

# Raritan, Inc.

## Paragon<sup>®</sup> II Cat5 KVM Switch & Enhanced User Station Video Quality Evaluation versus Avocent<sup>®</sup> AMX Switch and Enhanced User Station



### Test Summary

*Premise: With the increasing use of video-intensive applications (i.e., CAD/CAM, and broadcast applications), end users require a KVM solution that can handle extremely high video resolutions. In addition, since many of the end-users of these high resolution video applications are outside the data center, IT departments need to deliver high-resolution access to multiple servers over greater distances. For end-users whose work requires them to spend hours viewing high-resolution graphics and/or video, high quality video is essential. Poor video quality cannot only impact accuracy and productivity, but it can also be detrimental to the vision of end users.*

Raritan commissioned The Tolly Group to evaluate the video quality of its enterprise-class Paragon<sup>®</sup> II Cat5 KVM Switch and Enhanced User Station analog Keyboard/Video/Mouse (KVM) solution against Avocent's AMX<sup>®</sup> solution. Both solutions provide analog KVM over unshielded twisted pair (UTP) cables. For this evaluation, we used switches that can support up to four users and 42 servers.

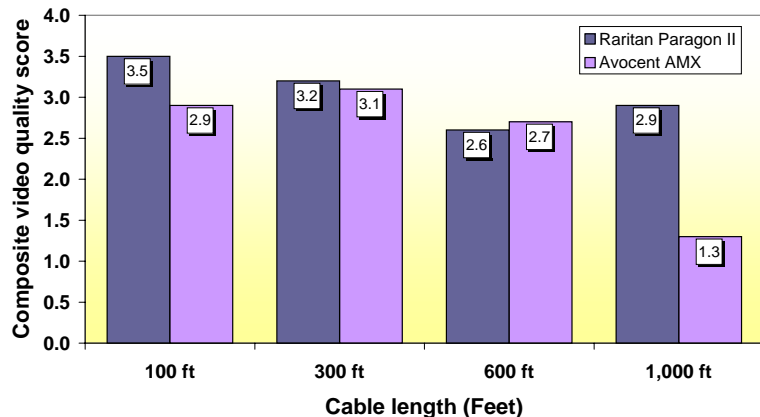
Tests involved the subjective evaluation of the video quality of both solutions at various display resolutions in terms of video bandwidth, color gradient, jitter, distortion and ghosting/reflection, using various cable lengths. A video expert rated the solutions during a series of blind tests, with brand identities hidden.

Raritan's Paragon II KVM solution delivered an overall better video quality than Avocent's solution tested. Tests were conducted in October 2006.

### Test Highlights

- ▶ Delivers an overall better video quality measured in terms of video bandwidth, color gradients, jitter, distortion and ghosting compared to the Avocent solution tested
- ▶ Maintains superior video quality over the shortest and longest cable length and highest resolution compared to the Avocent solution
- ▶ Provides an option for manual and automatic skew correction for longer length cabling

Composite Video Quality Score\*  
 Raritan Paragon II versus Avocent AMX



Composite video quality score of:  
 4 = Good, crisp video image with no apparent distortion  
 3 = Good, crisp video image with minimal distortion  
 2 = Fair and viewable image with noticeable distortion  
 1 = Poor image with too much distortion

Note: Video quality was measured by an independent video expert in a blind test. See the Executive Summary section of the report for details.

Source: The Tolly Group, October 2006

Figure 1

## Executive Summary

Raritan's Paragon II Cat5 analog KVM solution delivers and maintains superior video quality compared to Avocent's AMX solution tested.

The Tolly Group's evaluation focused on a solution involving a Raritan Paragon II Cat5 UMT442 KVM switch and a P2-EUST Enhanced User Station. The Paragon II solution was tested against an Avocent AMX5020 KVM switch and an AMX5130 user station.

Each KVM solution was

evaluated for its video bandwidth, color gradients/sharpness, jitter and distortion, and finally, ghosting/reflection.

Though the quality of video delivered by a KVM solution is subjective by nature, The Tolly Group took a number of steps to ensure a controlled test environment. The company exposed both KVM solutions to the same tests over cable lengths of 100, 300, 600 and 1,000 feet.

Further, the company invited a subject matter expert in the area of digital audio-visual communications systems to act as an impartial evaluator of the video quality. The expert, a professor at a state university in Florida, holds a PhD in Electrical Engineering from Columbia University and regularly contributes to

the MPEG-4 video standard. Tests were conducted where the video expert viewed test patterns delivered by the KVM solutions tested and assessed the quality of the two solutions — although the product brands being tested were not revealed to the subject expert. Furthermore, the tests were repeated with products swapped between the display monitors unbeknownst to the video expert, to ensure a fair test.

The video expert evaluated image quality and assigned a subjective score on a scale of 1 to 4 (4 = Good, crisp video with no apparent distortion, 3 = Good, crisp video image with minimal distortion, 2 = Fair and viewable image with noticeable distortion, and 1 = Poor image with too much distortion).

Video Quality Comparison of KVM Solutions Raritan Paragon II vs. Avocent AMX										
Cable Length	Display Resolution (pixels)	Display Refresh Rate	Video Bandwidth		Color Gradients		Jitter and Distortion		Ghosting or Reflection	
			Raritan Paragon II	Avocent AMX	Raritan Paragon II	Avocent AMX	Raritan Paragon II	Avocent AMX	Raritan Paragon II	Avocent AMX
100 ft	1280x1024	75 Hz	3.5	3.0	3.0	3.0	3.5	3.0	3.5	3.0
		85 Hz	3.5	3.0	3.5	3.0	3.0	3.0	3.5	2.5
	1600x1200	75 Hz	3.5	3.0	3.5	3.0	3.5	2.5	3.5	2.5
		85 Hz	3.5	3.0	3.5	3.0	3.5	3.0	3.5	2.5
	1920x1440	60 Hz	3.5	3.0	3.5	3.0	3.5	3.0	3.5	3.0
300 ft	1280x1024	75 Hz	3.5	3.0	3.0	3.0	3.5	3.0	3.5	3.5
		85 Hz	3.5	3.0	3.0	3.0	3.5	3.5	3.5	3.0
	1600x1200	75 Hz	3.5	3.0	3.0	3.0	3.0	3.0	3.5	3.0
		85 Hz	3.0	3.0	3.0	3.0	2.5	3.0	3.5	3.0
	1920x1440	60 Hz	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0
600 ft	1280x1024	75 Hz	2.5	2.5	2.5	2.5	3.0	3.0	3.5	3.5
		85 Hz	2.5	2.5	2.0	2.5	2.5	3.0	3.5	3.0
	1600x1200	75 Hz	2.5	2.5	2.0	2.5	2.5	3.0	3.5	3.0
		85 Hz	2.5	2.5	2.0	2.5	2.0	2.5	3.0	3.0
	1920x1440	60 Hz	2.5	2.5	2.0	2.5	2.5	2.5	3.5	3.0
1000 ft	1280x1024	75 Hz	3.0	1.5	3.0	1.5	3.0	1.5	3.0	2.5
		85 Hz	3.0	1.5	3.0	1.0	3.0	1.5	3.0	1.5
	1600x1200	75 Hz	3.0	1.0	3.0	1.0	3.0	1.0	2.5	1.0
		85 Hz	3.0	1.0	3.0	1.0	3.0	1.0	2.5	1.5
	1920x1440	60 Hz	3.0	1.0	3.0	1.0	3.0	1.0	2.5	1.5

NOTE:  
 4 = Good, crisp video image with no apparent distortion      3 = Good, crisp video image with minimal distortion  
 2 = Fair and viewable image with noticeable distortion      1 = Poor image with too much distortion

Raritan Paragon® II Solution consisted of the UMT442 KVM Switch, P2-EUST Enhanced User Station and P2-CIM Computer Interface Module  
 Avocent® AMX Solution consisted of the AMX5020 KVM Switch, AMX5130 Desktop User Station and AMIQDM Server Interface Module

Source: The Tolly Group. October 2006 Figure 2

In every test, in almost all the areas tested, the Raritan Paragon II switch demonstrated superior video quality over the Avocent solution tested. In fact, across the four major test scenarios, the Raritan Paragon II switch matched or clearly exceeded the performance of the Avocent AMX solution.

*(A comparison of the composite video scores for each solution under test (SUT) for the various cable lengths tested is shown in Figure 1, and individual video quality scores for each SUT and test scenario is shown in Figure 2.)*

### VIDEO BANDWIDTH

This test measured the sharpness and horizontal resolution of the displayed video using the “Misconvergence 2” test pattern from the NEC Monitor Test application, see Figure 3.

The test verified if the SUT provided enough end-to-end horizontal and vertical video bandwidth from the video output of the server all the way to the end user station, to faithfully preserve the video quality. Lack of sufficient video bandwidth results in the loss of horizontal or vertical lines in the test pattern. The displayed video image was examined for sharpness and any loss of vertical lines, which indicates lack of horizontal resolution bandwidth.

Test results showed that Raritan’s Paragon II Cat5 KVM solution achieved consistently better video quality scores than Avocent’s AMX KVM solution as tested across all the cable lengths, display resolutions and refresh rates. The Raritan solution achieved an average score of 3.08 versus

2.43 for the Avocent solution across all cable lengths.

### COLOR GRADIENTS & SHARPNESS

This test evaluated the ability of the KVM solution to maintain uniform color intensity and contrast over different cable lengths and display resolutions.

Tests once again showed that Paragon II Cat5 KVM solution achieved better video quality scores than Avocent’s AMX solution, for 100 ft and 300 ft cable lengths for all display resolution settings. Avocent scored slightly better than Raritan for just the 600 ft cable length, while Raritan clearly outperformed Avocent at 1,000-ft length. On average, Raritan scored 2.88 versus 2.4 for the Avocent product across all cable lengths.

Tests used the “Color Bars” test pattern from the NEC monitor test. (See Figure 3.)

### JITTER & DISTORTION

This test evaluated the ability of the KVM solution to present a jitter and distortion-free image over varying cable lengths and display resolutions. The “Test Picture” pattern from the NEC monitor test application was used for this test. See Figure 3.

Once again, test results showed that the Raritan Paragon II achieved better video quality scores than Avocent — 3.0 for Raritan versus 2.5 for Avocent. Raritan and Avocent were evenly matched at cable lengths of 100 and 300 ft, while Avocent performed slightly better than the Raritan Paragon II solution at 600 ft.

Raritan, Inc.

Paragon II  
Cat5 KVM

Competitive  
Video Quality  
Evaluation  
versus Avocent AMX



### Product Specifications

*Vendor-supplied information not necessarily verified by The Tolly Group*

#### Raritan, Inc. Paragon II Cat5 KVM Switch

- Industry-leading Cat5 analog KVM switch with ultra-high performance video
- Plug-and-play auto-configured installation
- “Keep-alive” technology for continuous server availability
- Industry’s highest video resolution: Up to 1920 x 1440 at distances of 1,000 ft. at a refresh rate of 60Hz
- Cross-platform support for PS/2, USB, Sun and serial devices
- Automatic and manual skew compensation with the P2-EUST for video applications with extremely stringent signal tolerances
- Automatic and manual video tuning with the P2-EUST, video tuning occurs automatically, saving time on server setup, or it can be manually adjusted
- Industry’s broadest range of port densities — non-blocked access up to 64 users have a clear path to up to 10,000 servers
- Optional UST-IP user station provides KVM-over-IP access and control of servers

#### For more information contact:

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However, at 1,000 ft, Raritan clearly outperformed Avocent across all display resolutions and refresh rates.

**GHOSTING OR REFLECTION**

Engineers also measured the ability of the KVM solutions under test to preserve the quality of text of different font sizes, (See Figure 3) over varying cable lengths and display resolutions.

Displayed video was examined for the presence of ghosting (hazy outline of the text shapes around the letters) or reflection (hazy outline of the text shapes inside the letters).

The tests once again showed that the Paragon II delivered better video quality by preventing ghosting or reflection of the

text across all scenarios.

The Raritan Paragon II achieved an average score across all cable lengths of 3.28 versus 2.63 for the Avocent product.

**TEST BED SETUP & METHODOLOGY**

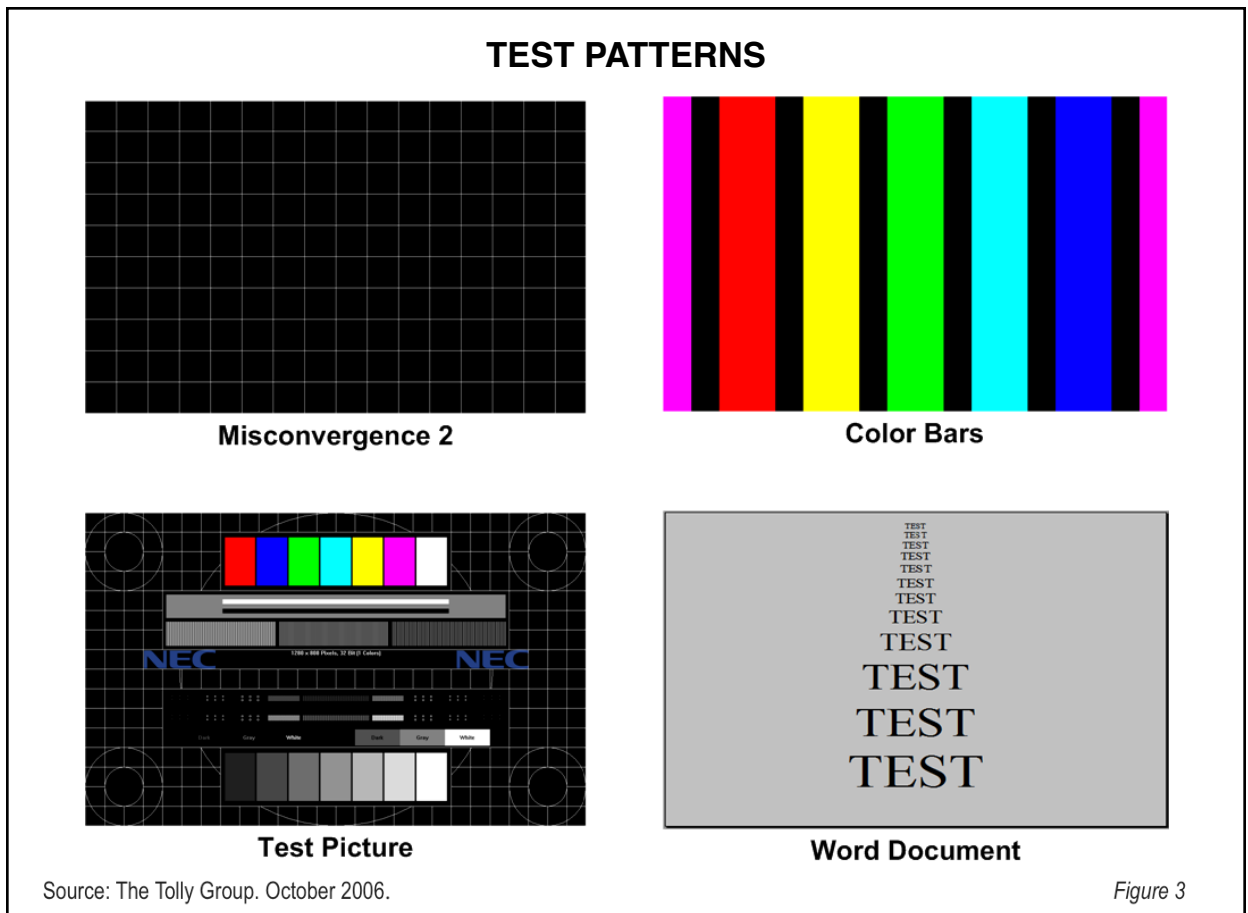
The solutions tested consisted of Raritan’s Paragon II solution and Avocent’s AMX KVM solution. The test infrastructure consisted of two identical servers and CRT monitors each connected to one SUT. Each server was once again configured with identical video cards. (See Figure 4.)

The Paragon II solution consisted of a UMT442 KVM switch, a P2-EUST Enhanced User Station and a P2CIM-APS2 (Computer Interface Module) which essentially converts the standard video

output of the keyboard, video and mouse outputs of the server to a UTP (RJ-45) port.

The comparable SUT from Avocent consisted of an AMX5020 KVM switch, an AMX5130 desktop user station, and an AMIQ-PS2 Server Interface Module, which converts the keyboard, video and mouse outputs of the server into a single UTP (RJ-45) port.

For each SUT, the server was connected to the KVM switch using the supplied interface module adapter and a (Cat 5e) UTP cable. The user port on the KVM switch was then connected to the corresponding user station using a Belden CDT Networking DataTwist 1700 series UTP (Cat 5e) cable of desired length (100-, 300-, 600- and 1,000-ft lengths were



tested). The user station was then connected to a 21" View-Sonic G225fB CRT monitor using a VGA cable. The CRT monitors were capable of displaying 1920x1440 resolution at 32-bit color depth and 60Hz refresh rate.

A publicly available NEC Monitor Test application was used for evaluating the video quality of each KVM solution over different cable lengths. See Figure 3 for the test patterns used from this test application. In addition to the NEC Monitor Test application, a Microsoft Word document was created with variable text sizes to examine how each product preserved the quality across different cable lengths and display resolutions.

### TEST SCENARIOS

Tests were run at video resolutions of 1280x1024 (75Hz and 85Hz refresh rates), 1600x1200 (75Hz and 85Hz refresh rates) and 1920x1440 (60Hz refresh rate). For each test, the SUTs used identical cables of the desired length.

The tests were run by Tolly Group engineers and the video quality of the displayed images was evaluated by the independent video expert in a blind test. During the test, the engineers switched the displays between the two SUTs unbeknownst to the video expert. The tests were run a second time with the monitors connected to a different SUT than the first run, in order to ensure a fair test.

At the completion of testing, Tolly Group engineers calculated a composite score for each SUT, for each tested cable length. For each cable length, there were 20 test

scenarios, and the video quality score achieved in all the test scenarios for a particular cable length were averaged.

### VIDEO BANDWIDTH TEST

For this test, engineers used the "Misconvergence 2" test pattern from the NEC monitor test application. The displayed image was checked for sharpness and horizontal resolution bandwidth.

The vertical lines in the displayed image had to be visible and distinct, the lack of which indicates bandwidth issues that affect horizontal resolution.

The video expert assigned a video quality score for each SUT under the various test scenarios described earlier.

### COLOR GRADIENTS TEST

For this test, engineers used the "Color Bars" test pattern. Under the various test scenarios mentioned earlier, displayed video was evaluated for each SUT.

The image was checked for color gradient changes and contrast, with the requirement that

there be no visible distortion or smearing of the color bars on to the black background.

### JITTER/DISTORTION TEST

In this test, engineers used the "Test Picture" test pattern (See Figure 3). For all the various test scenarios outlined earlier, the video expert evaluated the video quality of each SUT.

The requirement for passing the test mandated that all the distinct grids in the crosshatch pattern be clearly visible, and be of equal brightness. Vertical lines, circles and text info in the test pattern had to be clearly visible.

The presence of jitter could be identified in the form of "sparkling pixels" on the black background.

### GHOSTING OR REFLECTION TEST

For this test, the engineers used a Microsoft Word document (See Figure 3). The Word document contained text of different font sizes, and boldness levels.

#### Fair Testing Charter™ Interaction with Competitors

In accordance with The Tolly Group's process, competitors were contacted and invited to review the test plans, the product levels and configurations of their products and to review and comment on their results. Avocent accepted this invitation. For more information on this process, please see: <http://www.Tolly.com/FTC.aspx>.

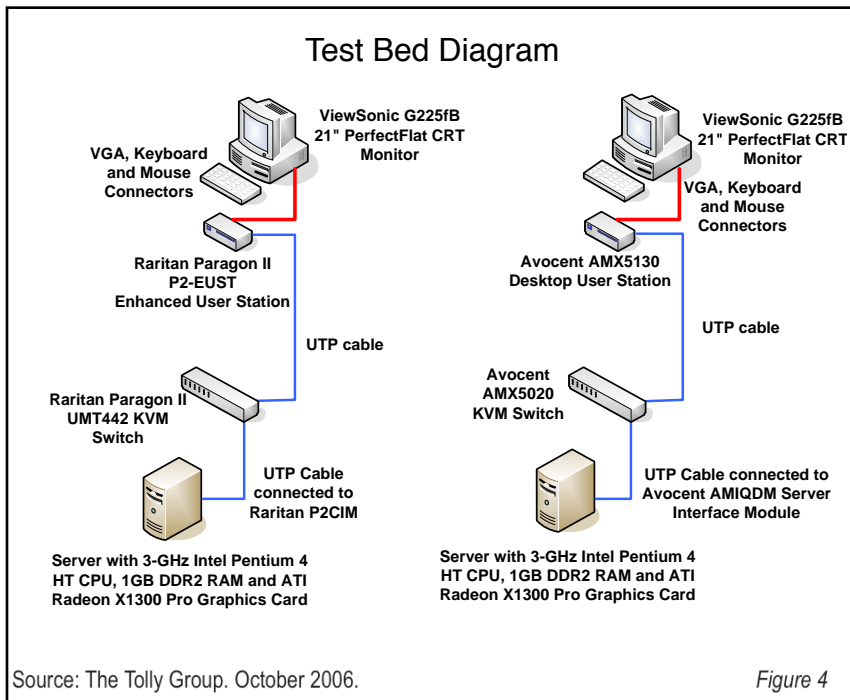


Avocent representatives attended the product evaluation and were given the opportunity to verify the configuration of the Avocent equipment and the test environment. Following a review of the results, Avocent said, "The Avocent AMX switching system was tested using only the automatic video equalization and de-skew settings. The AMX5130 user station allows manual fine-tuning of both the video equalization and video de-skew settings to optimize the video quality at the user station. The manual fine-tune settings are most beneficial when accessing higher resolution target devices at longer cable distances, such as the 600 foot and 1,000 foot distances that were tested by The Tolly Group."

The requirement of the test was that the text should be clear and free of ghosting or reflections around or

inside the text. The video expert evaluated the quality of the displayed video of each SUT under

each of the test scenarios listed earlier.



The Tolly Group is a leading global provider of third-party validation services for vendors of IT products, components and services.



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**Test Equipment/Software Summary**

The Tolly Group gratefully acknowledges the providers of test equipment/software used in this project.

Vendor	Product	Web
NEC Deutschland GmbH (available in public domain)	NEC Monitor Test Program	<a href="http://www.benchmarkhq.ru/english.html?be_monitor.html">http://www.benchmarkhq.ru/english.html?be_monitor.html</a>

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