

KODAK Digital LAD Test Image

User's Guide

and

Digital Recorder Calibration and Aims

The KODAK Digital LAD Test Image is a digital image that can be used as an aid in setting up digital film recorders to produce properly exposed digital negatives and in obtaining pleasing prints from those negatives.

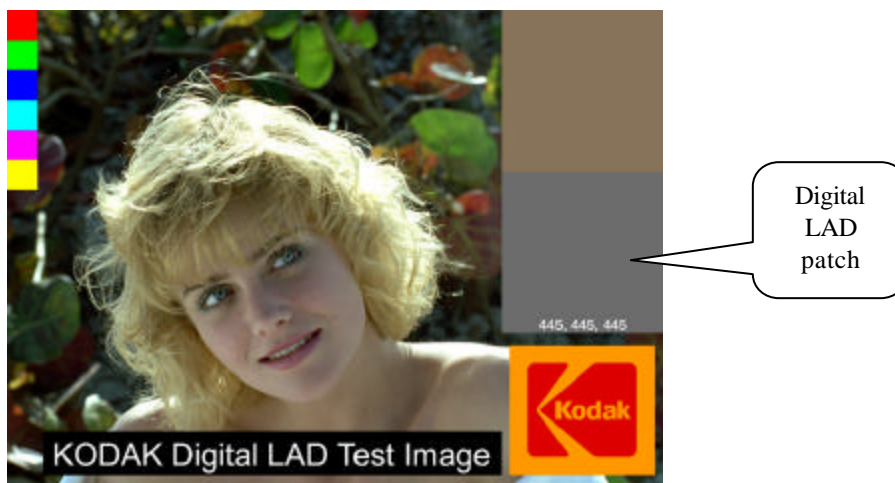
The recommended procedure is as follows:

- Record one or more frames of the KODAK Digital LAD Test Image at the head end of every job.
- After the digital negative is processed, measure the density of the digital LAD patch and compare with aims.

Table I: Summary of Digital Recording LAD aims

Film Type	Mode	Status M density above D-min		
		Red	Green	Blue
KODAK VISION Color Intermediate Film 5242	Neg	0.87	0.93	0.91
KODAK VISION Color Intermediate Film 5242	IP	1.02	1.09	1.08
EASTMAN EXR 50D film 5245	Neg	0.67	0.72	0.69

- **Note that the table gives Status M density aims with D-min density subtracted. Measure the D-min density from your laboratory and add it to the densities given in Table I to determine the total Status M aim density.**
- When the negative is sent for printing, a satisfactory print can be obtained if the printing lab is instructed to adjust the printing color timing so that the digital LAD patch prints to the recommended LAD densities for the print film being used. (e.g. 1.09/1.06/1.03 Status A density for KODAK VISION Color Print film 2383).



Digital Film Recorder Calibration

The following is a summary of recommended practices for calibration of digital film recorders when recording CINEON or DPX format images. It is based on practices that were developed by Eastman Kodak Company and is often referred to as the CINEON calibration aim. References are listed at the end of the document.

Step 1: Calibrate the Recorder to the CINEON Calibration Aim

The calibration aim is the relationship between the code values of the image (the input) and the density on the film (the output). It is calculated by the following equation:

$$\text{Printing Density} = 0.002 * CV$$

Where CV = codevalue (10 bit, 0 to 1023)

And Printing Density = the density above D-min of the negative as “seen” by the combination of print film and the illumination of a standard motion picture printer.

Note that the densities are not Status M densities, but rather printing densities. Table I gives the corresponding Printing Density for selected code values. It also gives equivalent Status M densities as well as Status M density above D-min for the film commonly used for laser film recorders, KODAK VISION Color Intermediate Film 5242.

**Table II: Calibration Aims for Digital Recording onto
KODAK VISION Color Intermediate Film 5242**

	Printing Density Code Value			Printing Density (above D-min)			Status M (above D-min)			Status M		
	R	G	B	R	G	B	R	G	B	R	G	B
	0	0	0	0.000	0.000	0.000	0.009	-0.014	-0.048	0.079	0.556	0.622
	22	22	22	0.044	0.044	0.044	0.052	0.033	0.000	0.122	0.603	0.670
	95	95	95	0.190	0.190	0.190	0.193	0.188	0.158	0.263	0.758	0.828
	200	200	200	0.400	0.400	0.400	0.397	0.411	0.385	0.467	0.981	1.055
Digital LAD	445	445	445	0.890	0.890	0.890	0.871	0.932	0.915	0.941	1.502	1.585
	520	520	520	1.040	1.040	1.040	1.017	1.091	1.077	1.087	1.661	1.747
	685	685	685	1.370	1.370	1.370	1.336	1.442	1.434	1.406	2.012	2.104
	800	800	800	1.600	1.600	1.600	1.559	1.686	1.682	1.629	2.256	2.352
	900	900	900	1.800	1.800	1.800	1.753	1.899	1.899	1.823	2.469	2.569
	968	968	968	1.936	1.936	1.936	1.884	2.043	2.046	1.954	2.613	2.716
	1000	1000	1000	2.000	2.000	2.000	1.946	2.111	2.115	2.016	2.681	2.785
	1023	1023	1023	2.046	2.046	2.046	1.991	2.160	2.165	2.061	2.730	2.835

D-min	0.07	0.57	0.67
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Note 1. These total Status M densities are valid only for the D-min densities given. Calculate your total densities for your D-mins.

Some recorders, such as the KODAK Lightning and Lightning II Laser Recorders, have the calibration formula given above programmed into the calibration software. They convert the Status M densitometer readings taken during the calibration process to printing densities before calculating the film calibration look-up table. Other recorders may make use of a calibration table file given in terms of Status M densities. The values given in the table above may be used in such a file. In addition, these aim files may be generated to eliminate the small negative values

at low code values as well as limits at high code values to be compatible with available density range.

Table III: Calibration Aims for Interpositive Digital Recording onto KODAK VISION Color Intermediate Film 5242

Printing Density Code Value	Printing Density (above D-min)			Status M (above D-min)			Status M					
	R	G	B	R	G	B	R	G	B			
0	0	0	0	1.930	1.930	1.930	1.878	2.037	2.039	1.948	2.607	2.709
22	22	22		1.886	1.886	1.886	1.836	1.990	1.992	1.906	2.560	2.662
95	95	95		1.740	1.740	1.740	1.694	1.835	1.834	1.764	2.405	2.504
200	200	200		1.530	1.530	1.530	1.491	1.612	1.607	1.561	2.182	2.277
445	445	445		1.040	1.040	1.040	1.017	1.091	1.077	1.087	1.661	1.747
520	520	520		0.890	0.890	0.890	0.871	0.932	0.915	0.941	1.502	1.585
685	685	685		0.560	0.560	0.560	0.552	0.581	0.558	0.622	1.151	1.228
800	800	800		0.330	0.330	0.330	0.329	0.337	0.309	0.399	0.907	0.979
900	900	900		0.130	0.130	0.130	0.135	0.125	0.093	0.205	0.695	0.763
943	943	943		0.044	0.044	0.044	0.052	0.033	0.000	0.122	0.603	0.670
1000	1000	1000		-0.070	-0.070	-0.070	-0.058	-0.088	-0.123	0.012	0.482	0.547
1023	1023	1023		-0.116	-0.116	-0.116	-0.103	-0.137	-0.173	-0.033	0.433	0.497

D-min	0.07	0.57	0.67
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The relationship between Status M and printing density changes from film to film. Table IV gives Status M code values for EASTMAN EXR 50D film 5245. This film is commonly used in CRT film recorders.

Table IV Calibration Aims for Digital Recording onto EASTMAN EXR 50D film 5245

Printing Density Code Value	Printing Density (above D-min)			Status M (above D-min)			Status M					
	R	G	B	R	G	B	R	G	B			
0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.600	0.980
95	95	95		0.000	0.000	0.000	0.000	0.000	0.000	0.210	0.600	0.980
200	200	200		0.210	0.210	0.210	0.201	0.217	0.207	0.411	0.817	1.187
400	400	400		0.610	0.610	0.610	0.584	0.631	0.601	0.794	1.231	1.581
445	445	445		0.700	0.700	0.700	0.670	0.724	0.690	0.880	1.324	1.670
600	600	600		1.010	1.010	1.010	0.967	1.045	0.995	1.177	1.645	1.975
685	685	685		1.180	1.180	1.180	1.129	1.221	1.163	1.339	1.821	2.143
800	800	800		1.410	1.410	1.410	1.350	1.459	1.389	1.560	2.059	2.369
900	900	900		1.410	1.410	1.410	1.350	1.459	1.389	1.560	2.059	2.369
1000	1000	1000		1.410	1.410	1.410	1.350	1.459	1.389	1.560	2.059	2.369

D-min	0.21	0.60	0.98
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Record a Digital LAD Image

Once the recorder is calibrated, it is recommended that a Digital LAD image be recorded along with each production job. This digital LAD image will consist of or contain a patch recorded at a set of LAD code values. This patch may be printed to standard LAD densities on the print to

obtain a reasonable starting print balance. Suitable print densities for the LAD patch are 1.09/1.06/1.03. Status A for KODAK VISION Color Print Film / 2383

The recommended code values for a digital LAD patch are:

Red	Green	Blue
445	445	445

Note that these code values do not result in densities that are exactly the same as those recommended in the KODAK Publication H-61, *Laboratory Aim Density* (See Table IV, next page). However, the densities are close and still result in an image well placed on the straight-line portion of the film characteristic curve.

Table IV also gives the recommended aim densities for digital recorders when used to make interpositives. The LAD aims for negative are different than for interpositive or master positive, even though they're printed from the same code values.

Finally note that some facilities may choose to use a digital LAD with code values other than 445, 445, 445. We chose these values to be consistent with a large body of industry practice. However, other values could be chosen, such as a set of code values that give densities closer to the publication H-61 densities.

References

G. Kennel, "Digital Film Scanning and Recording: The Technology and Practice," SMPTE Journal, March, 1994.

"Laboratory Aim Density, Using LAD to Set Up an Electronic Color Analyzer and Printing Control," KODAK publication H-61.

Table IV: Summary of Digital Recording LAD aims

Mode	Red	Green	Blue
Negative Mode 5242			
Code Values for Digital LAD	445	445	445
Printing Density for Digital LAD	0.89	0.89	0.89
Status M density above D-min for Digital LAD	0.87	0.93	0.91
Status M density for Digital LAD	0.94	1.50	1.58
Normal LAD aims (per publication H-61)	1.00	1.45	1.55
IP Mode 5242			
Code Values for Digital LAD	445	445	445
Printing Density for Digital LAD	1.04	1.04	1.04
Status M density above D-min for Digital LAD	1.02	1.09	1.08
Status M density for Digital LAD	1.09	1.66	1.75
Normal LAD aims (per publication H-61)	1.15	1.60	1.70
Negative Mode 524554			
Code Values for Digital LAD	445	445	445
Printing Density for Digital LAD	0.70	0.70	0.70
Status M density above D-min for Digital LAD	0.67	0.72	0.69
Status M density for Digital LAD	0.88	1.32	1.67
Normal LAD aims (per publication H-61)	0.80	1.20	1.60

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