

TIPS ON A SUCCESSFUL HDMI OVER CAT5/6/7 INSTALLATION

By

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Today when I Googled the term – HDMI problem – I came up with 28,700,000 pages with 10 links on each page making for over a quarter of a BILLION posts by individuals who were looking for solutions to their unique HDMI problem....again a quarter of a BILLION.

Why?

HDMI is not like the older plug-and-play analog VGA, component, composite or s-video technologies as it digital and encompasses a host of handshakes and synchronization along with EDID display information signals that weren't in analog. There isn't even a video wire or an audio wire in a 19 wire HDMI cable as it is all digitized together.

Many of the reported problems are about sending HDMI over long distances and not getting video or audio or having video but it has sparkles within the picture. The cause could be any one of a dozen plus problems but typically there are:

1. The HDMI cable is too long given the 1080p resolution being send and wire gauge.
2. The HDMI cable internal wires are too small.
3. The capacitance in the long HDMI cable impacts the resolution, like 1080p, being sent.
4. The HDMI source devices HDMI output doesn't have enough voltage and current to drive a long HDMI cable. PC's are notorius for that as ther video card designer thought his card would be used with only a 3 or 6 foot HDMI cable.
5. The EDID of the display gets garbled due to any of the above. One must remember that HDMI is bi-directional and signals are being sent back to the source from your display.

With the advent of our HDMI extenders over CAT5 cabling the number of Google instances have gone down but you still have to be careful when sending HDMI over UTP or STP Ethernet cabling.

This is the reason I wrote the document. In it you will find tips on assuring a succesful installation.

Lastly, this document is written for HDMI users but much of it applies to component, composite and VGA over long CAT5/6/7 cabling so it should help you in those types of applications also.

Call us at 800-841-9238 before or after your order if you have any questions or email us at support@hdtvsupply.

Jim in The Engineering Department at HDTV Supply, Inc.

YOU MUST READ THE DOCUMENT OR YOU MAY NOT HAVE A WARRANTY ON THIS UTP/STP DEVICE!

If you bought this for someone else you must immediately FORWARD this email to them and they must reply to it within 24 hours or the warranty may not in effect. Please remind them. If you follow the above instruction and have a question send us a message at <http://www.hdtvsupply.com/info.html> or call us at the below number.

SINCE THESE DEVICES MAY BE USED ON DIFFERENT PANEL CIRCUIT BREAKERS AND THEIR GROUND POTENTIAL MAY BE DIFFERENT YOU CAN BLOW OUT THE UNITS IF THE ATTACHED INSTALLATION PROCEDURE IS NOT FOLLOWED ACCURATELY. PLEASE READ IT THOROUGHLY AS IF THE DOCUMENT IS NOT FOLLOWED YOUR WARRANTY MAY BE CANCELLED.

A SUMMARY IS:

1. UNPLUG ALL DEVICES: "All devices" must be turned OFF when you are installing or trouble shooting. The means satellite and cable boxes must be unplugged from the wall as they are normally ON. Do not, repeat do not, work on the system with any unit turned on.

2. GROUND YOURSELF BEFORE HANDLING ANY EQUIPMENT AND KEEP DOING IT THROUGHOUT THE INSTALL: Because you are not grounded and maybe walking on rugs collecting static electricity you can destroy electronic products due to the static electricity build up on your body. Use rubber gloves or buy yourself hand or feet ground straps.

We use: http://www.apogeekits.com/antistatic_heel_strap.htm and http://www.apogeekits.com/wrist_strap.htm





Thank you for buying a device that converts a signal to a CAT5/6 cable(s) from www.hdtvsupply.com

Here is some CAT5/6 wiring tips to help you have a successful installation:

Cat 5e vs. Cat 6: Installers traditionally use Cat 5e because, for starters, because that's what they have always used. It is also less expensive, and easier to pull within walls and around tight radii due to a smaller diameter and more flexible cable design. But due to its bandwidth of 250MHz compared to 100MHz for Cat 6, Cat 6 is preferable on jobs where bandwidth is important for the applications being run over the network like with HDMI devices.

Cat 6 offers better performance due to larger gauge size wire and spacing between adjacent pairs is increased for improved Near- End Crosstalk performance. Your choice of cable also revolves around data rate considerations, and should, specifically, be based on Ethernet needs - what is the size of the network that is being run? Cat 5e is OK in a 100Mb system, but GB networks will require Cat 6, 10 GB-plus will need 6A.

1. STP/UTP CABLE LENGTH: A shorter cable is a better cable as it has less resistance, capacitance and inductance which can potentially harm a picture. Don't buy/make a 90 foot cable when a 75 foot cable will work. Measure accurately. Keep in mind the higher the resolution the less distance you will get. 1080p will not go nearly as far as 480p so always get the distance specification for the resolution you will be using. Most extenders list their best distance at the lower resolution.

2. STP vs. UTP: A shielded cable (STP) is better than an unshielded cable (UTP) as it protects the signals from AC, noise and electromagnetic interference entering the cable impacting your picture. You can always unwire the shield if you are experiencing rare ground loop problems. To protect your high-speed high definition network from noise and electromagnetic interference, use a shielded cable (STP).

Using shielded wire is especially important when using HDMI extenders as it minimizes EMI interference emitted from other cabling and electronics in the room. Since shielding is so critical for HDMI extender applications, should you have to choose between a shielded Cat 5e or a non-shielded Cat 6, always pick the shielded Cat 5e to minimize EMI interference. The preferred choice would be a shielded Cat 6.

EMI stands for Electro-Magnetic Interference. It is potentially harmful to your high definition system because it can lead to signal loss and degrade the overall performance of high-speed, CAT-5E cabling. EMI is interference in signal transmission or reception and is caused by the radiation of electrical or magnetic fields which are present near power cables, heavy machinery, or fluorescent lighting. Avoiding EMI is as

simple as not laying your network cable within 12" of electrical cable, or if needed switching from UTP to more expensive shielded cable (STP) and remember to only ground one end of the shield.

It's not shielding from power lines that is the primary reason for using STP. Individually shielded twisted pairs also reduce crosstalk within the cable. The twisted pairs within the cable may well be taking care of all interference from (60 Hz) power fields outside the cable. The electromagnetic field is relatively far away from the twisted pairs, even if that distance is only an inch. Twisted pairs work their magic by common mode rejection. Any interference hitting that pair equally gets cancelled out, regardless of field strength. Shielding works by simply getting in the way of noise, whether within or outside of the cable.

3. SOLID vs. STRANDED CABLES: Use CAT6 shielded solid core for new installs as it will give you the greatest distance. A solid wire cable is better than a stranded cable as it has less resistance (given equal gauges) allowing somewhat longer cable lengths. Connectors need to be designed differently for solid core than for stranded.

Use of a connector with the wrong cable type is likely to lead to unreliable cabling. Plugs designed for solid and stranded core are readily available, and some vendors even offer plugs designed for use with both types. The punch-down blocks on patch-panel and wall port jacks are designed for use with solid core cable.

For A/V transmission application, solid CAT-5 or CAT-6 provides the better performance than stranded types. Most of the reason is that the stranded rolls of wires effect each other while signal active. Considering the tendency of an alternating electric current (AC) to distribute itself within a conductor so that the current density near the surface of the conductor is greater than that at its core, the electric current tends to flow at the "skin" of the conductor.

This is so called the skin effect. The skin effect causes the effective resistance of the conductor to increase with the frequency of the current. Due to the multiple of pairs of wires in single differential path, the electronic interfaces among the wires are considerably higher than solid type cables. Therefore, using stranded type cables, it is not favorable to transmit high frequency signals such HDMI or DVI.

No matter if your cable is Cat3, Cat5, Cat5e, Cat6 or Cat6a rated, it is also classified as either "[solid](#)" or "[stranded](#)".

A **solid** cable is most commonly used as a backbone cable in walls, ceilings and conduit, where flexibility isn't really needed. This is because a solid cable's conductors are made of solid metal (usually a single thick copper wire) and the cable as a whole is generally more rigid. Additional characteristics:

- o Transmits electrical signals better over longer distances
- o Lower attenuation (resistance)
- o More likely to break with repetitive bending
- o Lower Cost
- o Used for horizontal cabling in Ethernet networks

In a **stranded** cable, the conductors are made up of many fine metal filaments which are twisted together to form a larger, thicker wire. Due to this composition of thin wires, the stranded cables are a lot more flexible than solid cable. Stranded cables are commonly used as patch cords and other shorter network cables that require frequent flexing and bending during use. Additional characteristics:

- o Shorter transmission distance (de-rate length by 25-50%)
- o Higher Attenuation (resistance)

- o Not likely to break due to repetitive bending (continuous movement cables require special jackets)
- o Higher Cost
- o Used for patch cabling in Ethernet networks

4. **CABLE GAUGE:** A 23 gauge (23 AWG) is better than a 24 gauge (24 AWG) cable allowing somewhat longer cable lengths. The smaller the gauge number the bigger the diameter of the internal wires and the less the resistance in the cable.

5. **CAT6 is better than CAT5E.**

6. **CAT5E is better than CAT5.** CAT5 cable works fine on most resolutions (Component Video) in excess of 500 feet. However, in order to future proof the system, CAT6 (HDMI) would be a worthy investment. It has lower loss, more bandwidth, and less time delay skew than CAT5. These are very desirable in a video system.

Both CAT-5 and CAT-5E have 100 ohm impedance and electrical characteristics supporting transmissions up to 100 MHz . The differences between CAT-5 and CAT-5E show in all aspects of performance: capacitance, frequency, resistance, and attenuation. CAT-5E components were designed with high-speed gigabit Ethernet in mind. While CAT-5 components may function to some degree in a gigabit Ethernet, they perform below standard during high-data transfer scenarios. CAT-5e cables work with ATM and gigabit speed products. Simply, if you are using a 100Mbps switch, get CAT-5E cable instead of CAT-5, especially for HDMI audio/video.

CAT7 can be used on all our products, we recommend using CAT6 then CAT5E and CAT5 should be only be used as the last resort.

Based on the discussion above and tentative setup, the simple selection guide line of CAT-5 type cables for HDMI/DVI/VGA and audio extension application is provided as below!

Performance Guide for HDMI over LAN Cable Transmission

Performance rating		Type of LAN		
Wiri	Shielding	CAT	CAT5	CAT
Solid	Unshielded	Good	Better	Best
	Shielded (STP)	Good	Good	Better
Stranded	Unshielded	**	OK	OK
	Shielded (STP)	*	*	OK
Termination		Please use EIA/TIA-568-B termination (T568B) at any time		

* = POOR

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7. NUMBER OF CAT5 WIRES: If the device, like an HDMI to CAT5 converter set, has 2 - RJ45 connectors you must wire with 2 - CAT5/6 cables, not one. The 2 cables must be an equal length.

8. EIA/TIA 568 A or B? Wire the connectors using EIA/TIA 568 A or B, straight through wiring. We prefer EIA/TIA 568B wiring. We get occasional emails about the difference between 568A and 568B wiring. Which one you use is a matter of your decision.

T568A and T568B are the 2 wiring patterns for 8 position RJ45 modular plug, both permitted under the TIA/EIA 568A wiring standards document. The only difference between the two pattern is that the pairs 2 (orange) and 3 (green) are interchanged. All our cables use T568B standard. These standards apply to the color code used within any SINGLE cable run - BOTH ENDS, AND IF 2 CABLES YOU MUST USE THE SAME. We recommend 568B.

The only difference between 568A or 568B is that the green and orange pairs are terminated to different pins, there is no difference as to what signal is used on what pin, only what color wire is terminated onto it. So technically the standards are the same, they operate in the same manner and neither one is technically superior to another.

It is only a concern when an Ethernet system and a phone system are combined on the same cable that the difference really becomes apparent. Always terminate RJ45 connections using the EIA 568B standard. Most major video transmission manufacturers recommend 568B for HDMI primarily because it tends to lessen video sync issues at longer lengths.

TIA/EIA-568A and -568B are two standards for connecting Category 3 and Category 5 wire to connectors. Both are appropriate for high speed data, though 568B is somewhat more common for installed wiring and 568A is more common in jumpers. There is no performance advantage either way. The only real difference between the two is the order in which the pairs are used (orange and green).

Hold a cable as if to plug it into a wall jack, the locking tab down (contacts facing you). The contacts are numbered 1-8 from left to right. Here's what you will see:

EIA/TIA-568A:

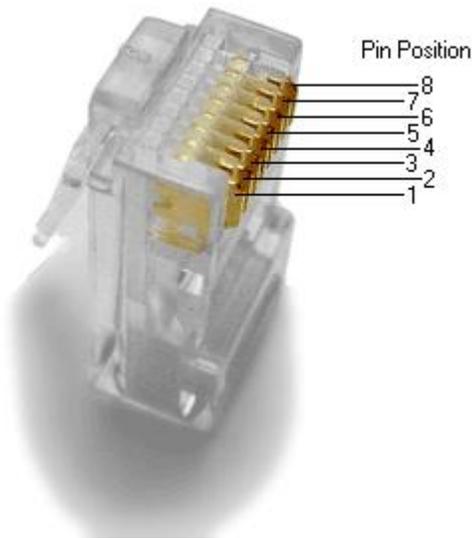
- Pin 1: White/Green
- Pin 2: Green/White (or just plain Green)
- Pin 3: White/Orange
- Pin 4: Blue/White (or just plain Blue)
- Pin 5: White/Blue
- Pin 6: Orange/White (or just plain Orange)
- Pin 7: White/Brown
- Pin 8: Brown/White (or just plain Brown)

EIA/TIA-568B:

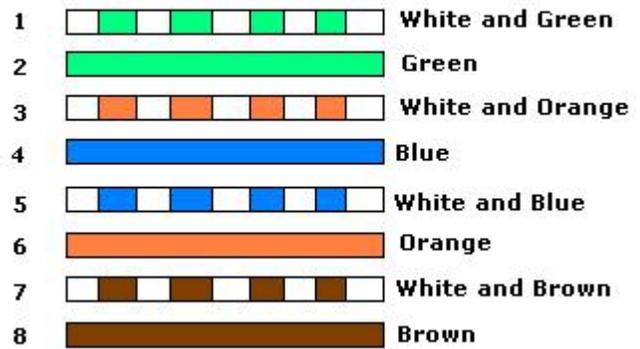
- Pin 1: White/Orange
- Pin 2: Orange/White (or just plain Orange)
- Pin 3: White/Green
- Pin 4: Blue/White (or just plain Blue)
- Pin 5: White/Blue
- Pin 6: Green/White (or just plain Green)
- Pin 7: White/Brown
- Pin 8: Brown/White (or just plain Brown)

568A and 568B may be used interchangeably in a system SO LONG AS both ends of a given cable are terminated the same way.

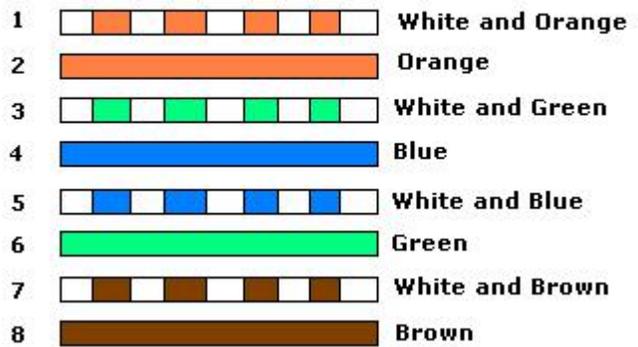
We recommend 568B.



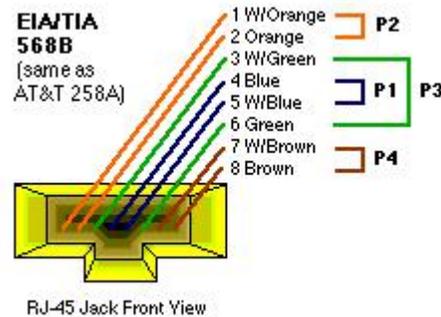
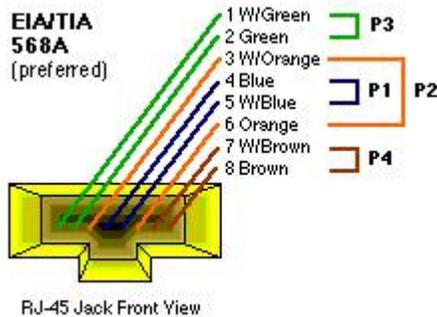
TIA/EIA 568A Wiring



TIA/EIA 568B Wiring



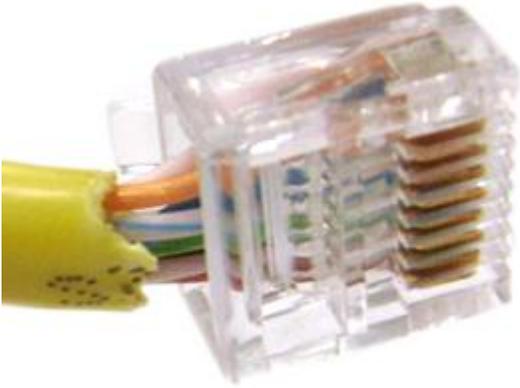
STANDARD.



Pins on plug face (socket is reversed)

9. CROSSOVER CABLES: Using CROSSOVER cables will result in no picture nor audio so don't use them. A cross-over cable is a segment of cable that crosses over pins 1&2 and 3&6. This cable is normally used to connect two PCs without the use of a hub, or can be used to cascade two hubs without using an uplink port. Some DSL modems require a crossover cable to the PC or hub they are connected to.

10. INITIAL TESTING: Do not install the cables in the wall until you have tested your system on the floor first. Move equipment if you have to.



11. MAKE VS. BUY: Buy our pre-made CAT5/6 cables as they have been tested with not only a continuity tester but with video. See them at <http://www.hdtvsupply.com/cat6-cable.html> and <http://www.hdtvsupply.com/cashcaforhdi.html>

If the cable is exposed to a hostile environment see our TOUGH CAT-5E cables at <http://www.hdtvsupply.com/cat5-cable.html>

12. AC ADAPTERS: HDMI, or other technologies, to CAT5 converters that attach to a laptop or an AV receiver may work better with converters that have 2 - AC adapters due to those devices are sometime designed to work with only a cable that

has an effective cable length of 6 foot. Check with the manufacturer if you need to.

13. USABLE DISTANCE: The actual usable maximum distance between baluns will vary on a number of factors including strength of a signal, quality of terminations and local sources of interference. Depending upon the size of the video monitor, and level of required video signal, usable distances may increase with CAT5E, CAT6 or higher rated cables.

Since so many factors determine what resolution works at what length, like type of cable, resolution sent and AC adapters or not, we suggest you rate your installation conservative. Buy a CAT5 device that works at, say, 100 feet if your application only requires 75 foot.

Because the quality of the CAT5/6 cables has the major effect on how long the transmission limit can achieve and how good is the received picture quality, the actual transmission range is subject to one's choice of Cat-5/5e/6 cables. For desired resolutions greater than 1080i or 1280x1024, a Cat-6 cable is recommended.

The transmission length is largely affected by the type of Cat-5/5e/6 cables, the type of HDMI sources, and the type of HDMI display. The testing result shows solid UTP cables (usually in the form of 300m [1,000ft] bulk cables) can transmit a lot longer signals than stranded UTP cables (usually in the form of fixed length patch cords).

Shielded STP cables are better suited than unshielded UTP cables. A solid UTP Cat-5e cable shows longer transmission range than stranded STP Cat-6 cable. For long extension applications, solid UTP/STP cables are the only viable choice.

14. THE RJ45 CONNECTOR: The RJ45 connector is the critical connection - always use the highest quality connectors you can afford. The most common cause of connection faults are bad connectors. See this poorly made cable on the left. There are different connectors for stranded and solid cable and manufacturers do not always do a good job at differentiating them.

To reduce video dropout problems from ceiling fans and other EMI issues, it is strongly recommended that you pull shielded CAT5e/CAT6 and use shielded RJ45 connectors with this extender product. "EZ end" connectors are not recommended for use with HDMI extenders.

Spend the time to make sure you have the right connector type. If you use the wrong type of connector the cable may or may not work initially but it will almost certainly fail very quickly. Make and test practice cables until you get it right every time - especially before you destroy a cable you just spent 2 hours fitting. When cutting the exterior cover of the cable be very careful not to cut the insulation cover of the conductors since this can cause shorts - bottom line: the cable won't work.

Expose a maximum of 1 inch of individual conductors when preparing the cable for connection.

Line up all the conductors according to the wiring standard you are using.

Measure the cable and trim the conductor ends so they are all the same length and no individual conductor wire is visible outside the plastic cover of the RJ45 connector.

Carefully slide the prepared cable into the RJ45 connector making sure the end of the conductors reaches the end of the RJ45 connector. Using the crimp tool makes the connection using one firm squeeze operation. Test the cable before on the floor before installing, if possible.

15. MAKING THE CABLE: Mistakes are easily made when making cables, so if you do not have experience with this type of work do not hesitate to get an experienced installer. It is always best to defer this to a professional. Only use Cat 5e/6 for runs longer than 20 feet. Anything less, and an HDMI cable should be used straight to the display.

It is vitally important to use the very best material that you can get in the construction of the cable, and that a top quality crimper is used as well. Make certain that the cable is checked using a test meter, to ensure that the wiring sequence is correct on each end.

16. HDMI VIDEO CARDS: HDMI, or other technologies, to CAT5 converters that attach to a PC/laptop or an AV receiver may work better with converters that have 2 - AC adapters due to those devices are sometime designed to work with only a cable that has an effective cable length of 6 foot. Check with the manufacturer if you need to.

Sending HDMI from a PC's video card over CAT5 may have setup problems that other devices don't have as they are designed to be connected with a short HDMI cable as well as require the video card to be properly configured in the Windows Control Panel. If you don't see a picture try the following:

- a. Set the resolution to its lowest setting and then raise it until you see a picture. The video card resolution output CANNOT be larger than the HDTV's native resolution i.e. you can't send a 1080p video signal to a HDTV that only support 720p.
- b. Do a Control-Alt-Delete to see what else is running that may impact the HDMI output and experiment with taking those programs out. Use the MSCONCONFIG file if you are computer savvy.
- c. Try a SAFE BOOT to see if the Windows start up screen is seen.
- d. Call the video card manufacture and have them go through the set up procedure to configure an HDMI output.
- e. If a laptop you need to configure the unit to send the HDMI out. Usually a Click <ctrl> with <F4> buttons will work to send the signal from a laptop to the TV.

PC video cards and AV Surround sound receivers are notorious for not conforming to the HDMI spec of providing a stable 5 volt at 55 mill-amp output. We have seen many Onkyo, Integra, Yamaha and other AV receivers who can't drive long HDMI cables and source powered HDMI to CAT5 devices due to their poor HDMI switching design.

We have even seen some laptops and AV receivers that only measure 30ma on Pin 18 of the 19 pin HDMI connector so if you source device is similar and you are buying a up-powered HDMI to CAT5 converter you may need an AC powered HDMI to CAT5 converter with 2 - AC adapters as it may be required. See ours at <http://www.hdtvsupply.com/hdmi-over-1-cat5.html>

HDBaseT Applications: Cat 5 has been used for years in HDMI transmission, but has distance limitations between 100 and 200 feet for 1080p for any cable type. With HDBaseT, the maximum distance runs on Category Cable is 100M. Some HDBaseT extenders have an option for even longer runs than 100M, as long as the cable rating is at least 350MHz and the video is limited to 1080i.

Even with new HDBaseT extenders, a shielded CATx is preferred to guard against possible video dropouts from EMI

For HDBaseT, keep these three factors in mind:

HDBaseT is more forgiving than older 1 Cat extenders on runs with breaks in the line. It can be used on cables that have, at most, two keystones or couplers in the run. Couplers have outperformed punch down keystones testing so they are preferred. Patch cables may be used in HDBaseT installations as long as they are 5 meters or less in length and may be stranded or solid type. Limit any run to two patch cables (max 5 meters each). There is no compromise in resolution versus distance for HDBaseT up to 1080P60 48bit color. For Ultra-HD (4K) distances are somewhat reduced depending on cable type. Also the limit of each extender model must be considered no matter the video, or audio format.

17. HOW TO CHOOSE: There are 7 factors on choosing an HDMI (or other) to CAT5/6 converter. They are:

- a. Resolution being sent, like 1080p.
- b. Length of cable.
- c. Type of cable, like CAT5 or CAT6. We like CAT6E shielded.
- d. One or 2 cables being used.
- e. AC powered or powered from the source device. We like AC powered.
- f. Pre-made cables or make them yourself. We like pre-made and tested.
- g. Budget

We have >100 for you to choose from at <http://www.hdtvsupply.com/cawipr.html>

18. PROBLEMS: Many different factors can affect the performance of category 5/6/7 cable for video. The main problem is that when there is any break in the smooth flow of the video signal there is a referred visual anomaly that every viewer will see on the monitor. In order to have 100% satisfaction we need to transmit 100% of the signal without interruption or deviation. Weakening can be corrected to some degree via attenuation, but true errors or damaged signals cannot be fixed.

Factors that affect the performance of twisted pair cable include:

- The quantity of sharp bends or kinks amid cable runs
- External magnetic or electrostatic interference
- Ground loops
- Quality of the termination
- Quality of the connector
- Strength of the original signal
- Actual amperage of the source device

Baluns are not the ideal solution for every application; certain environments and applications will degrade twisted pair transmission performance. It is crucial that you pre-qualify your application and uncover any potential hazards.

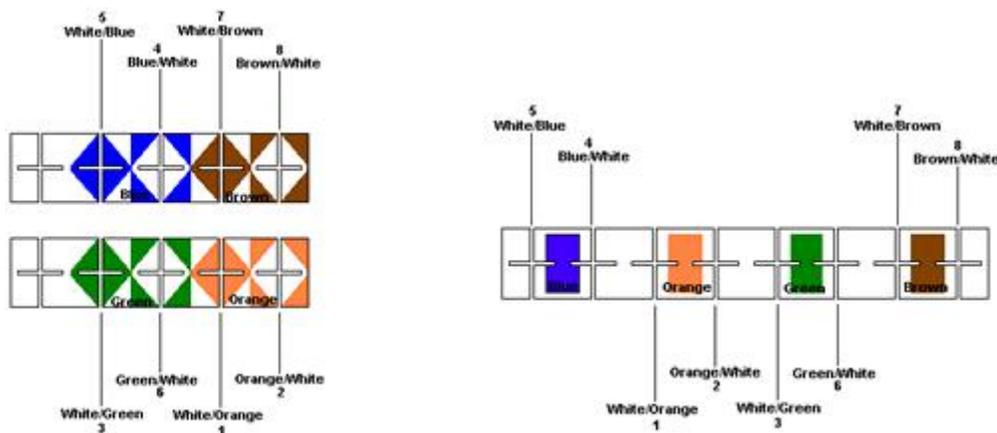
- ✓ Balun performance may be compromised in facilities with excessive RF interference, such as factories with large AC motors.
- ✓ Twisted pair cabling, such as Cat 5, carrying an audio-visual signal should not be run within one foot of fluorescent lights.
- ✓ Twisted pair cabling, such as Cat 5, carrying an audio-visual signal should not be run for more than three feet parallel to high voltage lines. Ideally, twisted pair cables which must cross high voltage lines should do so at a 90 degree angle.
- ✓ Twisted pair cabling, such as Cat 5, carrying an audio-visual signal should not be passively split or routed through an Ethernet hub or switcher. Cat 5 carrying an audio-visual signal may be run through a passive patch bay as long as point-to-point connectivity is maintained.
- ✓ Data, such as computer Ethernet traffic, should not run on the same twisted pair cable as your audio-visual signal.
- ✓ Balun performance may be compromised with excessive jumping and signal conversions. Every time you convert a signal or pass through a connector, there will be some signal loss. Try to maintain a point-to-point connection, or if impossible, use an active product.

19. OUTDOOR CAT5 CABLES: UTP/STP cables are not rated for outdoor use, however it can generally be used without a problem. If possible, run the cable through some kind of conduit to prevent moisture or an attractive site for lightning to strike. You should be able to find gray PVC conduit suitable for cable at any hardware store. Or buy our heavy duty cables seen at <http://www.hdtvsupply.com/cat5-cable.html>

20. SPLITTING HDMI: If you need to split a signal like sending a DirecTV HDMI signal throughout your house you can use CAT5/6 cables for that also. See our HDMI over CAT5/6 splitters at <http://www.hdtvsupply.com/hdtocasp.html>

21. TERMINATING 110-STYLE PATCH PANELS and WALLPLATES: The following instructions should help you to connect your wall plate and/or patch panel with the 110-type punch down connector to your Cat5 cabling. Solid conductors should always be used. Stranded conductors do not always make a good connection.

Never terminate a cable run with 110-type on one end and RJ-45 (modular plug) on the other end. This more often than not will cause problems and does not conform to EIA Category 5 specifications. If you have a wall plate/patch panel at one end of a cable run, you should also have a wall plate/patch panel at the other end of the cable run. If you have an RJ-45 at one end of a cable, the other end must also have an RJ-45.



The above vertical (left) and horizontal (right) diagrams describe the color code for the EIA/TIA 568B standard. If your wall plates/patch panels conform to EIA/TIA 568A standards, simply reverse the green and orange pairs.

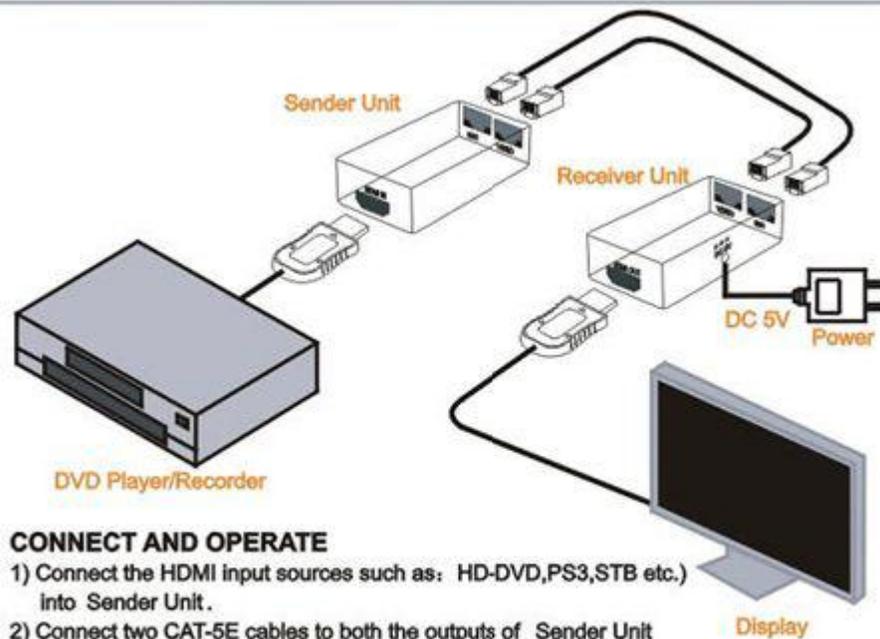
Step One: Strip the outer jacket off of the cable, exposing the colored conductors. You should strip off no more than two inches. Take care to make sure the colored conductors are not damaged. A tool such as the Cyclops wire stripper (CTG ref# 09732) is perfect for this task.

Step Two: Carefully separate the colored conductors. To insure Category 5 performance, you should not untwist the paired conductors more than 1/2 an inch.

Step Three: Carefully place each conductor into the appropriate slot on the 110 block, one pair at a time, and punch them down using a 110-type punch. To insure Category 5 transmission performance, punch the conductors from the center to the outside. Use the above diagrams to aid with the proper placement of the conductors. There are two common types of 110 blocks. Use the diagram that matches your configuration.

Step Four: Trim excess so conductors are flush, and place strain relief caps over the connections. The jacks should now be ready for use.

21. TYPICAL LAYOUT: The below picture shows a typical layout for wiring a DVD player to widescreen TV. It has an HDMI SEND unit, HDMI RECEIVER unit and an AC adapter. We supply HDMI over CAT5 extenders that us one or two CAT5 cables, one or two AC adapters, self-powered w/o AC adapters. Two STP/UTP cables and one AC adapter is used in the below example.



CONNECT AND OPERATE

- 1) Connect the HDMI input sources such as: HD-DVD,PS3,STB etc.) into Sender Unit.
- 2) Connect two CAT-5E cables to both the outputs of Sender Unit and Inputs of Receiver Unit
- 3) Connect the HDMI output (such as : HD-LCD、 HD-DLP)into Receiver Unit.
- 4) Plug the power into Receiver Unit.

22. TESTING CAT5/6 CABLES: Testing CAT5/6 cables the traditional way with ohmmeters, continuity testers, or network testers does not apply with video over CAT5/6 as that type of cable testers are strictly just for networking. They do not test for bandwidth so if you are having a problem you will need to try another cable, hopefully pre-made, tested and purchased from us.

24. 3D HDMI: HDMI 3D signals require products that support a bandwidth of greater than 1080p as 2 – HDMI signal are being sent at essentially 2X1080p.



This means good CAT6 cables must be used when using our 3D HDMI over CAT5 products seen at <http://www.hdtvsupply.com/3dproducts.html>

Many of our HDMI products will support a 3D signal but if you are using UTP or STP you must use a CAT6 cable and set the Blu-ray player 3D to "ON", instead of Auto.

25. CAT5 RECEIVERS – HANDLE WITH CARE: When the CAT5 Receiver is attached to the matrix switch or transmitter unit the CAT5 Receiver is "live" whenever the base is plugged in (even if the device is in STANDBY).



Electrostatic Discharge (ESD) Precautions: The CAT5 Receiver can be

damaged by static electricity. Static problems are the worst when humidity is low. Indoor heating systems operating in winter reduce humidity the air (which is already low when the air is cold), so winter installations are particularly susceptible to ESD, and precautions are even more critical.

In the immediate work area, where the CAT5 Receivers will be installed, remove possible sources of static: Styrofoam, plastic plates or trays, plastic bags or tarps, and similar *insulating* materials.

Before removing the CAT5 Receivers, the installer should touch a ground to discharge any static accumulated and avoid walking around with the receiver in-hand when it is out of the bag. For better protection, an ESD wrist-strap setup may be used.

ESD Handling Precaution – All receivers are sensitive to static electricity. Always carry the receiver carefully and be cautious on carpeted flooring.

Ground Connection - For successful installation of the Cat5 receiver, there must be a valid ground connection. Ensure the AC Outlet is wired properly.

Test all cables for correct wiring with a network cable or bandwidth tester. **Failure to test your cables can damage the module.**

26. What is HDCP Encryption?

HDCP (*high definition content protection*) encryption was created as a deterrent for data piracy, particularly due to the advent of all-digital interfaces such as DVI and HDMI. Most consumer electronic devices with DVI or HDMI connectors are HDCP compliant; however, some consumer and many professional grade DVD players, projectors, and plasmas lack HDCP coding, thus it become important when building a system to research your devices.

If a device without HDCP encryption is connected to a device with HDCP encryption, the picture will be seriously degraded. In most cases, the picture will either be "grainy" or "snowy", or possibly output at a very low level resolution.

General Precautions:

CAT5 Cables: Accidental connection to an Ethernet cable may damage the CAT5 Receivers and/or the network equipment.

The CAT5 cable must have at least 24 gauge wires. Smaller or larger wire may cause problems with the CAT5 Receivers automatic gain circuits. When in doubt, use a high quality cable tester to ensure the proper connections have been made in the wire and RJ45 plugs.

Grounding Problems:

Some CAT5 Receivers have an automatic gain control (AGC) that adjusts for signal loss, due to resistance, over the CAT5. The longer the cable, the more signal loss, and hence more gain is needed. To determine the cable length, the AGC circuit compares voltages at the source (matrix switch) and at the receiver. This depends on having a common reference the matrix and the CAT5 Receivers, such as the earth ground wire in the AC supply circuit.

In the "real world" grounds may be totally compliant with electrical codes, but can still have small fluctuations or differences that affect the CAT5 Receivers performance. In large homes or commercial installations, there may be multiple distribution panels that are varying distances from the ground bond and neutral tie-in. The AC supplied to the equipment rack supply may run off a different panel than the display. Electrical noise due to AC leakage or "noisy" motors, relays, etc. in appliances may appear in the grounding circuits, causing "confusion" in the CAT5 Receivers automatic gain circuitry.

If a CAT5 Receiver has stopped working after a while, it could be that a new, high current device (e.g. window AC) has been added and more leakage current is going through the ground circuit. Small "wall wart" power supplies using switching mode technology may also cause interference (they are typically rated 100-240 VAC).

Symptoms of Ground Problems:

Audio Symptoms:

- Distorted audio
- No audio
- 60Hz hum

Video Symptoms:

- No video
- Slow moving bar in video
- Missing colors
- Very high contrast images

Troubleshooting a Ground Problem: Here are two methods for troubleshooting:

- Take a length of wire (unused CAT5, etc.) and attach it to the matrix or transmitter chassis via one of the rear-panel screws. Attach the other end to the CAT5 Receivers, per instructions. If the problem goes away, you have a grounding problem.
- For TVs with a 3 prong supply plug, use an extension cord from the rack power source to power the TV. If the problem clears, you have a ground problem.

Correcting Ground Problems:

- Run a dedicated wire between the base and CAT5 Receivers.
- Attach an additional wire from the CAT5 Receiver to the chassis of the TV.

Supplementary Information:

ESD Principles: (http://en.wikipedia.org/wiki/Electrostatic_discharge).

Grounding in Electrical Systems: [http://en.wikipedia.org/wiki/Ground_\(electricity\)](http://en.wikipedia.org/wiki/Ground_(electricity))

Ground Loops: [http://en.wikipedia.org/wiki/Ground_loop_\(electricity\)](http://en.wikipedia.org/wiki/Ground_loop_(electricity))

26. HDMI CABLES: This paragraph will help you rule out several factors that can cause no video issues due to the HDMI cables you are using.

- The quality of an HDMI cable can reduce or prevent the video signal from transmitting properly
 - Connect the HDTV and computer through a direct connection
 - Use the shortest HDMI cable length possible to allow for the highest signal transmission quality. The maximum recommended length is 50ft
 - Use the latest HDMI cable version available to ensure compatibility for the highest output quality supported by the HDTV and graphics card. The latest version available for HDMI cables is currently 1.3c
 - Try another HDMI cable to rule out whether the HDMI cable is at fault
- Some HDTV devices require that a computer be connected specifically to a PC HDMI input on the TV in order to allow the highest quality video between the two devices
 - If available, connect the HDMI cable to the PC HDMI input on the HDTV
 - Check the HDTV's manual for any settings that may need to be configured for the PC HDMI input to work properly
 - If no specific PC HDMI port is available on the HDTV:
 - Try connecting the computer to another HDMI input on the HDTV to determine if the input on the TV is bad
 - Try connecting the HDTV to another HDMI input on the computer to determine if the input on the computer is bad

3. A defective graphics card can prevent the desired HDMI audio device from working correctly
 1. Try to connect another HDMI capable device to the HDTV using the same cable and input to rule out any issues with the HDTV

We hope the above have helped you with your high definition installation. If you follow the above instructions and have a question reply to this email, send us a message at <http://www.hdtvsupply.com/info.html> or email us at the below with YOUR ORDER NUMBER.

Thank you for your purchase,

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Engineering Department

www.hdtvsupply.com
support@hdtvsupply.com

This WORD document is located at <http://site.hdtvsupply.com/cat5.doc>