



Clearing Up the HDMI™ Confusion

AN OVERVIEW FROM  **MONSTER**®

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OVERVIEW

HDMI™ is becoming the connection standard for High-Definition consumer electronics products. The growth of HDMI is “Monstrous™.” The purpose of this paper is to give you an overview of this technology, how Monster® plays an important part in bringing it to you, and to answer your questions on which HDMI cable is right for you.

WHAT EXACTLY IS HDMI?

HDMI stands for “High-Definition Multimedia Interface.” It provides an all-digital connection solution in one cable, with the potential for the most incredible video picture ever seen, combined with full, uncompressed digital audio sound.



The HDMI connectivity standard was a result of a combination of giants in the industry getting together to create a high performance digital connection. Sony, Hitachi, Thomson (RCA), Philips, Matsushita (Panasonic), Toshiba, and Silicon Image are the founders of HDMI.

High-Definition, as we know it today is advancing rapidly, and will pale in comparison with the video of tomorrow. Soon, you will hear new buzz words like “deep color,” higher refresh rates, and higher resolution displays.

Driven by advances in computer, display, and source technologies that will enable consumers to achieve a more lifelike video experience, HDMI has updated its versions to reflect an increase in data capability. Hence some of the confusion over HDMI cables.

There have been five versions of HDMI since its inception in 2002. The latest version provides for a superhighway of data for products that will come in the near future. Evolving technologies in video displays (1080p, 1440p and beyond), new sources such as Blu-ray Disc™, HD DVD and Playstation® 3, and content (such as the latest in HD movies in 1080p, and 10bit/12bit and greater color depth) all need more advanced cable technologies.

HDMI: BEAUTY AND THE BEAST

HDMI offers a connection that provides the most incredible audio and video experience that the Consumer Electronics industry has ever known. With every advance, HDMI delivers even sharper, more vivid images, with brighter and deeper colors, and with the highest-quality surround sound available. The “one-cable” solution that makes it easier for consumers to hook up their products- that’s the “Beauty.”

The “Beast” is that HDMI engenders more confusion than any other connector type with many different cable and component standards, interoperability problems, and false information about the quality and performance of HDMI cables.

For example, the most recent HDMI standard HDMI 1.3 category 2 specification lays the groundwork for technologies in components yet to come, such as deep color beyond what is available today, higher refresh rates for smooth video, higher resolution to 1080p and beyond, and greater pixel density as displays get larger. Poor picture quality can range from dropped pixels, snow, streaks across the screen, or to total picture drop out.

Moreover, many electronics and cables do not perform to the standard, so many combinations of cables and components don’t work. Additionally, cable performance, especially over long runs, have degraded picture quality.

EXPLAINING THE HDMI CABLE CONFUSION.

A common misconception is that all HDMI cables are the same—so just buy the cheapest cables you can find and they'll work for you. The truth is:

- There are many levels of High-Definition digital video, and different standards for HDMI-enabled components. Hence, there are different levels of HDMI cables to connect them.
- High-Definition (720p/1080i), as we know it today, is delivered at a 2.2 Gbps (giga-bits per second) throughput rate. Although high compared to standard DVD at .81 Gbps, it is miniscule compared to the throughput requirements that will achieve the best performance from High-Definition in the near future, which will require 10.2 Gbps and more. Previous generation HDMI cables developed to meet the original 2.2 Gbps standard are not certified for the new standard and may not pass the full bandwidth required to provide the best performance from these new products.

TABLE 2				
HDMI Signal Combinations				
Application	Signal Resolution	Color Depth	Frame Rate	Bandwidth Required
480p DVD Player or Game Console	480p	8-bit	60 Hz	0.81Gbps (27MHz)
HD Set-Top Box	720p/1080i	8-bit	60 Hz	2.23Gbps (74.25MHz)
Playstation 3	1080p	8-bit	60 Hz	4.46Gbps (148.5MHz)
	1080p	12-bit	60 Hz	6.68Gbps (222.75MHz)
HD DVD/Blu-ray	1080p	8-bit	60 Hz	4.46Gbps (148.5MHz)
	1080p	12-bit	60 Hz	6.68Gbps (222.75MHz)

Source: IDC, 2006

- HDMI marks the first time that a cable connection standard has created a “superhighway” for digital content, with components yet to come. Even some of the original HDMI 1.0 cable from 2002, may not work with the latest sources and displays and sources of today (1080p, 12 bit color), and will surely strain to deliver the quality picture and sound content of tomorrow.
- Unlike computer data, which is tolerant of data transmission losses, video data is not. Accurate transmission is essential. Most HDMI-compliant cables can transfer older versions of High-Definition (720p/1080i) data rate over short lengths, but have problems maintaining the same performance over longer lengths as well as higher data rates required of 1080p.

- HDMI cables are very sensitive to construction variances. With HDMI's super-high data rate and microscopically tight tolerances, mishandling of cables during an install can significantly affect performance. Look for better shielded connectors, mesh jackets for durability, special winding techniques, nitrogen gas dielectrics to minimize loss, and CL 3 jacket ratings, to ensure maximum performance with every installation. These features all provide high practical use value.
- A number of manufacturing factors such as cable construction, precision cable twisting, low loss dielectrics contribute to better performance in digital.
- A new term has come to HDMI cables. With all of the confusing numbers of Megahertz, 60 hz refresh rates, as well as Gigabytes per second to rate cables, Silicon Image, co-founders of HDMI, has determined that speed is good way to combine all of the parameters above. Standard Speed and high speed are the two groups of cable designations, but there is a wide spread of speeds that these cover.

CABLES THAT WORK TODAY MAY NOT BE SUITABLE TOMORROW

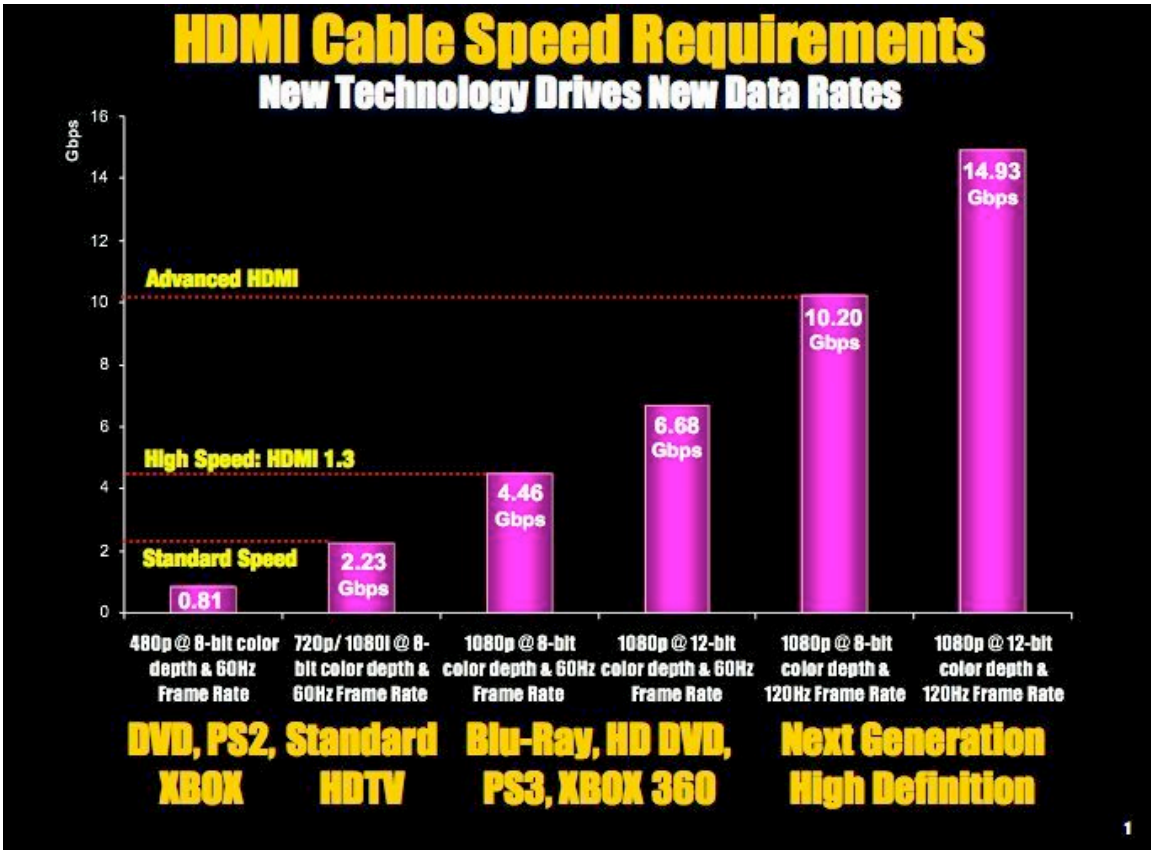
The goal of HDTV is to approximate the same color depth, smoothness of motion, sharpness, and detail that the eye can see. We are far from that, even with tomorrow's technology, but the race is on!

Technology continues to advance at a rapid rate. High-Definition as we know it today (720p/1080i) is relatively low bandwidth. With new displays that increase sharpness and resolution from 1080i from 1080p, we double the scan lines—and therefore the data that has to be transferred to the screen every second from 2.2 Gbps to 4.46 Gbps. This is *double* the previous data rate per second. Cables that worked for 1080i, may not work for 1080p, especially over longer lengths as one might need to install a flatscreen on the wall.

To get even better color, the technology is coming to provide “deep color”. Today's standard is 8-bit color, but Blu-ray and HD DVD will feature 12 and 16-bit color, increasing the data rate again to 6.6 Gbps and 8.8 Gbps!

In order to provide “smoother video” which becomes important for fast action and videogames, we will see displays with higher refresh rates. These are already available for computers today (check our your video display settings on your computer). The refresh rates of displays will go up this year from 60 times a second (60Hz) to 90Hz and 120Hz, increasing the data rate again to 12.2 Gbps. These cables are still under development and are expected to be available later 2007.

To make matters even more demanding, future TVs will have even more pixels than 1080p, to 1440 and greater, as consumers demand ever-bigger, brighter, sharper pictures. The data rate increases as the pixel count increases. These displays are already available for computers and professional grade projectors.



The conclusion is that HDMI cables that work today may not work tomorrow. HDMI cable technology is a bargain considering the cable performance of just a few years ago. Since the cable is probably the least expensive component in a home theater system, it pays to purchase the best possible cable that current technology allows.

WHERE DOES MONSTER STAND IN ALL OF THIS CABLE CONFUSION?

Monster commits to providing the widest range of HDMI cables at various price points, from entry level standard speed cables, to ultra high speed cables for the most advanced video home theaters, some of which are yet to come. Monster has been a leader in HDMI connectivity from the beginning, working with HDMI co-inventor, Silicon Image, to educate consumers on the benefits and performance aspects of the cables. Silicon Image plans to advance HDMI performance specifications, the latest of which serves as a gateway for future technologies that will provide even better, more lifelike picture quality

Monster has always designed and engineered advanced audio and video cables, assuring consumers that they get maximum enjoyment from their home theater investment. Cables are the least expensive component in a home theater system so if possible, it pays to get the best.

Monster is excited about this even-higher-definition future. While some HDMI cables are “good enough” to meet original HD standards, Monster endeavors to not conform to just “standards.” Just as skinny 16-gauge speaker cable was not good enough when the first Monster Cable was designed, current HDMI standards are just a challenge for Monster to supersede them.

Monster’s technology gives you the highest performance cables for the money, using precision windings, nitrogen gas dielectrics, larger conductors, and a specially designed connector to maintain performance integrity during installation.

Advanced HDMI performance is guaranteed.

With Monster HDMI, you will maximize the enjoyment of your home theater and feel confident that Monster has provided a reliable and high-performance video connection



DIFFERENT LEVELS OF MONSTER HDMI

Monster manufactures 18 different kinds of HDMI cables. Monster reserves higher performance manufacturing techniques and materials on higher-end cables where the best performance is desired, such as with 1080p TVs, larger screens, or High-Definition DVD players and game consoles. The best technology also allows for longer-length performance. The lower-priced cables, such as Monster’s flatscreen cables, are designed for less critical use (1080i sources and smaller screens, for example). The speeds are denoted below and will show up in future Monster Cable packages so you can decide which cables are best for you.

THE MONSTER VALUE PROPOSITION

For those who don’t require maximum performance, but still want Monster Cable quality, we offer cables at every performance level with price points ranging from \$79.95 for the Monster FlatScreen™ HDMI to \$200 for the ultimate performance M Series HDMI 1000. Monster may cost more, but it’s worth it.

APPENDIX: MORE ON MONSTER HDMI CABLES



FREQUENTLY ASKED QUESTIONS

Question: Aren't all HDMI cables the same? After all, it's just ones and zeros.

Today's High-Definition TV technology is on an unprecedented pace of growth placing greater demands on HDMI cable technology. With recent advances in High-Definition displays such as 1080p, and sources such as PlayStation® 3, data rate requirements have tripled since last year. Cables that worked with original HD standards may not work for the much more demanding standards of today and tomorrow. As a result, HDMI co-founder Silicon Image has developed many revisions of HDMI cable specifications to meet these demands.

Not all HDMI cables are the same but you can look to Monster for high performance cables and designs that exceed current specifications.

Question: Why should I buy a Monster Cable over other less expensive cables?

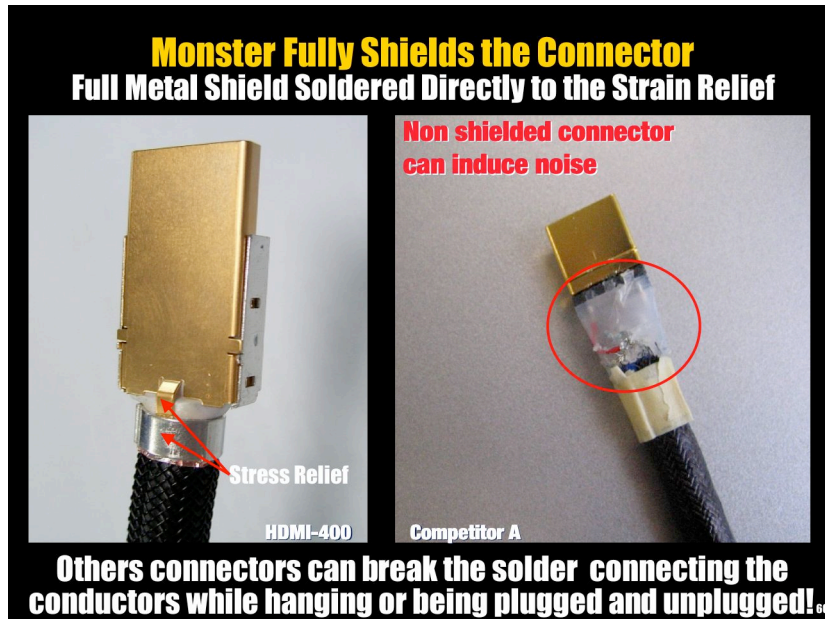
Monster is the world leader in high performance cables, and is a leader in HDMI Cable technology. Monster builds products to exceed current specifications so that as displays and components advance and improve, the cables don't have to be upgraded.

Monster HDMI cables are also more durable and better shielded with special connectors and mesh outer jackets that protect the inner jacket from deformation that might occur in installation. High bandwidth signals are very sensitive to cable construction variances.

Get all the performance you paid for with your home theater TV investment. Monster may cost more, but it's worth it, considering the overall cost of the system, coupled with the cable/installation costs of upgrading to meet each new standard.

Question: What is important in HDMI cables?

- Construction and shielding: Monster HDMI features precise construction, with exacting cable lengths in all conductors, using low-loss dielectrics. Monster developed a special Quad Helix back-twisting process, combined with special nitrogen gas dielectrics with extremely low dielectric constants, for ultra-low loss. Monster cable/connector shielding is superior to other designs that use only a foil shield.



- **Durability:** The heavy casing on Monster connectors is directly soldered to the heavy-duty strain relief, so the cables maintain their performance even if the connectors are pulled or manhandled by the installer. In addition, the mesh jacket in Monster's higher-end THX Ultra cables helps to protect the cables from deformation, which may severely impact performance.

The Monster Cable® Answer to guaranteed performance.

Monster has always built the highest performance cable possible, which is especially important in the ongoing improvements in High-Definition TVs and Sources. You need the highest quality cable possible to maximize the performance of your system, now and into the future.

Monster offers a Limited Lifetime Warranty on all its HDMI cables.

Question: What makes a Monster Cable HDMI cable different from others?

Depending on the price point, Monster utilizes precision manufacturing techniques with the highest quality dielectrics to gain the best performance. Monster also builds to exceed all current specifications, so that your cables are *future-proofed*. Monster also builds for durability, so the cables maintain their performance after being manhandled by installers, and over the years.

Question: Does Monster HDMI have audio as well as Video?

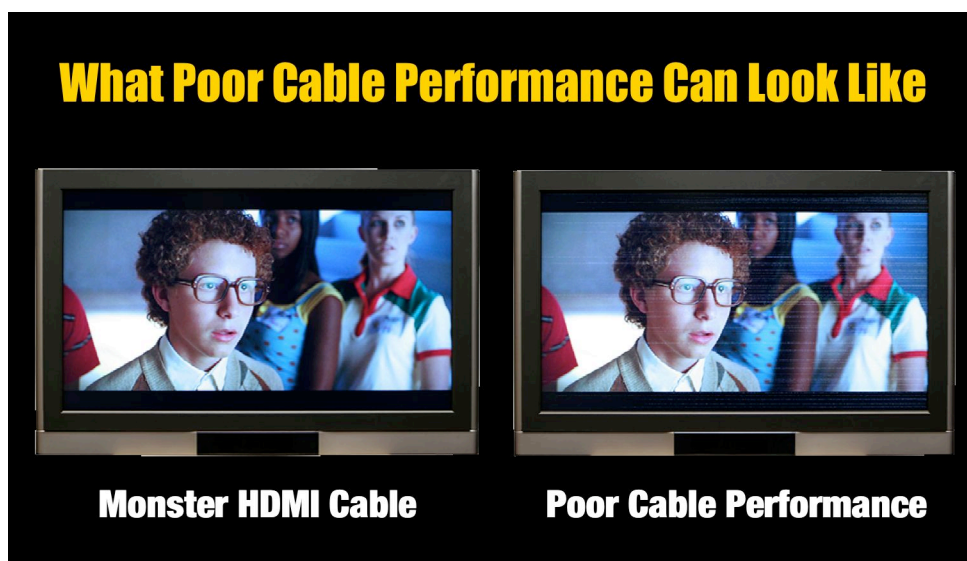
Monster HDMI is also an incredible audio cable and worth the price of the cable alone. Monster HDMI transmits up to eight channels of 192/24 audio (DVD Audio Quality). Future audio and video software will take full advantage of this capability.

Question: What are all of the different versions of HDMI about?

Since HDMI's debut in 2002, there have been five cable specifications. It's like software revisions. First there was HDMI 1.0, then HDMI 1.2, HDMI 1.2a, and now HDMI 1.3, with Category 1 and Category 2. Each revision provides the consumer more features and performance, but also requires more bandwidth and speed. Monster designs ahead of these specifications, typically exceeding existing specs.

Question: What does a bad cable look like?

It depends on the sources and the TV capabilities. It could be intermittent pixels that disappear, color that's not as deep, an increase of grain and "sparklies" that looks like interference, or streaks that dart across the screen. If a cable can't handle an upgrade to a more demanding HDMI component, one may not get a picture at all.

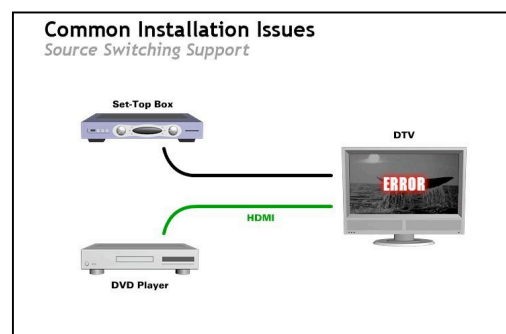
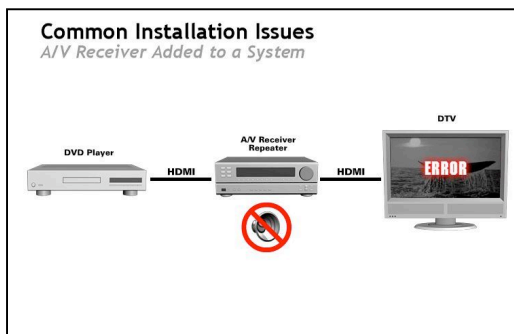


MONSTER CABLE DELIVERS ON THE HDMI PROMISE: HIGH-DEFINITION CONSIDERATIONS

- The sharpest picture, the deepest colors, the very best in high-resolution digital sound, and the peace of mind that your cable will be good now and into the future. Monster makes this commitment to all of our customers.
- Monster always develops the latest in cable technologies, and you can be assured that Monster HDMI Cables meet or exceed the HDMI standards at their respective price points.
- One should plan to invest 10% to 15% of the total cost of their home theater purchase to get all the sound and picture quality they paid for.
- Get all of the performance you paid for. The cost of a Monster HDMI is a small investment compared to the price of a home theater system.
- You and your family will be spending hours daily with the new TV. Why not insure that you are getting the best possible performance over the years of usage?
- The larger your display, the more you will need Monster Cable and Monster Power. Cable artifacts are more visible with larger pictures.
- People who say that there are no differences in HDMI cables may be uninformed. There have been no less than five HDMI cable standards since 2002. The latest are HDMI 1.3 Category 1 and Category 2, with 10.2 Gbps data rate, to bring out the best in the latest sources and displays. Monster will continue to build cables that supersede this standard.
- Many inexpensive and non-branded cables may be questionable as to their certification, performance specifications, and their ability to perform with many different grades of equipment.

SOME PROBLEMS WITH HDMI-NOT RELATED TO THE CABLE

- 1) Not all manufacturers adhere to HDMI compatibility standards. Consequently, with some component combinations, the picture may appear intermittently, or not at all. This is a complex HDCP copy protection handshake issue. Look for Simplay HD™ verified products to insure compatibility or use Monster component video with separate Monster Audio cables.



- 2) One may have everything connected properly and the HDMI signal still doesn't transfer. If so, check the components' setup menus. Many components and set-top boxes have setup menus that must be activated to use HDMI. Also, ask the local cable broadcaster if the HDMI circuitry is turned on, and if it transmits both video and surround audio.

We hope this guide clarifies some of the issues on HDMI to give you the best possible experience with your HDTV. Monster is committed to our important leadership position, helping to educate consumers as to this exciting new medium. We will continue bringing to market the best-performing cables possible, so home theater owners will get the best sound and picture performance.