Electro-optical Characteristics Measurement System

LCMS-100

Introduction

세심광전자기술㈜의 LCMS-100은 LCD Cell에 구형파(Square wave)를 인가하며 LCD Cell의 전기광학특성을 측정하는 장비 이다.

Basic measurement items

- **Voltage vs. Transmittance**
- **Response time**
- **Transmittance**
- **Contrast ratio**
- **Residual DC**

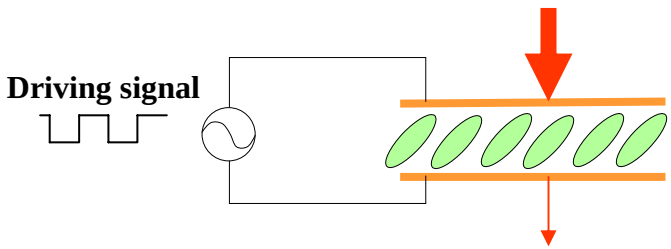
Optional measurement items

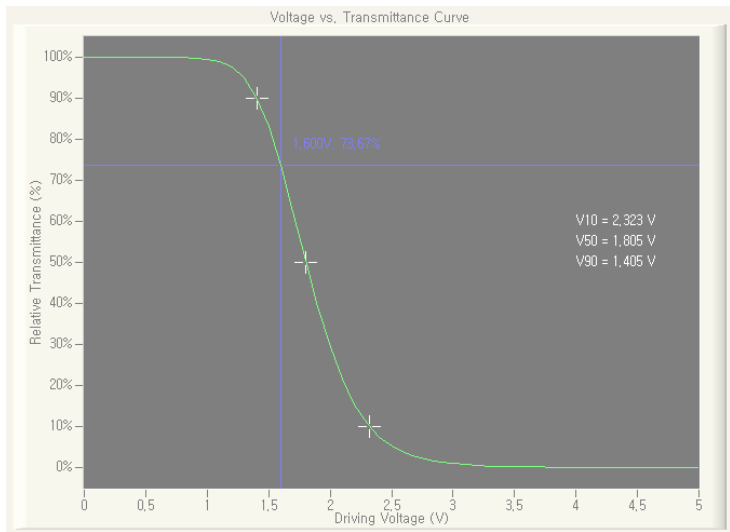
- **Voltage holding ratio**
- **Viewing angle characteristics**

Measurement principle : V-T Curve

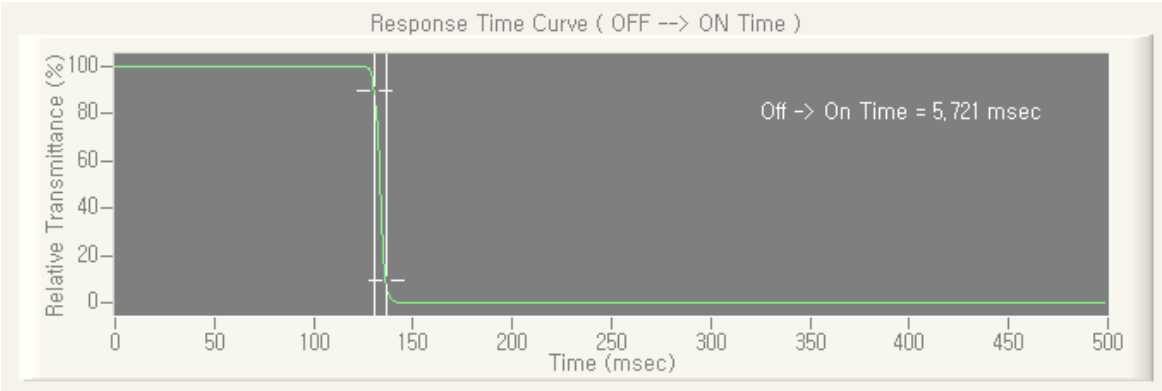
LCD Cell의 전기광학투과곡선은 가장 중요한 특성으로서 Module의 구동전압을 정한다. LCD Cell의 투과하는 광량은 Photo-Diode(PD)를 사용하여 측정한다. PD는 광량에 따른 출력의 선형성이 PMT보다 좋다.

전기광학특성은 LCD Cell의 가장 밝은 상태의 광량을 100%, 가장 어두운 상태의 광량을 0%로 하여 10%가 변한 전압을 V10, 50%가 변한 전압을 V50 그리고 90%가 변한 전압을 V90이라고 정의한다.

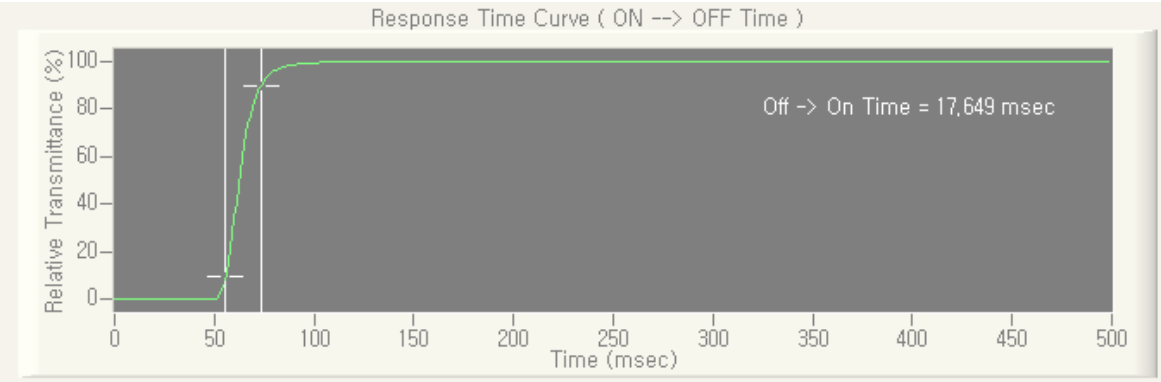




Measurement principle : Response time



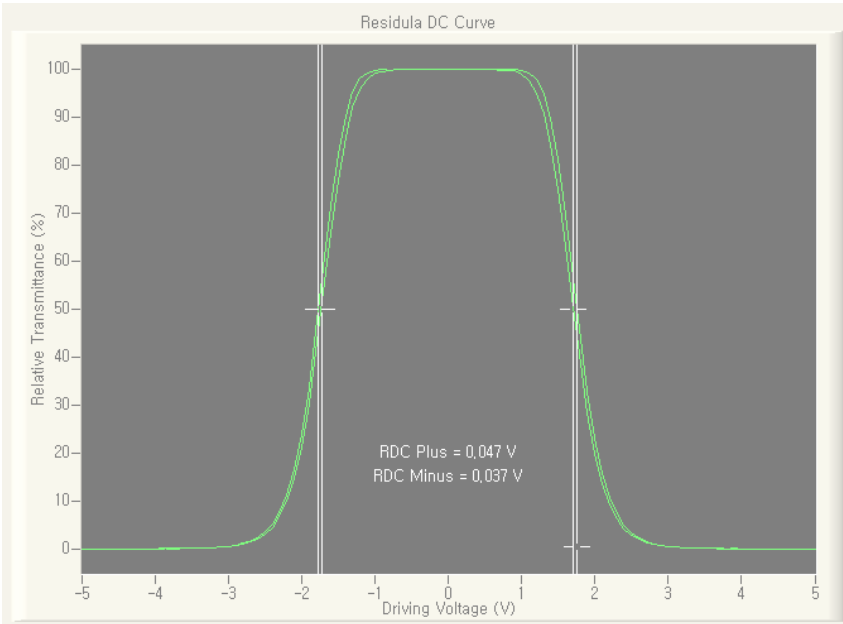
$$\tau_{off} = t(90\%) - t(10\%)$$



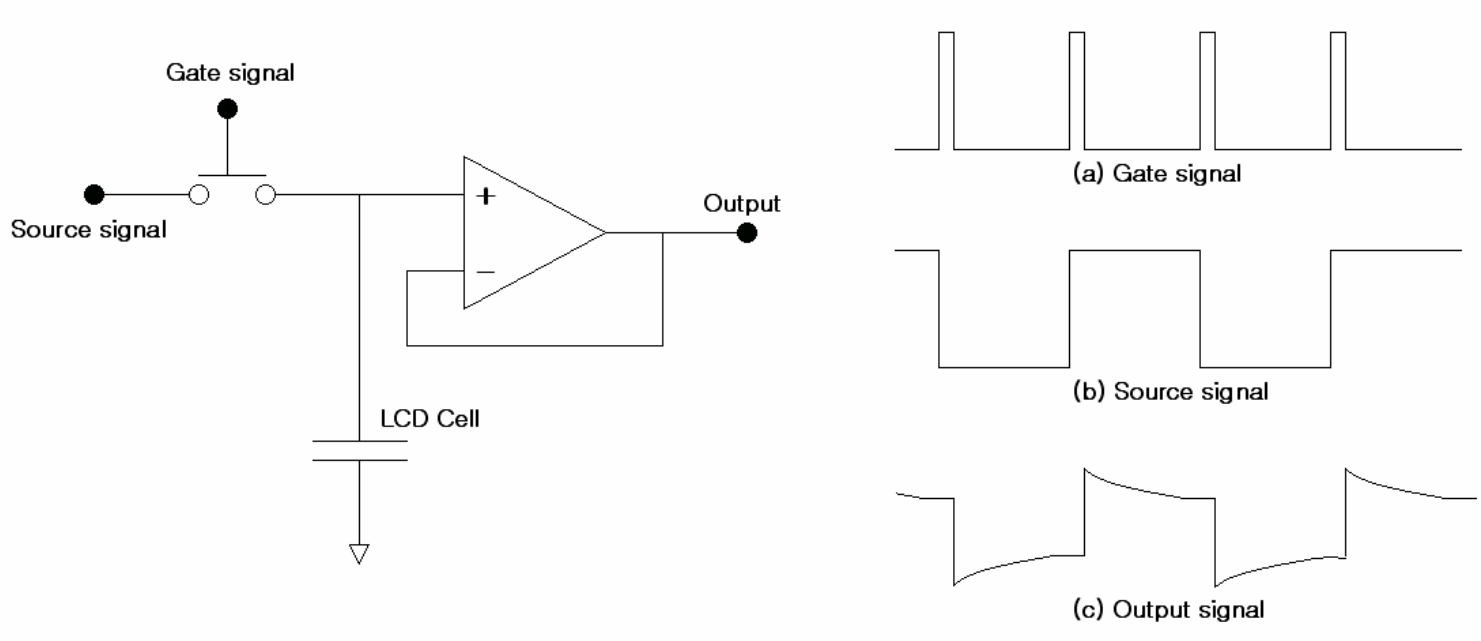
$$\tau_{on} = t(10\%) - t(90\%)$$

Measurement principle : Residual DC

DC Bias 전압을 변화시켜가면서 LCD Cell의 전기광학투과곡선을 측정하여 곡선의 간격으로부터 Residual DC 정도를 측정한다.



Measurement principle : VHR



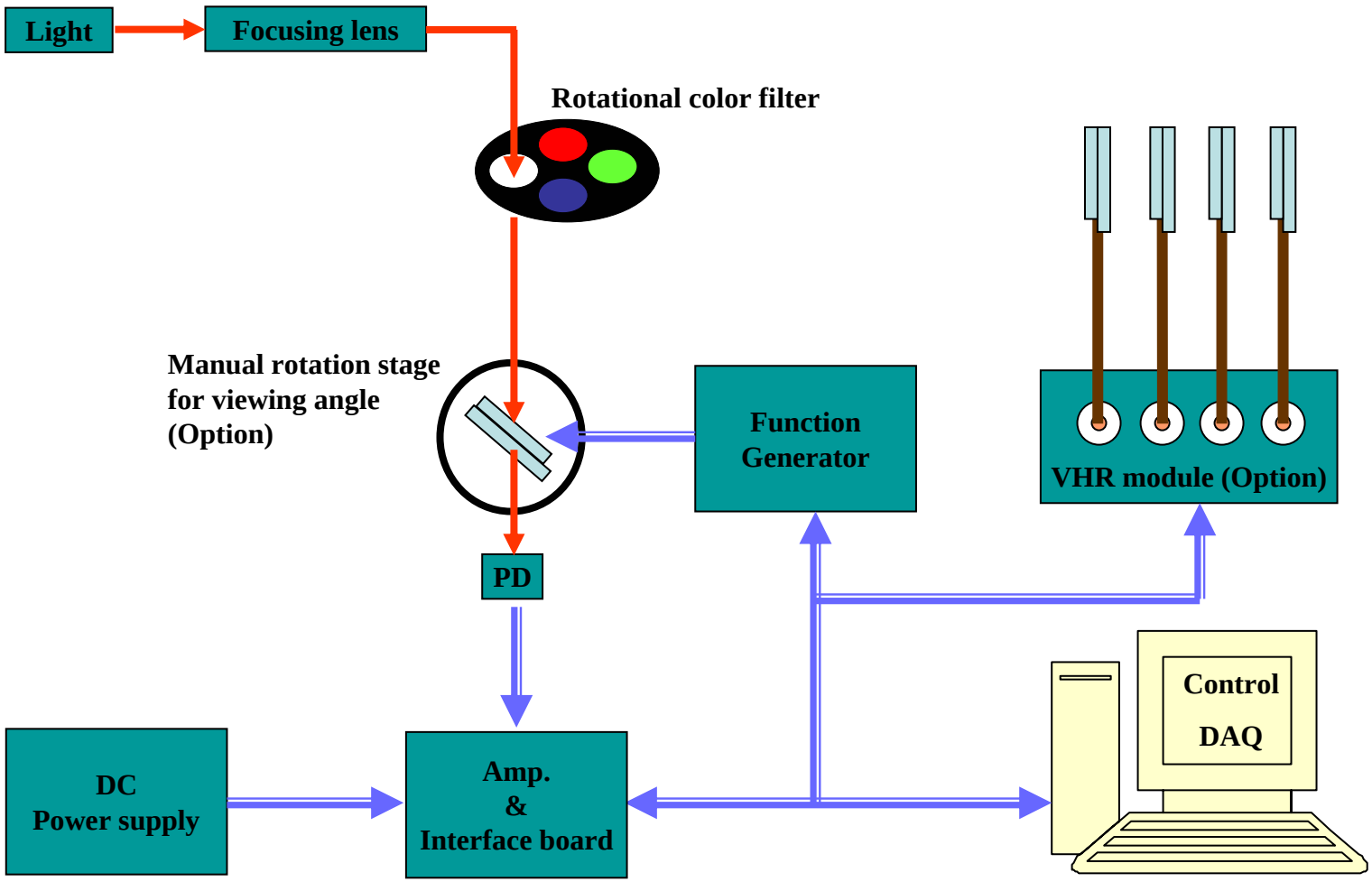
$$VHR(\%) = \frac{2\sqrt{\frac{1}{T}\int_0^T V^2(t)dt}}{V_{P-P}} \times 100$$

Vp-p : Source signal의 peak-to-peak 전압

T : 주기

V(t) : OP-Amp 출력단 전압

System Block Diagram



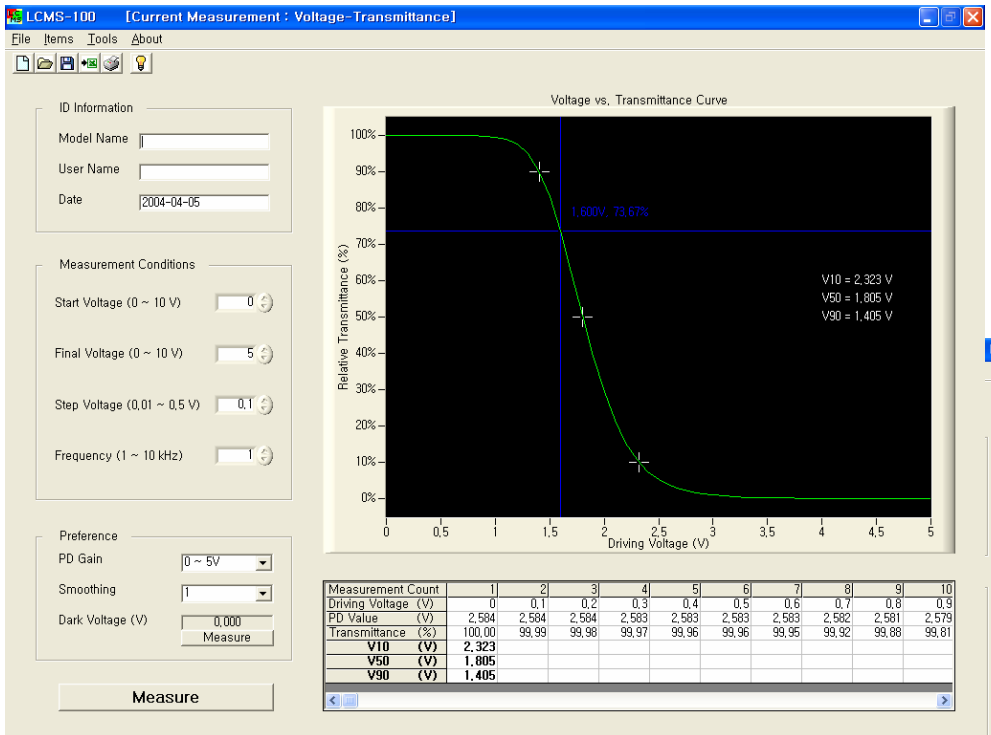
Detail : Sample loader & VHR module

R/G/B/White Color filter with rotation stage

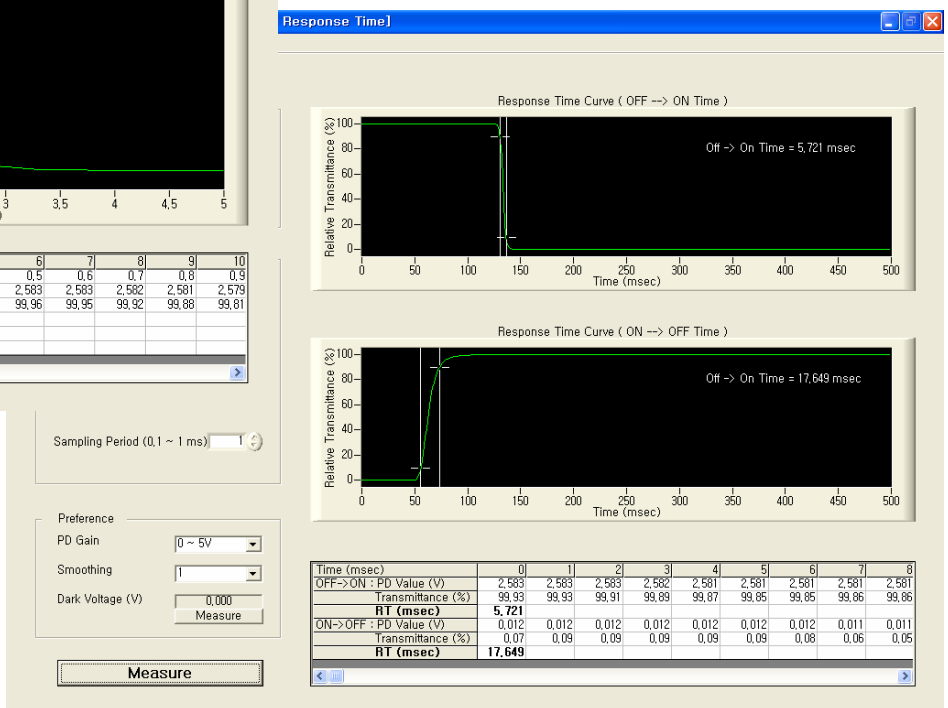
R/G/B/White Color filter without rotation stage

VHR Module

Sample 측정 : V-T Curve & Response time

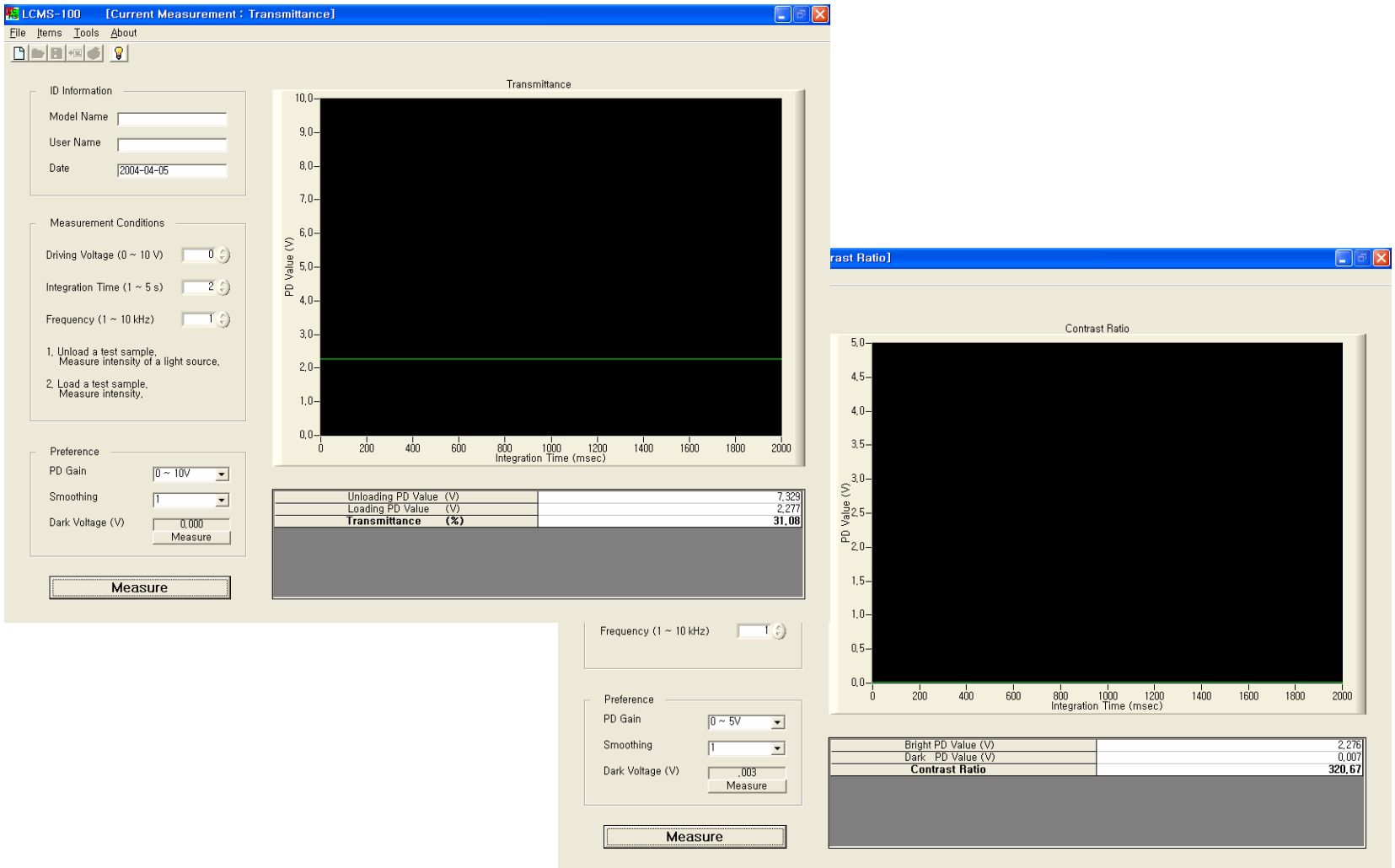


Measurement Count	1	2	3	4	5	6	7	8	9	10
Driving Voltage (V)	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PD Value (V)	2.584	2.584	2.584	2.583	2.583	2.583	2.583	2.582	2.581	2.579
Transmittance (%)	100.00	99.99	99.98	99.97	99.96	99.96	99.95	99.92	99.88	99.81
V10 (V)	**2.323**									
V50 (V)	**1.805**									
V90 (V)	**1.405**									



Time (msec)	0	1	2	3	4	5	6	7	8
OFF->ON : PD Value (V)	2.583	2.583	2.583	2.582	2.581	2.581	2.581	2.581	2.581
Transmittance (%)	99.93	99.93	99.91	99.89	99.87	99.85	99.85	99.86	99.86
RT (msec)	**5.721**								
ON->OFF : PD Value (V)	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011
Transmittance (%)	0.07	0.09	0.09	0.09	0.09	0.09	0.08	0.06	0.05
RT (msec)	**17.649**								

Sample 측정 : Transmittance & Contrast ratio



Sample 측정 : Residual DC & VHR