



The HAI Graphics Primer

An introduction to Touchscreen interface design

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The HAI Graphics Primer

Thank you for choosing HAI as your home automation solution. HAI created this document to provide its customers and dealer network a basic understanding of how to prepare graphics for use on a home automation Touchscreen. With the advent of HAI's Automation Studio software, you now have the power to develop and modify a home's Touchscreen interface to suit your needs or style. To get the most out of this software it is suggested that you be introduced to various essential terms and tactics that can help ensure your interface design projects are as rewarding as possible.

While HAI provides this document as assistance in your efforts, there are many, many additional resources both online and in your community that go much further in depth. Please utilize these avenues for additional information into creating graphics for your Touchscreens.

For support with graphic editing software, please contact the software provider directly. These vendors generally provide very intuitive online help guides and even user support forums to answer your questions quickly and accurately.

Raster versus vector

There are essentially two different types of computer graphics: raster and vector.

Raster graphics are flat images, and as such, do not increase in scale well. A good example of a raster graphic is a digital photograph. It can be reduced in size and not lose quality, but if increased in size, quality will suffer proportionately.

Vector graphics are fully scalable solid shapes created from points and lines, sometimes referred to as *paths* or *outlines*. A typical example of a vector graphic is a corporate or sports logo. Through simplified solid color shapes a fully scalable image is created that can be applied to numerous applications.

Raster graphic formats

Raster graphic formats include JPG, GIF, PNG, BMP, and TIFF. Sometimes the term *bitmap* is used in place of raster to define all types of raster images. This is a misnomer as BMP is literally the *BitMaP* format.

Some raster images limit their file size by limited the color information to only the existing colors in use. This is called *indexed color*. Other raster images limit file sizes by *pixelating* the areas where colors meet each other, creating a distorted blurry look the more compression is applied. High quality raster images will feature smooth, clear transitions between colors. These soft-edged transitions are called *anti-aliasing*. Anti-aliasing is where pixels average their color based on their nearest neighbors which are usually two distinct colors. This renders a natural transition, avoiding hard, jagged edges.

Depending on the software you open an EPS with, it will render as a raster image, due to the TIFF or JPG preview inherent in a PC-based EPS.

Vector graphic formats

Vector graphic formats are typically program specific. The exception is the relatively new .SVG format. Adobe Illustrator is arguably today's most popular vector graphics program in the realm of professional graphic design. Illustrator's native file format is .AI, but it can also render PDF and EPS files with vector characteristics. Other popular vector applications include CorelDraw, Macromedia Freehand, and—to a lesser extent—Microsoft Visio. Shareware and freeware applications possessing similar abilities also exist.

Standard image file formats

- PDF – “Portable Document Format”
- EPS – “Encapsulated PostScript”
- TIFF – “Tagged Image File Format”
- JPEG/JPG – “Joint Photographic Experts Group”
- GIF – “Graphics Interchange Format”
- PNG – “Portable Network Graphics”
- BMP – “BitMaP” file format
- SVG – “Scalable Vector Graphics”

A brief summary of standard image file formats

PDF

Pros

- Extremely popular
- Good quality to compression ratio
- Embeds images and typefaces
- Print quality available
- Can potentially import as vector graphic

Cons

- Compression affects quality
- Typically sized as a letter/legal document

Adobe’s PDF file format is incredibly popular due to its ability to render a variety of qualities and files sizes from documents that would otherwise be extremely cumbersome to transfer via the Internet. When generating these files the user can select various compression settings that reduce the file’s size.

A PDF file that contains vector generated graphics can be opened in a vector application and the graphics therein scaled and modified. Because these files are generally formatted for printing on standard letter or legal paper, they are not practical for importing into an application as a stand-alone graphic. If specific content embedded in a PDF needs to be separated, the PDF can be opened in a vector or raster application and modified to that result.

EPS

Pros

- Very good print quality
- Potential vector conversion
- Cross platform & application format

Cons

- Large file size
- Screen preview misrepresented by TIFF
- Suggested for print use only

The Encapsulated PostScript file originates from Apple Computers. As such, PCs tend to render EPS files differently, particularly depending on the application used to open them. Usually a PC vector program will only show a TIFF preview image when an EPS has been imported. The advantage of an EPS file is the ability for many applications to open this format. It can provide a high resolution output on a printer, but due to that, incurs a large file size.

TIFF

Pros

- Very high press quality capability
- Recognized by most applications

Cons

- Large file size (zero compression)
- Not recommended for screen graphics

The Tagged Image File Format (TIFF) is a widely popular format for high resolution images reproduced in professionally printed documents. Incredibly high pixel-per-inch (ppi) ratios are available to TIFF images allowing them unparalleled quality. With such resolution though, comes large file size. Thus, the TIFF is not given to web or email use. These images simply exceed the resolution needed for on-screen only display applications where more efficient file formats are more comfortable.

JPG (pronounced “Jay-Peg”)

Pros

- Small file size
- Recognized by most applications
- Can be made with print quality

Cons

- Compression affects quality
- Not recommended for printing (use TIFF)

The JPG file format has become the standard for web image files. It’s small image size and compression characteristics have made it the preferred file format for any number of online uses. JPGs can be exported from graphic applications through a variety of compression settings that balance “rasterization” (i.e. image quality loss due to compression) with practical file size. With file size being the

primary concern due to bandwidth limitations, JPG is a friend to web developers and digital photographers alike as it is inherently a compressed file format.

GIF (pronounced like “Gift”)

Pros <ul style="list-style-type: none">• Small file size• Transparent background capability• Animation capability (via several GIFs)	Cons <ul style="list-style-type: none">• Compresses too much for photos• Not recommended for printing
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The GIF format’s characteristics and popularity is quite relative to that of the JPG file format. Both gained massive use during the growth of the Internet as both provided good image quality for screen use at low file sizes. GIF, however, was capable of beating JPG at the file size game. GIF files use what is known as “indexed” color. The color information saved for a GIF image is limited to only the specific colors that exist in the image, up to 256 total colors. That reduces the amount of information a GIF file needs to store, thereby reducing the size of the GIF file overall. While this is great for file size restrictions found in web use, it’s damaging to image quality. Typically a user will want to save a vector image as a GIF, and never save a raster image as a GIF. Photographs are more inclined to the JPG format as it is not indexed and permits anti-aliasing. Of additional note is that GIF files can be built to include transparent backgrounds and even animations through more advanced software.

PNG

Pros <ul style="list-style-type: none">• Small file size• Understood by most applications• Transparent background capability	Cons <ul style="list-style-type: none">• Best for screen-only use• Not recommended for printing
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The PNG file format has much in common with the JPG file format. The only exception would be that the PNG can be saved with a transparent background, much like the GIF can. PNG is a good compressed image format for web or screen-only use. Again, it’s only unique advantage is its transparent background capability, which may or may not be utilized, depending on the user.

BMP

Pros

- Very small file size
- Understood by all applications
- Simple graphic rendering capability

Cons

- Not recommended for printing
- Jagged edges
- Not suggested for photographs

BMP is one of the most established image file formats. However, it does not have any specific advantages over other raster formats such as JPG, GIF, or PNG. It is a very basic format that all machines can read.

SVG

Pros

- Small file size
- Vector editing capability
- Fully scalable (in a vector environment)
- Well suited to mobile devices

Cons

- Limited to solid shape graphics (no photos)
- Jagged edges
- Not photograph compatible

As mentioned, the SVG is relatively new to the family of graphic file formats. It is also unique in that out of all the graphic file formats discussed here, it is the only one of them that deals strictly with vector art (a PDF containing vector art can be imported into a vector program and re-interpreted). Typically, vector files are of a proprietary file format such as .AI from Adobe Illustrator. Being committed to that format leaves a user stuck only being able to modify that file in that program or one that reads that program's file format. SVG has opened up unparalleled freedom in sharing vector art and is used widely in online resource websites such as Wikipedia's Wikimedia Foundation for article imagery.

Graphic design applications

As the Internet has blossomed, and computer technology has become a daily part of people's lives, the use of graphic design software—professional and otherwise—has become more commonplace. What used to be software only mastered by those in the industry is now found in schools and homes of individuals simply interested in recreational design for their own personal use. This has spawned terms like *photoshopped* (using Adobe Photoshop to edit an image) and *pic* (short for picture, particularly a digital image).

Beyond the high-priced upper echelon of graphic design software is shareware that functions almost exactly the same but for none of the cost, thus making this type of work even more approachable. Programs such as GIMP (GNU Image Manipulation Program) have grown from curious imitations of Adobe's Photoshop franchise to become a respected resource for the casual designer.

On the retail side of the market, Adobe's 2005 buyout of their stiffest competitor, Macromedia, added an armada of popular graphic design tools to Adobe's already dominant arsenal.

Below is a list of what are considered the most popular and standardized graphic design software applications organized by vector, raster, and animation purpose:

Raster Editor Software

- Adobe Photoshop/Photoshop Elements (retail)
- GIMP (freeware)
- Corel Paint Shop Pro (retail)

Vector Editor Software

- Adobe Illustrator (retail)
- Adobe (formerly Macromedia) Freehand (retail, but being phased out)
- Inkscape (freeware)
- Corel Draw (retail)

Animation Editor Software

- Adobe (formerly Macromedia) Flash (retail)
- Adobe ImageReady (retail, functions within Photoshop)
- Autodesk 3D Studio Max (retail)
- Blender (freeware)

Image optimization

For the particular application of graphics to Touchscreens, it is important to ensure the images you use are built with consideration for this unique hardware's capabilities. Essentially, it's best to utilize the image optimization tactics proven during the late '90s era of the Internet: 1) minimize file sizes as much as possible without sacrificing image quality, and 2) reuse the same image files as much as possible to reduce redundant processor effort.

Practice these steps to keep file sizes down:

- **Resolution:** In your raster software, confirm the resolution (pixels/inch) is no larger than 72. This resolution is the ratio that computer monitors—including Touchscreens—display at. There is no reason to exceed this resolution, and doing so only increases the image's file size.
- **Color Mode:** Some programs will have two color modes for images abbreviated as *CMYK* and *RGB*. *CMYK* indicates a four-color mixture for a printing press (Cyan, Magenta, Yellow, and Black). This mode increases file size due to the necessary color separations required for printing and is not necessary for screen-only graphics. You will always want your images to be in *RGB* (Red, Green, Blue) mode as their sole application is for display on a computer screen. Keeping your color mode correct will ensure a smaller file size.
- **Dimensions:** Keep your active button image areas consistent. Work within a set dimension for all of them so they stay similarly sized not just in measurements, but also in file size. HAI has developed a sample gallery of ready to use graphics following set pixel dimensions of 128x128, 64x64, and 32x32. Other graphics should be sized with the Touchscreen's screen size in mind.

For logo, floor plan, or any other third party graphics you plan to import into your interface design, open these files in your editing software and confirm that they abide by these formatting tactics.

Test your graphics early on

Imagine the frustration of completing an impressive Touchscreen interface only to find that when uploaded to your devices things look different. Take into account a few additional elements of graphical context and you can avoid a lot of frustration down the road. Essentially, it's a good practice to test fit your composition—or just a few of your graphics—early in the process.

Your graphics will always display at 100% of their finished size according to the resolution of the Touchscreen they are applied to. Keep in mind they may appear smaller on your computer than when on the Touchscreen. This is because computers display at various resolutions—most of them much higher than that of a Touchscreen, which maintains a singular consistent resolution (800x600 or 640x480, depending on the model).

If you intend to create a family of identically sized graphics it is suggested that you upload and display one or two of them prior to completing the whole series. This way you can keep the context of how those image dimensions look on the Touchscreen(s).

Design resources

The following products and links are provided as a quick reference should you require or have an interest in advancing your design efforts. A variety of books on the subject of graphic design and the industry's related software tools provide excellent tips, how-to's, and shortcuts. Also included are references to help sites and the software developers themselves. Due to the nature of the ever-changing Internet, these website addresses are always subject to change by the respective entities in control of them. A quick Google search is always a fair substitute. HAI does not endorse these entities nor the use of these products but rather makes this resource available as an informational tool.

Software

- Adobe Systems <http://www.adobe.com/>
- Corel Corporation <http://www.corel.com>
- Inkscape <http://www.inkscape.org/>
- GIMP <http://www.gimp.org/>
- Autodesk, Inc. <http://usa.autodesk.com>
- Blender <http://www.blender.org/>

Online Help

- Adobe Illustrator <http://www.adobe.com/support/illustrator/>
- Adobe Photoshop <http://www.adobe.com/support/photoshop/>
- Adobe Flash <http://www.adobe.com/support/flash/>
- Corel Software <http://www.corel.com/servlet/Satellite/us/en/Content/1211295787104>

Communities

- PhotoshopTechniques.com <http://www.photoshoptechniques.com/forum/>
- DEVPL <http://www.devpl.com/>
- Adobe Online Forums <http://forums.adobe.com>
- Biorust <http://www.biorust.com/>

Book Titles

- The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques http://www.amazon.com/Essential-Guide-User-Interface-Design/dp/0470053429/ref=sr_1_4?ie=UTF8&s=books&qid=1239383444&sr=1-4#
- Logo Design Workbook: A Hands-On Guide to Creating Logos http://www.amazon.com/Logo-Design-Workbook-Hands-Creating/dp/1592532349/ref=pd_sim_b_5#
- The Principles of Beautiful Web Design http://www.amazon.com/Principles-Beautiful-Web-Design/dp/0975841963/ref=sr_1_5?ie=UTF8&s=books&qid=1239384623&sr=1-5
- Adobe Photoshop CS4 Classroom in a Book http://www.amazon.com/Adobe-Photoshop-CS4-Classroom-Book/dp/032157379X/ref=sr_1_4?ie=UTF8&s=books&qid=1239385041&sr=1-4
- Adobe Illustrator CS4 Classroom in a Book http://www.amazon.com/Adobe-Illustrator-CS4-Classroom-Book/dp/0321573781/ref=sr_1_7?ie=UTF8&s=books&qid=1239385041&sr=1-7
- Adobe Flash CS4 Professional Classroom in a Book http://www.amazon.com/Adobe-Flash-Professional-Classroom-Book/dp/032157382X/ref=sr_1_14?ie=UTF8&s=books&qid=1239385298&sr=1-14
- Beginning GIMP: From Novice to Professional, Second Edition http://www.amazon.com/Beginning-GIMP-Novice-Professional-Second/dp/1430210702/ref=sr_1_15?ie=UTF8&s=books&qid=1239385298&sr=1-15