INSTRUCTIONS
AIC PhotoDocumentation Targets (AIC PhD Targets)

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Produced by Robin Myers Imaging

Fully assembled and ready for use!


The AIC PhD Targets provide an easy and efficient way to include photographic reference standards as well as image and artifact identification information. Their primary photographic function is to facilitate white balancing and the setting and standardization of exposure and lighting. They are not designed for camera profiling. The design of the AIC PhD Targets has been carefully planned to minimize the space occupied by this important reference material in the image frame. Lightweight and of robust construction, each target has the following elements: six-step grey scale, six primary color patches (CMYRGB); an illumination guide associated with a parallelism indicator, a size scale, and an area for date and object identification information.

The color and grayscale patch material used in the targets is manufactured by X-Rite® and is identical to that used in X-Rite ColorChecker® and ColorChecker Passport®. The grayscale is used for determination and standardization of exposure and for white balancing; the color patches serve primarily as a viewing aid to facilitate immediate triggering of color perception when photographing monochromatic subjects such as black and white photographs, they also can serve as a convenient check on proper channel substitution for false-color infrared and false-color ultraviolet photography.

AIC PhD Targets are provided with instructional information and with online resources including printing templates for slip-in labels for all targets.

AIC PhD Targets are available in 3 sizes designed to accommodate the photography of very small subjects, such as daguerreotypes or photographs of details, as well as that of large artifacts such as paintings and sculpture.

<table>
<thead>
<tr>
<th>Size</th>
<th>Description</th>
<th>Overall dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>Each color/grey patch measures 1 cm x 3 cm.</td>
<td>4 cm x 50 cm</td>
</tr>
<tr>
<td>Medium</td>
<td>Each color/grey patch measures 1 cm x 1 cm.</td>
<td>2 cm x 16 cm</td>
</tr>
<tr>
<td>Small</td>
<td>Each color/grey patch measures 0.5 cm x 0.5 cm.</td>
<td>1 cm x 8 cm</td>
</tr>
</tbody>
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* The designers of the AIC PhD Targets have relinquished their rights to these materials to the American Institute for Conservation without compensation. The AIC is grateful for their generosity and for the substantial time and effort they freely volunteered to present this valuable tool to the field of conservation. The target sets were produced with the cooperation of AIC and Robin Myers Imaging who managed issues relating to materials, production, marketing, and fulfillment.

The AIC PhD Targets are based on an early design developed at Buffalo State College by Jiuan-Jiuan Chen and Dan Kushel in 2000, and then further developed by Chen, Kushel, and Luisa Casella at the George Eastman House and presented at the 2008 AIC annual meeting as assembly kits for purchase through the AIC Photographic Materials Group.
Users of the AIC PhD Targets are encouraged to reference the following sections in the AIC Guide to Digital Photography and Conservation Documentation, 2nd Edition for additional information on the use and purpose of these and other reference targets:

- Section 2.5: Grayscale and color targets
- Section 3.2: White balance
- Section 3.4: Exposure

Also:
- Chapter 6 for numerous illustrations of targets in use and for in-depth discussion of conservation lighting methods including infrared and ultraviolet techniques.

ALWAYS refer to pretreatment photographs when setting up for all subsequent photographs in a treatment documentation series! This is the only way to insure that target placement, subject size, positioning, framing, and illumination are precisely standardized in all comparative images, and that the treatment series thus accurately documents only the changes in appearance of the subject that result from treatment measures.

Target Placement:

All subjects:
1. Position and orient the target to allow for maximum image size of your subject.
2. Consider the needs of raking and normal illumination before placing the target. It is best if placement can accommodate both.
   - For normal illumination, this means the target should be positioned so that it receives the same intensity of illumination as the artifact. Usually this means centered between the light sources.
   - For raking illumination this means that the target will not cast a shadow on the subject or vice versa, and that the face of the target is parallel with the plane of interest of the subject. For best functioning of the illumination guide, it is best if the target is placed halfway between the edge closest to the raking light source and the opposite edge, although this may not always be possible. The critical factor is that it is positioned exactly in the same location in all comparative images.
3. It is best if the target is positioned parallel with, and if possible, adjacent to the edge of the frame.
4. For non-rectangular subjects, avoid placing the target within the artifacts “personal space” (i.e., create an imaginary “frame” and place target outside that frame).

Planar subjects:
Target should be level with and parallel to the subject surface. This may require placing the target on or in a support.

Subjects in the round that extend into depth:
Determine the plane of focus that will maximize depth of field and place the target in that plane. To locate this plane, first determine the nearest and furthest points on the subject that need to be in focus. Then for maximum depth of field, focus slightly behind the closest point, approximately 2/5-1/3 the distance between the near and far points.

Target support:
1. The back surface of all targets is magnetic and will stick to metallic surfaces such as steel strip magnet boards available from on-line retailers. This greatly simplifies mounting the targets on easels.
2. For holding targets when photographing free-standing subjects, Delta1 Grip-It™ gooseneck clamping systems, available from large photographic equipment suppliers, are highly recommended (http://www.cpmdelta1.com/light_support.htm). See illustrations below.
3. An area for clipping or clamping the targets is provided on each end of the small and medium target and on the right half of the large target. The targets may also be adhered to metal strips using their magnetic backs, with the strips clamped rather than the target itself.
Delta1 Grip-it™ clamps:

**Above**: Dual Arm Triple Clamp (#46010) for small and medium targets.

**Below**: Single Arm with 1” Clamp (#46020) for large target. An additional length 12.5” of flexible gooseneck was ordered with the clamp.

Targets shown are prototypes and thus differ slightly from actual targets.
Illumination Guide:

Each AIC PhD Target contains a sundial-like area with a central gnomon to create shadows that can assist in the positioning of lighting and that can serve to document the character and positioning of light sources illuminating the subject. Such a record is critical when creating a series of comparative photographs documenting changes in an artifact during treatment, and especially for comparative raking light images.

The number of shadows indicates the number of lights; the shadow position indicates the placement of the lights; the shadow length shows the angle of illumination; finally, the shadow sharpness and contrast denotes the character of illumination, i.e., focused or diffused.

1. Lighting angle reference circles:

![Lighting Angle Reference Circles](image)

Gnomon heights for each target have been carefully calculated and adjusted so that the labeled circles provide a reasonably accurate indication of the angle of illumination. This function works best with focused sources, but will work with many diffuse sources. Lighting angles between 10 and 15 degrees are common for effective raking illumination, 25 degrees for normal illumination with minimum glare at common camera distances, and 45 degrees (indicated on large target only) for polarized illumination (see Polarized Illumination below).

Gnomon heights:
- Small Target: Background field width 10mm; gnomon height = 0.88 mm
- Medium Target: Background field width 20mm; gnomon height = 1.76 mm
- Large Target: Background field width 80mm; gnomon height = 7.05 mm

2. Shadows:

- **Focused illumination:**
  The gnomon will produce sharp high contrast shadows. Differences in shadow darkness under normal illumination (i.e., with lights placed equidistant and at the same angle from on each side of the subject) is most commonly caused by variations in the position of barndoors or gobos controlling the lights.

- **Diffused illumination:**
  The gnomon will produce soft low-contrast shadows that may, however, be distinct enough to read and use as a placement reference.

- **Light Line (for raking illumination):**
  Because a light line consists of a line of thousands of point sources, the gnomon’s shadow will be very diffuse. The gnomon may be modified by slipping an appropriately sized short tube over it to increase its width and create a more readable shadow.

3. Polarized illumination:

The gnomons on AIC PhD Targets have a rounded top with a reflective metal surface that can assist in the setting up and documentation of polarized illumination (i.e., light sources fitted with polarizing screens, and a polarization filter on the camera lens oriented to produce maximum extinction of glare). Because the filter will thus eliminate the reflection of the lights in the gnomon, the top of the gnomon will appear black if screens and filter are properly adjusted. Because the tip of the gnomon is small, however, this function works best as a space efficient means of documenting the use of polarized illumination in an image. The larger Polarizer Alignment Card® tool by Robin Myers Imaging is highly recommended to assist in the proper adjustment of polarizing screens and filters prior to photography. It also functions well as a focusing aid.

Note that lights for polarized illumination are generally positioned at 45-degree angles to maximize intensity and thus offset some of the light loss caused by the polarizing screens and filters.

4. Parallelism Indicator

The cross hair and circles can serve as an indicator of perspective distortion resulting from a lack of parallelism with the camera focal plane.
Exposure and white balance using the AIC PhD Target gray scale:
As noted above, the AIC PhD Target gray scale patches are identical to those of the X-Rite ColorChecker® and ColorChecker Passport®. Recommendations for use of the gray scale for exposure and white balance adjustments in those products provided in the AIC Guide to Digital Photography and Conservation Documentation, 2nd Edition are thus appropriate to AIC PhD Targets. In the recommendations below, the patches are identified by the following designations (white to black): white; N8; N6.5; N5; N3.5; and black. As a general working procedure, however, it is still advisable to take the time to set white balance on your camera before capture using a neutral surface such as a Robin Myers Digital Gray Card®.

1. **Normal Illumination:**
   - **Exposure**: As described in the AIC Guide, for subjects under normal illumination, recommended RGB values for the N8 patch (adjacent to the white patch) are 200 +/- 5
   - **White Balance**: Assuming exposure is proper, use the N8, N6.5 or N5 patch to adjust white balance. (Do not use the N3.5, black, or white patches.)

2. **Raking Illumination:**
   - **Exposure**: Gray scale values are significantly altered in raking illumination. Exposure should be determined by eye using a profiled monitor, and set to produce the best rendition of desired information. The gray scale may, however, be used to assist in matching corresponding raking photographs in a treatment series.
   - **White Balance**: Because patches are generally much darker under raking illumination, only the N8 patch should be used for white balancing.

3. **Specular Illumination:**
   - **Exposure**: Exposure should be determined by eye using a profiled monitor, and set to produce the best rendition of desired information. The gray scale will appear significantly lower in contrast than normal (darker patches will appear lighter). The gray scale may, however, be used to assist in matching corresponding specular illumination photographs in a treatment series. Hint: If shooting in RAW, Adobe Camera Raw’s Recovery function can assist in control of hotspots.
   - **White Balance**: Use the N8, N6.5, or N5 patch.

4. **Transmitted illumination:**
   Targets can only be used if there is some front lighting on the subject. Front lighting need only be intense enough to permit basic legibility of the target label information. Dim localized illumination, such as from a fiber optic source, is a way of illuminating the target alone. However this source should be spectrally similar to the light transilluminating the subject. Filtration of the source may thus be required.
   - **Exposure**: Exposure should be determined by eye using a profiled monitor, and set to produce the best rendition of desired information. If the subject is relatively translucent, standard camera metering is recommended as a starting point.
   - **White Balance**: In general, post-capture white balance is best made from a photograph of the transilluminator surface taken without exposure compensation so that it is of middle gray value, or preset in the camera using the transilluminator surface instead of a gray card. The AIC PhD target gray scale can be used only if front lit with by a light that is spectrally identical to the transillumination source. As the intensity of this light may be low, the N8 patch is best to use for white balancing.

5. **Reflected Near Infrared (NIR) photography:**
   See Chapter 6 in the AIC Guide for a complete discussion of infrared sources, camera filtration, focusing factors, and exposure recommendations for infrared photography.
   - **Exposure**: See NIR exposure recommendations in the AIC Guide to set primary exposure. Setting the N8 patch to a value of 200, as in normal visible light photography, is recommended. See Chapter 6 in the AIC Guide for recommendations for subsequent image adjustments using Levels function in Adobe Photoshop®.
   - **White Balance**: Infrared images should be gray scaled.

6. **Transmitted Near Infrared (NIR) photography:**
   Targets can only be used if there is some front NIR radiation on the subject. Front irradiation must only be intense enough to permit basic legibility of the target label information or the transmitted NIR image of the subject may be compromised. Dim localized IR irradiation of the target only, such as from a fiber optic source, is another option.
• **Exposure**: See transmitted NIR exposure recommendations in the *AIC Guide* to set primary exposure. Final exposure should be determined by eye using a profiled monitor, and set to produce the best rendition of desired information. See Chapter 6 in the *AIC Guide* for recommendations for subsequent image adjustments using Levels function in Adobe Photoshop®.

• **White Balance**: Transmitted NIR photographs should be gray scaled.

7. **False Color Infrared photography**: Color shifts in the color patches can be used as a check for proper channel substitution procedures.

8. **Photography of UVA and UVC induced visible fluorescence**.
   See Chapter 6 in the *AIC Guide* for a complete discussion of ultraviolet sources, camera filtration, color adjustments, and exposure recommendations for fluorescence photography.
   - Other than the red patch, the gray and color patches on the target show little fluorescence and are generally not useful for fluorescence photography. The primary function of the targets is thus to permit easy inclusion of subject information and size scales in the image. See labels and scales below. (A target containing materials that show neutral fluorescence that will thus permit post-capture white balancing is not yet available.)

9. **Reflected Ultraviolet Photography (UVA)**:
   See Chapter 6 in the *AIC Guide* for a complete discussion of ultraviolet sources, camera filtration, focusing factors and exposure recommendations for reflected UVA photography.
   - **Exposure**: See reflected UVA exposure recommendations in the *AIC Guide* to set primary exposure. Setting the N8 patch to a value of 120 is recommended. See Chapter 6 in the *AIC Guide* for recommendations for subsequent image adjustments using Levels function in Adobe Photoshop®.
   - **White Balance**: Reflected ultraviolet images should be gray scaled.

10. **False Color Ultraviolet photography**:
    Color shifts in the color patches can be used as a check for proper channel substitution procedures.

**Labels and Scales**:

**Small and medium targets**:
Each target has a clear plastic holder for slip-in labels. A template for the production of properly sized labels (with appropriate fonts) and instructions for use can be downloaded from [http://www.conservation-us.org/PhDtargets](http://www.conservation-us.org/PhDtargets). The template allows for efficient printing of all labels prior to a photography session.

**Fluorescence photography**:
The printing template includes labels that will print white on black; this generally provides better legibility of text than does standard black on white printing on typical office papers containing optical brighteners. The scale on the targets shows slight fluorescence and will generally be legible in fluorescence photographs.

**Large target**:
The face of the target is surfaced with a metal-cored paper that will allow for the use of magnetic letters and numbers or for the convenient mounting of a magnetic card holder strip for slip-in labels. If the latter is desired, a printing template with accompanying instructions can also be downloaded from [http://www.conservation-us.org/PhDtargets](http://www.conservation-us.org/PhDtargets). It is designed for the printing of labels for 6 x 1 inch magnetic card holders available from many on-line retailers and office supply stores. (See images of the bust, above, for use of the large target with magnetic card holder label.)

**Fluorescence photography**:
The label area on the target is coated with shellac. Shellac fluoresces a distinctive orange under UVA and UVC radiation. This fluorescence allows for legibility of magnetic letters and numbers (which generally do not fluoresce) and can be used to assist in standardization of color. If slip-in labels are used, the label template also includes white on black labels for fluorescence photography.

The large target also includes a second size scale on the left. This is a forensic scale designed for fluorescence photography and is printed with ink that fluoresces bright orange under ultraviolet irradiation. As an added feature, the ink is applied to produce three different intensities of fluorescence. This is to accommodate the variation in fluorescence intensity of different subjects (and the resulting exposure variation) so that at least one section of the ruler will always exhibit maximum legibility.
Target Care and Storage

• Handle targets with care.
• Avoid touching the surface of the gray scale and color patches.

While the magnetic backs on the targets allow for simple storage on doors or walls, etc., it is best if the targets are kept covered to protect them from airborne dirt and grime, accidental touching, and unnecessary exposure to light. AIC PhD Targets are shipped in reusable tubes that can serve both as effective studio storage and as convenient and protective containers for transporting the targets to work sites outside the studio.