Using LAD* to Set Up an Electronic Color Analyzer and Printing Control

Black Patch
Appears neutral, and slightly lighter than the black background behind the model.

LAD Patch
Used to help adjust the calibration controls of the color analyzer. When properly calibrated, appears as a neutral gray on the display tube of the analyzer. You can obtain precise and repeatable adjustment by visually matching the display of the LAD patch to a neutral density filter placed over the display of the "reference white" frameline. (See setup instructions on the opposite page.)

Frameline with Neutral Density Reference Filter(s)
The nearly opaque frameline will produce a "reference white" on the display tube of the color analyzer. Neutral density (gray) filters may then be placed over the display tube to produce "reference gray" for visual matching of the LAD patch and gray scale.

White Patch
Appears neutral, and nearly white, on the display tube of the color analyzer.

Color Patches
Color patches should be displayed as blue, green and red.

Black Background
Displayed as a neutral black, noticeably darker than the black patch.

Fleshtone
The fleshtone appears natural when the color analyzer is properly set up to display the LAD patch as a neutral gray, with no contrast mismatch evident in the gray scale. You can adjust contrast that appears too high or too low using the color analyzer "gamma" or "contrast" controls.

Gray Scale
May be used to subjectively adjust or check the color analyzer's "gamma" or "contrast" controls. Appears as a neutral gray scale for all six steps. Contrast mismatch is evident as a shift in color up and down the scale (e.g., pink highlights and green shadows with neutral midtone).

In the Laboratory Aim Density (LAD) printing control method, a standard control patch specifies densities midway between the minimum and maximum of those typically obtained for a normal camera exposure.

These specific densities have suggested tolerances for each film type in the duplicating and print system, and are listed in this publication, along with helpful hints for their use and evaluation. All color films in a production, regardless of film type or origin, are timed with respect to the LAD control film. Each frame of LAD control film, having the standard patch, with proven accurate exposures plus other information, is available from Eastman Kodak Company.

* The LAD control method is described in the paper "A Simplified Motion-Picture Laboratory Control Method for Improved Color Duplication:' by John P. Pytlak and Alfred W. Fleischer in the October 1976 SMPTE Journal, Volume 85: 781-786.

Kodak **Entertainment Imaging**

LAD
Laboratory Aim Density

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If you follow the procedures outlined in this publication for using the LAD system, and within tolerances of normal film, printer, and process variability, you will obtain consistent duplicates and prints having desired tone and color reproduction characteristics. Using the LAD method will assure optimum screen quality when you use Eastman color films.

1. Turn analyzer power on.
2. Allow analyzer to "warm up" and stabilize.
3. Set analyzer controls:
   a. Polarity (negative or positive)
   b. Film type (print, master positive [interpositive], reversal, black-and-white)
   c. Film format (16 mm/35 mm gate, optics, magnification, etc.)
   d. Color temperature of display (arc or tungsten)
   e. Other controls (filters, focus, orientation, matrix, etc.)
4. Adjust room lights to provide proper amount and color of surround illumination:
   a. Light should not fall directly on analyzer display.
   b. Surround illumination should have same color temperature (arc or tungsten) as the open-gate white display of the color analyzer.
   c. Surround luminance should be approximately 1/10 the luminance of the open-gate white display of the color analyzer.
5. Verify that "white" and "black" of display tube are properly set:
   a. In negative mode, block film gate with opaque card or film to produce a "white" display – display should appear uniform white, with proper color temperature and no coloration. Any colored non-uniformity indicates a "purity" problem with the CRT display. For the open-gate luminance, see your color analyzer manual.
   b. In negative mode, without film in the gate, the display appears neutral and black. Any "smokiness" or coloration shows possible misadjustment of the display black level.
6. Place LAD standard film in the gate of the analyzer.
7. Set timing controls to the labs standard LAD setup balance (usually TAPE 25-25-25).
8. Note that the opaque frameline generates a "reference white" on the analyzer display, regardless of the setting of the timing controls.
9. A neutral density (gray) filter may be placed at the lower left corner of the analyzer display, with the LAD standard film positioned so that the "reference white" frameline is displayed through the neutral density filter, providing a "reference gray" representing the aim of a gray LAD patch on the print. This filter will normally be neutral, and have a visual density of approximately 0.70 (see Appendix to the right).
10. Adjust the calibration controls of the analyzer to provide a visual match of the display of the LAD patch with the "reference gray." Verify that the match is as close as possible by moving each timing control one printer light either way.
11. Set the analyzer "gamma" or "contrast" controls to adjust overall contrast and to minimize any visible contrast mismatch (coloration) in the six-step gray scale. (You may need to readjust the calibration controls to match the LAD Patch again.)
12. Once a desirable setup is determined, you can choose other neutral density filters to match the six-step gray scale along the bottom of the frame to provide setup and verification of the contrast. Which filter you use will depend upon the analyzer and its viewing conditions.
13. The printing negative may then be scene-to-scene timed.
14. Judge the relative exposure of the negative being timed by examining the timing values:
    a. Normally exposed negatives will time close to the LAD setup balance.
    b. Underexposed negatives will time much lower than the LAD setup balance (-7 printer lights = -1 camera stop).
    c. Overexposed negatives will time much higher than the LAD setup balance (+7 printer lights = +1 camera stop).
    d. Duplicate negatives will ideally time higher than the LAD setup balance. (See individual datasheets.)
    e. Significant departure from a "neutral" printer balance may indicate that the negative was exposed using an improperly filtered light source (e.g. very low red TAPE might result from unfiltered mercury vapor light source).

Appendix: Choice of Filter to Produce Neutral "Reference Gray"

The filters used over the analyzer display to produce the "reference gray" and six-step gray scale should be neutral. Silver neutral density filters are a good choice since they are very neutral and relatively inexpensive.

You may also use black-and-white film flashed and processed to suitable densities. You should not use other "neutral density" filters, especially those containing dyes (e.g. KODAK WRATTEN 96 Filters) that may have slight coloration.

The density of the "reference gray" filter will depend upon the analyzer and viewing conditions, and must be determined empirically. Use a filter having a visual diffuse density of 0.70 as a starting point. If timing with a given setup filter is consistently too dark, increase the density of the filter. If timing is consistently too light, decrease the density of the filter.

Once the analyzer setup conditions ("reference gray," gamma, viewing conditions, etc.) have been established, choose suitable filters to match each of the six steps of the gray scale, thus providing a reference gray scale. Again, silver neutral density filters are recommended.