BAT Brightness Acuity Tester

Product No. BAT-2000

Instruction Manual
INTRODUCTION

The Marco BAT Brightness Acuity Tester is a handheld instrument designed for two major visual function tests.

1) Brightness Acuity Test – Many people with cataracts and other ocular Media opacities are visually disabled in bright light conditions from intraocular light scatter often referred to as glare. The BAT Brightness Acuity Tester provides objective measurements of functional visual acuity in three common bright light conditions while the patient is in a standard refracting lane.

2) Macular Photostress Test – The BAT Brightness Acuity Tester produces a full hemispherical light source to photostress the retina when maculopathy is suspected.

BRIGHTNESS ACUITY TEST

Clinicians are acutely aware of the disparity between functional vision in bright light conditions compared to that measured in a standard dark refracting lane. Significant disparity usually occurs with opacities or distortions in the ocular media such as:

1) Corneal opacities, e.g. corneal scars or irregularities.
2) Lenticular opacities, e.g. anterior subcapsular, posterior subcapsular and nuclear sclerotic cataracts.
3) Posterior capsular opacification following extra capsular cataract surgery.
4) Vitreous opacities, e.g. dense central vitreous floaters or asteroid hyalosis.

These phenomena are frequently described as glare producing conditions.

The BAT Brightness Acuity Tester can simulate three bright light conditions: 1) High-direct overhead sunlight; 2) Medium-partly cloudy day; 3) Low-bright overhead commercial lighting. The visual acuity measurements will be similar to those that would be measured in these three conditions using a standard eye chart. The result is an assessment of functional visual acuity which can be obtained in a standard refracting lane.

BRIGHTNESS SETTINGS

HIGH (400 foot-lamberts*)
Equivalent to the patient being in direct overhead sunlight (10,000 foot-candles) and standing on a white concrete sidewalk or sandy beach.

MEDIUM (100 foot-lamberts*)
Equivalent to the patient being in indirect sunlight (2500 foot-candles) and standing on a white concrete sidewalk or sandy beach on a cloudy day.

LOW (12 foot-lamberts*)
Equivalent to the patient being in bright overhead fluorescent lighting (300 foot –candles) such as in a department store, plant assembly line or classroom.

*Average bowl luminance for setting

Brightness acuity testing should be performed at all three settings in order to determine the functional visual acuity in various bright light conditions. Some patients may be unable to tolerate the high setting due to photophobia.

PATIENT PREPARATION

The patient should be comfortably seated at the standard distance from the eye chart.

The test should be performed without dilating the pupil so that the normal pupillary constriction from bright lights will occur. The patient may then be dilated and retested to see if functional vision improves or worsens with dilation.

Make sure the patient’s glasses or contact leases are clean and not scratched, since dirt or scratches will cause glare and affect the results of the test. Tests should be performed with the best correction in place.

EXPLAINING THE PROCEDURE TO THE PATIENT

To alleviate any anxiety the patient may have explain that the test simulates various bright light conditions. Explain that you will be turning up the brightness from low to medium to high and recording a visual acuity at each level.

Inform the patient that the purpose of the test is to assess his or her ability to see in various bright light and glare producing conditions.

THE EXAMINING ROOM

The examining room should be dark (less than20 foot-candles) to assure maximum contrast of the acuity chart. Make sure that the presented acuity chart corresponds to ISO 8596 and ANSI Z80.21-1992 (R2004) standards.

1 Holladay, J.T., Trujillo, J., T.C. Ruiz, R.S. Brightness Acuity Test (BAT) and outdoor visual acuity in cataract patients. Journal of Cataract and Refractive Surgery, Jan. 1987, 67-69
PERFORMING THE BRIGHTNESS ACUITY TEST

1) Make sure the battery handle is turned OFF before you begin. Have the best correction in place and occlude the eye you are not testing. Remove the Occluder and instruct the patient to hold the BAT vertically so that he or she can see the presented eye chart through the 12mm central aperture. Although the patient may rest the instrument lightly against eyeglasses or eyebrow, observe to make sure the patient does not press the BAT against the eyelid at any time, since this may distort the eye and affect visual acuity.

2) Using the BAT with the battery handle switch set to OFF, measure the patient's vision in the standard manner with the best correction.

3) Turn the battery handle switch to full ON. Press the BAT Brightness Selector Button. The BAT will start at the “LOW” brightness level as indicated by the Brightness Level Indicator Light. Test and record the visual acuity at this level. Adaptation to the bright light may normal take approximately 30 seconds although more time may be necessary says their vision is improving. Encourage the patient to read the chart until he or she has read the smallest set of characters. Repeat this procedure with the BAT brightness selected at the “MEDIUM” and “HIGH” positions.

NOTES ON THE PROCEDURE:

1) The patient should be tested wearing his or her own best correction, either eyeglasses or contact lenses.

If the patient’s eyeglasses or contact lenses are not available, the test can be conducted with trial frames. When using trial frames, rimless and thin trial frames are necessary to reduce shadowing of the BAT illumination.

Do not perform the test through a refractor, as it will occlude significant peripheral illumination and therefore reduce the effectiveness and accuracy of the test.

2) Recording the visual acuity before the patient has adjusted to each luminance level; “LOW MEDIUM and HIGH may produce falsely low visual acuities. This is particularly true for some older patients who do not adapt to bright light conditions as quickly as younger people. These older patients should be given several seconds longer to adapt to the BAT light before recording the “best” visual acuity.

3) To avoid chart memorization, have the patient begin with the smallest line of letters he or she can see at each light level. It also helps to have the patient alternate the direction of the letters are read (i.e., left to right then right to left) at each successive light level.

4) Be careful not to handle or touch the matte white surface of the reflector side of the BAT, as oil from the skin will soil the matte finish. (For cleaning instructions, see “Cleaning the White Reflector”.)

BRIGHTNESS ACUITY TEST RESULTS

There are three potential outcomes when the Brightness Acuity Test is performed:

1) No change in acuity – The patient's acuity in bright light conditions is the same as normal measured in the standard refracting lane. This is an indication that no significant ocular opacities or distortions are present. See clinical example 1.

2) Reduction in acuity – The patient’s functional acuity in bright light conditions is less than what is normally measured in the standard refracting lane. This commonly encountered finding implies that opacities or distortions in the ocular media are present. Probable causes are corneal scars, cataracts, posterior capsular opacification or central vitreous floaters. See clinical example 2 and 3.

3) Improvement of acuity – Some patients may actually have improvement in their acuity in bright light conditions. This is primarily due to the “pinhole effect” form the pupil constricting. It implies a residual refractive error or an opacity/irregularity which is less significant when the pupil is small. Clinical examples include: Residual refractive error, irregular astigmatism, paracentral corneal scars, non-central cortical cataracts and eccentric opacification of the posterior capsule. These patients will have better functional outdoor acuity than in dark or dim light. See clinical example 4.
CLINICAL EXAMPLES

1) Normal Patient

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/20</td>
<td>20/20</td>
<td>20/20</td>
<td>20/25</td>
</tr>
<tr>
<td>OS</td>
<td>20/20</td>
<td>20/20</td>
<td>20/20</td>
<td>20/20</td>
</tr>
</tbody>
</table>

Comment: No significant change with increasing brightness. A line decrease in vision on the high setting is normal.

2) Mild Posterior Subcapsular Cataracts (OS>OD)

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/25</td>
<td>20/30</td>
<td>20/40</td>
<td>20/50</td>
</tr>
<tr>
<td>OS</td>
<td>20/30</td>
<td>20/30</td>
<td>20/50</td>
<td>20/60</td>
</tr>
</tbody>
</table>

Comment: A 3-line decrease in acuity to 20/50 and 20/60 at the maximum brightness. The patient usually experiences difficulty only on bright sunny days.

3) Severe Posterior Subcapsular Cataracts (OS>OD)

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/40</td>
<td>20/60</td>
<td>20/80</td>
<td>20/400</td>
</tr>
<tr>
<td>OS</td>
<td>20/50</td>
<td>20/80</td>
<td>20/200</td>
<td>&lt;20/400</td>
</tr>
</tbody>
</table>

Comment: A 7 to 8 line decrease in acuity to 20/400 or worse at the maximum brightness indicates that the patient is legally blind in direct sunlight.

4) Residual Refractive Error with no Opacities (OS>OD)

<table>
<thead>
<tr>
<th></th>
<th>OFF</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/30</td>
<td>20/30</td>
<td>20/25</td>
<td>20/20</td>
</tr>
<tr>
<td>OS</td>
<td>20/40</td>
<td>20/40</td>
<td>20/30</td>
<td>20/25</td>
</tr>
</tbody>
</table>

Comment: The patient actually sees better in bright light due to the "pinhole effect" from pupillary constriction.

MACULAR PHOTOSTRESS TEST

When the occluder is in place, the BAT provides a hemispherical light source which stresses the entire macular region with consistent brightness.

Macular photostress testing is a sensitive test for detecting patients with macular disturbances such as cystoid macular edema, central serous chorioidopathy and senile macular degeneration. These disturbances have been shown to have significantly prolonged recovery form photostress. Photostress testing is particularly helpful following intracocular surgery when cystoid macular edema is suspected. Prolongation of the recovery time indicates a maculopathy and helps rule out other complicating factors reducing the visual acuity that do not have prolonged recovery such as astigmatism, early capsular opacification or optic nerve disease.

PERFORMING THE MACULAR PHOTOSTRESS TEST

1) Record the patient’s acuity with the best correction in place, but without the BAT.
2) Close the central 12mm aperture by inserting the occluder into the aperture.
3) Photostress the eye with the BAT for at least 10 seconds by having the patient look into the center of the BAT on the HIGH setting.
4) Remove the BAT and record the length of time for visual acuity to recover within 2 lines of the initial visual acuity.

RECOVERY TIME RESULTS

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 seconds</td>
<td>Normal recovery time</td>
</tr>
<tr>
<td>30-60 seconds</td>
<td>Marginal prolonged recovery</td>
</tr>
<tr>
<td>&gt;60 seconds</td>
<td>Maculopathy possible but not definite. Definite prolongation of recovery indicating maculopathy.</td>
</tr>
</tbody>
</table>

POWERING THE BAT BRIGHTNESS ACUITY TESTER HEAD

The Marco BAT Brightness Acuity Tester Head is to be powered by a commercially available 3.5VDC ophthalmic instrument battery handle with a standard Welch-Allyn twist lock fitting. The BAT will then fit into the recharging well of most popular instrument stands or battery handle chargers. The circuitry design of the BAT utilizes a logic element to maintain a consistent preset current supply to the LED to ensure consistent illumination levels from patient to patient.

When not in use for patient assessment, the BAT should rest in the battery handle charging receptacle to keep the battery refreshed and fully charged.

When the battery handle is fully charged, the BAT will operate for approximately 30 minutes. Although it is not necessary to recharge the battery handle after each exam, the BAT should be stored in a powered charging receptacle when not in use.

SERVICE
The BAT is a solid state device. There are no user serviceable parts in the BAT.

CLEANING THE WHITE REFLECTOR
To clean the BAT reflector:
1) Clean the inner surface with a lint free material MOISTENED with a mild non-abrasive soap or detergent solution; make sure the soap does not contain lanolin, other hand lotions or abrasives.
2) Rinse with a lint free material MOISTENED with clean water.
3) Gently dab the rinsed reflector with a lint free material or allow to thoroughly air dry.
4) Do not vigorously rub the matte surface of the reflector as this will create shiny spots and provide uneven brightness.

If the reflector becomes stained or scratched, have it replaced by your Authorized Marco Distributor.

SPECIFICATION
Model: BAT-2000 Brightness Acuity Tester (BAT) Head Only
Light output:
HIGH = 400 foot-lamberts
MEDIUM = 100 foot-lamberts
LOW = 12 foot-lamberts

Power Input: 3.5VDC 750ma
Size: 5” H X 2.5” W X 2.5” D
(128mm H X 64mm W X 64mm D)
Weight: 0.5 lb. (.23 kg)

Replacement Parts or Repairs
When ordering replacement parts or scheduling repairs with your Authorized Marco Distributor, state the model number and serial number of the instrument.

To locate an Authorized Marco Distributor open the following link via the internet.

http://marco.com/distributors.html

Marco Ophthalmic, Inc.
11825 Central Parkway
Jacksonville, FL 32224
Tel: 904-642-9330
Toll Free: 800-874-5274
Fax: 904-642-9338
Web site: http://marco.com

Marco® and BAT are trademarks of Marco Ophthalmic, Inc., Jacksonville Florida

P/N IM-BAT-2000 Rev. A
MARCO BAT
Brightness Acuity Tester

- LED SHIELD
- CENTRAL APERTURE (Contains: Aperture Occluder when performing Photostress test)
- REFLECTOR RIM
- WHITE HEMISPHERICAL REFLECTOR
- APERTURE OCCLUDER
- BRIGHTNESS LEVEL INDICATORS
- BRIGHTNESS SELECTOR BUTTON
- BATTERY HANDLE
- ON-OFF SWITCH
- TWIST LOCK CONNECTION