ANSI-recommended uncoated polyester, a durable plastic that will not oxidize, discolor, distort a film presentation, or cause sticking or ferrotyping of the film image surface. The plastic is so clear that slides can be made without removing the film from the holder. Reduced surface glare makes viewing easier too. Spot-Checks take up less than half the filing and storage space of conventional film holders, resulting in significant savings in shipping and storage costs.

**Mounting and viewing are easy.** The original film is cut every three to six spots, depending on the size of the film and holder, and each cut group is inserted into one channel in the film holder. The film will not fall out of the holder but can be removed easily when necessary. An area at the top of each film holder (except 105 mm size) is provided for patient identification.

Depending on the size of the holder, up to 12 spots can be organized sequentially. Individual channels are easily detached from the holder by cutting along the special “separation guide.”

Available by the carton (100 holders) or by the case (five cartons of 100 holders each).

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>07-934</th>
<th>07-930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Size</td>
<td>105 mm</td>
</tr>
<tr>
<td>Holder Size</td>
<td>14&quot; x 17&quot;</td>
</tr>
<tr>
<td>Channels per holder</td>
<td>3</td>
</tr>
<tr>
<td>Spots per channel</td>
<td>4</td>
</tr>
<tr>
<td>Capacity (spots/prints)</td>
<td>12</td>
</tr>
<tr>
<td>100 Holder Carton Price</td>
<td>Wt.: 8 lbs.</td>
</tr>
<tr>
<td>500 Holder Case Price</td>
<td>Wt.: 42 lbs.</td>
</tr>
</tbody>
</table>

**ULTRA-PAK FILM HOLDERS**

Give your filing system the extra-professional touch!

- Standardize.
- Simplify filing.
- Protect.
- Eliminate taping.
- Make viewing easier.

These holders are compatible with letter-size filing systems and study report folders. Space is provided at top for patient identification and data. Each holder accommodates eight films.

**SPECIFICATIONS:**

Dimensions: 8½" x 9½"

84-002 Ultra-Pak Film Holders, Box of 100,
Weight: 7 lbs (3.2 kg)
Box of 500, Weight: 36 lbs (16.5 kg)

*BEWARE OF PVC FILM HOLDERS!*

OUR HOLDERS ARE UNCOATED POLYESTER!

*Excerpts from A.N.S.I. Publication PH1.43-1976 “Practice for Storage of Processed Safety Photographic Film.”*
CLEAR-Pb® LEAD-PLASTIC COMPENSATION FILTERS FOR RADIOGRAPHY

*Improve image quality and reduce patient exposure!*

- Filters are 30% lead by weight.
- Reduce the need for multiple exposures.
- Ensure a more uniform image density.
- Reduce patient exposure by selectively attenuating the x-ray beam.
- Lightweight, easy to use.
- Mount to any collimator.
- Collimator light field is never blocked.

Advantages of using CLEAR-Pb Lead-Plastic Filters compared to other filter methods.

CLEAR-Pb Compensation Filters eliminate the problems inherent in imaging a wide range of densities on one radiograph. Because they are far superior, they replace the bulky, heavy aluminum filters that block the collimator light field. In addition, CLEAR-Pb Filters are only one-fifth as heavy as aluminum filters. And, they eliminate the use of gradient-speed intensifying screens.

CLEAR-Pb Filters are made of lightweight plastic that is 30% lead by weight. A unique “Quick-Stik” magnetic mounting system plus a filter holder that slides into the collimator tray ensure that the filter is held firmly in place. It also permits instant repositioning as the area and/or degree of filter coverage changes.

Improve image quality, even in areas of varying body thickness.

Many routine radiography exams including mediastinum and chest tomography, aortic arch angiography, dorso-plantar foot views and full-spine scoliosis studies, present the problem of maintaining an optimal range of film densities because of the great differences in body thickness. In order to achieve diagnostic quality, conventional methods subject the thinner body areas to unnecessary radiation exposure. By compensating for the differences in body thickness, CLEAR-Pb Filters reduce over-exposure of both the film and the patient. The filters help ensure optimum image quality and provide improved diagnostic detail. Because the use of CLEAR-Pb Filters result in a reduction of radiation exposure where it is not needed, in some studies patient doses can be reduced by a factor of 100.

Clinical tests confirm advantages of CLEAR-Pb Lead-Plastic Compensation Filters.

In tests conducted by the Center for Devices and Radiological Health (CDRH), Nuclear Associates' Lead-Plastic Transparent Compensation Filters and Breast Shields were used with children undergoing scoliosis radiography. The tests had a two-fold purpose: to reduce radiation doses to the children and to provide more uniform film densities throughout the entire spine. The CDRH reports exposure reductions of about 80% to the skin of the breast when using this filter for AP projections and a greatly improved image quality of the upper spine.1,2

References:

* Patents 4,129,524 and 4,182/821
THE IMAGES SPEAK FOR THEMSELVES...

LATERAL DECUBITUS RADIOGRAPHS (double contrast studies): The decubitus image at left was obtained without a CLEAR-Pb Filter. The image on the right, obtained with a CLEAR-Pb Filter, reveals an 8 x 12 mm polyp (black arrows).

SINGLE-EXPOSURE SPINAL RADIOGRAPHS: The radiograph at left was obtained without a CLEAR-Pb Filter. Notice “burn-out” in cervical and thoracic areas. At right is radiograph obtained with a CLEAR-Pb AP/PA Filter. Note uniform density throughout the spinal column.

SINGLE-EXPOSURE DP VIEW OF THE FOOT: Radiograph at left was taken without a CLEAR-Pb Filter. Notice “burn-out” at the toes due to increased technique needed to properly expose the dense tarsal bones. The radiograph on the right was taken with a CLEAR-Pb Filter. The image density is uniform from instep to toes.

AP (14” x 17”) cervical/thoracic radiograph with CLEAR-Pb Filter and Breast Shields.

MORE DIAGNOSTIC DETAIL... LESS RADIATION EXPOSURE!

(Continued on the next page)
TYPICAL CLEAR-Pb FILTER POSITIONS

AP Full-Spine (small to average patient)
- AP:PA Filter (57-405)
- Breast Shields (57-409)
- Gonad Shield (57-408) or (57-444)

AP Full-Spine (large patient)
- AP:PA Filter (57-405)
- Thin Build-Up Filter (57-430)
- Breast Shields (57-409)
- Gonad Shield (57-408) or (57-444)

Lateral Full-Spine (single exposure)
- Lateral Cervical Filter (57-406)
- Lateral Thoracic Filter (57-407)
- Breast Shields (57-409)
- Gonad Shield (57-408) or (57-444)

Lateral Thoracic Spine (sectional view)
- Breast Shield (57-409)
- Lateral Thoracic Filter (57-407)
- 14" x 17" FILM SIZE

Lateral Cervical Spine (sectional view)
- Lateral Cervical Filter (57-406)
- 10" x 12" FILM SIZE

Lateral Lumbar Spine Including (L5-S1) Interspace (sectional view)
- Lateral Thoracic Filter (57-407)

Unfiltered | CLEAR-Pb Filters | Region of Interest
Shielded Area | Magnetic Tape

(Continued on the next page)
CLEAR-Pb® LEAD-PLASTIC FULL-SPINE SCOLIOSIS FILTERS

Tested and proven in FDA and specialized radiography studies...enables scoliosis radiography with more diagnostic detail and less radiation exposure.

Whether you are taking full-spine (14” x 36”) or sectional (14” x 17”) spinal radiographs, the facts are in...FDA tests prove that CLEAR-Pb Lead-Plastic Transparent Compensation Filters and Breast Shields significantly reduce radiation exposure while providing a more uniform radiograph (see Table 1). Test results showed exposure reductions of about 80% to the skin of the breast when using this system for AP projections. At the same time, these lightweight, easy-to-use filters greatly improved the image quality of the upper spine. Further exposure reduction of about 50% was achieved using fast rare-earth intensifying screen-film combinations.

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>POTENTIAL BREAST EXPOSURE REDUCTION (AP PROJECTION)</th>
<th>Exposure Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare Earth Film/Screen</td>
<td>2-6X</td>
</tr>
<tr>
<td>Compensation Filter</td>
<td>2-5X</td>
</tr>
<tr>
<td>Breast Shield</td>
<td>3-10X</td>
</tr>
<tr>
<td>(or PA Projection)</td>
<td>3-12X</td>
</tr>
<tr>
<td>Total</td>
<td>Approx.: 10-350x</td>
</tr>
</tbody>
</table>

Reduce risk from multiple exposures required during course of treatment to adolescents.

Screening programs for the early detection of scoliosis in school children has led to an increase in the number of x-ray examinations of the spine. The early detection program is endorsed by the American Academy of Orthopedic Surgeons. The screened children ranged in age from nine to fourteen years, with females comprising roughly two-thirds of those found to require treatment and follow-up examinations. Studies have demonstrated that the increase in the rate of breast cancer is much higher for radiation exposure during puberty than that experienced later in life. Therefore, it is critical that the dose administered to the breast, as well as to other radiosensitive organs (thyroid and active bone marrow) be as low as possible during the scoliosis radiography examination.

For radiation exposure during puberty than that experienced later in life. Therefore, it is critical that the dose administered to the breast, as well as to other radiosensitive organs (thyroid and active bone marrow) be as low as possible during the scoliosis radiography examination.

References:
CLEAR-Pb LEAD-PLASTIC FULL-SPINE SCOLIOSIS FILTERS

Optional accessories recommended for use with Full-Spine Scoliosis Filters

**BREAST SHIELDS (57-409):** Provide protection to the radiosensitive breast and lung parenchyma adjacent to the spine. Fully adjustable; may be used on the Filter Holder Assembly (57-426) with or without a compensation filter. Consists of two 3” x 3” steel/lead shields with magnetic tape on one side.

**ADULT GONAD SHIELD (57-408):** Shamrock-shaped insert has three overlapping lead circles (each 1/2” diameter) cemented to clear plastic.

**PEDIATRIC GONAD SHIELD (57-444):** For imaging children and the sacroiliac joints of adults. Overlapping lead circles are 1/4” D.

**THIN BUILD-UP FILTER (57-430):** Used with AP/PA filters for patients with measurements from 14 to 25 cm. Provides additional filtration in the cervical area to compensate for the added exposure that may be needed in the lumbar area.

**THICK BUILD-UP FILTER (57-434):** Same as 57-430 Filter (above), but for patients whose measurements exceed 25 cm.

---

### CLEAR-Pb AP/PA Filters

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Filter Type</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Filter Holder Required</th>
<th>Other Applications</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-405*</td>
<td>AP/PA (72” FFD)</td>
<td>5 oz.</td>
<td>6.5”</td>
<td>2.5”</td>
<td>Yes (see 57-426)</td>
<td>• Lateral Chest</td>
<td></td>
</tr>
<tr>
<td>57-415</td>
<td>AP/PA (40” FFD)</td>
<td>9 oz.</td>
<td>6.5”</td>
<td>4.125”</td>
<td>Yes (see 57-426)</td>
<td>• Sectional, AP cervical thoracic</td>
<td></td>
</tr>
<tr>
<td>57-406*</td>
<td>Lateral Cervical (72” FFD)</td>
<td>3.2 oz.</td>
<td>6.5”</td>
<td>1.25”</td>
<td>Yes (see 57-426)</td>
<td>• Lateral full spine (with 57-407 filter) • Lateral aortic arch</td>
<td></td>
</tr>
<tr>
<td>57-407*</td>
<td>Lateral Thoracic (72” FFD)</td>
<td>2.6 oz.</td>
<td>6.5”</td>
<td>1.25”</td>
<td>Yes (see 57-426)</td>
<td>• Oblique or AP esophagram (obese patients) • Lateral chest tomography • Routine lateral thoracic</td>
<td></td>
</tr>
<tr>
<td>57-430</td>
<td>Thin Build-Up</td>
<td>2.5 oz.</td>
<td>6.5”</td>
<td>2.5”</td>
<td>Yes (see 57-426)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-434</td>
<td>Thick Build-Up</td>
<td>3.5 oz.</td>
<td>6.5”</td>
<td>2.5”</td>
<td>Yes (see 57-426)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-409</td>
<td>Breast Shield Set (72” FFD)</td>
<td>2 oz.</td>
<td>3.0”</td>
<td>3.0”</td>
<td>Yes (see 57-426)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-408</td>
<td>Adult Gonad Shield</td>
<td>.50 oz.</td>
<td>6.5”</td>
<td>1.0”</td>
<td>Yes (see 57-426)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-444</td>
<td>Pediatric Gonad Shield (72” FFD)</td>
<td>.25 oz.</td>
<td>6.5”</td>
<td>1.0”</td>
<td>Yes (see 57-426)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-426</td>
<td>Filter Holder (Set of Mounting Plates Included)</td>
<td>24 oz.</td>
<td>6.5”</td>
<td>6.5”</td>
<td>Has two steel rails, 1” wide x 5½” long, positioning filters and shields. Only one Filter Holder is needed per x-ray machine. Comes with a Plexiglas cutter.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*These models manufactured under licensing agreement with the Mayo Clinic® Mayo Foundation

---

### BUILD-UP FILTERS

To obtain the optimum diagnostic detail, the AP/PA Wedge Filter (57-405) should be used when performing full-spine examinations. First the Breast Shields (57-409) are placed on the filter holder. The AP/PA Wedge Filter (57-405) is placed on top of the Breast Shields. The Gonad Shield (57-408) is placed below the AP/PA Wedge Filter. Build-Up Filters are used to provide additional filtration in the cervical area to compensate for the added exposure that may be needed in the lumbar area. Build-Up Filters are placed on the AP/PA Wedge Filter.

---

*(Continued on the next page)*
XIS FULL-LENGTH LEG X-RAY COMPENSATION FILTER SYSTEM

For superior pre-operative radiographic alignment planning and post-operative assessment.

Ends image “burn-out” at knees and ankles.

This system provides unsurpassed image uniformity while it reduces excessive radiation exposure to less-dense tissue.

Preoperative radiography planning is very important in determining proper angles in total knee replacements and in tibial and distal femoral osteotomies. The problem has always been how to get a high-quality radiograph that can properly visualize the dense hip area without overexposing the less-dense knees and ankles. The problem is solved when you utilize the XIS Comp Filter System during standing, weight-bearing radiography. It provides a dramatic improvement in image quality throughout the entire leg...from hip to ankle...using just one x-ray exposure!

Decrees error factor.

With a single good exposure, the exact alignment deformity can be measured. It decreases the error factor involved when trying to evaluate images of poor quality or “eyeballing” separate radiographs. Image quality is enhanced over a wide range of body densities. XIS provides the finest detail for precise alignment planning.

Unsurpassed image uniformity.

CLEAR-Pb X-Ray Compensation Filters provide the correct hip exposures while attenuating radiation to the knees and ankles, thus eliminating any chance of image “burn-out”. This is the kind of image quality you’ve been looking for but which was unavailable until now!

Reference:


Save money on film & chemistry, through improved image quality!

(Continued on the next page)
**XIS FULL-LENGTH LEG X-RAY COMPENSATION FILTER SYSTEM COMPONENTS**

The system consists of a Thin Wedge Filter for average patients, (hip measurements of 28 cm or less), a Thick Wedge Filter for larger patients, (hip measurements of 29 to 35 cm), a C-Wedge Filter (for hip measurements greater than 35 cm), and a Filter Holder Assembly.

For optimum results, the following additional components are required: a 14" x 36" or 14" x 51" cassette, a 103 LP/mm, 8:1 linear grid, and 14" x 36" or 14" x 51" rare earth intensifying screens. (These items may be obtained from your local x-ray equipment supplier.)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Filter</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Filter Holder Required</th>
<th>Other Applications</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-437**</td>
<td>Thin Wedge; for conventional machines</td>
<td>8 oz. 6.5&quot; 4.50&quot;</td>
<td>Yes (see 57-426)</td>
<td>• AP scanograms, for determination of long-leg length discrepancies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-438**</td>
<td>Thick Wedge; for conventional machines</td>
<td>13 oz. 6.5&quot; 4.50&quot;</td>
<td>Yes (see 57-426)</td>
<td>• Full-leg radiography (under bodyweight load) • Orthopedic angiographic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-439</td>
<td>XIS Full-Length Leg X-Ray Image System Kit. (Includes 57-437 Thin Wedge, 57-438 Thick Wedge and 57-426 Filter-Holder Assembly)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-442**</td>
<td>C-Wedge; for conventional machines</td>
<td>17 oz. 6.5&quot; 6.0&quot;</td>
<td>Yes (see 57-426)</td>
<td>• Lateral scanograms, for determination of long-leg length discrepancies • Full-standing, single exposure lateral radiographs from hip to ankle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-435</td>
<td>Filter; for ceiling-mounted machines</td>
<td>8.0 oz. 7&quot; 4.0&quot;</td>
<td>No</td>
<td>• Full-leg radiography (recumbent) • Orthopedic and angiographic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-426</td>
<td>Filter Holder (Set of Mounting Plates included)</td>
<td>24 oz. 6.5&quot; 6.5&quot;</td>
<td>Has two steel rails 1&quot; wide x 5 1/2&quot; long, for positioning filters and shields. Only one Filter Holder is needed per x-ray machine. Comes with a Plexiglas cutter.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* These models manufactured under licensing agreement with the Mayo Clinic® Mayo Foundation
** These models manufactured under licensing agreement with Alvarado Orthopedic Research Company.

(Continued on the next page)
CLEAR-Pb LEAD-PLASTIC CHEST X-RAY COMPENSATION FILTER

For greater diagnostic detail over entire lung with fewer repeats.

Reveals details that conventional x-rays usually miss.

The CLEAR-Pb Chest X-Ray Filter eliminates a problem commonly encountered in chest x-rays: a portion of the lung field is usually severely underexposed because it is hidden behind the hilum. With the CLEAR-Pb Filter, you can increase the beam intensity sufficiently so that all details of the lung and the posterior mediastinal field are clearly revealed. The CLEAR-Pb Filter attenuates the x-ray beam while protecting the rest of the field from overexposure. You get clear diagnostic detail of the lungs, heart and spine.

Easy to use; swings out of the way for non-chest applications.

The CLEAR-Pb Chest X-Ray Filter is anatomically shaped to match the lungs. The lightweight, transparent filter never blocks the collimator light field. Select area beam shaping is simple and effective. The filter is hinged to a plastic mounting plate that easily adapts to the collimator’s accessory tray. It swings easily out of the x-ray path for lateral views or non-chest applications.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Filter</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Filter Holder Required</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-429</td>
<td>Chest</td>
<td>16 oz.</td>
<td>5.125&quot;</td>
<td>5.125&quot;</td>
<td>No</td>
<td>PA View (72&quot; FFD)</td>
</tr>
<tr>
<td>57-429-6322</td>
<td>Chest</td>
<td>16 oz.</td>
<td>5.125&quot;</td>
<td>5.125&quot;</td>
<td>No</td>
<td>AP View (72&quot; FFD)</td>
</tr>
</tbody>
</table>

Every Department Needs This Filter!

(Continued on the next page)
CLEAR-Pb LEAD-PLASTIC LATERAL DECUBITUS X-RAY COMPENSATION FILTER

**Excellent diagnostic detail in double-contrast barium enema examinations.**

Ends image “burn-out” while reducing patient exposure.
Lateral decubitus images normally obtained during double-contrast barium enema exams are often difficult to interpret because of the extreme differences in film densities. A high percentage of such images have been clinically unacceptable due to over-or under-penetration on one side of the patient. For example, overexposed decubitus views have been responsible for a high percentage of missed lesions, especially in the ascending colon.7

Easy to use.
The CLEAR-Pb transparent filter is lightweight. With the unique “Quick-Stik” magnetic mounting system, the filter easily mounts on the holder. The filter is held firmly in place, yet it can be repositioned instantly.

Reference:

---

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Filter</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Filter Holder Required</th>
<th>Other Applications</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-432</td>
<td>2” Wedge Lateral Decubitus at 40” FFD</td>
<td>3.4 oz.</td>
<td>6.5”</td>
<td>2”</td>
<td>Yes (see 57-426)</td>
<td>• All lateral decubitus position views • Angiography of neck and head (use 2 filters)</td>
<td></td>
</tr>
<tr>
<td>57-433</td>
<td>3” Wedge Lateral Decubitus at 40” FFD</td>
<td>5.5 oz.</td>
<td>6.5”</td>
<td>3”</td>
<td>Yes (see 57-426)</td>
<td>• Suggested for children</td>
<td></td>
</tr>
<tr>
<td>57-426</td>
<td>Filter Holder (Set of Mounting Plates included)</td>
<td>24 oz.</td>
<td>6.5”</td>
<td>6.5”</td>
<td>Has two steel rails, 1” wide x 5½” long, for positioning filters and shields. Only one Filter Holder is needed per x-ray machine. Comes with a Plexiglas cutter.</td>
<td>(Required for 57-432, 57-433)</td>
<td></td>
</tr>
</tbody>
</table>

(Continued on the next page)
CLEAR-Pb LEAD-PLASTIC TRANSPARENT FOOT & ANKLE X-RAY COMPENSATION FILTER

For uniform radiographic imaging of the entire foot.

Until now, trying to obtain a uniform radiographic image of the foot has been a problem. How do you get a high-quality radiograph of the dense tarsal bone area without overexposing the less-dense terminal phalanges?

The solution is the CLEAR-Pb Foot and Ankle X-Ray Filter. You get the correct exposure to the tarsal area while attenuating radiation to the metatarsal and terminal phalanges. Now the entire foot can be imaged in a single, good exposure! You will obtain the kind of improved image quality you have been looking for. This CLEAR-Pb filter provides the finest detail needed for precise radiographic evaluation.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Filter</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Filter Holder Required</th>
<th>Other Applications</th>
<th>Configuration</th>
</tr>
</thead>
</table>
| 57-440    | Foot & Ankle Filter     | 3.9 oz.| 6.5''  | 2''   | No                     | • AP foot
                                                      • Podiatric equipment                                    |               |
| 57-441    | 2'' Wedge DP foot at 40'' FFD | 2 oz. | 6.5''  | 2''   | Yes (see 57-426)       | • Lateral and oblique
                                                      • Axial view of calcaneus                                  |               |
| 57-426    | Filter Holder           | 24 oz. | 6.5''  | 6.5'' |                        | Has two steel rails, 1'' wide x 5½'' long, for positioning filters and shields. Only one Filter Holder is needed per x-ray machine. Comes with a Plexiglas cutter. |               |

(Required for 57-441)

Image Uniformity Made Easy!
**PATIENT X-RAY PROTECTION SYSTEM**

- Eliminates cumbersome tube housing attachments.
- Shields never touch the patient.
- Positioning is quick, simple, and precise.

Reduce radiation to your patients during radiography with the Patient X-Ray Protection System. The magnetic mounting system ensures unobtrusive, instant-adjust shielding. It mounts on the collimator, not the tube housing or the patient, so there are no sanitary or mechanical problems.

The Patient X-Ray Protection System consists of: one Gonad Shield, two Breast/Lung Shields, and a Shield Holder. The Magnetic Mounting System and Shield Holder is easy to install and ready to use without interfering with normal operations. Precise positioning takes only a few seconds; Simply slide a shield into place by observing its shadow in the collimator light field.

**SPECIFICATIONS:**

**Gonad Shield:** Shamrock-shaped lead insert has three 1/2" diameter circles mounted to clear plastic with a magnetic mounting strip at each end. Labeled for correct orientation for male and female patients.

**Breast/Lung Shields (two):** Steel plates, 2" x 3". One side of each plate has a magnetic mounting strip.

**ACCESSORIES**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Accessory</th>
<th>Weight</th>
<th>Length</th>
<th>Width</th>
<th>Description</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-426*</td>
<td>Filter Holder (Set of Mounting Plates included)</td>
<td>24 oz.</td>
<td>6.5&quot;</td>
<td>6.5&quot;</td>
<td>Has two steel rails 1&quot; wide x 5 1/2&quot; long, for positioning filters and shields. Only one Filter Holder is needed per x-ray machine. Comes with a Plexiglas cutter.</td>
<td></td>
</tr>
<tr>
<td>57-414</td>
<td>Wall Rack</td>
<td>8 oz.</td>
<td>12&quot;</td>
<td>1&quot;</td>
<td>Can hold a complete Filter Set plus 3 to 5 extra filters. Two-sided foam tape holds the rack to the wall.</td>
<td></td>
</tr>
<tr>
<td>57-411</td>
<td>Replacement Mounting Plates</td>
<td>6.5 oz.</td>
<td>9&quot;</td>
<td>9&quot;</td>
<td>Attaches to filter holder with screws. Easily cut to fit collimator assembly. Set of two</td>
<td></td>
</tr>
</tbody>
</table>

*All filters, except the 57-435 Long-Leg Filter and the 57-429 Chest Filter, require a 57-426 Filter Holder Assembly to make them compatible with collimator accessory trays. One Filter Holder Assembly per machine is sufficient.

**MAGNETIC MOUNTING SYSTEM/SHIELD HOLDER:** Includes two clear plastic Mounting Plates (6 1/2" x 6 1/2") and one Filter Holder Assembly (5 1/2" x 5 1/2"). The Filter Holder has two steel rails that magnetically hold the shields in position. A plexiglas cutter is also included.

**Weight of Set:** 1 lb, 10 oz

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Accessory</th>
<th>Description</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-404</td>
<td>Patient X-Ray Protection System, Includes One Gonad Shield, Two Breast/Lung Shields and One Magnetic Mounting System/Shield Holder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-408</td>
<td>Adult Gonad Shield</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-409</td>
<td>Breast/Lung Shields (Two)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-426</td>
<td>Magnetic Mounting System/Shield Holder, Includes Mounting Plates</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>