



How to Handle the Reference Area on Charts created for Barbieri Spectrophotometers

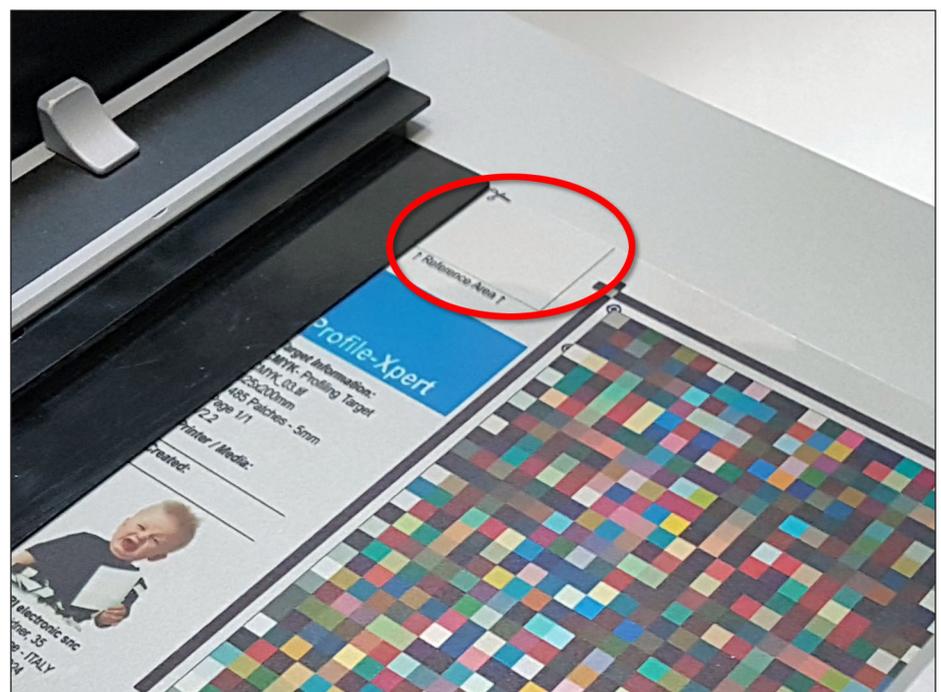
Introduction

This paper is intended as a guideline for users of Barbieri measuring devices about how to handle the reference area found on color management charts for Barbieri spectrophotometers.

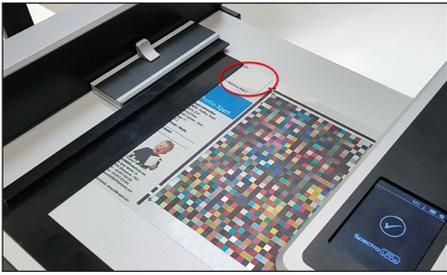
It will highlight that for general color management purposes this area shall not be cut and will provide some deeper insight about theory on backlit applications.

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2 What is a Reference Area?



The reference area is always located in the top left corner.

The reference area is a non-printed (empty) area, located in the top left corner of charts created for Barbieri spectrophotometers. It can have a printed border, be marked as “Reference Area” and/or have scissors.

3 Why a Reference Area?

The reference area is used by Barbieri devices when measuring in transmission mode. The device moves to this position to perform the calibration.



Reference area is always empty (not printed).

4 Cut the Reference Area?

4.1 Short Answer for Standard Applications

For most color management applications in signage industry and ease of use: Do **not** cut the reference area unless your software application is explicitly instructing you to do so.



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4.2 Additional Information for more Experienced Users

Transmission measurements can be done with Spectro LFP qb and Spectro LFP S3 (the following is partly applicable also to Spectro Swing).

A transmission instrument needs to calibrate to “full light” in order to measure the absolute values of the absorbed light by the transmissive medium.

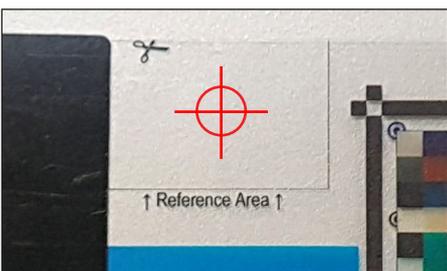
4.2.1 Purpose of the Reference Area

Ideally a completely clear material with no absorption in all wavelengths is used. The instrument calibrates on this material to a transmission factor of 1 ($L=100$, $a=0$, $b=0$). This is done in the reference area.

If the material is not 100% transparent or has a color cast, the reference area needs to be cut to measure the “full light” and get absolute measuring values.

4.2.2 Absolute Measuring Data Suitable for Color Management?

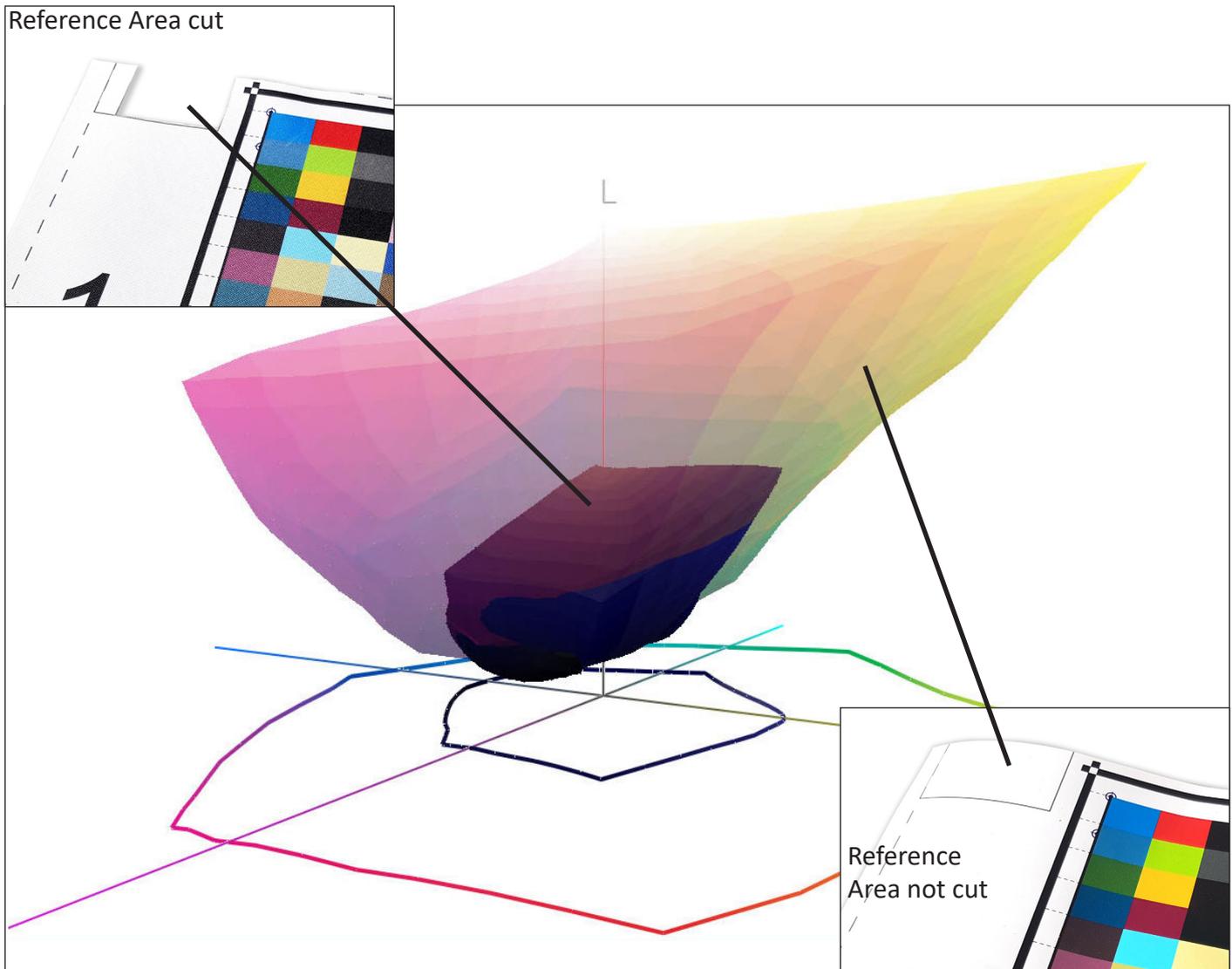
As the dynamic measuring range of the spectrophotometer is limited, especially in case the material has a low translucency (white/opaque looking), this method will result in less accurate measurements in dark



The spectrophotometer moves to an absolute xy position to calibrate.

areas.

Translucent media used in the signage industry can have a transmission factor of 0,3 or lower resulting in a white point measurement of $L=30$ or lower. The resulting ICC profiles calculated from these measurements have a very small color gamut. Moreover, the white point is not reflecting the human eye's impression when looking at the print. $L=30$ is dark grey but human eyes do not recognize the backlit material as dark grey.



The human eye automatically applies an adaptation when looking at a backlit print placed on a light box. It perceives the material as the white point, even if it is not white.

To simulate this adaptation, the reference area is used to calibrate the instrument relatively to the white point of the the material resulting to $L=100$, $a=0$, $b=0$.

When using media relative calibration (reference area not cut), the full contrast and color gamut of the print is captured with the highest dynamic accuracy the instrument offers.

5 Backlit Color Management Applications



Note: the following information is partly extracted from a research publication conducted by the German research institute FOGRA (published currently in German language only). <https://www.fogra.org/en/fogra-research/wc-digital-printing/digital-printing-current-projects/backlit-2-623/colormangement-for-backlit-materials.html>

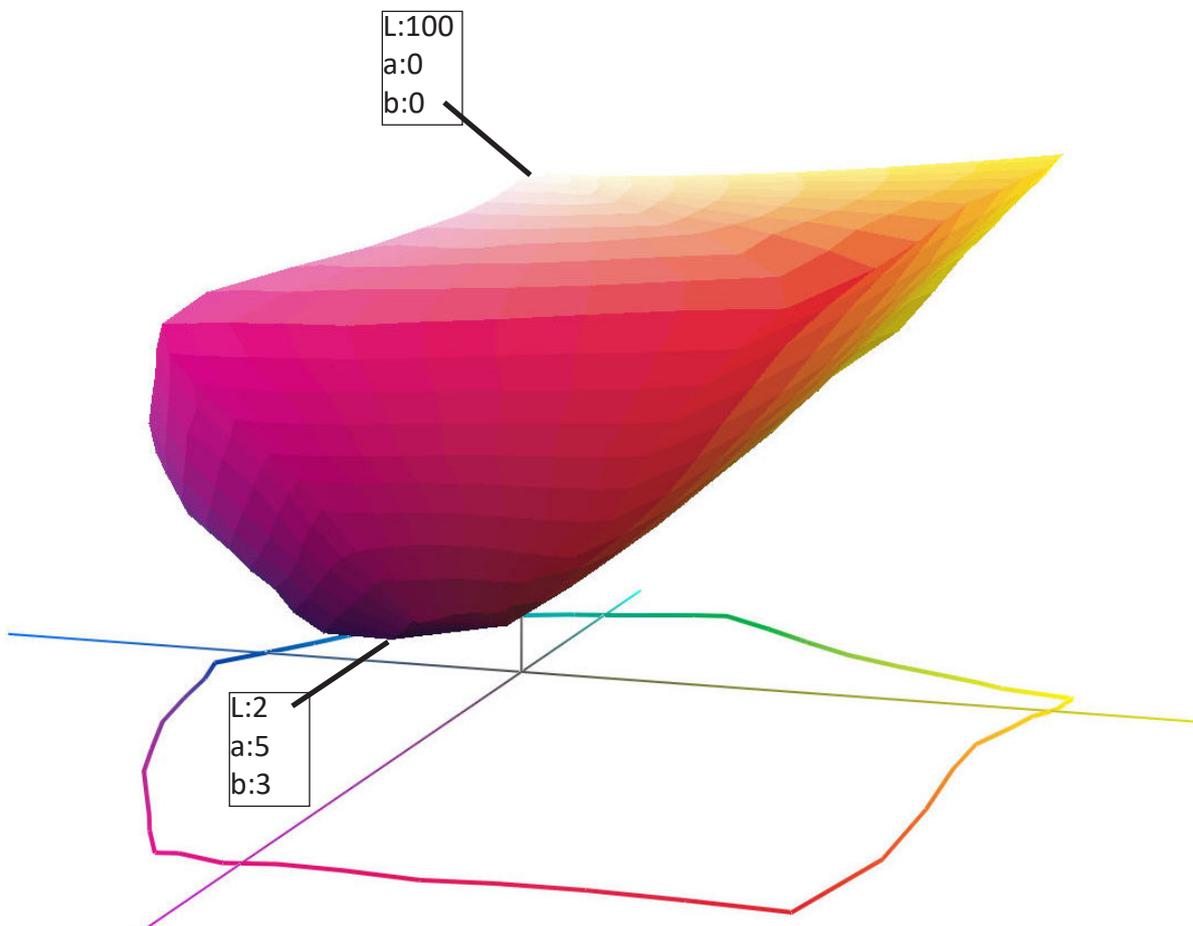
Backlit color management applications can be divided into 3 categories:

- Backlit Alone
- Backlit near Backlit
- Backlit near Reflective Proof

5.1 Backlit Alone

When looking at a backlit print on a light box, the human eye will adapt relatively to the white point of the backlit print. The observer is seeing/expecting a colorful picture using the full gamut capabilities offered by the material and ink.

The measuring instrument uses the media relative calibration method by **not** cutting the reference area and the build ICC profile will assure perfect color perception (grayscale, contrast etc.)



5.2 Backlit near Backlit

In this application two prints are viewed on light booths where either the media can be different (in color cast or in translucency) or the light booth color temperature and brightness.

The suggested method by FOGRA is to use media relative calibration by **not** cutting the reference area. In addition a software shall be used which adds the spectral values of the unprinted media to the relative measurements made by the instrument.

5.3 Backlit near Reflective Proof

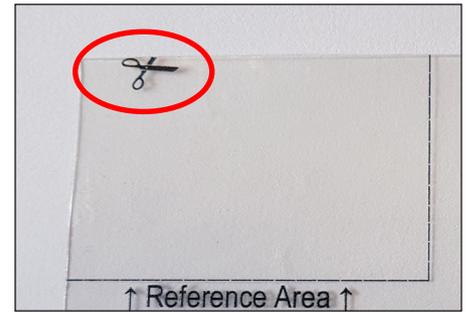
Same as above, but in addition a proofing profile needs to be applied to the image.

6 Reference Area Versions

The reference area is a non-printed (empty) area, located in the top left corner of charts created for Barbieri spectrophotometers. In transmission measuring mode, the device moves to this absolute XY-coordinate and calibrates there.

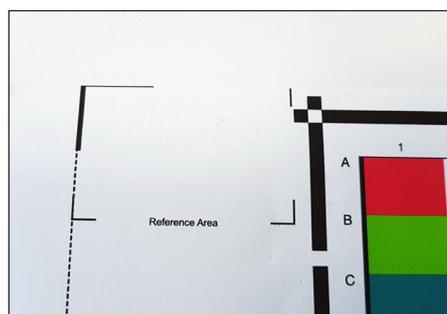
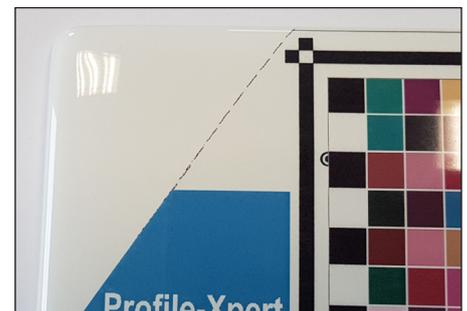
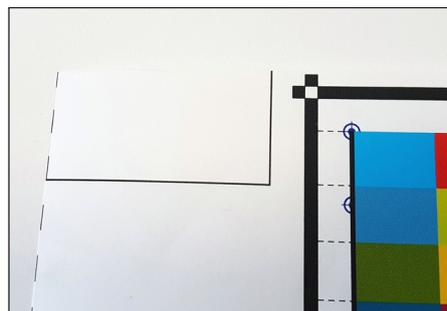
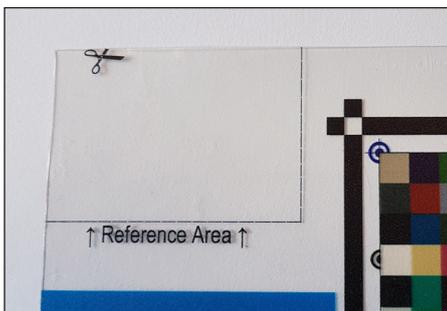
Depending on the software you are using this area can be in the form of a triangle/edge or a rectangle. It can have a boarder, be with or without scissors and be marked as "Reference Area".

Generally, the triangle/edge version are equally usable, but the rectangle version avoids possible problems by not fixing accurately the chart on the sample holder.



Scissors: At the beginning, backlit prints were printed on clear materials (photographic industry/slides) and cutting the reference area assured absolute measurements. Over time, more and more materials for the signage industry became translucent (not 100% transparent anymore) and the reference area is recommended not to be cut.

Various versions of Reference Area:



Barbieri Measuring Devices

Automatic devices for printer setup. Reflection and transmission readings:



Portable device for process control (and printer setup). Reflection readings only:



About Barbieri

Barbieri is an internationally operating manufacturer and supplier of intelligent color measurement systems which ensure the highest image quality for professional digital printing. The international Barbieri technical laboratory continuously discovers new features, characteristics and applications to improve products and assist clients for improved performance.

Barbieri is the color measurement market leader for wide and large format, flatbed and industrial printing.

Barbieri electronic snc/OHG
Via I.-Seidner-Str. 35
39042 Bressanone/Brixen - Italy
Tel.+39 0472 834 024
Fax +39 0472 833 845
info@barbierielectronic.com
www.barbierielectronic.com