

Date: 8-28-09

Aydin Displays, Inc.

Decoding Display-Speak

Display Industry Terms for the Non-Technical

Author: Cheryl Kern



IN THIS DOCUMENT:

The words used by any business to describe what it does are often a foreign language to people new to that company. Aydin Displays has created this document to help translate our language for those of you who may be confused.

Each section below contains terms related to its title; the index at the end should be a handy reference when you need to look something up quickly. Each term is defined in as clear a manner as possible. For some terms, additional explanation is available in a section marked “More Detail”; although this information may be of interest to the more technical-minded, it isn’t necessary for most of us who aren’t engineers to know.

This document is intended as a starting point in your search for answers, and only gives a basic understanding of what these terms mean; remember that there is much more to it than you see here. Always rely on more experienced employees to make product recommendations or generate quotes until you truly understand.

If you can’t find the term you’re looking for, please let the author know so the document can be expanded. If you have a question about how to do something at Aydin, the [FAQQuestions section](#) of the intranet is a great place to start.

CONTENTS:

General Terms	2
LCD Specifications	9
Surface Treatments	15
Video Input Signals/Interfaces	17
Power Terms	20
Touch Screens	20
Mounting Options	22
Embedded Computers	23
Military Environments	25
Index	32

GENERAL TERMS

Display: The unit that actually displays information for the user to see. For Aydin, this is a video display, or a monitor.

Intranet: A website containing information for corporate employees. Unlike the internet, an intranet is intended mainly for internal use, and either can be accessed over the internet through a login or can be accessible only to a company’s internal

network. Aydin's intranet is not currently accessible from outside the network, and it contains a lot of useful information for employees. Aydin's intranet address is at intranet.aydindisplays.com or internal.aydindisplays.com.

Quality Procedures/Instructions: Aydin Displays is certified as maintaining a high level of quality control in our processes and products. Currently, Aydin meets the requirements of a standard called ISO 9001:2000; this standard means that Aydin documents all the processes used to plan, build, and deliver our products to our customers. A copy of Aydin's certificate is available on the company [intranet](#), along with all of the documents that state how our work is to be done. New office employees are advised to skim the Master List of documents to determine if they will need any of them in their position; employees who work directly with product will be trained in the needed procedures.

KEMA: KEMA is the independent company which currently certifies Aydin Displays as meeting the requirements of ISO 9001:2000. KEMA auditors visit the plant periodically to review processes and procedures and determine if Aydin's Quality Management System is still functioning as documented.

AS9100: Aydin's Quality System is currently certified to this Aerospace Quality standard, which means that Aydin documents all processes affecting our products. Documentation of these processes eliminates variations in product quality which can happen if things are not done the same way every time. AS9100 certification includes ISO 9001:2000 plus additional requirements..

ECO: Engineering Change Order. Any document (including design drawings) under Engineering Control requires an ECO to implement changes. This control guarantees that all associated parties will be aware of the changes and that all units made to a specific revision will have the same design.

Markets: Aydin Displays supports three major markets, each of which has different needs and must be treated differently.

Commercial: Aydin does not deal in the commercial market, which supplies monitors like the ones used in homes or schools. These displays are mass-produced and require no ruggedization or enhancements.

ATC: Air Traffic Control. The ATC market deals with displays installed in Air Traffic Control centers, and as such is highly specialized. The displays are relatively protected from damage, but need high resolutions and clarity.

Industrial: Industrial customers can include anything from rental car agencies looking for a display to put at the check-in station, to food processors needing displays on the packing line, to oil rigs that need displays to monitor functioning equipment. These displays need to be a little sturdier than commercial displays, but they don't need to meet anything nearly as harsh as military requirements.

Military: Military customers are going to put their displays into very harsh environments, which will be described later in this document. In most cases, a display that is acceptable for Industrial or ATC customers will be quickly damaged or destroyed by a military customer's normal use.

Made2Manage (M2M): The software Aydin currently uses to track all work in the plant, including jobs, purchase orders, sales orders, and accounting. Aydin has also developed some other interfaces to the data in M2M using Microsoft Access because some reports and applications weren't available in M2M. Training courses for M2M are available on the Aydin Intranet [under Learn M2M](#).

Job Order (JO): In Aydin's system, a Job Order is used to get work done. Sales Orders can generate Job Orders, but so can a number of people in house, if they need them to support proposals, demonstrations, or other work. When employees whose time is to be charged directly against the work they do complete time sheets, they must reference Job Orders.

Purchase Order (PO): Customers send Purchase Orders to Aydin, which become Sales Orders once in-house. Aydin generates Purchase Orders to send to our vendors for material or services.

Sales Order (SO): When Aydin receives an order from a customer, it is entered into our system as a Sales Order. If you know the SO number, you can find out a great deal about the status of an order directly from the system or through Contracts.

SalesLogix (SL): The software Aydin currently uses in the Sales Department to track customer contacts and communications.

NRE: Non-Recurring Engineering. When a significant design change is required to meet a custom specification, NRE may be required to cover the costs of having the Engineering Department make all design and documentation changes.

ROM: Rough Order of Magnitude. Essentially a ballpark price generated by Engineering so that a customer can determine if they wish to pursue getting a real quote, or if the project is likely to be beyond their current means. Usually a request for ROM pricing will be followed by a request for fixed pricing in one form or another.

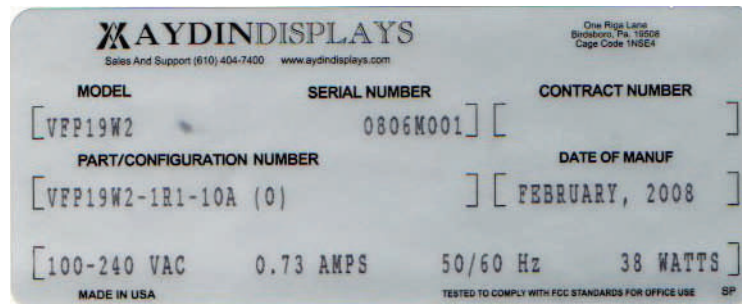
Cage Code: A 5-character code used in industry to identify a specific company quickly. The cage code is usually included on all technical documentation and on product labeling. Aydin's cage code is 1NSE4.

NSN: National Stock Number. A part number assigned by the government to a product. An agency located in Battlecreek, MI, assigns them. Government employees and anyone else who has paid for access to the NSN website can use NSNs to order products. The NSN isn't always tied to a complete part number,

however. Some NSNs for Aydin product have been attached to incomplete model numbers instead.

GSA: General Services Administration. A government agency that acts as a sort of distributor which buys product from manufacturers for government agencies. Some government programs require that the parts involved be purchased from the GSA. When Aydin's price list is not under revision, all of the Aydin-built products on the list are also listed with the GSA, including model number, part number, price, and delivery. The price on the GSA must be the lowest price for which the item was ever sold. Some products also list large quantity discounts.

ID Label: Aydin places a silver label on each unit shipped so that a customer can contact us if they have questions or issues. In addition to full contact info (with cage code), the labels show a model and serial number, part or configuration number, and the date of manufacture. They can also include information such as power specs, contract, customer part number, etc. The information on the ID Label will be dictated by Engineering documentation associated with the product. If a unit must be returned for repair, Customer Service will need to know the model and serial numbers in order to authorize the return. When a customer wants a replacement for a discontinued unit, the full part or configuration number is needed to find a suitable match.



Sample ID Label: Data will vary with unit type and customer requirements; basic contact info stays the same.

Model Number: The first part of a configuration number, up to the first hyphen. The model number can help you determine if a unit is rugged or not, and often indicates its size, resolution, and mounting configuration. The specific information included in the model number is based on the configurator for the product, if one exists.

Configuration: A number assigned to a finished product from Aydin Displays that includes characters which stand for features and information about the product. Each character in the configuration number means something specific, including details such as paint color, dimming options, window size, video inputs, power inputs, and anything else that is important to a customer when making a decision what configuration they wish to purchase. To decode the number, you must refer to the configurator for the model.

Configurator: A document showing the numbering scheme created for an Aydin model and defining the meaning of each character in the configuration number. The configurator is created or controlled by Electrical Engineering.

Part Number: A number used in Aydin's system to identify a specific part. A part can be anything from one little transistor all the way up to a finished unit. Part numbers are generally independent of models or configurations, and are assigned by Documentation Control based on procedures included in the Quality Control System.

ESD: Electro-Static Discharge/Damage. Since our products all involve electricity, it is important to avoid any static shocks to material, even those you may not feel. New employees will receive training on ESD prevention.

FOD: Foreign Object Damage/Debris. This is essentially dirt that gets into products and reduces their quality. Depending on the product, it can make a unit worthless. New employees will receive training on FOD prevention.

Specification: A document which dictates the requirements that a unit must meet. A customer supplies a specification, and that specification may call out other specifications or standards.

Standard: A document which dictates a requirement in detail. Standards are created by any organization which has been granted authority to define a subject. The military creates standards for determining when equipment will work in military environments, electrical societies create standards that describe how equipment will function in specified situations, safety commissions create safety standards, etc. A customer's specification can call out standards as needed.

UL: Underwriters Laboratory; the group that certifies that a product meets safety standards. Products marked with a UL label have been review by the group.

CE: European version of UL-type qualification.

Plastic Unit: A commercial, mass-produced monitor.

Membrane Switch: A switch that's covered by a thin layer of plastic or other flexible material so that nothing can get in around it. A membrane switch will be almost flat, with a slight lump in the center where you press. Some cell phones use this kind of switch to protect the phone from humidity.

COTS: Commercial Off-The-Shelf. A product which is used "as-is" and is usually purchased from a commercial vendor. Aydin orders COTS parts to use in our units, evaluating them at selection to determine that it meets our standards. Aydin's standard products are also considered COTS because they are intended to plug right into the customer's system with little difficulty and no modification. Aydin's

Quality Management System guarantees customers that each unit they purchase will be identical to other units with the same configuration, and will be interchangeable. However, because COTS parts are used in Aydin's products (i.e., the LCD), the lifetime of these parts is not in Aydin's control, which means that Aydin will need to deal with End of Life issues on some major parts to continue supporting our products.

GFE/CFE: Government Furnished Equipment/Customer Furnished Equipment. Any item which is owned by the government or a prime contractor (GFE) or another customer (CFE) but is currently on Aydin property. This can happen under several circumstances, such as:

- The customer sends a unit to Customer Service for repair
- The customer orders replacement or upgrade parts to be applied to consoles shipped to Aydin.
- The customer is paying for testing on units which Aydin builds; the moment the customer is billed for the unit, it must be treated as GFE, even if it has never been shipped to the customer.

GFE/CFE must be carefully tracked and handled to be sure it is returned to the customer in the same condition in which it arrived.

Harmonized Code: Part of the Harmonized Commodity Description and Coding System, a standardized system for classifying products which are traded internationally. The Harmonized Code can be used for tariff calculations, trade statistics, etc. Because the code definitions are revised over time, if an older document references a code, it should be checked against the definition set from that time period.

ECCN: Export Control Classification Number. A code which identifies how strictly an item is controlled, and thus under what circumstances it can be exported. The level of control is determined by the intended end use of the technology.

EAR: Export Administration Regulations. A section of the Code of Federal Regulations pertaining to the export of most commercial items.

ITAR: International Traffic in Arms Regulations. These regulations control importing and exporting items or services listed on the United States Munitions List (USML). Anything which is included on the USML cannot be shared with anyone who is not a US citizen or organization unless the Department of State authorizes it or a special exemption is used. Although the ITAR name refers to Arms, it is a misconception that only products which are specifically weapons are affected; in fact, any product include on the USML is controlled by ITAR, and US citizens and organizations face heavy fines if they provide foreign persons access to any ITAR-controlled items without proper authorization.

RoHS: Restriction of Hazardous Substances. A directive adopted by the European

Union in 2003 with the intention of reducing or eliminating the amount of hazardous substances making their way into the environment from electronic devices which are disposed of after use. The six substances covered by this directive are lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ether. Of these, lead and mercury restrictions pose special problems for display manufacturers. Mercury is found in the lamps of a CCFL backlight, which can be avoided by using LEDs. Lead is a component in common soldering materials; many manufacturers attempt to avoid lead by using material with tin instead, but tin solders can develop 'whiskers' over time, which cause more problems with sparking or arcing in harsh environments.

Plasma: A type of panel in which the image is created by applying electrical current to a gas containing a variety of types of atoms and electrons. These atoms and electrons collide, and some of them create light in a manner similar to the way neon lights glow. Plasma screens are very popular for home TVs, but are not necessarily the best choice for industrial or military applications because they require more expensive ruggedization for severe environments and for some it is too difficult to achieve the level of ruggedization necessary (i.e. - plasma is not approved for naval applications because the movement of the ship eventually breaks them and the gas would be released). Also, they have a tendency for intense, still images to become burnt in, which means that they will continue to show on the screen even after the image is supposed to change.

LCD: Liquid Crystal Display - sometimes also shown as Active Matrix Liquid Crystal Display (AMLCD). This is a flat-panel monitor in which light is shined through a layer of liquid crystal in which color is filtered and controlled electronically. The original LCDs involved a passive matrix, but that technology is not longer used in regular applications, and thus LCD and AMLCD are used interchangeably. LCDs can be more subject to motion blurring than Plasma screens, but this can be corrected by faster response times in the LCD design. LCDs are far less likely to experience images showing up even when the image is supposed to have changed, and if the unit is shut off or a white screen is displayed for the same duration as the retained image, it will clear. LCDs are also less difficult to ruggedized and use reliably in military environments.

Image Retention: This is a rare issue with modern LCDs in which a still image displayed for a long time remains on the screen even after the unit is either turned off or the image is supposed to change. This is a special concern for military customers who will be displaying classified information. As LCD technology improves, image retention is going away. If an LCD has a retained image, shutting the unit off or displaying a white screen for the same amount of time the original image was displayed will clear it.

LCD SPECIFICATIONS

Size: The size of an LCD does not refer to its outer dimensions, which will be called dimensions. Instead, it refers to the size from one corner of the screen diagonally across to the opposite corner. A 12.1" LCD will be 12.1" from upper left corner of the screen to lower right, but the height and width of the screen can be different lengths on different 12.1" panels.

Active Display Area: The width and height of the native resolution as it is displayed on the screen. On an LCD, the diagonal of the Active Display Area is the same as the diagonal of the visible screen. Because of the way they're made, CRTs lose some of the Active Display Area, which means that the diagonal measure of the screen is not the same as the diagonal of the active display area. Thus, generally, a 20" CRT is comparable to a 19" LCD.

Pixel: Picture Element. One "dot" on an LCD screen, which is the smallest piece of the information that makes up an image. The more pixels are used in an image, the more detail it can show. Each pixel in a color display is made of red, green, and blue subpixels, which are used to create the pixel color.

Pixel Pitch: The dimensions of one pixel on the panel, usually measured in mm.

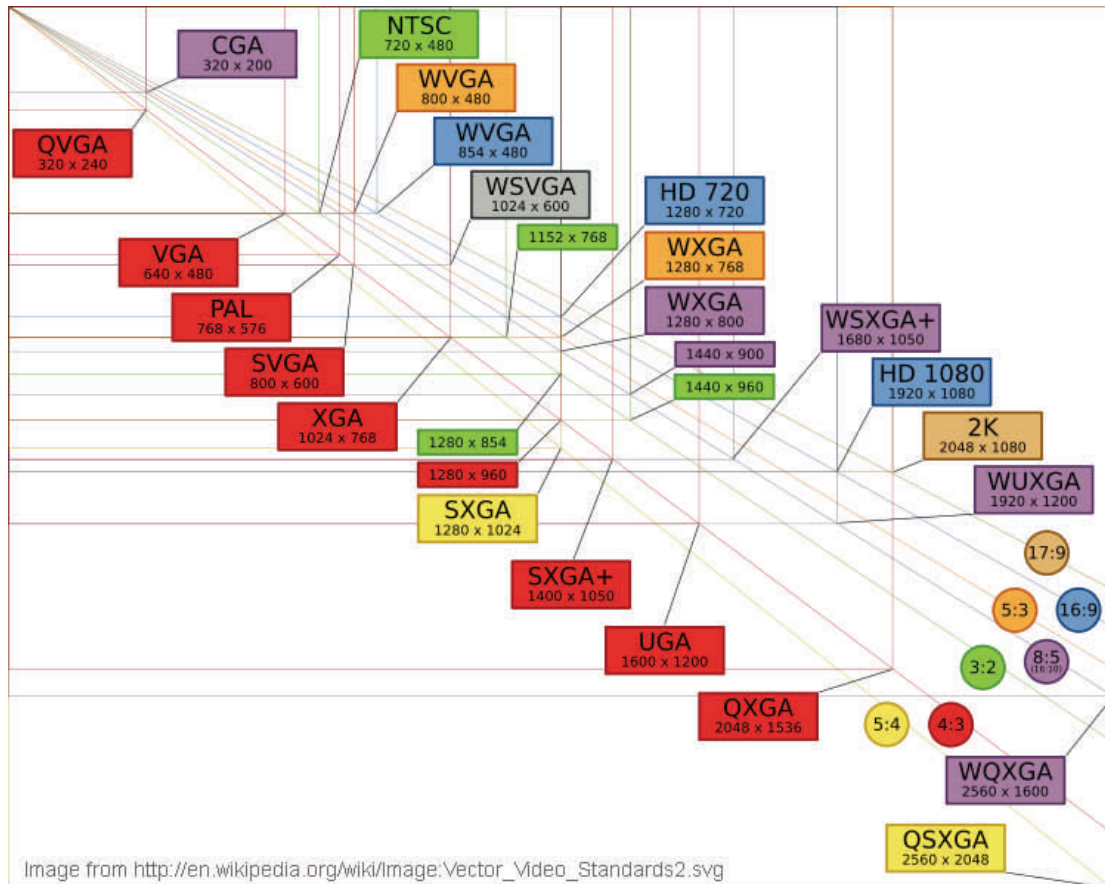
Resolution: The number of pixels available on a monitor. It is usually shown as width by height or horizontal by vertical.

More detail: Width is the number of visible pixels in one line, height is the number of visible lines on the display. The more pixels are used in an image, the more detail it can show. A monitor that is 640 x 480 is 640 pixels wide and 480 pixels tall. High Resolution Digital Televisions (HDTV) are typically 1920 x 1080, or 1920 pixels wide by 1080 pixels tall. The numbers that represent resolution do not necessarily represent active display area dimensions, because a pixel can be a different size on a different LCD panel. VESA Standard resolutions have been given names, such as:

QCIF: 176 x 120	SXGA+: 1400 x 1050
VGA: 640 x 480	WSXGA+: 1680 x 1050
PAL: 768 x 576	UXGA: 1600 x 1200
SVGA: 800 x 600	HD 1080: 1920 x 1080
WVGA: 854 x 480	WUXGA: 1920 x 1200
XGA: 1024 x 768	QXGA: 2048 x 1536
HD 720: 1280 x 720	WQXGA: 2560 x 1600
SXGA: 1280 x 1024	QSXGA: 2560 x 2048

Resolutions supported: Data sheets on different units list resolutions that are supported by the unit. If a resolution is not on the list, it cannot be assumed that it is supported. Most units support the standard, or named, resolutions up to their

native resolution, but the video controller must be programmed to handle any resolution that is not one of these.



Names and Aspect Ratios of Standard Resolutions found on Wikipedia on 9-24-08

Aspect Ratio: The ratio of the screen width to the height in generic units.

More Detail: The aspect ratio of the screen of a standard computer monitor and TV set is 4:3, which is a rectangle that is somewhat square. The 4 means 4 units wide, and the 3 means 3 units high. The high definition TV (HDTV) format is 16:9, which is a wide rectangle that is closer to panoramic wide screen movies. Although 4:3 and 16:9 are the common aspect ratios, there are some picture formats that use 5:4 and 16:10 formats.

Zooming: Increasing the resolution of an image to a higher resolution for display. This can be used to zoom in on one section of an image and use that to fill the screen.

Scaling: Reducing an incoming image from a higher resolution to a lower resolution or increasing it from a lower resolution to a higher resolution, with the resulting image filling the screen as a maximum. This is usually done when the image is a different

resolution than the native resolution of the display.

Fill: Used when the incoming image is at a resolution that is lower than the resolution of the panel. A setting which takes the incoming image and fills the screen with it, even if it has to distort the image to do so. The image may end stretched or crunched side-to-side or top-to-bottom.

Auto Screen Sizing: This is an option that allows the user to choose to either display the incoming video at its actual size on the screen (which could be smaller than the screen) or zoom the incoming video to fill the native resolution of the screen.

Native Resolution: The same as the resolution used to describe the panel; an XGA (1024 x 768) panel has a native resolution of 1024 x 768. Most panels can display resolutions up to their native resolution, but no higher.

Luminance: The brightness of the screen output. Luminance is usually determined by measuring the brightness of white, and can be expressed as a number of either NITS or cd/m^2 . These two units of measure are interchangeable. Foot lamberts is also a way of expressing the level of output luminance.

NITS: A way to express luminance of a display $3.43 \text{ NITS} = 1 \text{ foot lambert}$.

Lux: A measure of light intensity. A lux is a little over 1/10 of 1 foot candle.

Contrast Ratio: Contrast determines the ability of the user to separate an image from its background. The greater the contrast, the easier this is.

More detail: Contrast Ratio is expressed in terms like 300:1, which means that in a dark room, white will be 300 times brighter than black on the panel. Contrast Ratio will vary anywhere from 300:1 up to and over 1000:1. In a room with light or in sunlight, the Contrast Ratio will decrease. Depending on the customer's requirement regarding ambient light (the amount of surrounding light the unit will be used in), the panel may require modification to keep the contrast ratio from decreasing too far. Typical sunlight Contrast Ratios will be around 6:1 through 30:1, depending on the unit. In an office environment, it could be much higher. Ambient lighting is expressed in foot candles.

Foot Candles: A way to measure ambient light for Contrast Ratio measurement.

More detail: A typical sunlight requirement for Ground Mobile is an ambient environment of 6,000 foot candles, which is direct sunlight on the face of the earth. In an airborne application, it can reach 8,000 foot candles. Specific customer applications will define the ambient light.

Ambient Light: The amount of light surrounding a unit; more ambient light will reduce the contrast ratio of the unit. Ambient light is expressed in foot candles. The light of the sun hitting the earth's surface is typically expressed as 6,000 foot candles.

Viewing Angle: as you move side-to-side or up-and-down relative to an LCD screen, the image can get harder to see, or colors can become dimmer or change. The viewing angle for an LCD is the most extreme angle you can view the image from without distortion.

More Detail: The viewing angle is usually measured as the point where the contrast ratio decreases below 5:1 (or 10:1 if a specific requirement calls for it). Although the viewing angle can be the same in all directions, it is most often *different* left-to-right (l,r) from up-and-down (u,d). Sometimes even up is different from down (typically, when the screens are smaller, the viewing angle in the vertical direction is reduced). The total possible viewing angle for either l,r or u,d is 180°, which is all the way from one side of the panel to the other (going over 180° would mean going behind the panel). Usually, if the viewing angle is shown as a number over 90, it is the total viewing angle for either horizontal or vertical. If it is 90 or under, it is usually the viewing angle for one direction only (left or right, up or down), and would be doubled to get the total viewing angle for both directions.

Enhancements: Processes done to an LCD panel to improve its performance. These can include surface treatments like AR or AG, replacing the backlight, or lamination.

Backlight: A lighting unit that sits behind the main LCD panel. Light from the backlight passes through a layer that filters the colors and controls the brightness. Two kinds of backlight currently used are CCFL (Cold-Cathode Fluorescent Lamp), which uses multiple fluorescent bulbs, and LED (Light Emitting Diode), which uses individual, tiny light bulbs arrayed in a pattern. Each type of backlight has its own pros and cons, but CCFLs are still the most common backlight in use.

LED Backlight: A backlight which uses Light Emitting Diodes. LED backlights can result in longer life, improved ruggedness, extremely low dimming ranges, and/or lower power usage. An LED backlight with a specially-designed controller can even be used to improve a panel's contrast ratio (by turning off LEDs behind areas that are supposed to be dark), and they permit a much lower dimming level than CCFLs can handle on larger panels. However, LED backlights are more expensive to build, and they have additional issues such as heat which must be dealt with in the unit design - especially as the panel size increases and more LEDs are required. These are challenges that most display manufacturers must currently take on, however, because it is where market demand is leading the industry.

CCFL Backlight: A backlight which uses Cold Cathode Fluorescent Lamps, very small glass tubes which function much like the fluorescent lights in an office. Also like those lights, each bulb in a CCFL backlight contains a very small amount of mercury, although the total amount of mercury in a typical backlight unit is less than that contained in one overhead bulb. CCFL backlights have been around as long as LCD panels, and so they do not cost much, but they

can take extra time to reach maximum brightness when used in cold situations and can begin to flicker in very low dimming ranges. They also require more ruggedization to meet severe vibration and shock specifications.

LED: Light-Emitting Diode. This is a very small light which burns very bright for the amount of power it uses. LEDs are found all over the common household, as the little indicator lights that glow red or amber or green to indicate the status of a piece of equipment, and because of their low power impact they are even used on some USB memory sticks to indicate when they are powered. They are even found as replacements for light bulbs in modern car taillight designs, which results in much more visibility at night. Because of current concerns over lead in the environment, many applications are now moving to the use of LEDs for backlights.

Scanning Frequency: How fast the picture gets painted on the screen. The horizontal scanning frequency refers to the time to paint one line of the image, left to right. Vertical scanning frequency is the whole image, top to bottom, and is usually called refresh rate.

Refresh Rate: In order for the image on an LCD to stay the same brightness, the image has to be refreshed regularly. The refresh rate is how often the image is sent to the screen again, and determines if the eye detects any blink in the image.

More detail: In order to eliminate perceived blink, the refresh rate should be 60 or greater. The number used to express refresh rate indicates how many times a second the refresh is completed. The rate is expressed in the form of Hz, or Hertz, so a refresh rate of 60 Hz means that the image is refreshed 60 times a second.

Update Rate: This term doesn't usually come up outside of touchscreens or similar equipment. This is how often the video controller communicates with the computer to determine if the screen image must change. This is what determines if mouse movement or fast video will appear smooth or jumpy to the user.

Interlaced: A method for painting an image onto the screen in which alternate lines are shown first, and when the last line in that group is painted, the scan returns to the top of the screen and fills in the missing lines. Although it takes more time to paint the entire picture than the progressive (newer) method, the viewer may perceive it as about the same because they will not have time to notice the missing data before it is filled in, and may thus perceive the entire image as being completed quicker than it is.

Slow Scan: Essentially interlaced presentation of images.

Progressive: A method for painting an image onto the screen in which lines are shown in order from top to bottom without interruption. If the scanning frequency is too slow, a user may perceive Progressive scanning as being slower than

Interlaced, but this is not true. At normal scanning frequencies, the viewer won't notice anything.

Normal-black Panel: The panels Aydin usually uses are “normal-black”, which means that the panel doesn't allow light from the backlight to pass through unless an electrical current is applied. The opposite of a normal-black panel is a normal-white panel, where no light is blocked unless a charge is applied. To understand how an LCD panel works, see the article “How Does an AMLCD Work?” [Aydin Chronicles, Volume I, Issue I](#), June 14, 2007, for more detail. (Available on the intranet).

Blank Level: On a normal-black panel, the temperature at which the pixels in the LCD turn white; the LCD will have to warm after reaching its clearing point before any more information can be displayed. This is above the point where the crystals actually freeze.

Clearing Point: On a normal-black panel, the temperature at which the pixels in an LCD turn black; the LCD will have to cool after reaching its clearing point before any more information can be displayed.

Display Colors: The number of colors a panel can display.

More Detail: This number became important in the switch from CRTs and analog LCDs, which had unlimited colors, to digital LCDs, which have limits because of the way the screen shows the colors. Modern LCDs are capable of showing so many colors that there are few applications where this limit matters anymore. A digital LCD can typically display over 16 million colors.

PIP (Picture-in-Picture): The ability of a unit to display a second video source in a small window on the screen. The PIP window will usually be a lower resolution than the main image.

PAP (Picture and Picture): The ability to split screen and show two images from two different video sources, each in a designated section of the screen, side-by-side, to fill the screen in the same aspect ratio as the aspect ratio of the screen.

Multi-Imaging: The ability of a unit to display multiple video signals on the screen at nearly any size and resolution.

Windowing: See Multi-Imaging.

EDID: Extended Display Identification Data. EDID identifies a display to the graphics card to which it is connected. If you plug a new monitor into a computer and it recognizes that monitor immediately, it has EDID. If it identifies the monitor only in generic terms, it doesn't have functioning EDID. The EDID helps the graphics card determine how to communicate with the display, and avoids issues with special resolutions or formats not being shown correctly on the display.

More Detail: The standard for EDID is published by the Video Electronics Standards Association (VESA). EDID includes the manufacturer name, product type, phosphor or filter type (for CRTs), timings the display supports, size, luminance data and (digital only) pixel mapping data.

OSD: On-Screen Display. The OSD is a menu through which the user can adjust the various settings available on the display, including brightness, resolution, etc. The OSD is usually activated with a button or switch on the display, itself, although sometimes it can be reached through the computer running the display.

Transflective: A transflective panel allows light from an outside source to pass through the LCD panel, and then reflect back out again, adding to the brightness of the panel. The lower the light in the room, the less contrast there is between the image and the background. Although transflective designs can be used to heighten the brightness of a display, the level of improvement is unreliable because they depend on the level of ambient light to do this.

SURFACE TREATMENTS

Substrate: Any material to which coatings or other processes are applied. Glass and plastic panels are often substrates for the application of films and coatings.

Evaporated Coating: A coating which is applied to a substrate through evaporation. The substrate is placed in a vacuum with the material to be applied, which is heated until it evaporates. The coating will then stick to all exposed surfaces of the substrate in an even layer.

AR: Anti-Reflective. A coating applied to a surface to reduce the amount of reflected light. The reflected image will have the same clarity, but will be reduced in brightness. For instance, if you were looking at a window with AR at night, you would still see your reflection, but the image would be much dimmer than if there was no AR. Can be combined with AG for better results.

AG: Anti-Glare. A finish applied to a surface to scatter reflected light. The same amount of light is reflected, but it is blurred over a larger area. This would be the equivalent of a matte finish in car paint as opposed to a gloss, which shows reflections. Can be combined with AR for better results.

ITO (Conductive Coating): Indium-Tin Oxide. A thin coating of Indium-Tin Oxide which is see-through and conducts electricity. An ITO-coated surface can be used in front of an LCD to provide EMI shielding. ITO can also be used to quickly heat the LCD in extremely cold environments by applying a current through the ITO coating.

Safety Glass: Glass which is designed for improved safety. There are two kinds of safety glass: laminated glass and tempered glass.

Laminated Glass: A type of safety glass made with a thin layer of flexible, clear rubber or epoxy between two pieces of glass. The plastic/resin holds the glass in place when the glass breaks, helping to reduce injuries from flying glass shards. Car windshields are this sort of safety glass.

Heat Tempered Glass: (Tempered glass is used in safety glass, and some people use the terms interchangeably.) Glass that has been heated and then quickly cooled. The quick temperature change causes tension between the inside and surface of the glass which adds strength and changes the breaking properties. Tempering increases the strength of the glass to 5-10 times that of untempered glass. When tempered glass is struck, it doesn't break into large, sharp, jagged pieces as untempered glass does. Instead, it shatters into many little pebble-like pieces, without sharp edges. Unlike untempered glass, tempered glass can't be cut by standard methods without shattering.

Chemically Strengthened (or Tempered) Glass: Glass can be strengthened by heating it and dipping it into a chemical bath for a prolonged period. Like tempered glass, chemically strengthened glass will be 5-10 times stronger than it was originally.

Plastic Window: Used instead of glass in front on an LCD. Plastic strengthens the display because it adds another layer of protection. It also functions like safety glass, because it has no sharp edges when broken. Some forms of plastic are:

Polycarbonate: The hardest and most scratch-resistant plastic—Lexan[®] is one brand name.

Acrylic: A softer plastic. Trade names include Lucite[®] and Plexiglass[®].

Hard Coating: A coating applied to plastic to make it more scratch-resistant.

Lamination: A process used to combine two (or more) layers and make one finished item. Lamination is done both for strength and to remove reflections.

More Detail: Light is reflected whenever it passes through materials of different densities (such as glass-to-air change); lamination reduces reflected light by eliminating the air-to-glass interfaces.

Optical Bonding: Lamination performed between the LCD and an outer panel for the purpose of increasing the visual performance by reducing the number of surfaces which can cause reflections, improving the ruggedness of the display, or adding enhancements or finishes to the panel without adding reflective surfaces.

VIDEO INPUT SIGNALS/INTERFACES:

Synchronization: Synchronization is the monitor's ability to match its timing to the host's video timing. Monitor timing can vary depending on the type of computer.

More Detail: In order to try to standardize video output timing, the Video Electronics Standards Association (VESA) was formed. VESA published an Industry Standards and Guidelines for computer display monitor timing. This standard lists over 56 possible monitor timings. Of course monitors could not be expected to be able to sync to every possible timing listed in the VESA standard. Monitor manufactures generally design their monitors using the most common video timings. When a monitor is connected to a video source, such as a computer, the monitor will synchronize to the incoming video timing.

Analog: A signal that acts like a wave, and is translated by looking at the different levels/strengths of the signal. Analog signals are vulnerable to loss of information as they travel, and are considered outdated in most modern systems.

Digital: A signal that acts as a pulse, and is translated by looking at strings of "on" and "off" settings in the signal. Because they depend on transmission of only two values, digital signals can carry more information with less loss, and are the modern signal of choice.

Composite Video: Composite video is the earliest form of transmitting video information, and transmits all the information about the video signal in one wire. It is an analog video type.

More Detail: The Composite Video Signal is made up of 3 components:

1. A signal corresponding to the variations in light.
2. The synchronizing pulses, or sync, to synchronize the scanning.
3. The blanking pulses to make the retraces invisible.

Color information was added to the composite video signal in 1953.

NTSC (or composite video): National Television System Committee. For driving a display, NTSC is a single-wire analog video signal using an RCA connector. Although this is an old system, some monitor video controller cards still maintain an NTSC input. If one of the inputs is an RCA connector, the monitor will accept an NTSC signal.

More Detail: NTSC originally started as a standard for transmitting video monochrome (black and white TV) information in 1941. Color information was added to the monochrome signal in 1953.

PAL: Phase Alteration Line; the European version of NTSC. Unlike NTSC, PAL has several variations depending on the country. As with NTSC, the PAL standard is complex and includes the signal requirements for monochrome (black and white TV) and color signals.

RGB (or VGA): Red, Green, and Blue are the three primary colors that are mixed to create all the colors you see when you are using light. RGB video signals use separate red, green, and blue signals, each carrying a version of the original image as it would look through a red, green, or blue optical filter. RGB is an analog system. Signal levels control how bright or intense a color appears to the viewer, in addition to how the three primary colors will mix to create the intended color on the screen. RGB and the accompanying sync signals can be fed from a video source using either BNC connectors or a sub-miniature “D” connector like the one normally used by modern computers to connect to a monitor.

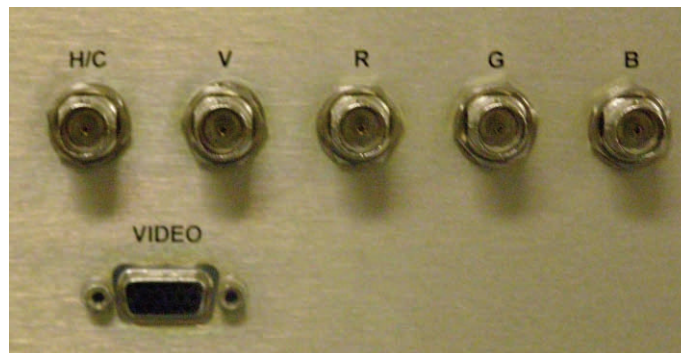
Synchronization (Sync) signals: These RGB control signals dictate how the picture is painted across the viewing screen side-to-side (horizontal) and top-to-bottom (vertical).

3, 4, and 5-Wire RGB: These systems are used to drive monitors and don’t relate to television signals. They’re different methods to transmit picture information to a monitor.

3 Wire: RGB with 3 inputs, Red, Green, and Blue. Synchronization signals are embedded *within* either the Red, Green, or Blue color signal. Generally, but not always, the vertical and horizontal sync signals are sent with the Green color signal. This is commonly known as a “Sync on Green” system.

4 Wire: RGB with 4 inputs: Red, Green, Blue, and Composite Sync. The vertical and horizontal sync signals are combined into Composite Sync and sent to the monitor on one input line.

5 Wire: RGB with 5 inputs, Red, Green, Blue, Vertical Sync, and Horizontal Sync. The Vertical Sync and Horizontal Sync signals are sent to the monitor on separate wires.



Two types of RGB connectors: *Top:* 5 BNC connectors are used to input the Red, Blue, Green, and Sync signals for older systems; these connectors are not needed for new systems. For sync-on-green, only connectors R, G, & B will be used. For H & V, all 5 will be used. For composite sync, only connectors H/C, R, G & B will be used. *Bottom:* The sub-miniature “D” connector is the connector a modern computer uses to connect to a monitor.

S-Video: Super Video or Separate Video (also know as Y/C) – an analog signal. This is mostly used in home entertainment systems, but some video controller cards still have this input.

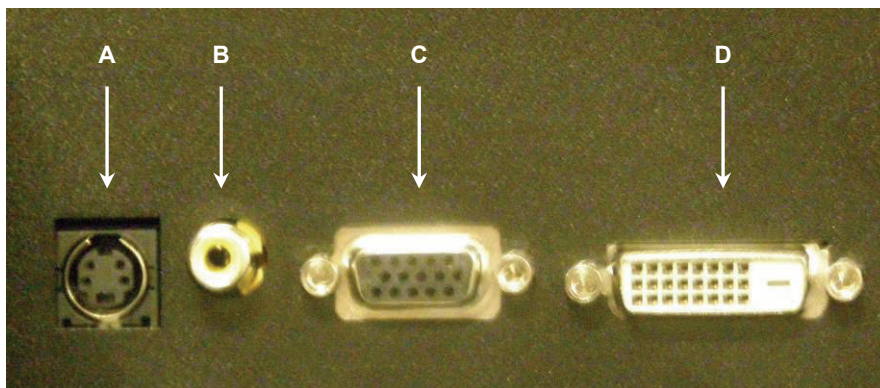
More Detail: S-Video is an analog video signal that carries the video data as two separate signals, luma (luminance or black & white information) and chroma (color information). S-Video, as most commonly implemented, carries 480i or 576i resolution video, i.e., standard definition video, but does not carry audio on the same cable. A 4-pin mini-Din connector is the most common of several S-Video connector types.

DVI: Digital Visual Interface. Connectors for DVI input are available in two basic types, a digital-only connector commonly called DVI-D, and a DVI-A or DVI-I connector which is capable of carrying both the digital signal and the legacy analog (RGB) signals in one connector.

More Detail: The Digital Display Working Group (DDWG) was formed to create a universal standard for attaching a flat panel monitor. The DVI interface is also used on plasma displays, digital TVs (DTVs), and set top boxes. DVI devices *may* include HDCP (High-bandwidth Digital Content Protection), which is an encryption method for safeguarding copyrighted material. A digital interface ensures that the content transferred over this interface remains in the lossless digital domain from creation to consumption. The digital interface was developed with no assumption made as to the attached display technology.

HDMI: High Definition Multimedia Interface. This digital connection system is primarily intended for commercial use and is currently not used in Aydin monitors.

More Detail: HDMI connects digital audio/video sources like set-top boxes, Blu-ray Disc players, personal computers, video game consoles, and AV receivers to compatible digital audio devices, computer monitors, and digital televisions including HD (high definition). (*AV receiver:* Audio/Video receiver, better known as surround sound receiver/ amplifier.)



Video Connectors: A: S-Video mini-DIN input connector. B: NTSC or PAL RCA jack input. C: Analog (RGB) video “D” connector. D: Digital DVI-D connector.

A/B Switch: On displays, an A/B switch allows the user to select one of two (usually VGA) video inputs to display on the screen.

POWER TERMS:

AC: Alternating Current. This is the type of voltage (electricity) that your electric company delivers to your home. It is called “Alternating” because it pulses back and forth along the wire.

More Detail: Standard home voltage out of a wall socket is between 105 to 120 volts with an *alternating* frequency of 60 Hz (or 60 cycles per second).

Electricians often refer to the 60 Hz as the “line” frequency. Many aircraft use the same voltage, but the frequency is increased to 400 cycles per second (400 Hz). AC voltage can be found at many voltages and frequencies. For instance, the common household voltage in Europe is 220 volts AC at 50 Hz.

DC: Direct Current. This is the type of voltage (electricity) that a battery produces. “It is called “Direct” because it always flows in the same direction in the wire.

More Detail: The voltage contains no frequency component, or 0 Hz. Flashlights, cell phones, and portable electronic gear are all examples of equipment powered by batteries (DC voltage). Televisions, stereo amplifiers, and surround sound amplifiers plug into the wall outlets, but power supplies inside the equipment converts the wall power (115 VAC, 60 Hz) into DC power that is used by the electronic circuits.

Wattage: Commonly called “Power”. It is the ability of the voltage and current to do work. Work can be thought of as simply lighting a flashlight bulb in the case of DC or heating up your toaster in the case of AC. The electric company measures the amount of power you use in your house by installing a Watt Meter.

TOUCH SCREENS

Touchscreen: A monitor on which the screen functions like a mouse. It can connect to the computer using either USB or RS-232 connectors. The screen senses where it is touched top-to-bottom and side-to-side, and translates that touch into the position on the screen which receives focus. If the touch is dragged, then the focus drags with it. Depending on the software used on the computer running the touchscreen, the user can navigate through files, draw, select options, or do anything they could have done with a mouse. Each touch screen must have a driver installed on the computer that will use it, and standard touch drivers are available online from the supplier whose touch screen is being used.

Resolution: Touch screen resolution refers to the number of touch points available on the screen, and determines how fine the target of a touch can be. This is independent of the resolution of the LCD panel.

Driver: The software necessary to work with an operating system to make a piece of equipment connected to a computer work. Aydin's products have drivers compatible with Windows operating systems; Linux drivers can usually be purchased from the Touch Screen Vendor online.

Touch Screen Types: There are several types of touch screen; the ones Aydin currently uses are described, in order from least to most expensive, below:

Resistive: Anything can be used to touch the screen. The touch screen is made up of a layer of insulated spacers surrounded by two layers of material, one of which is a plastic and the other glass, each of which carries an electric current on the side facing the other. The screen senses the place where the plastic and glass layers touch.

Advantage: Can touch it with anything. Unaffected by anything sticking to the surface.

Disadvantage: Because there are two layers of material that go over the screen, it reduces the light output by about 18% and blurs the image. Because the outer surface is plastic, it can scratch, which will also impair the image even though the plastic does have a hard coating on the surface.

Capacitive: The user must touch this type of screen with an exposed finger. The screen senses the touch because of a change in the electrical charge on the surface of the touchscreen.

Advantage: Because it is clear glass, this type is very durable and does not block very much light from passing through, and it doesn't blur the image.

Disadvantage: Can't wear gloves or use anything but a finger. Scratches can cause dead spots.

SAW: Surface Acoustic Wave. The user must touch this type of screen with an exposed finger. The screen senses the touch because of a change in the flow of sound waves sent across the surface of the touchscreen.

Advantage: Because it is clear glass, this type is very durable and does not block very much light from passing through, and it doesn't blur the image. The user can also wear some types of gloves.

Disadvantage: Liquids or other things that stick to the screen can cause dead spots. This type of touch isn't good for NEMA sealing.

IR: Infrared. Anything can be used to touch the screen. The screen senses the touch because infrared light that is being shone down and across the screen is blocked by the touch.

Advantage: No glass or plastic needs to be overlaid on the monitor, so no light is blocked and no blurring will occur.

Disadvantage: The resolution is much lower, because it is dictated by the number of IR photo diodes (the part that shines the light).

Optical: Anything can be used to touch the screen. Cameras aimed across the screen sense the touch point.

Advantage: No glass or plastic needs to be overlaid on the monitor, so no light is blocked and no blurring will occur.

Disadvantage: Only available for large screens, and more expensive than other available types.

MOUNTING OPTIONS

Panel Mount: Generally a NEMA 4 or 4X front-sealed unit installed in a customer-supplied panel with an opening to match the supplied product size. NEMA 4 means that the product can be washed or hosed from the front of the display with no water getting into it. NEMA 4X is the same product with a Stainless Steel Front Panel, and is usually used in food processing and pharmaceutical manufacturing.

Rack Mount: A standard which defines the hole pattern on the front of a unit to be mounted in a rack. Sometimes referred to as RETMA Rack. Any unit which is RETMA rack compatible will fit into any RETMA rack in the world. The rack front panel is always 19" wide and is always a standard "U" in height. 1U represents 1.75"; therefore 9U is 15.75" high.

Chassis Mount: A simple metalwork that houses the electronics and generally embedded into customer furniture.

Console Mount: A unit which is intended to be mounted in to a customer's console. The console design is determined by the display provider whether a standard or custom. This includes the hole opening and the mounting technique i.e. studs or clamps. The customer is required to place mounting holes in specified locations to match up with the console design. If clamps are used in place of the stud design, only the hole/opening dimensions must be observed by the customer.

VESA Wall Mount: A metal enclosure (generally non NEMA rated) and has a 75 and/ or a 100mm mounting pattern in the rear of the cabinet for mounting to an arm or a table stand.

Desktop: Either a monitor like the ones used on office desks or a VESA wall mount that is attached to a desktop stand.

1U: A rack mount unit that stores within one unit of rack height. Aydin offers 1U units that include a 15" - 20" display, keyboard, and trackball, all of which are stored by sliding them into the rack with the display folded down. These may also include a KVM.

2U: A rack mount unit that stores within two units of rack height. Aydin offers 2U units

that include a 15" - 20" display, keyboard, and trackball, all of which are stored by sliding them into the rack with the display folded down. These may also include a KVM.

EMBEDDED COMPUTERS

Embedded Computer: To save space and equipment costs, some customers require that all of a computer be included in the display's design.

Single-Board Computer (SBC): A computer contained on one circuit card, including the Central Processing Unit (CPU), RAM, Graphical Processing Unit (GPU), and any local storage space. It is used in the creation of Embedded Computers/Thin Clients/Panel PCs.

Panel PC: A display which has the capabilities of a complete computer included in the design. A Panel PC is capable of running programs and storing information, and may be able to connect to a network. Panel PCs ship with input devices, usually a keyboard with a trackball attached.

Thin Client: A limited version of a Panel PC, which has less operating system capability and limited input/output capability. This is a low-cost but functional embedded computer.

X-Terminal: Another term for a Panel PC when the customer will be running the Linux operating system only.

PXE Boot: Any embedded computer which has the capability to boot using an operating system from a network. To do this, the computer must have a specific software in the boot-up sequence that looks for the operating system on the network and copies locally. Such a computer can have local memory for file storage, or it can use the network for this function, as well. When this type of computer is shut down, the operating system goes away, because it is stored in temporary memory. PXE boot systems are often selected for security reasons.

Operating System: The software that runs the computer. The two most typical operating systems Aydin deals with are Win XP (Windows XP) and Linux. If a customer is referencing kernels, this is a specific version of the core Linux software.

Processor: The chip in the computer that the operating system runs on. The processor speed dictates how quickly the computer can respond and how many programs can be open at the same time. Some processor types are Pentium M 1.4 GHz or Core 2 Duo 2.16 GHz.. The "GHz" is the term referencing the speed.

RAM or SDRAM: Temporary memory used by the operating system to store the

information it is currently working on. This memory clears when the computer is shut off.

Hard Drive: Storage for data kept on the computer. The hard drive holds all the files, programs, and other data that will be available to the operating system when the computer is not accessing a network. A hard drive can be either solid-state (flash) or magnetic (mechanical). Military customers usually prefer flash.

Compact Flash: A very small, removable flash drive.

Flash Drive: A form of memory used to store data. The data is stored in electronic circuits instead of mechanical media like magnetic hard drives (the drives used in normal computers). This type of memory can withstand military shock and vibration better than mechanical storage. The USB “memory sticks” or “thumb drives” people use to transfer data between computers are one form of flash drive.

Solid State Memory: See flash drive.

Protocol: A standard for regulating the way data is transmitted.

Ethernet: A high-speed connection between computers or equipment . Ethernet connections are more secure than other connection types such as RS-232 and USB because the protocol is more sophisticated. Ethernet connections can also bridge greater distances than other connection types. The most common Ethernet connector and cable (Cat 5 cable) looks like a phone jack and line, only larger (image below), but Ethernet can (rarely, these days) also use coaxial cable with a round plug.



Ethernet Connector *Left:* on the computer *Right:* on the cable

CAT 5 Cable: A cable used in networking, especially in Ethernet networks.

RS-232: Protocol for transmission of data between computers. The RS-232 connector is typically a 9-pin connector; older versions could also be 25-pin. AN image of an RS-232 connection on a computer is shown below. The RS-232 connector usually has two screws that attach it to the computer so that it cannot be shaken or jarred loose.

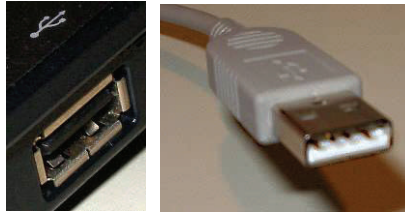


RS-232 Connector on the computer

Serial: A computer interface used to transfer data between devices. RS-232 is one

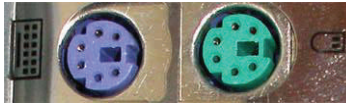
type of serial port.

USB: Universal Serial Bus - a connection for attaching devices to a computer. Modern keyboards and mice often connect using USB, along with printers, digital cameras, scanners, and nearly everything a user might wish to connect. USB connectors can be vibrated or knocked loose because they do not lock into place. Although USB connectors can come in a variety of shapes depending upon the equipment they plug into, the USB connector installed on a computer will be the rectangular connector pictured below.



USB Connector *Left:* on the computer *Right:* on the cable

PS/2: The type of connector originally used for keyboards and mice. This connector has often been replaced by the USB connector, but many computers still have them. See image below.



PS/2 Connectors on the computer

RJ-45: A connector that looks like the ones used with phone line; however, phone line uses only 4 wires, and RJ-45 uses 8. This connector can be used in networking.

OEM: Original Equipment Manufacturer. Although this term can be used for almost any manufacturer, this usually means the manufacturer of computer parts combined by another manufacturer into a finished product. Aydin doesn't build the computers we embed in our displays; instead, we buy them from an OEM, and the OEM usually sells them with the operating system installed. Sometimes OEM can also be used to reference the manufacturer who packages the parts for re-sale.

KVM: Keyboard, Video, Mouse - A KVM is used to connect a display, keyboard and mouse/trackball to two or more computers. In addition to allowing one set of input devices to be used with multiple computers, a KVM can also be used to extend the distance the user and their display are from the computer on which they are working.

MILITARY ENVIRONMENTS

Rugged: A unit is rugged if it has been made capable of taking rougher handling than a normal commercial unit. The term is usually applied to units prepared for military

environments. Units are ruggedized by designing them, both inside and out, to withstand harsh environments. The process of doing this is called ruggedization.

MIL Document Numbers: Military documents are numbered in a meaningful way, and knowing how to decode the document number can avoid confusion when discussing them. All Military document numbers will start with MIL (military) or DOD (Department of Defense), and the code after the first hyphen indicates what type of document it is. STD stands for Standard, while S alone stands for Specification. HDBK is Handbook. If the document number ends in a letter, the letter indicates the revision level of the document. For instance, MIL-STD-810E is older than MIL-STD-810F. Following are some typical MIL docs:

MIL-STD-810: a general requirement for environments, including things like temperature, humidity, some shock, some vibration, salt fog, fungus, sand and dust, altitude, and more.

MIL-S-901: Shipboard (Naval) Shock.

MIL-STD-167-1: Shipboard (Naval) Vibration

MIL-STD-461: EMI (Electromagnetic Interference).

MIL-STD-108: enclosures, including things like drip proof, etc.

DOD-STD-1399: Magnetic Fields – this is important because surface ships de-magnetize their hulls so that magnetic torpedoes and other such weapons won't be drawn to them. This de-magnetization interferes with CRTs, but LCDs aren't affected. However, some customers still require proof that the display won't be affected.

Other specifications/standards: Military customers most often cite MIL/DOD documents in their requirements, but occasionally a non-military specification is cited for a military project. In these cases, it is often helpful to engineering for the customer to provide both the document number and name, and also indicate what specific part of this document applies, in case it needs to be procured to determine compliance. The specs listed below are some of the non-military specifications cited for military applications:

RS-232, 422, 423 and 485: serial interface document

EIA-RS 170, 343, 412: video interface specifications

Shock: A sudden change in the direction of movement. (not an electrical term as used in military specs) Operational shock requires a unit to keep working, non-operational or safety hazard shock only requires that pieces of the unit not fly out and harm anyone nearby.

Airborne: shock comes from landing quickly (operational) or crashing (non-operational) in an aircraft.

- Typical military standard: MIL-STD-810F.

Shipboard: shock is caused by explosions, and the worst effect is the upward force. The importance of how the unit is used on the ship determines if it will require Grade B or Grade A shock. Grade B is for equipment that is not critical to the completion of the mission, and is a safety concern only. Grade A is for equipment without which a mission cannot be completed, and means that the unit must still work after the shock happens.

- Typical military specification: MIL-S-901D

Ground Mobile (army vehicles): shock is caused by rough terrain and nearby explosions. The Army doesn't make any distinction between operational and non-operational shock; if the vehicle can keep going, the monitor should keep working.

- Typical military standard: MIL-STD-810F.

Workbench/Handling shock: The effect of dropping a unit a short distance (lifting one corner or side 12" and letting go).

- Typical military standard: MIL-STD-810F.

Transportation shock: The effect of dropping a unit in shipping packaging from 48".

- Typical military standard: MIL-STD-810F.

Vibration: Vibration comes from the vehicle the unit is mounted in, and is shaking caused by the engine or the terrain the vehicle travels through.

Airborne: caused by the engines on the aircraft, and requires full operation. An aircraft's vibration can be very high.

- Typical military standard: MIL-STD-810F.

Shipboard: caused by the engines, and can increase depending on rough seas. A ship's vibration is very low.

- Typical military standard: MIL-STD-167-1.

Ground Mobile (army vehicles): this is the worst vibration environment (can be up to 6 times what is found on a ship), and is caused by the rough terrain that the vehicle travels through.

- Typical military standard: MIL-STD-810F.

EMI: Electromagnetic Interference. The ability of a piece of electronic equipment to work in the same room with another piece of equipment without either interfering with the other. An example of interference would be when you are listening to the radio in your car and go through a traffic light, and the light causes your radio to have static. EMI is the reason people with pacemakers have to be careful around microwaves. Interference can come from signals either in a powerline cable or in the air.

- Typical military standard: MIL-STD-461E.

Temperature: High or low temperature can cause a unit to malfunction if it is not

accounted for in the design. At a high temperature, the LCD can go black; the temperature at which this happens is called the clearing point. This can be dealt with by selecting an LCD with a high clearing point, by using fans and airflow, or by using heat sinks (pieces of metal designed to transmit the heat from inside the unit to the outside). At a low temperature, the liquid in the LCD starts to freeze, which causes the image to smear when data is changing. This can be dealt with by including heaters in the design. Operating temperature ranges are not as wide as storage temperature ranges.

- Typical military standard: MIL-STD-810F.

MTBF: Mean Time Between Failures. This is a calculation used to determine how long a unit is likely to be used in the field before it requires repair. It can be determined either through empirical evidence (a review of similar units in the field) or through a reliability analysis on a part-by-part basis.

MTTR: Mean Time To Repair. The amount of time usually needed to repair a unit which has suffered a failure. Most Aydin units are repaired by replacing the entire unit with a spare and shipping the original back to our Customer Service Department.

ECDIS: Electronic Chart Display and Information System. ECDIS is used by international Maritime Organizations and the US Navy and Coast Guard to display electronic charts with which ships are navigated. Because different monitors can display the same color information in different ways, units meant to display this information are often required to be ECDIS-certified prior to installation for this purpose. Certification is an option paid for by the customer at an outside source; Aydin builds the units as ECDIS-certifiable by selecting panels capable of properly displaying the specified ECDIS colors. A unit is not certified, however, until it has been characterized through the official process.

TEMPEST: Although several possible meanings have been attributed to the letters in this term, it is not officially an acronym - it is a code name which was applied to the study of Compromising Emanations (CE). TEMPEST-qualified units must reduce or eliminate electrical, mechanical, or sound emanations that an observer can use to determine what information the equipment is processing. Sophisticated equipment can be used to 'listen' to electrical fluctuations from a poorly shielded display and possibly interpret what is on the screen at the time. This requirement is obviously related to equipment which will be used to view sensitive, secret information.

Solar Loading: A display operating in sunlight will experience an increase in internal temperature similar to what happens in a car left parked with the windows closed. This means that the LCD may be required to operate in a temperature far above its clearing point, even though the ambient temperature is not that high. Surfaces of

such a unit may also become hot. The design will have to incorporate methods for discharging the internal heat to the outside safely.

Altitude: The higher above the earth's surface that a unit is used, the less air will be around and in the unit. This causes problems with controlling temperature, and can also cause electrical issues such as arcing (electricity jumping from one part to another inside the unit). rapid decompression and explosive decompression are concerns at high altitude.

- Typical military standard: MIL-STD-810F.

Rapid Decompression: When an aircraft loses cabin pressure due to a puncture; this quickly reduces both the amount of air and the heat inside the aircraft. Temperatures at high altitude can be freezing.

Explosive Decompression: Like rapid decompression, but the loss of cabin pressure happens at a significantly higher speed.

Explosive Atmosphere: If a unit is operated in an enclosed area in which jet fuel fumes can gather, it must not cause the fumes in the air to ignite.

Humidity: The amount of moisture in the air affects how well a unit works. High and low moisture changes the way electricity moves in the unit, and can lead to sparks or shorts. Additionally, exposure to high and low humidity can wear down the electrical parts and cause them to fail quicker than they would if used consistently in a normal office environment. Humidity without condensation is easier to meet, because condensation leads to shorting of the electrical parts and affects the operation more strongly than when the air is humid, but no moisture condenses.

- Typical military standard: MIL-STD-810F.

Submersible: A unit is submersible if it can be placed under water without the water getting into the unit. Depending on the customer's specific requirement, a unit may only need to function after submerged while it is turned off, or it may need to continue to function while it is underwater. The typical submersible requirement is non-functional, and only requires the unit to be tested under a small amount of water (1 meter or thereabouts for two hours). Deeper water puts more stress on the seals of a unit, which makes the design more difficult.

- Typical military standard: MIL-STD-108.

Salt Fog: Salt fog occurs especially in ocean settings, and is a form of high humidity that carries salt with it. Salt in humidity adds to corrosion of materials inside a unit, and also makes the moisture carry electricity more freely, which can lead to sparks or shorts.

- Typical military standard: MIL-STD-810F or MIL-STD-108.

Sand and Dust: Sand or dust blown or pulled into a unit will degrade its performance, possibly causing problems with overheating. This can be avoided with a variety of

solutions including anything from filters over openings that draw air into the unit to, in the most extreme environments, a sealed unit design.

- Typical military standard: MIL-STD-810F or MIL-STD-108.

Fungus: Working LCDs are warm and dark inside, which means that if a unit is exposed to high humidity, it could end up growing fungus; a fungus requirement means that the design cannot allow this to happen. This is avoided by selecting parts for the display which are made from materials on which fungus will not grow, by coating parts with a special material that doesn't allow fungus to grow and doesn't interfere with how the parts work (conformal coating), and/or by designing the unit as a sealed unit so that fungus spores and humidity cannot get inside.

- Typical military standard: MIL-STD-810F.

Conformal Coating: Coating parts with a material that blocks out humidity or fungus spores, which could damage the parts.

Drip Proof: A unit designed for a drip-proof environment is intended to keep dripping water from entering the unit through any holes in the outer surface. This can be accomplished by using shields or louvers (slats of angled metal that break up an opening), or by designing a sealed unit. There are two levels of requirements, one that requires the unit to be drip proof when tilted 15°, and one that requires a tilt of 45°. The requirement can also be limited to front-panel only.

- Typical military standard: MIL-STD-810F or MIL-STD-108.

Driving Rain: A more severe form of the Drip Proof requirement, where the moisture falling onto the unit will be more constant and have more force. It may also have a more severe angle.

Sealed Unit: A sealed unit has no holes in the outer surfaces, and will not use fans or airflow to deal with high temperatures. A unit can be sealed to deal with humidity, salt fog, sand and dust, fungus, or other requirements to avoid something from getting into the unit from outside. A sealed unit is not necessarily submersible. The requirement for a sealed unit is typically a ground mobile requirement.

- Typical military standard: MIL-STD-108.

Roxtec Sealed Glands: Special sealed connectors which block moisture and contamination from entering a unit. They're used in sealed unit designs.

Inclination: The requirement that a unit can operate when sitting on a slant. This is not difficult to meet.

- Typical military standard: MIL-STD-810F.

NBC: Nuclear, Biological, Chemical. These are contaminants which can be experienced by the military in the field, and which will need to be removed from a

display. An NBC requirement means that the display must be able to withstand the moisture and cleaners used in the cleaning process, and that it must be capable of being operated by a person wearing the gear that protects them from these contaminants.

CARC Paint: Chemical Agent Resistant Coating Paint. This is a special paint which is especially resistant to NBC, in addition to providing extra protection from water. It is used by the US military for equipment which may be exposed to NBC, and cannot be exported to other countries. It also requires special handling on products because touching up scratches is not easy, and must be done under controlled circumstances.

Steam/Waterjet: A unit which has undergone NBC contamination will need to be cleaned with high-pressure water or steam. The test to determine if a unit passes this requirement involves spraying the display with something similar to a fire hose and then opening the unit to see if any water has gotten inside. One drop observed inside the casing when it is opened can be a failure in the test.

MOPP: Military Operational Protective Posture. The MOPP rating determines the type of gear personnel can be wearing while trying to operate the display. Most of Aydin's MOPP requirements have been MOPP 4, in which the user will be wearing protective rubber gloves as a part of their overall protective gear. The display must have controls which allow it to function and respond properly to use by a person wearing the MOPP 4 gloves, and buttons or other controls must be spaced to be both accessible to fingers enlarged by these gloves and also to avoid such fingers accidentally activating two controls at once.

Arctic Gloves: When military personnel are working in extreme cold, they will have to use equipment while wearing gloves designed to protect them from the extreme temperature. Military Arctic Gloves do not have individual fingers, and are more like mittens. The display must have controls which allow it to function and respond properly to use by a person wearing these gloves, and buttons or other controls must be spaced to be both accessible to fingers enlarged by these gloves and also to avoid such fingers accidentally activating two controls at once.

Characterization: Characterization is when you measure something about a unit, and record the results. It is a form of test, but there is no pass/fail; it is what it is. *In the case of ECDIS characterization*, the characterization information is intended to be used when the unit is set up by the customer to make sure that it is being optimally handled by the computer that runs it so that colors displayed are consistent with all other ECIDS panels. It is possible for an LCD to be unable to show ECDIS colors, which can be called a fail, but this is part of the design of the LCD from the manufacturer; Aydin selects panels that can meet ECDIS for the appropriate units, then sends them to be characterized at the customer's request before the customer puts them in their system.

Index

Page numbers shown in bold indicate that the entry is a definition. Numbers shown in italics indicate that the entry is an image. Other numbers indicate entries in which the term is referenced.

0-9			
1U	22	LED	12
<i>2K</i>	<i>10</i>	in Enhancements	<i>12</i>
2U	22	Blank Level	14
3, 4, and 5-Wire RGB	18	BNC	in RGB <i>18, 18</i>
3-Wire	18	Brightness	see Luminance
4-wire	18		
5-Wire	18		
		C	
A		Cage Code	4
A/B Switch	20	in ID Label	<i>5</i>
AC	20	Capacitive	21
in Wattage	<i>20</i>	CARC Paint	31
Acrylic	16	CAT 5 Cable	24
Active Display Area	9	CCFL Backlight	12
in Resolution (LCD)	<i>9</i>	in Backlight	<i>12</i>
AG	15	CE	6
in Enhancements	<i>12</i>	CFE	7
Airborne	in Vibration <i>27</i>	CGA	<i>10</i>
in Shock	<i>26</i>	Characterization	31
Alternating Current	see AC	Chassis Mount	22
Altitude	29	Chemically Strengthened Glass	16
Ambient Light	11	Clearing Point	14
in Contrast Ratio	<i>11</i>	in Temperature	<i>28</i>
in Foot Candles	<i>11</i>	Commercial	3
Analog	17	Compact Flash	24
in Composite Video	<i>17</i>	Composite Video	17
in Display Colors	<i>14</i>	Condensation	in Humidity <i>29</i>
in NTSC	<i>17</i>	Configuration	5
in RGB	<i>18</i>	1U	22
in S-Video	<i>19</i>	2U	22
Anti-Glare	see AG	Chassis Mount	22
Anti-Reflective	see AR	in Configurator	<i>6</i>
AR	15	Desktop	22
in Enhancements	<i>12</i>	in ID Label	<i>5</i>
Arctic Gloves	31	in Model Number	<i>5</i>
AS9100	3	Panel Mount	22
Aspect Ratio	10, 10	in Part Number	<i>6</i>
ATC	3	Rack Mount	22
Auto Screen Sizing	11	VESA Wall Mount	22
		Configurator	6
B		in Configuration	<i>5</i>
Backlight	12	Conformal Coating	30
CCFL	12	in Fungus	<i>30</i>
		Contrast Ratio	11
		in Ambient Light	<i>11</i>
		in Foot Candles	<i>11</i>

in Viewing Angle	12	Evaporated Coating	15
Console Mount	22	Explosive Atmosphere	29
COTS	6	Explosive Decompression	29
		in Altitude	29
		Extended Display Identification Data	see EDID
D			
D Connector	see Sub-Miniature D Connector		
DC	20	F	
in Wattage	20	Fill	11
Desktop	22	Flash Drive	24
Digital	17	in Hard Drive	24
in Display Colors	14	FOD	6
in DVI	19	Foot Candles	11
in HDMI	19	in Ambient Light	11
Direct Current	see DC	in Contrast Ratio	11
Display	2	Foot Lambert	in NITS 11
Display Colors	14	Fungus	30
DOD	in MIL Document Numbers 26	in Conformal Coating	30
Drip Proof	30	in Sealed Unit	30
Driver	21		
in Touchscreen	20	G	
Driving Rain	30	GFE	7
DVI	19, 19	Ground Mobile	
		in Sealed Unit	30
		in Shock	26
		in Vibration	27
		GSA	5
		General Services Administration	see GSA
E			
EAR	7	H	
ECCN	7	Hard Coating	16
ECDIS	28	in Resistive	21
in Characterization	31	Hard Drive	24
ECO	3	Harmonized Code	7
EDID	14	HD 1080	in Resolution, LCD 9, 10
EIA-RS 170	in Other Specs/Standards 26	HD 720	in Resolution, LCD 9, 10
EIA-RS 343	in Other Specs/Standards 26	HDBK	in MIL Document Numbers 26
EIA-RS 412	in Other Specs/Standards 26	HDMI	19
Electromagnetic Interference	see EMI	Heat-Tempered Glass	16
Embedded Computer	23	Humidity	29
in OEM	25	in Conformal Coating	30
Panel PC	23	in Fungus	30
PXE Boot	23	in Salt Fog	29
in Thin Client	23	in Sealed Unit	30
X-Terminal	23		
EMI	27		
in ITO	15		
Enhancements	12		
ESD	6		
Ethernet	24, 24		
in CAT 5 Cable	24		

I			
ID Label	5, 5		
Image Retention	8		
Inclination	30		
Indium-Tin Oxide	see ITO		
Industrial	3		
Infrared	see IR		
Interlaced	13		
Intranet	2		
	in Quality Instructions	3	
	in Quality Procedures	3	
IR	21		
ISO 9001:2000	in AS9100	3	
ITAR	7		
ITO	15		
J			
JO	4		
Job Order	see JO		
K			
KEMA	3		
Keyboard, Video, Mouse	see KVM		
KVM	25		
	in 1U	22	
	in 2U	22	
L			
Laminated Glass	16		
Lamination	16		
	in Enhancements	12	
	in Safety Glass	16	
LCD	8		
LCD Specifications			
	Active Display Area	9	
	Aspect Ratio	10	
	Clearing Point	14	
	Contrast Ratio	11	
	Display Colors	14	
	Luminance	11	
	Pixel Pitch	9	
	Size	9	
	Refresh Rate	13	
	Resolution	9	
	Viewing Angle	12	
LED	13		
	Backlight	12	
	in Backlight	12	
	Lexan®	in Polycarbonate	16
	Linux	in Operating System	23
		in X-Terminal	23
	Lucite®	in Acrylic	16
	Luminance		11
		in NITS	11
	Lux		11
M			
M2M			4
	JO		4
	Job Order		4
	PO		4
	Purchase Order		4
	Sales Order		4
	SO		4
	Made2Manage		see M2M
	Magnetic Drive	in Hard Drive	24
	Markets		3
		ATC	3
		Commercial	3
		Industrial	3
		Military	4
	Mechanical Drive	in Hard Drive	24
	Membrane Switch		6
	MIL Document Numbers		26
	Military		4
	Military Environments		25
		see MIL-STD-461	
		see MIL-STD-167-1	
		see MIL-STD-108	
		see MIL-STD-810	
		see MIL-S-901	
	Altitude		29
	Arctic Gloves		30
	Drip Proof		30
	Driving Rain		30
	ECDIS		28
	EMI		27
	Explosive Atmosphere		29
	Explosive Decompression		29
	Fungus		30
	Humidity		29
	Inclination		30
	MOPP		30
	MTBF		28
	MTTR		28
	NBC		30
	Rapid Decompression		29
	Salt Fog		29
	Sand and Dust		29
	Sealed Unit		30

Shock	26	MTBF	28
Solar Loading	28	MTTR	28
Steam/Waterjet	30		
Submersible	29		
Temperature	27	N	
TEMPEST	28	Native Resolution	11
Vibration	27	in Active Display Area	9
MIL-S-901		in Auto Screen Sizing	11
in MIL Document Numbers	26	in Resolutions Supported	9
in Shock	26	in Scaling	10
MIL-STD-108		NBC	30
in Drip Proof	30	NEMA	in SAW 21
in MIL Document Numbers	26	NEMA 4, 4X	in Panel Mount 22
in Salt Fog	29	Nits	11
in Sand and Dust	29	in Luminance	11
in Sealed Unit	30	Normal-Black Panel	14
in Submersible	29	in Blank Level	14
MIL-STD-167-1		in Clearing Point	14
in MIL Document Numbers	26	Normal-White Panel	in Normal-Black Panel 14
in Vibration	27	NRE	4
MIL-STD-461		NSN	4
in EMI	27	NTSC	17, 10, 19
in MIL Document Numbers	26		
MIL-STD-810		O	
in Altitude	29	OEM	25
in Drip Proof	30	Operating System	23
in Fungus	30	in Driver	21
in Humidity	29	in Hard Drive	24
in Inclination	30	in OEM	25
in MIL Document Numbers	26	in Processor	23
in Salt Fog	29	in PXE Boot	23
in Sand and Dust	29	in RAM	23
in Shock	26	in X-Terminal	23
in Temperature	27	Optical	22
in Transportation Shock	27	Optical Bonding	16
in Vibration	27	Original Equipment Manufacturer	see OEM
in Workbench Handling	27	OSD	15
Multi-Imaging	14	On-Screen-Display	see OSD
Model Number	5	Other Specs/Standards	26
in Configurator	6		
in ID Label	5	P	
in Part Number	6	PAL	17, 19
MOPP	31	in Resolution, LCD	9, 10
Mounting Options	22	Panel Mount	22
1U	22	Panel PC	23
2U	22	in Thin Client	23
Chassis Mount	22	in X-Terminal	23
Console Mount	22		
Desktop	22		
Panel Mount	22		
Rack Mount	22		
VESA Wall Mount	22		

PAP	14	Resolution, LCD	9, 10
Part Number	6	in EDID	14
Picture-in-Picture	see PIP	in Multi-Imaging	14
PIP	14	in Native Resolution	11
Pixel	9	in PIP	14
in Pixel Pitch	9	in Resolutions Supported	9
in Resolution, LCD	9	in Scaling	10
Pixel Pitch	9	in S-Video	19
Plasma	8	in Zooming	10
Plastic Unit	6	Resolutions	
Plastic Window	16	HD 720	9, 10
Acrylic	16	HD 1080	9, 10
Polycarbonate	16	PAL	17, 10
Plexiglass® in Acrylic	16	QCIF	9
PO	4	QSXGA	9, 10
Polycarbonate	16	QXGA	9, 10
Power	see Wattage	SXGA	9, 10
Processor	23	SXGA+	9, 10
Progressive	13	SVGA	9, 10
Protocol	24	UXGA	10
in Ethernet	24	VGA	9, 10
PS/2	25, 25	WQXGA	9, 10
Purchase Order	see PO	WSVGA	10
PXE Boot	23	WSXGA+	9, 10
		WUXGA	9, 10
		WVGA	10
		WXGA	10
		XGA	9, 10
		Resolution, Touch	20
		Resolutions Supported	9
		RETMA	see Rack Mount
		RGB	18
		3-wire	18
		4-wire	18
		5-Wire	18
		in Synchronization Signals	18
		RJ-45	25
		RoHS	7
		ROM	4
		Rotex Sealed Glands	30
		RS-232	23, 24
		in Ethernet	24
		in Other Specs/Standards	26
		in Touchscreen	20
		RS-422 in Other Specs/Standards	26
		RS-423 in Other Specs/Standards	26
		RS-485 in Other Specs/Standards	26
		Rugged	25
Q			
QCIF in Resolution, LCD	9		
QSXGA in Resolution, LCD	9, 10		
Quality Instructions	3		
Quality Procedures	3		
QVGA	10		
QXGA in Resolution, LCD	9, 10		
R			
Rack Mount	22		
in 1U	22		
in 2U	22		
RAM	23		
Rapid Decompression	29		
in Altitude	29		
RCA in NTSC	17, 19		
Refresh Rate	13		
in Scanning Frequency	13		
Resistive	21		

S

S	in MIL Document Numbers	26
Safety Glass		16
	in Heat Tempered Glass	16
	in Laminated Glass	16
	in Plastic Window	16
Sales Order	see SO	
SalesLogix		4
Salt Fog		29
	in Sealed Unit	30
Sand and Dust		29
SAW		21
SBC		23
Scaling		10
Scanning Frequency		13
SDRAM	see RAM	
Sealed Unit		30
	in Drip Proof	30
	in Fungus	30
	in Sand and Dust	29
Serial		24
Shipboard		
	in Shock	26
	in Vibration	27
Shock		26
	Transportation Shock	27
	Workbench Handling	27
Size		9
Single-Board Computer	see SBC	
SL	see SalesLogix	
Slow Scan		13
SO		4
Solar Loading		28
Solid-state Memory	see Flash Drive	
Specification		6
Standard		6
	NEMA (Panel Mount)	22
	in NTSC	17
	in Protocol	24
	in Quality Instructions	3
	in Quality Procedures	3
	in Synchronization	17
STD	in MIL Document Numbers	26
Steam/Waterjet		31
Submersible		29
	in Sealed Unit	30
Sub-Miniature D Connector	in RGB	18, 18, 19

Substrate		15
Surface Acoustic Wave	see SAW	
Surface Treatments		
	AG	15
	AR	15
	Chemically Strengthened	16
	Enhancements	12
	Evaporated Coating	15
	Hard Coating	16
	Plastic Window	16
	ITO	15
SVGA	in Resolution, LCD	9, 10
S-Video		19, 19
SXGA	in Resolution, LCD	9, 10
SXGA+	in Resolution, LCD	9, 10
Sync	see Synchronization	
Synchronization		17
	in 3-Wire	18
	in 4-Wire	18
	in 5-Wire	18
	in Composite Video	17
Synchronization Signals		18
T		
Temperature		27
	in Sealed Unit	30
Tempered Glass		16
	in Safety Glass	16
TEMPEST		28
Thin Client		23
Touchscreen		20
	in Update Rate	13
Touchscreen Types		21
	Capacitive	21
	IR	21
	Optical	22
	Resistive	21
	SAW	21
Transflective		15
Transportation Shock		27
U		
UGA		10
UL		6
Underwriters Laboratory	see UL	
Update Rate		13
USB		25, 25
	in Ethernet	24

	in Touchscreen	20
	in PS/2	25
UXGA	in Resolution, LCD	9

V

VESA	in EDID	14
	Wall Mount	22
	in Resolutions, LCD	9
	in Synchronization	17
VGA	see RGB ,	10
	in Resolution, LCD	9
Vibration		27

Video Input Interfaces/Signals

Analog	17
Composite Video	17
Digital	17
DVI	19, 19
HDMI	19
NTSC	17, 19
PAL	17, 18
RGB	18
S-Video	19

Viewing Angle	12	
Voltage	in AC	20
	in DC	20
	in Wattage	20

W

Waterjet	see Steam/Waterjet	
Wattage	20	
Win XP	in Operating System	23
Windowing	14	
Workbench Handling	27	
WQXGA	in Resolution, LCD	9, 10
WSVGA		10
WSXGA+	in Resolution, LCD	9, 10
WUXGA	in Resolution, LCD	9, 10
WVGA	in Resolution, LCD	9, 10
WXGA		10

X

XGA	in Resolution, LCD	9, 10
X-Terminal		23

Y

Z

Zooming	10
----------------	----