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A Laboratory Evaluation of Color Video Monitors

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Abstract

Sandia National Laboratories has considerable experience with monochrome video monitors used in alarm assessment video systems. Most of these systems, used for perimeter protection, were designed to classify rather than to identify intruders. There is a growing interest in the identification function of security video systems for both access control and insider protection. Because color video technology is rapidly changing and because color information is useful for identification purposes, Sandia National Laboratories established a program to evaluate the newest relevant color video equipment. This report documents the evaluation of an integral component, color monitors. It briefly discusses a critical parameter, dynamic range, details test procedures, and evaluates the results.

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1.0 INTRODUCTION

Color monitors translate the electrical signal they receives from cameras into a visual image; therefore, performance is critical when used in a CCTV system. An evaluation was conducted on seven monitors to determine their dynamic range and resolution performance. Monitor selection criterion were:

- different screen sizes
- different screen sizes and different manufacturers
- different manufacturers.

2.0 MONITOR DYNAMIC RANGE EVALUATION

The dynamic range of a monitor is defined as the range of highlight luminance level that can be achieved while maintaining the complete ten step gray scale response and without any appreciative degradation in resolution. The dynamic range is important in determining the ambient light level in which the monitor can operate. Brighter screens are necessary when viewed in an environment with higher ambient light levels. The following paragraphs describe the test setup and procedures used for evaluating the monitors' dynamic range.

2.1 Test Setup

A camera was set up to view a backlit EIA resolution chart. The video output of the camera was attached to the input of a waveform monitor. The output of the waveform monitor was connected to the input of a video monitor.

2.2 Test Procedures

Initially, while viewing the resolution chart displayed by the monitor, the contrast and brightness controls were set to maximum. At this setting a horizontal resolution reading was taken, and the number of gray scale

steps reproduced by the monitor were counted. The results were tabulated along with the measured luminance intensity of the monitor. The luminance intensity of the monitors were measured in the top and bottom inner portion of the central circle of the EIA chart. One measurement was taken at the top and another at the bottom quadrant of the circle in order to get an indication of the uniformity of the intensity.

If ten steps of gray scale were discerned and if the measured resolution was equal to or better than the manufacturer specification, then no other measurements were taken. If the monitor failed to reproduce either ten gray steps or the specified resolution, then the contrast and brightness levels were adjusted to the point where the monitor best performed, and the results were tabulated. The table below gives the results of the evaluation.

2.3 Test Results

To check the resolution of color monitors the camera used should provide greater resolution. However, at the time of this evaluation there were no known color video cameras made for security applications that met that requirement. The highest resolution for the cameras was 480 horizontal television lines compared to 600 for the monitors, therefore, some of the monitors were not tested for their maximum performance. Keeping that fact in mind all of the cameras performed as expected except the Barco AVM-22H and the Panasonic CT-1400MG. Their resolution at full brightness/contrast was considerable lower than the published specifications. Also, it should be noted that the Panasonic monitor only produced eight of the ten gray scale steps.

All the monitors except the JVC VMR-190SU displayed relative luminance intensity uniformity over the entire screen.

Dynamic Range Test Results Table

MANUFACTURER AND MODEL NUMBER	Screen Size	Horizontal Resolution Specification	Horizontal Resolution Test Results	Screen Luminance Measurement in Foot Lamberts .		Number of Gray Scale Steps Displayed
				<i>Top</i>	<i>Bottom</i>	
JVC VMR-190SU	19 inches	480 TVL	480 TVL	57	34	10
SONY PVM- 1344Q	13 inches	600 TVL	*480 TVL	69	70	10
JAVELIN CVM-9	9 inches	330 TVL	320 TVL	83	80	10
BARCO AVM-22IH	10 inches	500 TVL	<200 TVL	81	85	10
BARCO AVM-22IH	10 inches	500 TVL	450 TVL	29	29	10
PANASONIC BTM-1310Y	13 inches	550 TVL	*470 TVL	49	43	10
PANASONIC CT-1400MG	14 inches	370 TVL	280 TVL	57	54	8
PANASONIC CT-1400MG	14 inches	370 TVL	350 TVL	48	46	10
SONY PVM-8221	8 inches	400 TVL	410 TVL	48	50	10

* Denotes resolution was limited by the camera's resolution of 480 horizontal television lines.

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