

DARKROOM AUTOMATION

1412 Dorsh Road
Cleveland, OH 44121-3840

216.691.3954
nolindan@ix.netcom.com
<http://www.darkroomautomation.com>

Application Note

RECIPROCITY and INTERMITTENCY in ENLARGING PAPER

A Short Summary:

There are no appreciable intermittency and reciprocity effects with enlarging paper over the normally encountered range of light intensity and exposure time:

- There is no appreciable change in print tone over a 256:1 range in light intensity and exposure time when the total exposure is held constant.
- There is no appreciable change in print tone between 32 x 1- second exposures and 1 x 32-second exposure.

Reciprocity:

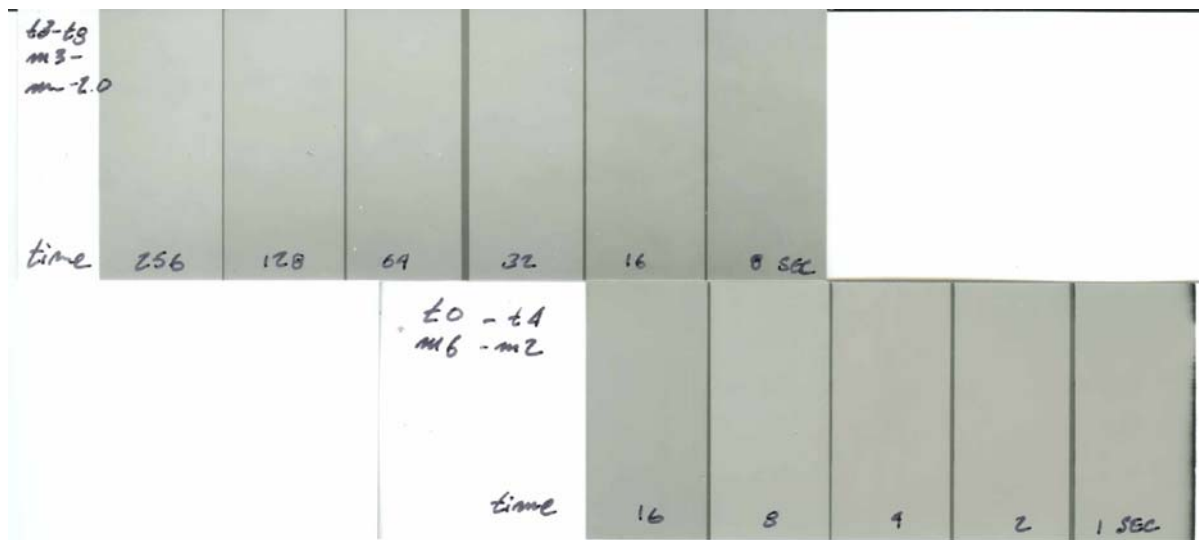


Figure 1: Reciprocity test results: exposure time 1 to 256 seconds

Reciprocity was tested by making exposures at varying times from 0.0 stops of time (1.0 seconds) to 8.0 stops of time (256.0 seconds). The light intensity was measured with the Darkroom Automation Precision Enlarging meter and the

aperture was adjusted so the total exposure, the meter reading + the timer setting, was held constant at 6.0. The test was done in two strips with a neutral density filter used for the long exposure time strip.

That there is no reciprocity failure should not come as any surprise. Making exposures over the same 8 stop range in a camera at shutter speeds from 1 second to 1/250 of a second won't produce reciprocity failure either.

Intermittency:



Figure 2: Intermittency test results: 1-32 second to 32-1 second exposures

Exposures were timed with a Darkroom Automation f-Stop timer. There was a nominal 2 second pause between exposures to simulate the time it takes to move a covering card when making sequential progressive test strips.

Again, the results should come as no surprise. Intermittency effects with film are only significant at very high light intensity and very short exposure times, and the same holds true with paper.

Discussion:

The reciprocity test proves the ability to precisely control print tone with an enlarging meter and timer. By knowing the exposure needed to produce a tone on particular paper it is possible to meter an area on the image and set the timer to the exposure required to get exactly the tone one desires.

The intermittency test proves the accuracy of making progressive test prints where a covering card is advanced across the paper with increasing additive exposures. It also proves the ability to measure and control dodges and burns and get the precise tone desired.

The range of light intensity and exposure times encountered in the darkroom is very narrow compared with the range that must be accommodated when taking pictures. Effects that come into play at the limits of camera operation are not normally encountered in the darkroom.

Apparent failures of intermittency and reciprocity in the darkroom are the result of pushing timers and meters past their capabilities.

Equipment:

Darkroom Automation f-Stop Timer
Darkroom Automation Precision Enlarging Meter
Beseler 45MX enlarger, condenser lamphouse, PH212 bulb
Ilford # 2 1/2 under-lens contrast filter
Rosco Cinegel neutral density lamphouse filter
Sola CVS constant voltage transformer
Durst 1209 test strip printer

Ilford MGIV RC glossy paper
D-72 developer, 1:2 dilution, 2 minutes, 70F
50 millisecond warmup compensation was used for the PH212 enlarger bulb