



EXPERTS
GROUP

DVLED DISPLAYS AND NORTH AMERICAN CERTIFICATIONS AND STANDARDS: LET THE BUYER BEWARE!



Written by:

Alan Brawn, CTS, ISF-C, DSCE, DSDE, DSNE, DCME, & DSSP & Brawn Consulting

WHITEPAPER

Overview of the LED marketplace issues that may impact: regulatory issues, performance and serviceability, and total cost of ownership. Let the LED Experts Group help find the “perfect fit”



E X P E R T S
G R O U P

The title of this white paper is intended as an admonition for buyers of direct view LED (dvLED) displays to be aware (from the outset) of issues that may impact them: regulatory issues, performance and serviceability, and total cost of ownership. Unlike in a big box store buying a consumer-grade flat panel display, there are layers of research and proper due diligence that must be addressed to make the best dvLED decision for your application.



The dv LED market is growing exponentially in both outdoor and (most significantly), indoor applications. As dvLED pricing is moderating and becoming more accessible and understood, sales are becoming more pervasive... but also more complex. Historically, end users buying large outdoor displays would work directly with manufacturers. With the expansion into fine pitch indoor products, we are increasingly seeing dvLED provided through resellers and systems integrators to an expanded end user community with unique needs.

Pursuant to the measurable increase in demand, we see a literal wave of dvLED manufacturers and suppliers attempting to fill this newly created void. This rush to market by a plethora of unknown providers is a key factor in the complexity and confusion we are seeing. It is a fact that most dvLED products are produced in Asia. This is true for the LED diodes as the core component, as well as the assemblies and modules that make up the full displays. According to Made-in China.com there are over 2,000 manufacturers and over 6,000 products that fall under the heading of dvLED displays. It is not difficult to see where the confusion might lie, in terms of selecting a product for your applications. There are huge differences in the discrete LED diode itself, and even more so with the end products from the manufacturers that fall into this category.

Manufacturers range in size from truly tiny operations with a few people, all the way up to full factories with manufacturing, testing, and quality control. What further complicates the manufacturer selection process is that one product may look like another on the surface, with the "apparent" difference being pixel pitch. Suffice it to say that appearances can be deceiving.

As noted, there are numerous types and sizes of companies that consider themselves dvLED display manufacturers. Sorting out one from another is difficult, but a good place to start is qualifying as part of a manufacturing management standard. A quality management system (QMS) is a set of policies, processes and procedures required for planning and execution (production/development/service) in the core business area of an organization. (i.e., areas that can impact the organization's ability to meet customer requirements.) ISO 9001 is an example of a Quality Management System. It is an internationally recognized Quality Management System and is the only standard that requires certification.

A second sorting out of vendors is to look for those that exceed the ISO 9001 standards. Beyond meeting the minimum standards are those that go above and beyond in terms of quality. For those select few, this directly relates to overall design, increased mean time between failure (MTBF), redundancy, and serviceability.

The design of the display is about much more than pixel pitch. Design also refers to the panel configuration, power supplies and electrical connections. This also speaks to ease of serviceability. To the first order, this establishes how serviceable the design is and how easy is it to access replaceable



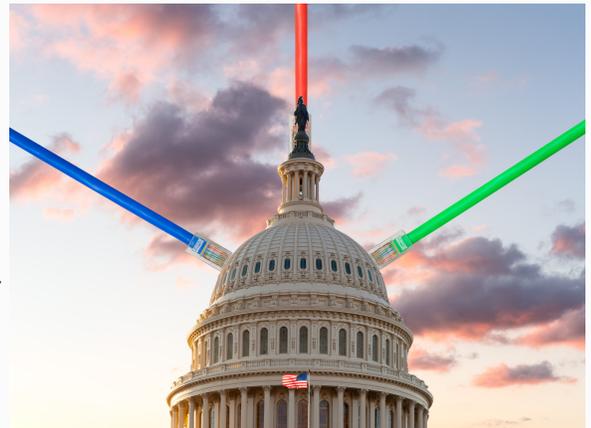
EXPERTS
GROUP

components, and finally how much time is required to conduct maintenance. One major part of the service issue is whether full service to the component level is available in country with authorized service centers and a full complement of spare parts. It is also critical to understand what the typical turn-around time is. This falls under mean time to repair or MTTR.

One potential dealbreaker in the list of items to consider, is whether a product meets applicable regulations and standards. This is often assumed as being in order, and that some regulatory agency has checked to make sure that all is correct and approved... the key word (and warning) is assumed.

Products being brought into the USA must meet certain standards, and many are (seemingly) done in the factory at the manufacturing and testing levels during quality control. While there are other standards you will see touted by manufacturers like the CE mark in Europe, and others around the world, here is a list of North American standards and codes with proper testing and certifications that are met by quality manufacturers.

- Federal Communications Commission (FCC) is an emissions and interference compliance standard.
 - The Federal Communications Commission regulates interstate and international communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia and U.S. territories. An independent U.S. government agency overseen by Congress, the Commission is the federal agency responsible for implementing and enforcing America's communications law and regulations.
 - The FCC Code of Federal Regulations (CFR), Title 47 Part 15 Class A regulates unlicensed transmissions and "spurious emissions" to unlicensed low-power broadcasting.
 - Nearly every electronics device sold inside the United States radiates unintentional emissions and must be reviewed to comply with Part 15 before it can be advertised or sold in the US market.
- Underwriters Laboratories (UL) is a safety compliance standard.
 - UL performs product safety testing with the goal of improving employee and consumer safety. It is an independent, third-party, non-profit organization, UL has no stake in the products they test. Their seal of approval, therefore, is unbiased. UL approval offers assurance that the safety and performance claims behind a product have been thoroughly verified by a third party. UL is also an accredited standards developer per the American National Standards Institute (ANSI) in the U.S. and Canada, setting industry standards for manufacturers that innovate new products.
 - UL Standards are used to assess products, test components, materials, systems, and performance. Example issues considered:
 - Product has the wrong solder or inferior solder, or no solder used at all.
 - Circuit boards made of inferior materials that deform under extreme heat or cold or a combination of both.
 - Power cables that are not up to specification or not up to standard, or incorrectly assembled.





EXPERTS
GROUP

- Data cables made from inferior materials or incorrectly assembled or connected.
- Leaking assemblies.
- Missing grommets.
- Exposed wires and components.
- Foreign matter used for seals that quickly disintegrates from the elements where protection from the elements is crucial.
- Two significant standards for the LED industry are UL-1950 and UL-60950 which addresses construction and performance criteria with the intent of reducing the risk of fire, personal injury, and electric shock.
- Intertek (ETL Mark) is a testing compliance to safety standards.
 - Intertek is a Nationally Recognized Testing Laboratory (NRTL). NRTL labs are independent laboratories recognized by the Occupational Safety and Health Administration (OSHA) to test products to the specifications of applicable product safety standards. An NRTL's function is to provide independent testing and certification of any electrically operated product.
 - The ETL Mark is proof of product compliance to North American safety standards. Authorities Having Jurisdiction (AHJs) and code officials across the US and Canada accept the ETL Listed Mark as proof of product compliance to published industry standards.
 - List of Standards tested to for the North American Market (USA, Canada, Mexico):
 - ASME
 - ASTM
 - ANSI
 - CSA
 - NFPA
 - NOM
 - NSF
 - UL / ULC
- Norma Oficial Mexicana (NOM)
 - NOM is a set of standards and legal enforcement documents that regulate the products, processes, and services that could pose a safety or health risk for people, animals, plants, or the environment. Most products imported, stored, transported, commercialized, sold, or used within Mexico must comply with these official Mexican standards, regardless of if they have previously been certified to U.S., Canadian, or other international standards. Testing can be conducted by a laboratory outside of Mexico, only if it holds a mutual recognition agreement, which has been approved by the Mexican General Directorate of Standards (DGN).
 - NOM outlines the minimum safety requirements that an organization and its product, including the method of production, must meet. There are also requirements related to the packaging and materials such as commercial information and labeling that must also be observed. For electronics or electrical products, relevant energy efficiency standards may also be required.





E X P E R T S
G R O U P

- NOM requirements for electrical and electronic products include:
 - Safety requirements (certification)
 - Energy efficiency or Sustainable Energy Use Law (LASE) declaration
 - Electromagnetic Compatibility (EMC)
 - Commercial information requirements (packaging)
 - Homologation
- All applicable products entering the Mexican market must be compliant with these regulations and receive a NOM mark, including exports that were once allowed into the country prior to these standards.

Much of the testing and compliance of all the above regulations is conducted by the manufacturers at their respective facilities, often with their own selected third-party testing verification. When done within the scope of work of each regulation, they are intended as a guarantee that a product is safe and that it adheres to the dictates and limitations of a given standard. While each standard has their own degree of complexity, it is the nebulous nature and lack of proven compliance of the FCC standard that prompts this article and the admonition, let the buyer beware. We will work from the top down and build the case for this concern.



The FCC Chapter I Telecommunication 47 Code of Federal Regulations oversees the management of the radio spectrum in the US. One of the mandates of the agency is to protect against “radio and broadcast pollution” and it regulates electromagnetic interference (noise) sources. This is a huge concern in the digital age. Let me explain.

Electromagnetic interference (or EMI) is the disruption of operation of an electronic device when it is near an electromagnetic field in the radio frequency (RF) spectrum that is caused by another electronic device. The concern and propensity for noise is when RF signals are in the vicinity of one another. One intrudes on the other. Going back to the laws of physics we know that as electric current moves around inside an electrical product, the current will produce electromagnetic field waves that will travel through space. All electric and electronic systems and equipment generate signals that could potentially interfere with the normal operation of another nearby piece of equipment. Also, EMI can degrade the performance of equipment, introduce errors or operational faults, or even cause complete failure.

Specific FCC regulations apply to any electrical and electronic products that do (or may) produce radio frequency pollution or EMI. There are two main product categories that are covered: “Intentional Radiators” and “Unintentional Radiators”. Unintentional radiators



E X P E R T S
G R O U P

As the term suggests, an intentional radiator is a device that is intended to emit radio energy. This includes, among many other products, Cell phones, Tablet PCs, Wi-Fi routers, Walkie talkies and Bluetooth headsets – essentially any item whose operation depends on transmitting radio waves. Compliance with FCC regulations is mandatory when importing products classified as intentional radiators and must therefore undergo an equipment authorization procedure.

Unintentional radiators are a bit more complex and not as obvious to the casual observer. An unintentional radiator is, as defined in 47 CFR 15.3, any electrical device “operating at over 9000 pulses per second (9 kHz) and using digital techniques”. This definition includes most electronics containing a chip, even if the device is not equipped with a Wi-Fi or Bluetooth transmitter. Unintentional radiators are also electronic digital or radio devices that produce radio signals that are not central to their intended use. For our purposes, this section includes LED or digital signage. The FCC requires that any electronic product covered by their regulations undergo an “equipment authorization procedure”. It is important to note that it is illegal to import, sell, or lease equipment that is FCC regulated that has not undergone the required equipment authorization procedure. The penalties are not insignificant. The stakes are high when importing electronics to the United States. So, what could happen if you are caught importing non-compliant electronics? Below is a summary of non-compliance penalties:

- a.) If the FCC finds that you have willfully or repeatedly violated the Communications Act or the FCC Rules, you may have to pay as much as \$10,000 for each violation, up to a total of \$75,000. (See section 503(b) of the Communications Act.)
- b.) If the FCC finds that you have violated any section of the Communications Act or the FCC Rules, you may be ordered to stop whatever action caused the violation. (See section 312(b) of the Communications Act.)
- c.) If a federal court finds that you have willfully and knowingly violated any FCC Rule, you may be fined up to \$500 for each day you committed the violation. (See section 502 of the Communications Act.)
- d.) If a federal court finds that you have willfully and knowingly violated any provision of the Communications Act, you may be fined up to \$10,000 or you may be imprisoned for one year, or both. (See section 501 of the Communications Act.)

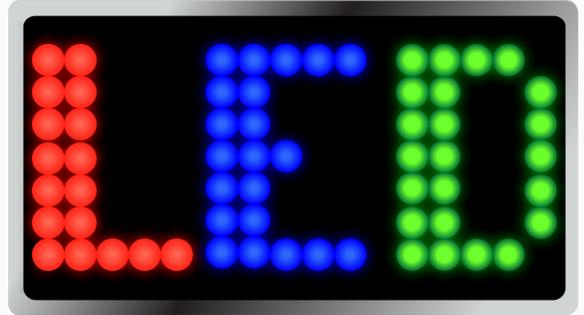
There are two people responsible; the person that buys it from China and End-User that installs it.

Per the FCC regulations on unintended radiators of EMI, manufacturers must comply with the radio pollution limits and equipment authorization procedures. Herein lies the problem. There is no FCC verified compliance certificate before a product is brought into the country. As one observer pointed out, it is an “honor system with teeth after the fact” if a product is found to not comply. This self-directed testing program mandates that digital signage must be independently tested and verified according to FCC standards to be compliant. The manufacturer is responsible to archive the test procedures and results and are asked to produce this if non-compliance comes into question.



EXPERTS
GROUP

This now falls under what is called the FCC Declaration of Conformity. The FCC Declaration of Conformity or the FCC label or mark is a certification mark employed on electronic products manufactured or sold in the United States which certifies that the electromagnetic interference (EMI) from the device is under the maximum limits approved by the Federal Communications Commission. The Federal Communications Commission established the regulations on electromagnetic interference under Part 15 of the FCC rules in 1975 and they were reconstituted as the Declaration of Conformity and Certification procedures in 1998. By the regulation, the FCC certification mark is mandatory for devices classified under part 15 including LED displays. The certification mark for part 15 requires a stand-alone logo along with other pertinent data, the trade name of the product, the model number, and information whether the device was tested after assembling, or assembled from tested components.



There are currently 280 accredited testing firms worldwide, who are qualified to issue the declaration of conformity certificate. Once verified, the FCC's Part 15 requires that a sticker, also known as a Two-Part Warning, be displayed. The label should state, "This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation." Manufacturers who fraudulently place stickers on unverified products face harsh fines and penalties from the FCC as noted above.

Since the FCC program is self-directed and there are no upfront checks and balances directly overseen by the FCC to ensure compliance, there are serious issues to take into consideration. For example, a manufacturer is not required to use one of the 280 testing centers. As a result, there are many substantiated occurrences of inferior testing that was not done properly or not done at all. There are other cases where the Declaration of Conformity logos and labels are being counterfeited. Overall, the dvLED display industry (particularly for outdoor products) has a spotty record of compliance.

In some cases, this lack of testing and conformity may appear after a display installation is completed and EMI is discovered causing serious issues with interference in proximity to the sign. At this point, investigations will ensue, testing done, and if violations are found, serious penalties will come into play. As we move forward in our wireless world, EMI pollution will become more apparent and regulations stricter. Violations will become more apparent.

If you are already employing a dvLED sign, depending upon the origin, you may be emitting illegal levels of EMI. As noted above, there can be significant fines and in extreme cases, the sign totally shut down or even confiscated. If a manufacturer's product is found to be out of compliance, the product may be held in customs or refused entirely, leaving the buyer in the lurch with no recourse.



E X P E R T S
G R O U P

In short, failing to comply with FCC Part 15 testing and regulations is illegal. Some questionable or unscrupulous manufacturers conduct “partial compliance” which is inadequate to say the least, and illegal. Others are guilty of counterfeiting the labels and marks, all with the objective to save short term dollars on their end. There are no approved instances of being somewhat compliant or legal in these cases. Of course, this puts into question the integrity of the manufacturer and their business practices, but also the quality of all the components in the product. Keep in mind the penalties and that display owners and end users are at risk for severe FCC enforcement.

Of course, this begs the question of how you can protect yourself and your investment. Here are a few guidelines that should be considered:

1. First, work with a trusted source. We are referring to a company with a proven track record of successful installations in the USA.
2. Check to verify what certifications and standards that a specific product has attained. Always ask for proof especially in terms of FCC Title 47 Part 15.
3. Check into local codes for rules and regulations that may affect the installation of an LED sign.
4. Does the manufacturer have service centers in the USA and what is the turnaround time on parts replacement?
5. Is there are USA based team to support the sales and application engineering effort

It does boil down to let the buyer beware. In this burgeoning market, it is difficult to sift through fact and fantasy. One adage holds especially true; “The sweetness of low price is long forgotten when the first problem arises”. You do not need “just” a dv LED vendor, rather a true partner that assumes part of the responsibility for the success of project along with you. It is not the original price but the overall total cost of ownership (TCO) that will determine the profitability of the project. Do not blindly accept the risks we have outlined above that are easy to avoid with clear thinking and some effort up front.



Let's collaborate!

-  1+866-668-6888
-  LED@CrimsonAV.com
-  www.ledexpertsgroup.com
-  www.CrimsonAV.com