ATS Laboratories
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Ultrasound Imaging Phantoms

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DISCONTINUED

Model 532A & B

Contrast Resolution Phantoms Instruction Manual

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Made in USA

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INTRODUCTION

Quality assurance tissue-mimicking phantoms are used to evaluate the accuracy and performance of ultrasound imaging systems. The phantoms mimic the acoustic properties of human tissue and provide test structures within the simulated environment. They are essential to detect the performance changes that occur through normal aging and deterioration of system components. Routine equipment performance monitoring can reduce the number of repeat examinations, the duration of examinations and maintenance time.

This phantom is constructed of a rubber-based tissue-mimicking material. This material extends the useful life of the phantom by avoiding problems due to melting, freezing, dehydration and breakage from dropping which are common with hydrogel (water-based) phantoms. By eliminating these problems, the durability, quality and reliability of this product is guaranteed for three years.

The acoustic properties of all biologic and non-biologic materials are affected by temperature variations. Most diagnostic imaging systems and tissue-mimicking phantoms are calibrated at room temperature, commonly referred to as 23°C. To ensure measurement accuracy ATS incorporates a thermometer strip affixed to the outside surface of the phantom.

The sound velocity of most diagnostic imaging systems is calibrated to 1,540 meters per second (mps), the assumed average velocity of sound through human soft tissue. The rubber-based tissue-mimicking material has a sound velocity of 1450 and 1473 mps at 0.5dB/cm/Mhz and 0.7dB/cm/Mhz respectively at room temperature (23°C).

PRODUCT DESCRIPTION

The Models 532A and 532B Contrast Resolution phantoms are composed of a rubber-based tissue-mimicking material. The Contrast Resolution phantoms are designed evaluated an imaging system's gray scale processing and displayed dynamic range. Both models provide three target sizes at eight levels of contrast, ranging from -12 to +12 dB/cm/MHz relative to the background material.

The difference between the models is the target size. The Model 532A contains 2.0, 4.0 and 8.0 mm diameter cylindrical targets. Whereas, the Model 532B contains cylindrical targets of 5.0, 10.0, 20.0 mm.

TESTS PERFORMED

- Functional Resolution
- Definition and fill-in
- Gray Scale
- Displayed Dynamic Range

SPECIFICATIONS

General

Overall dimensions:	28.5 x 14 x 14.5 cm*
Weight:	4.4 Kg*
Scanning Surfaces:	2
Dimensions:	27 x 11 cm*

Tissue Mimicking Material

Type:	Urethane rubber
Freezing Point:	< - 40°C
Melting Point:	> 100°C
Background Attenuation:**	0.5 dB/cm/Mhz measured at 3.5 Mhz
Speed of Sound:	1450 mps @ 23°C

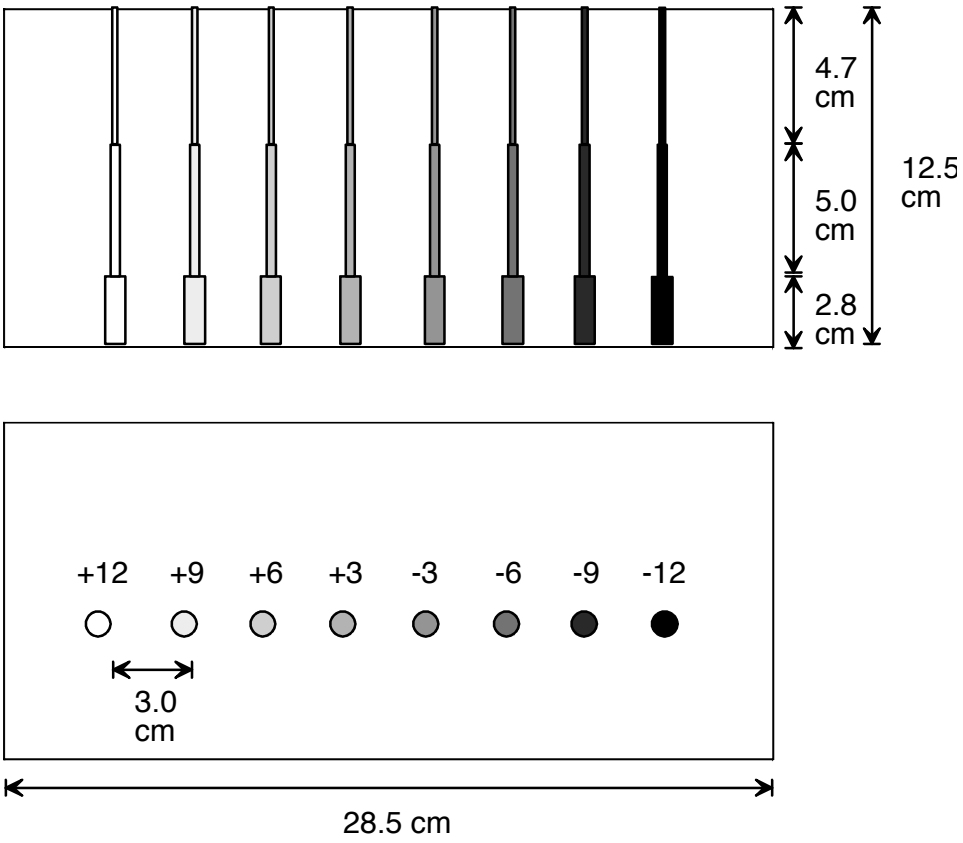
Targets

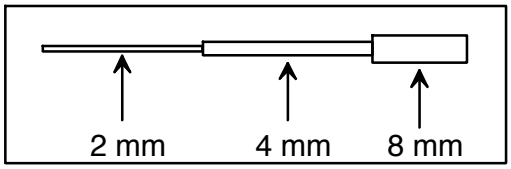
Type:	Echogenic, cylindrical	
Number of targets:	24	
Target groups:	3	
Size (mm):		
	Diameter	Length
Model #532A:	2.0	47
	4.0	50
	8.0	43
Model #532B:	5.0	50
	10.0	50
	20.0	40
Horizontal spacing:	3.0 cm	
Depth:	7.5 cm	
	3.5 cm	
Contrast relative to the background material	+12 dB, + 9 dB, +6dB, +3dB -12 dB, - 9 dB, -6dB, -3 dB	

*Nominal dimensions

**Other attenuations available upon request.

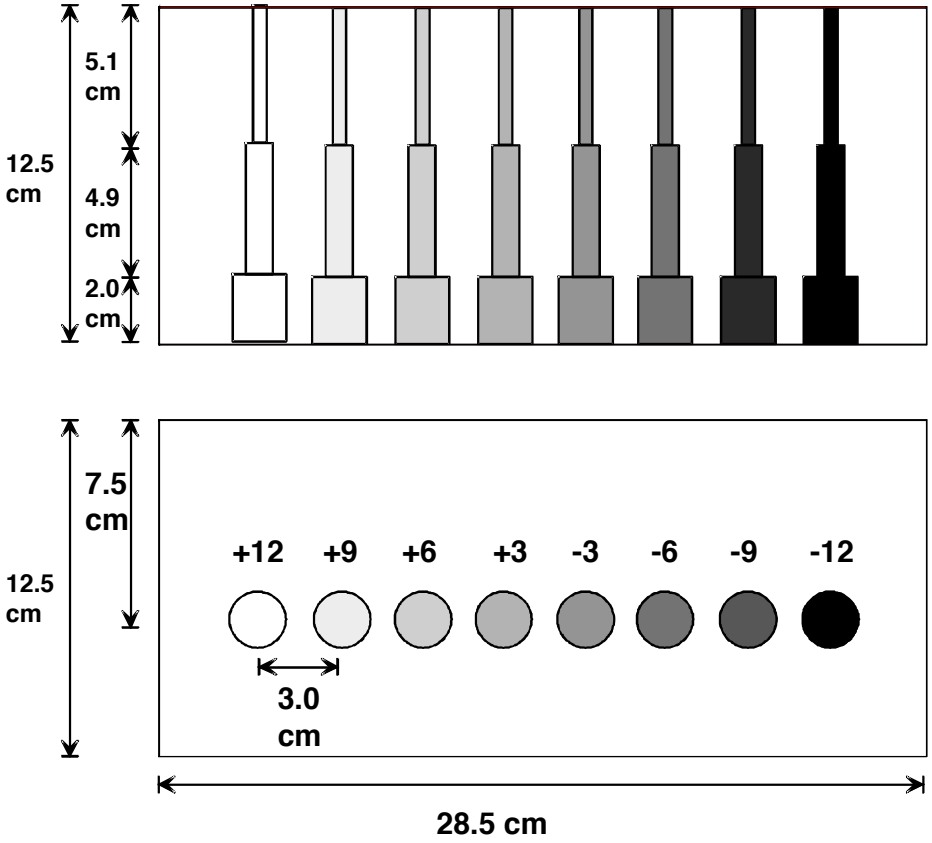
MODEL 532A
Contrast Resolution Phantom

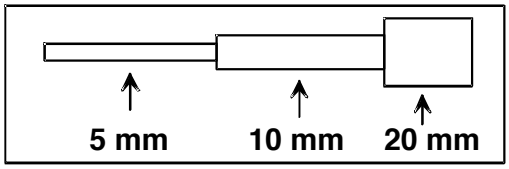




Model 532B

Contrast Resolution Phantom





CONTRAST RESOLUTION

Reason for Testing

Contrast resolution is defined as the system's ability to distinguish between regions of differing levels of brightness. An imaging system's degree of contrast resolution refers to it's ability to distinctly display two nearly equal degrees of brightness in the same view. The gray scale processing section of the imaging system controls the level of contrast by the adjusting the amplitude of the echoes received to vary the degree of brightness of the displayed image. The adjustment of the echo signal required to go from a just noticeable (lowest contrast) displayed echo to the maximum echo brightness is referred to as the displayed dynamic range. Clinically, the ability of a system to distinguish and display separately structures of similar levels of contrast is extremely important. Some cystic or solid masses, located within an organ, having very similar levels of brightness, potentially could go undetected.

Test Procedure

1. Place the phantom on a clean, flat surface with the appropriate scanning surface positioned for use.

2. Fill the scanning well with water. Attempts should be made to avoid introducing air bubbles while filling.

3. Adjust the instrument settings (TGC, output, etc.) to establish baseline values for "normal" liver scanning. If the penetration is such that the bottom of the phantom is seen, the gain settings are reduced such that the image fades and goes entirely black. These setting should be noted on the quality assurance record and used for subsequent testing.

4. Position the transducer over the cylindrical target group, until a clear image is displayed. Freeze image and obtain a hard copy.

5. The targets should appear circular in shape, with clear sharp edges and vary in the degree of brightness ranging from low to high levels of contrast. Examine the image to determine the smallest diameter target which has been displayed. Using this target group, determine if all eight levels of contrast, are distinctly displayed as varying levels of brightness. The presence or absence of any shadowing behind the structures should be noted.

6. Document all observation on the quality assurance record.

Results

The Model 532A or 532B provides a good indication of the performance of the gray scale processing and displayed dynamic range. The test should be compared with a baseline test using the same instrument settings, to determine if any change in the shape of the targets has occurred or the systems ability to distinguish between varying degrees of contrast.

CARE RUBBER-BASED PHANTOMS

For best results the phantom should be kept clean at all times and stored at room temperature. In particular a build-up of dried coupling gel on the scan surface should be avoided. The phantom may be cleaned with warm water using a lint free cloth. Particularly stubborn stains and dirt may be removed with a mild household cleaner. The use of petroleum solvents should be avoided since they may adversely react with the rubber-based material.

WARRANTY

Statement of Warranty:

ATS Laboratories, Incorporated warrants this rubber-based phantom for it's lifetime from the date of delivery to the purchaser, that the Phantom is free from functional defects in materials and workmanship. The lifetime of this phantom is estimated to be 10 years from the date of manufacturing. If ATS Laboratories, Incorporated, deems the phantom to be defective, at its sole option, the Phantom will be repaired or replaced free of charge, in a reasonable amount of time.

ATS shall not be otherwise liable for any damages, including but not limited to incidental damages, consequential damages, or special damages.

There are no express or implied warranties which extend beyond the warranties as stated below.

Conditions of Warranty:

1. The defect must be reported and the Phantom returned within the warranty period.

2. The Phantom must be packaged properly to avoid damage during shipping.

3. All transportation charges will be paid by the purchaser.

Invalidation of Warranty:

1. If the phantom has been altered or repaired other than by ATS Laboratories, Incorporated.

2. If the phantom has been subject to abuse, misuse, negligence or accident.

3. If the purchaser has exposed the Phantom to petroleum solvents.