

***Please review all contents of this packet completely before beginning this process.
Please follow all instructions carefully.***

General Instructions

Apply all instructions to every unit being reviewed for accreditation. Keep this entire packet for your records, and keep copies of everything you submit to the ACR for review.

The ACR strongly recommends using the services of a qualified medical physicist or MR scientist during both the process of accreditation and for your sites Quality Control Program.

Your facility has been assigned a unique identification number (MRAP #). This number appears on all correspondence from the ACR and on all of the enclosed labels. Please use this number on all submitted materials and to identify your facility when contacting the ACR for assistance.

The ACR website (www.acr.org) provides a listing of accredited facilities and facilities that have applied for accreditation and are under review. If a third party payer requests verification of your participation in one of the accreditation programs, please refer them to the ACR website.

Testing Materials Packet Contents:

1. This *Testing Instructions* Document
2. *Quality Assurance Questionnaire*
3. Phantom order form
4. *Site Scanning Instructions for Use of the MR Phantom* booklet, which includes the *MRI Phantom- Site Scanning Data Form* on the last page
5. *Phantom Test Guidance* booklet, which includes all measurements that will be done on your phantom data
6. *Clinical Test Image Data Form*- one for each type of clinical exam
7. Identification labels for all images, forms, and quality control data
8. Nonmagnetic bubble level for positioning the ACR phantom
9. MRI Quality Control Manual (Initial application packets only)
10. *Laser Printer Attestation* (This is only for sites that do not have a laser printer at the address given on the application for accreditation.)

Materials due date:

The labels included in this package have image collection due dates. You must collect your test images and return them with your completed application to the ACR by the date indicated on the labels. Failure to meet this due date will jeopardize completion of your accreditation. If your facility is renewing its accreditation, we cannot guarantee completion before your ACR certificate expires. If your site cannot submit the required materials by your due date, then notify the ACR immediately. Labeling of your images should be the **last** step in the preparation of the materials being submitted for accreditation review (See separate labeling instructions in this document.)

Image collection time period for phantom and clinical images:

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The ACR recommends that your facility select clinical examinations that were acquired within one (1) week before or one (1) week after you scan your phantom. If you have any difficulty collecting images within the recommended time frame, select an examination close to the date that the phantom was scanned, and document the reasons on the clinical image data form(s) enclosed in this package.

Quality resources:

The ACR has prepared a number of quality resources for your site to use to improve image quality before submitting any images to the ACR. Please review these materials carefully before proceeding with image collection. These resources include the following:

1. MRI Accreditation Video Tutorial
2. MRI Quality Control (QC) Manual
3. Site Scanning Instructions for Use of the MR Phantom
4. Phantom Test Guidance Document
5. ACR staff is available Monday through Friday, from 8:30a.m. to 5:00 p.m. (EST), to answer any questions you may have about the process. The telephone number is 800-770-0145.
6. The ACR Web site (www.acr.org) has frequently asked questions (FAQ's) for all accreditation programs under the Accreditation menu. The ACR *Appropriateness Criteria* and *Guidelines and Standards* can also be accessed from this site under the Quality and Patient Safety menu.

Electronic Submission

If your site is unable to perform the data translation of any images to CD-ROM format, please consult the following table. Specific requirements for electronic submission of phantom and/or clinical images are given later in this document.

Equipment Manufacturer	<u>Instructions</u>
Fonar Corporation	Please contact Customer Service at Fonar Corporation to discuss any charges that may apply for this service and to arrange for data translation of your phantom data. Tel. 631-420-4000.
General Electric, Philips, Siemens, Toshiba	<p>Call DesAcc directly or see the attached order form for questions regarding their service and any applicable fee for data translation: Phone: 866-638-0936 E-mail: questions@desacc.com Web: http://www.desacc.com/services/</p> <p>Copy your site scanning data form and send the form, your disk or tape, the order form, and a check for the applicable fee made payable to DesAcc Inc. to: DesAcc, Inc. ACR MR Accreditation 0844 SW Curry Street Portland, OR 97239</p> <p>Please note that your site is responsible for sending the CD to the ACR. You should factor in phantom data translation time of two weeks in order to make the deadline on your testing labels.</p>
Hitachi	Please contact Dawn Thompson at 1-800-800-3106 ext. 3696 to arrange for data translation of your phantom data.
Philips (units manufactured previously by Picker/Marconi)	Please contact Lance King at 440-483-5436 to arrange for data translation of your phantom data.

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Eight Channel Head Coils

If your facility uses an eight channel head coil, it is necessary to perform **all** phantom scans using the *surface coil intensity correction* option.

System Performance Evaluation and Quality Control Testing

All sites applying for accreditation or renewal must demonstrate compliance with the ACR requirements for quality control (QC) by including a copy of your most recent **Annual MRI System Performance Evaluation** (must be dated within 1 year of the date of ACR MRI submission for accreditation) and **copies of your weekly on-site QC data** (forms on pages 64, 65, and 66 of the *ACR 2004 MRI Quality Control Manual*) for your most recent quarter. All QC testing must be carried out in accordance with the written procedures and methods outlined in the *ACR 2004 MRI Quality Control Manual*.

If you have been conducting QC for less than one quarter, submit whatever you have on these forms. Additionally, if the **Annual MRI System Performance Evaluation** and/or **weekly on-site QC data** show performance deficits (e.g. problems with the system and/or data outside of the action limits), the facility must state what steps it has taken to correct the problems.

Please use the labels that we have provided for the **Annual MRI System Performance Evaluation** and **weekly on-site QC data** (forms on pages 64, 65, and 66 of the *ACR 2004 MRI Quality Control Manual*). For multiple pages of the same form, staple pages together, and place the label on the first form. If your facility does not have a laser printer, complete the *Laser Printer Attestation*, and have the supervising physician sign it. Place the laser printer label on the attestation.

Always keep copies of everything sent to the ACR for your records.

Phantom Testing Instructions

STEP 1: Scanning the ACR phantom

In order to proceed with this part of your image collection process, you must have an ACR phantom. An order form for the phantom is included in this packet. This package includes a nonmagnetic bubble level for positioning the phantom and all the instructions your physicist will need to scan your phantom can be found in the enclosed *Site Scanning Instructions for Use of the MR Phantom*. When your physicist has completed your phantom scans, proceed to step 2.

STEP 2: Evaluating your phantom image quality

After scanning the phantom, your physicist will use the *Phantom Test Guidance* booklet in this package to evaluate your images using the same procedures that ACR physicist reviewers will use. If the images do not pass, the physicist will inform the supervising physician, and service engineer, as corrective action may be warranted. If your site service engineer makes system adjustments and/or the supervising physician makes scan protocol changes, repeat step 1. *In order to ensure that your phantom data is accessible and passes all of the measurements the phantom reviewer will be making, you should download the Osiris DICOM viewer software at: http://www.sim.hcuge.ch/osiris/01_Osiris_Presentation_EN.htm*
Once your images pass, proceed to step 3.

STEP 3: Prepare the hard-copy film portion of your submission

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If your site has hard copy film capabilities, you must submit hard copies of your phantom in addition to a CD-ROM. If your site does not have the ability to film images due to your site being completely filmless, skip to Step 4. Detailed instructions on how to film your phantom images can be found in your site scanning instruction booklet.

STEP 4: Prepare phantom image data

Sites must choose one of the following options for submission of phantom data.

OPTION A

Digital Data Medium and Format

Digital data submission must be DICOM-formatted images on CD-ROM (**No DAT or MOD/ODs will be accepted**).

The CD should be in the ISO-9660 format, the most common type of data CD format. The CD should be "write-once-read-many" kind, often referred to as CD-R or CD-Recordable. Do not use rewriteable CD's, as they are not readable by all CD-ROM drives.

The Phantom CD that your site submits **must not have an embedded DICOM viewer** on the CD.

Store each series of films in a separate folder (directory), labeled to indicate which series it contains (i.e.: acrLoc, acrT1, acrT2, siteT1, siteT2). The individual slices should be labeled to indicate their order in the series (i.e.: img001, img002, etc.).

If the native format of the images on the scanner is not DICOM, it is important to preserve the image acquisition parameters and descriptive data about the image when converting to DICOM format. All the mandatory fields (attributes) defined in DICOM 3.0, part 3, must be present and contain correct data. Any of the optional fields (attributes) that are included should also contain correct data. **(You may need to contact your manufacturer and/or PACS manager for clarification on your ability to save data in this format or for assistance in translating your site's media into DICOM CD-ROM format.) Your site will be responsible for submitting media translated by the manufacturer to the ACR. Please note that DesAcc, Inc. is currently providing phantom data translation services for ACR accreditation applicants (see enclosed order form). If you choose to use DesAcc's services, please contact them to obtain the most current information regarding their ability to translate your media.**

OR

OPTION B

On-Site Review

If you are unable to obtain a translation of your media into DICOM PC CD-ROM format by using your site's own capabilities, DesAcc, or your manufacturer, archive the phantom data using the site's current archive media format (i.e. MOD or tape). The site must schedule an on-site review of their phantom data by an ACR physicist reviewer. The site will be responsible for all expenses for travel by the ACR. The ACR cannot be held responsible for any lost revenue to the site due to

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the interruption of the site's services. ***This process may cause significant delay in the completion of a site's testing cycle.***

Clinical Image Testing Instructions

Select examples of your best work.

If your site routinely performs localizer or scout sequences with the clinical examinations listed below, include those with your clinical image submission.

Sites cannot submit examinations performed on models or volunteers.

The images submitted for each individual examination must be from the same patient (i.e., all knee images must be from the same knee study.)

Submit normal examinations wherever possible. **Note: The purpose of the accreditation evaluation is to review the quality of the practice of MRI at applicant facilities and not to comment on abnormal findings. The ACR will not be responsible for clinical findings shown on the films. Submitting abnormal examinations will significantly delay the accreditation process.**

During accreditation review, ACR radiologist reviewers will use the images and data to assess the adequacy of the following image attributes:

1. Pulse sequences and image contrast
2. Filming technique
3. Anatomic coverage and imaging planes
4. Spatial resolution
5. Image artifacts.
6. Exam ID (Note: All patient information annotated on clinical examinations will be kept confidential by the ACR, as stated in the *Business Associate Agreement*.)

Spatial Resolution Assessment:

Before the collection of any images can begin, you must first evaluate your clinical image spatial resolution. You may use the video tutorial and the table of recommended spatial resolution parameters and formulas found below to assist you with this important step. If your site determines that an adjustment is warranted, please make changes before proceeding to the phantom testing instructions. Please be aware that further changes in clinical image spatial resolution may be warranted based on evaluation of phantom images performed during the test image collection phase.

STEP 1: Evaluate your spatial resolution for required examinations

MRI facilities should use the determinants and formulas listed below to determine the spatial resolution of their clinical MRI examinations. The five determinants of voxel dimensions in an MRI examination are listed below. As you proceed with this evaluation, make note of the voxel dimensions that you are currently using in your clinical examinations, and proceed to step 2.

1. Slice thickness (ST)
2. Field of view along the phase encode axis (FOVp)
3. Field of view along the frequency encode axis (FOVf)
4. Number of phase encoding steps (Np)
5. Number of frequency encoding steps (Nf)

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STEP 2: Calculate in plane pixel for each of your sequences

Use the voxel dimensions from your scan protocols and the formulas below to calculate your in plane pixel in both the phase and frequency directions for all of the sequences you are submitting for accreditation review (see clinical testing section below for list of required sequences) and record those values on a piece of paper.

To determine in plane pixel (phase), use this formula: (FOV_p/N_p)

To determine in plane pixel (read), use this formula: (FOV_f/N_f)

STEP 3: Compare values to recommended values below

Now that you have calculated the spatial resolution of your images, please compare the values to the ACR recommended values in the table below. The values shown below are intended to serve as recommendations. The numbers do not constitute a threshold for failure.

Sequence	Slice Thickness	Gap	Maximum Recommended In Plane Pixel Dimension for Phase and Frequency
Brain – Sagittal & Axial and/or Coronal	≤5 mm	≤2 mm	≤1.2 mm
Cervical Spine – Sagittal	≤3 mm	≤1 mm	≤1 mm
Cervical Spine – Axial	≤3 mm	≤1 mm	≤1 mm
Lumbar Spine – Sagittal	≤5 mm	≤1.5 mm	≤1.5 mm
Lumbar Spine – Axial	≤4 mm	≤1 mm	≤1.5 mm
Knee – Sagittal & Coronal	≤4 mm	≤1 mm	≤0.75 mm

Please note that if you make any alterations in any of these five parameters as a result of ACR recommendations, it will result in a modification of the voxel volume, the signal-to-noise ratio (SNR) of the image and the amount of partial volume averaging exhibited in the image. Alterations in the number of phase encoding steps (N_p) affects scan time, while alterations in the number of frequency encoding steps (N_f) may affect the maximum number of slices as well as the minimum possible TE for the imaging sequence. Your site will be responsible for making any necessary corresponding changes in scan protocols to maintain image quality.

Your site may choose to submit films electronically or on film. DO NOT submit both.

Instructions for electronic submission option:

Submit two (2) CD-ROMs that are identical. Both CDs must include copies of the same four required clinical examinations, and they must include an embedded viewer. Once you have created the CDs for submission, you **must** open the images on the CDs and check both CDs for accuracy and to make sure all of the minimum requirements listed below are easily available for the reviewers. If your embedded viewer does not meet the minimum requirements and you fail to review the images on the CD before submission to the ACR, **your site will fail accreditation.**

Minimum requirements for embedded viewers

The embedded viewer **must** include functions of window/level, magnification, region of interest (including measurement of area, pixel mean, pixel standard deviation), and distance measurement.

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Your viewer must be able to display the following scan protocol attributes for all exams submitted:

1. Facility name
2. Patient name (first and last)
3. Patient age or date of birth
4. Patient identification number
5. Date of examination
6. Type of sequence
7. TR
8. TE
9. TI (if applicable)
10. Flip angle (if other than 90 degrees)
11. Slice thickness
12. Slice localizer or plan scan
13. Interslice gap (may be inferred from slice position)
14. Field-of-view
15. Acquired Matrix (number of frequency encoding steps and number of phase encoding steps)
16. Acquisition time (indicated or easily calculated)
17. Size scale (e.g., scored lines indicating centimeters)
18. Laterality, left or right of midline section
19. Label that indicates location of slice relative to other slices

Instructions for hard copy submission option:

1. All images must be original (not film copies) and must be filmed using a 14 x 17 format.
2. Collect required clinical images.
3. Film your site's clinical images using your site's filming protocol, but making sure that all necessary parameters for review are easily discernable on the films.
4. Complete test image data forms for each clinical set and each phantom set.

Labeling Instructions

Please take care in following these instructions: The correct labeling of your images, forms and CDs is critical to the proper identification of the materials submitted for each magnet. Incorrect or incomplete labeling can delay the accreditation process. The ACR will return your package to you if your images are not labeled properly. This will delay the accreditation process.

Special barcode labels have been prepared for each of your films and data forms. Special labels have also been provided for the film jackets. You have received labels for each type of examination, examination jacket and data form. You may have more labels than you need. If you damage a label, use the next label in the series for that examination type. Please do not place labels over anatomic structures. Do not alter barcode labels in any way.

If you run out of barcode labels, use the additional image labels included in this package. Do not make copies of the existing barcode labels. Use one label per film. You must fill in all the blanks on each label. Retain a copy of the completed label sheet with the blanks filled in for your records. If you need additional labels, please contact the ACR.

Label all forms, CD-ROM cases (**not** the CD's) and films submitted with the corresponding label.

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Do not submit films or documents without labeling.

Hard Copy submission of Clinical Images:

1. Place one barcode label on each sheet of film of the examination for both clinical and phantom.
2. Place all films belonging to one type of examination in its own film jacket. You will have four (4) clinical film jackets and one phantom film jacket, which ***you must identify*** with the “film jacket” label for the type of examination. You will have separate jackets for brain, cervical spine, lumbar spine, knee and phantom.
3. Place the appropriate completed and labeled data form in each film jacket.

Electronic Submission of Clinical Images:

1. Place four barcode labels on the **jewel case** of each clinical CD-ROM. **Do not put labels on the CD-ROM.** Label the jewel case of the first clinical CD-ROM with Brain Film #1, Cervical Spine Film #1, Lumbar Spine Film #1, and Knee Film #1. Label the jewel case of the second clinical CD-ROM with Brain Film #2, Cervical Spine Film #2, Lumbar Spine Film #2, and Knee Film #2. Label the CD with a permanent marker if your facility does not have the ability to label it with a CD compatible label.
2. Make an extra copy of each labeled *Clinical Test Image Data Form*. Place one copy with each clinical image CD.

NOTE: Failure to provide the additional copies may significantly delay the review process for your facility.

The enclosed labels show when your testing materials are due to the ACR. Failure to meet this due date will jeopardize completion of your accreditation. If your facility is renewing its accreditation, we cannot guarantee completion before your ACR certificate expires.