Vigitron IP Infrastructure Design Educational Series

Do You Believe in Specifications?

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Manufacturer's product specifications are the main source of determining product purchases for video security users. In many cases, the ability to pre-test a product under the actual operating conditions is almost impossible. Often, the choice is between several different product manufacturers. The time and the expense it would take to install and evaluate each one in the actual application would be cost prohibitive. Some product categories have advantages. A camera's low light capability can be somewhat evaluated by decreasing the input light in any location. A VMS system can be evaluated by operating it under review or test program. The selection can be based on a matter of opinion. For the camera, the opinion is based on the user's view of quality. For the VMS, the opinion is based on how comfortable the operations are.

None of this applies to transmission products. The ability of transmission signals is a matter of physics, which is usually black and white. No manufacturer tries to use specifications which are untrue. However, your misreading can lead to making the wrong selection. With this uniqueness applied to transmission products, it is a good idea to go beyond the product specifications and also review the product's operating manual. What specifications are not included? Taking these additional steps can reveal factors that have substantial effects on your system performing as expected.

Let's start with a network switch. Its specification indicates a port speed of 1Gbps and the ability to handle jumbo frames with packet sizes up to 9600 bytes. However, what you have overlooked is the connection from the network camera requiring a port speed of 100Mbps and the misalignment of port speeds leading to the dropping of frames. At a 100Mbps, port speed packet sizes are limited to 1518 bytes. Potential video quality problems can exist with cameras greater than 3 megapixels.

Vigitron network switches provide the ability to program each port individually at 100Mbps up to the Jumbo Frame limit of 9600bytes, compatible with the highest megapixel cameras.

The switch specification states a port power of 30 watts compliant to 802.3at, but it doesn't state that all ports can provide 30 watts at the same time. The likelihood is that it cannot. The statement is true. However, the network switch may still not meet your application requirement.

Vigitron network switches clearly state their PoE budget separate from their operating power. They provide Class 3 PoE at 15.4 watts on all ports, and up to 6 ports at 802.3at at 30 watts for the Vi3010, and 12 ports at 30 watts for the Vi3026.

The switch specifications provide a figure for operating power. If you divide the number of ports or the number of ports needed to provide PoE, you can determine if there is enough power for your application. True, but maybe you haven't taken into account the power required to operate the switch. Not all switch manufacturers provide both a total power specification and a separate PoE budget. To determine if the switch will meet your application requirements, you need to focus on the PoE budget. If the manufacturer doesn't provide specifications, the safest approach would be to use 75% of the specified power and divide it by the number of ports.

If you've applied an operational power overhead to the switch and it still doesn't provide the port PoE power you needed during the actual operation, then the reason might be the switch's operation with regard to how PoE is applied. This may not be included in the product specifications. The switch may only provide the ability to turn on and off all the ports, or it may divide PoE equally between all the ports, or it may only apply PoE based on port priority.

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From the switch, we move to the transmission medium. Please note that all specifications are based on the IEEE transmission standards using UTP cable Cat 5 and above. If your application has to use Cat 3 cable and the product specifications doesn't show a Cat 3 specification, please check with the manufacturer. For any application that transmits over distances greater than 328 feet or on medium other than Cat 5, you are dealing outside the normal specifications and performance is only based by the equipment manufacturer. This is where things start to get complicated.

The manufacturer may claim that their product transmits at 100Mbps, but they did not specify if it's 100Mbps in both directions or if it's 50Mbps in each direction. However, the statement would still be true in both cases. The manufacturer may claim an operating distance of 5,000 feet, but they did not specify anything in regard to the bandwidth. They may omit the available bandwidth at the highest stated distance. Even if that bandwidth is only 1Mbps (a level that would not pass most IP cameras), the statement would still be true. The specification does not state the ability to handle jumbo frames. Keep in mind that most networking products are tested and performance claims are made based on the ability to handle 64 byte, a figure that doesn't come close to the lowest video packet size of approximately 1024 bytes. These could be embedded in any number of specification claims. The question to you should always ask is what packet size are they basing their claims on?

Vigitron extenders are tested and certified for providing 100Mbps for distance up to 1,800 feet over coax and up to 2,000 feet over UTP at 9,600 jumbo frame packets.

When it comes to large systems that use multicasting, bandwidth and packet size become even more important aspects. These cameras and video management systems features help reduce bandwidth when dealing with large groups of cameras. It's important that the system bandwidth must be at least 100Mbps and must be maintained throughout the transmission distance. Decreases in bandwidth will render multicasting inoperative.

Vigitron extenders have been tested, approved, and installed in major installations that require multicasting due to their ability to maintain bandwidth throughout their extended transmission operation.

The same approach applies to PoE. The specifications may state that it provides 802.3af power, but it may not specify what class? Please note that PoE power is defined in classes. Each classes has a range of power. That statement is still true, even if the power at the longest distance is under 4 watts. If the specification states the extender is capable of 802.3at power, that statement is true if the power level exceeds 15.4 watts. It doesn't have to be at any power level above that. As long as the power at the end of the longest distance meets the lowest figure of the specification itself, it is still true even if it fails to properly power your camera. You should always ask what power level within a PoE class does the product actually produce.

Vigitron specifications for distance transmission clearly state the operating PoE at 802.3af Class 2 (15.5 watts source) 6.49 watts at camera, Class 3 (15.5 watts source) 12.95 watts at camera, and 802.3at Class 4 (30 watts source) 25.5 watts at camera for all quoted distance to assure you of the available power at the distance you require.

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Now, let's discuss the actual cable. If the extended medium is UTP, always question if the associated specifications are based on Cat 5e or Cat 6. Cat 5e is more commonly used and Cat 6 has better performance characteristics. Also, don't assume the performance specification stated for unshielded twisted pair is the same for shielded twisted pair. Each has very different characteristics which could affect both the bandwidth and the power transmission. When it comes of single pair, twisted or untwisted, or coax, there simply are no standards for IP and PoE transmission. It is important to understand the association between the stated specifications and the cable you required. In most cases, conversions of existing analog video security system to IP will involve standard RG-59 cabling. There are several different types of cable resistance when using RG-59 cables. Fortunately, most of the common cable used will have a cable resistance that closely matches that of Cat UTP used for determining 802.3 performance. However, there are exceptions. Often, you may find a manufacturer stating the coax maximum distance performance based on either RG-11 or RG-6 coax cable. The main reason for using coax to Ethernet extenders is to avoid pulling out cables and to avoid the associated costs. It would make no sense if you have to replace the cable in order to achieve your distance goals.

Vigitron specifications are based on commonly used cables that match the standard cable resistance used for IP data and PoE transmission. You don't need to replace existing cables in order to achieve the longest video and PoE transmission.

In an ideal installation, you should be able to use the existing power from a PoE network switch. Always remember to ask what power source is the performance specification based on. In some cases, the ability for a cable extender to achieve its stated maximum distance is based solely using its own power supply at an extra cost. It may also require that the extender at the camera location have a power supply, creating an additional costs for the power supply and the need of a outlet. However in both cases, statements relating to the distance and the ability to provide a particular, usually high, power level are true.

PoE over coax becomes a complex subject when it's applied to the need for 60 watts. Physics dictate that the higher the power level, the shorter the distance. In addition, coax has more a resistance to power than UTP (Ethernet). In most cases, the actual ability to transmit 60 watts over coax is a very short distance with the rest of the product carrying either multiple ports of 30 watts or a combined port of a value over 30 watts on Ethernet cable. However, the statement of "We can transmit 60 watts over coax" remains true. It just overlooks the distance of the practicality of your actual applications.

Vigitron products maintain the safety standards required to assure your products and the environment they are installed in will be safe from any fire potentials due to overheated cables.

What about temperature? Most transmission product specifications will have an extended temperature rating. It is a consideration of products installed in extreme environmental conditions. How was that specification obtained? Is it based on actual product testing or is it taken by the rating of the individual components? The latter proves nothing. This is particularly important if the product in question requires a local power supply. Most extended distance products are compact. If local power sources are required, it will speed up internal component deterioration, shortening the operating life.

Pass-Through-PoE (PTP™) eliminates the need for local power supplies and outlets, while reducing internal temperatures and providing for operation ranges of -40C to +75C. This lowers the potential for component failures. Vigitron products are temperature tested and certified under NEMA-TS conditions.

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Latency or cable delay may have an important effect on how you viewed your camera. It is especially critical if your system includes PTZ, as the action of moving the joystick should closely follow the camera movement response. How a cable extender achieves its function is important. Some manufacturers reconfigured the transmitted packets at the control site and re-established them at the camera site. This is similar to the process of encoding and decoding video. This is often noted when an extended system has a separate transmitter and receiver. This process not only requires a lot of power, but also injects a signal delay to the point resulting in PTZ positioning problems.

Vigitron products have a latency of only 4.9us, compared to 10ms for products that subject signals to packetizing. This can make a significant different in viewing and recording, especially where the PTZs are used.

Furthermore, there is the subject of multiple channel extended bandwidth and PoE transmission. From an installation standpoint, this can lead to substantial cost savings. However, the key is to look beyond the stated specification. In most cases, we are dealing with four channels. The logic is simple and effective in providing the ability to transmit four IP cameras on single Ethernet (UTP) or coax cable. The specification may state the bandwidth is 100Mbps. Ask if the specification applies to each of the four channels or the system as a whole. If it's the latter, then each channel has a maximum bandwidth of only 25Mbps. Keep in mind that the IP packet transmission takes up to 50% or greater of this bandwidth with packet overheads. This reduces the usable per channel bandwidth to 12.5Mbps, a level that can be important when attempting to transmit high megapixel cameras and high frame rates. The same applies to PoE. If a single power source is used, it is also divided by four.

Vigitron multiple channel units provide a full 100Mbps for each port providing the maximum bandwidth transmission.

One of the most important specifications that is usually unaccounted for relates to switching. Any time you've considered transmitting more than one camera on a single path, there is a potential of camera transmissions conflicting with each other. If a product transmitting multiple cameras on a single path doesn't include references to switching specifications, you are most likely dealing with a hub. The differences between a hub and a switch can be illustrated by looking at four way intersection. The hub is an intersection with no traffic lights or stop signs. Each car proceeds across the intersection once they've reached it. A switch has regulation in the form of either stop signs or traffic lights. In the case of a hub (or a car in this case), a transmission from a camera will not make it across. To identify the product as a switch, look for claims of layering.

Vigitron multichannel are complete Layer 2 network switches providing all the benefits, security, and transmission of multiple channel via a single cable.

What does compliances to specifications really mean when it comes to transmission specifications? Does it mean operating under several different conditions that must all be true at the same time? Or does it mean that only part of the part of the system such as the Ethernet port itself is capable of handling a particular bandwidth or PoE power level? When dealing with transmission products, the answers are often left to the readers. More than often, a valid assumption turns out to be the opposite in a practical operation. The result becomes system removal, numerous service calls, back and forth blame between different manufacturer component within the same system, and worse, the loss of functionality on the part of the user and credibility on the part of the dealer. Taking the time to review product specifications, calling the manufacturer to address areas that are unclear, and even asking the manufacturer to provide test result and descriptions of test methods are less costly and time-consuming than the alternative.

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Vigitron specifications are supported by certified testing. In addition, Vigitron works with major IP camera manufacturers to conduct interoperational testing assuring you of exacting installed performance reducing the potential for system downtime and costly in field service calls.

Vigitron offers free and without obligation design center service to provide the most cost effective and reliable infrastructure solutions. The Design Center is staffed by trained engineers providing individual attention to your system requirements. The Design Center can be accessed by clicking here or by contacting Vigitron at support@vigitron.com.

Suggested Vigitron Product(s):

Vi2300 / Vi2400 Series

Single Channel UTP and Coax Extenders

Vi2300A

Vi2400A

Vi2301A

Vi2401A

Vi2516 / Vi2616

High Powered PoE Managed Midspan with Built-in Coax and UTP extension

Vi2516

Vi2616

Vi3002

74 Watt Inline IP / PoE Repeater

Vi3002

Vi2804AP / Vi3005

Layer 2 PoE Powered Network Switches with Pass-Through-PoE™ for Remote Camera Power

Vi2804AP

Vi3005

Vi3026

High Powered, High PoE Network Switch Designed for IP Video Security Applications

Vi3026

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