EDID HANDLING WITH ANALOG SIGNAL DISTRIBUTION

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APRIL 2010

KRAMER WHITE PAPER

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In an Industry Full of Acronyms, There are a Few That Stand Out Over The Rest

In today's world of widescreen displays with fixed resolutions, this one is certainly at the top of the list: **EDID** - which stands for **E**xtended **D**isplay **I**dentification **D**ata. EDID is a data structure indicating the capabilities of a display that is communicated to a computer graphics source.

It seems many articles are written about the necessity of EDID when using digital HDMI and DVI signals; however, usually these articles tend to leave out the critical role it plays when using analog signals in a system. The goal of this article is to show the importance of EDID, describe the symptoms when EDID is not available, and provide insights into corrective measures to restore it. So if you've got a comfortable seat… let's begin!

To understand what the EDID is and how it works, let's start by looking at the history of analog computer graphics video. Computer graphics video signals originally used a crude set of ID bits on pins 4, 11, and 12 to sense whether the display was color or B&W and higher or lower than XGA (1024x768) resolution. Before long, a more sophisticated means of one-way serial communication was adopted called the Data Display Channel or DDC, which allowed the monitor to communicate its needs to the computer graphics video source. Later improvements lead to the current EDID standard. EDID data, which can be thought of as "the train," travels on the DDC channel (pins 12 & 15 of the HD-15 connector), which can be thought of as the "the tracks." This new standard uses a bi-directional I^2C bus for identifying 128 bytes of data that describe different parameters of the display device, including information such as the model number, serial number, manufacture date, native resolution, timing, color space, audio capabilities, and more.

So you might say…that's nice, but so what?

Well, the all important "so what" with EDID is that widescreen monitors today do not follow any type of timing standard, and they are all now fixed resolution displays with specific, and often differing native resolutions. Gone are the good old days of variable resolution CRTs, a time when the most common resolution, XGA, always seemed to work just fine on any display.

Let take a closer look….

Today, when most people mention a computer graphics video resolution, they describe it in viewable or active pixels, such as 1920x1080. However, there is more going on in a computer signal than the number of active pixels being sent (See Figure 1). In the past, active pixels alone were enough to describe a resolution, because they referred to an existing industry standard. Resolutions like 1024x768 and 1600x1200 were in this category. Every monitor that supported 1024x768(XGA) supported the exact same pre-defined standard version of XGA. When you chose 1024x768 as your output resolution, every computer outputted the same standardized version of XGA. This made all devices automatically compatible with each other. Today's rapid acceleration toward High Definition and widescreen display devices has pushed aside standardization. Reliance on communication between the display and source, the "handshake," has become vital.

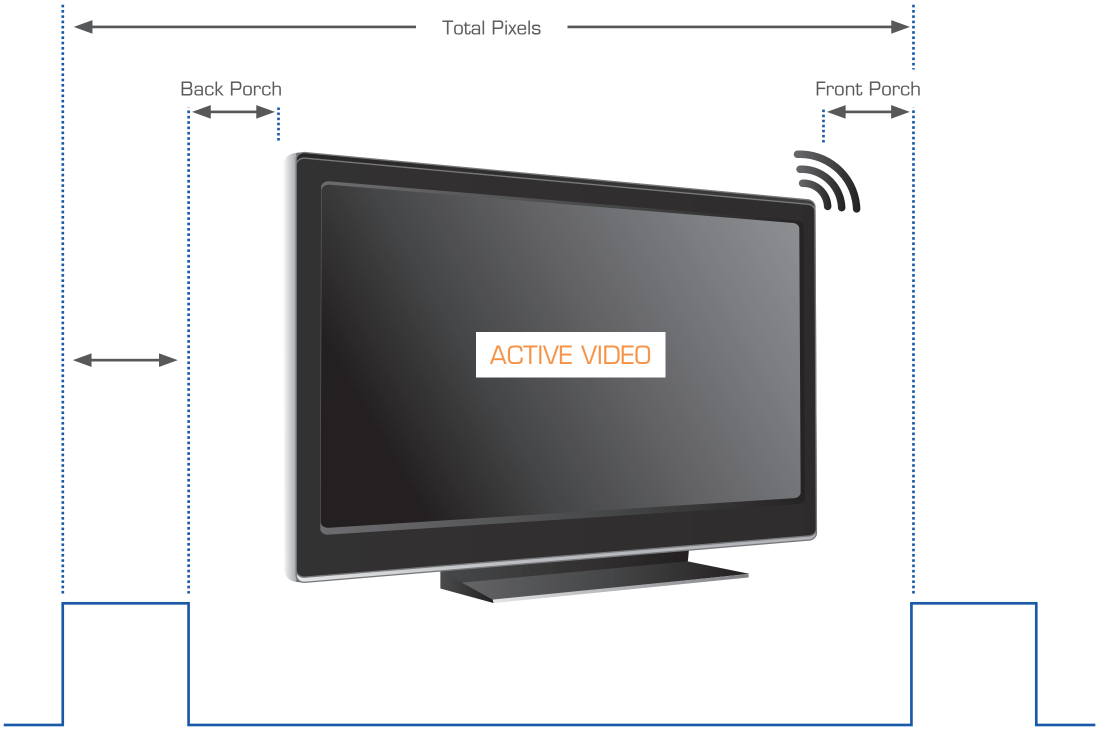


Figure 1: Make-Up of a Computer Resolution (Horizontal Only)

Figure 1 illustrates that a resolution is made up of much more than just the active pixels. Every resolution has a large set of parameters that must all be met in order to achieve a perfect image. Through its EDID, a display communicates all of these parameters to the source. The EDID can be displayed in what is called a mode line. The following is an example of one possible mode line for a 1024x768 signal:

Detailed timing #1............. 1024x768p at 60Hz (4:3)

Mode line.............. "1024x768" 65.000 1024 1048 1184 1344 768 771 777 806 -hsync –vsync

Beginning with 65.000 (the pixel clock for this resolution), the first four numbers describe the horizontal timing, the next four numbers describe the vertical timing, and finally the polarity of the sync pulses are indicated. Remember, if displaying XGA is your goal, this EDID mode line is overkill because every display and every computer support the same standard XGA mode line.

Knowing that the standardization problem exists mostly in widescreen resolutions, let us look at an example using 1920x1080. These mode lines came from the EDIDs of the computer graphics video inputs of different 1080p monitors:

Monitor 1 – LG LCD

- Detailed timing #1....... 1920x1080p at 60Hz (16:9)
- Mode line.............. "1920x1080" 148.500 1920 2008 2052 2200 1080 1084 1089 1125 +hsync +vsync

Monitor 2 – Westinghouse LCD

- Native/preferred timing.... 1920x1080p at 60Hz (16:9)
- Mode line.............. "1920x1080" 138.500 1920 1968 2000 2080 1080 1082 1087 1111 +hsync -vsync

Monitor 3 – Samsung LCD

- Native/preferred timing.. 1920x1080p at 60Hz (16:9)
- Mode line.............. "1920x1080" 138.500 1920 1968 2000 2080 1080 1083 1088 1111 +hsync -vsync

Monitor 4 – Panasonic Plasma

- Detailed timing #1....... 1920x1080p at 60Hz
- Mode line.............. "1920x1080" 148.500 1920 2008 2052 2200 1080 1084 1089 1125 -hsync –vsync

Monitor 5 – Vizio LCD

- Native/preferred timing.. 1920x1080p at 60Hz
- Mode line.............. "1920x1080" 136.500 1920 1952 1984 2048 1080 1081 1084 1111 +hsync +vsync

You can clearly see that while all these monitors claim to be 1920x1080 monitors, they each support a different version of 1920x1080. It is also clear that describing active pixels alone is not specific enough to define a resolution. Display manufacturers have taken to producing non-standard displays, because the specific timings are completely described in the EDID of the monitors they build. When a computer is connected directly to any of these monitors, the mode line is read by the PC and automatically the PC modifies its output to comply properly with that display.

What happens if that EDID is not present?

When the EDID of the display is not available to the PC, the computer graphics card decides on its own what to output to the monitor. Since no standards exist in monitors, no standards exist for computers either. Most often, the computer outputs a version of 1920x1080 that does not match the mode line of the specific monitor attached. This results in a picture that is not sized correctly on the display with the most common complaints being, "I can't see my toolbar" or "My picture is severely shifted to the left or right." Other results include no picture at all, or error messages that display, "Mode Not Defined" or "Invalid Mode."

When no EDID is available, some computers only provide a short list of output resolutions for the customer to choose from. This short list is comprised of standardized resolutions such as XGA and may not even include your desired native resolution. With no EDID, the computer becomes the master, the display becomes the slave, and incompatibilities result because the display cannot adapt to every mode line it may receive. However, with EDID, the display becomes the master and the computer changes its output to match the mode line of the display, thus creating a perfect plug-and-play environment.

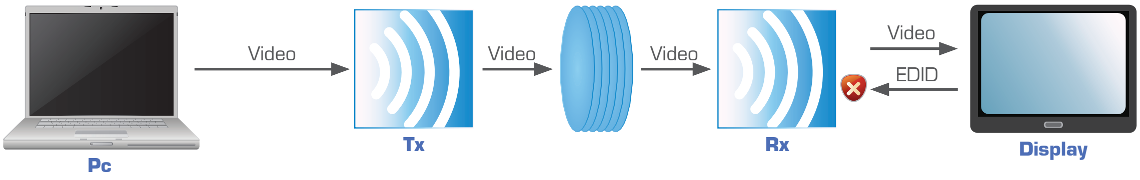
In the ProAV industry, DDC pins 12 and 15 (which carry the EDID) are not passed in many applications, such when RGBHV 5-wire cable is used. Touted as the best way to send a computer signal over any distance, it has the fatal flaw of not passing the DDC pins and therefore the EDID information. While it is still the best “pipeline” over which to send a signal, 5-wire cable does not ensure that the correct signal is being sent. A few applications that do not consider EDID include; twisted pair transmitters and receivers, distribution amplifiers, switchers and matrix switchers. Due to the critical importance of EDID, manufacturers like Kramer are beginning to build computer graphics video products with EDID support built-in, as well as standalone products to help manage EDID in systems that employ these other signal management tools.

Here are some examples…

The Kramer VA-1VGAN is an EDID emulator that is designed to capture EDID information from the monitor and make it readily available for the computer no matter what type of cable or other challenges are present in the installation. The VA-1VGAN will capture, in non-volatile memory, the resolution, the mode line, and all detailed timing parameters, in turn making an exact copy of the EDID information stored in the monitor. In applications, such as those involving the use of RGBHV matrix switchers, where EDID information will not travel from the display to the source, the VA-1VGAN can be used to emulate the handshake necessary for the computer to output the correct resolution and timing parameters.

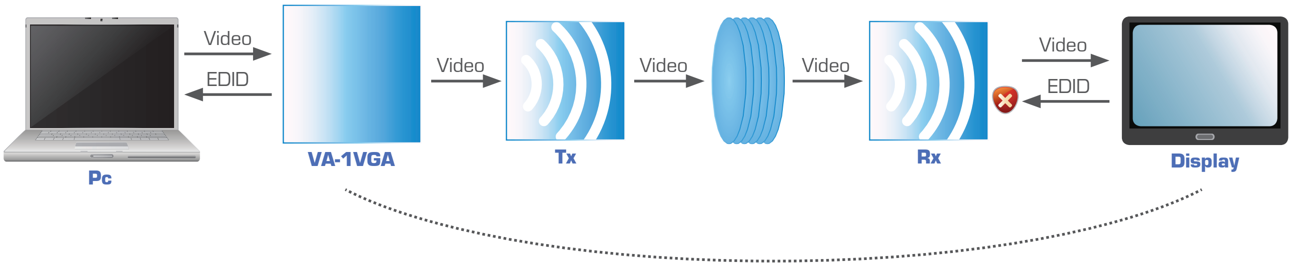
Many twisted pair transmitters and receivers are guilty of causing the same issues. By not passing EDID information from the display back to the source, your computer will be left guessing what resolution it is expected to output. See the example below…

The Problem

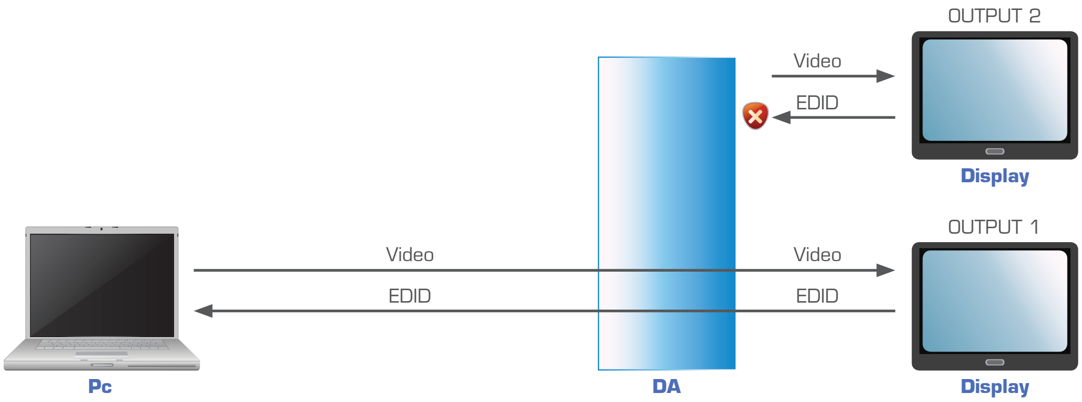


Our solution comes in the form of our VA-1VGAN. Using the VA-1VGAN we store the EDID information from the display device to the input of our VA-1VGAN. The VA-1VGAN is then placed directly after the PC so that when the computer is connected it sees the EDID just as it would if it was connected directly to the display. Now that our computer graphics card has the appropriate EDID information and timing parameters, it can create the exact native resolution of our display ensuring a perfect image despite still travelling through our twisted pair solution. This solution can be adapted to any application where EDID may be lost due to cable type or the lack of EDID compliance in specific ProAV products.

The Solution



EDID emulators are a much desired solution when there are cables or devices present that do not have any type of EDID handling. As the industry recognizes the importance of EDID, products are now being developed that take into account how EDID is handled. For example, new distribution amplifiers (DAs) allow EDID information to be passed back from one of the outputs whereas older DAs cut the DDC pins before entering the DA. See the following example. The latest Kramer, 1:2 computer graphics video DA, the VP-200K, now allows EDID information to be passed back through the DA from the display device connected to output 1.



In a solution like this one, we do not have issues with the lack of EDID and getting a correct picture does not require the use of an EDID emulator. Though, in an application like this one, monitor selection for output one is very important. A computer graphics card only has the ability to output one resolution at a time. Therefore, if EDID information is only being passed back from output 1, we need to connect a monitor whose EDID is acceptable to all of the monitors connected to the DA.

In an ideal world, all the display devices connected to the DA would be the exact same make and model, use all the same EDID information, and any one of the monitors could be connected to output 1. In the real world, it is not uncommon to have any number of different monitors connected to the same DA. In this case, we must choose the display we connect to output 1 carefully.

Let us explain further. In its simplest form, let's say we have four monitors connected to a DA with the following native resolutions: 480P, 720P, 1080i, and 1080P. When using a DA similar to the one above that passes EDID information from output 1 we must choose the 480P monitor for output 1. Choosing any one of the other displays would feed back EDID information to the computer that would cause it to output a resolution that would not be understood by the 480P monitor. If this monitor is removed from the application, the 720P monitor could be connected to output 1 and still satisfy all the displays connected.

In conclusion, providing the correct EDID information to a graphics card is critical to successful system design and operation. Whether that is accomplished via a standalone product like Kramer's VA-1VGAN or via a product with this circuitry built in, it is imperative to have the proper EDID handshake in every application.

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