Standards Guide

Graphical User Interface

Design Guide

Extron

Contents

Introduction

The control system touchpanel interface is perhaps the most highly visible component of an installed AV system, and one that encourages direct interaction from the user. The quality of the entire AV system is often judged by the touchpanel experience.

Quality user interfaces balance style and function. A layout that is familiar and pleasing to the eye is more likely to be used. An interface must meet the needs of the user and function the way they expect. Operating a poorly designed interface can be intimidating and overwhelming, so eliminating confusion is the key element to success.

With limitless color options, graphics, and logos available to the designer, a touchpanel interface can be infinitely customized. The challenge for the designer is not to be overly creative, but to design a professional looking interface that is easy to navigate. Fortunately, there are a number of concepts and templates that allow designers to make educated choices when creating an interface that is both functional and attractive.

This guide introduces these fundamental concepts within the context of AV control systems. The goal is to enable touchpanel designers to choose the right tools and methods necessary to create an intuitive interface that gives the user a positive experience.

The Extron Graphical User Interfaces Design Guide contains the following main chapters:

User Centered Design

This chapter provides an overview of how to design AV products with the user in mind. It outlines the GUI (Graphical User Interface) development lifecycle and offers insight into understanding the needs of your audience and how to develop effective deliverables.

Layout Principles

This chapter teaches the principles of consistency, navigation, screen layout, affordance, and color selection. A solid understanding of these building blocks is essential for touchpanel interface designers.

Design Fundamentals

This chapter teaches the designer how to apply layout principles when creating different aspects of user interfaces, such as pages, buttons, text, typefaces, and images.

Interaction Principles

This chapter presents a broad overview of the best practices of interaction design. Topics include anticipating the needs of the user, discoverability, button states, and other concepts to ensure your system provides enough feedback for user understanding.

Layout Standards

This chapter shows the Extron standards for design consistency. Through our templates we showcase the best practices and common patterns found within AV control interfaces. Extron templates consolidate years of experience working with consumer interfaces and provide integrators a starting point for client projects.

Assumptions

This document intends to illustrate the best practices of user interface design within the scope of the AV industry. It reflects common patterns and behaviors of the majority of our customers - and is not an all-inclusive guide. Applications within the AV industry often require a tailored configuration, and context should be taken into account when determining the best approach for an effective interface. Special care must be taken during the research and specification phase if designing an interface intended for highly specialized users or advanced configurations. When in doubt, the best approach is to ask for clarity and test your users.

- Insights within this guide are based on roughly 80% of the typical end-user behavior and scenarios encountered in the field. Some recommendations may not apply to incredibly specialized users or configurations. Applying a user-centered design process will always achieve best results.
- The GUI developer has a foundational understanding of Extron GUI Designer and its relation to Extron configuration and programming tools. Refer to the Extron website for a better understanding of how these software packages work together.
- System requirements for a project will have already been established and the GUI developer has access to these documents.

Extron TLP Pro 1725TG

Planning and Research

This section is designed to set the stage for success in planning and executing a successful GUI (graphic user interface) project. Topics covered include: an overview of the user centered design process, where the GUI fits in to the AV system design process, and foundational knowledge of human limitations regarding AV technology.

User Centered Design

The AV field is experiencing a fundamental shift in the approach to creating products. Traditionally products have been built based on technical limitations, and humans were expected to adapt to the product. Today products are developed to optimize the human experience, and user centered design serves as one of the greatest competitive advantages in the industry.

What Makes a Good Design?

Among all the details of colors, fonts, interactions, principles, and processes it is easy to lose focus about what makes a good design. Good design is not about novel technology, stunning visuals, or the latest trends; good design is about solving the problem. Understanding the problem and understanding the audience will frame your project in a way that produces powerful results. Effective design begins with a deep understanding of the scope of the problem and user expectations. The purpose of this section is to help developers understand their role in the business processes surrounding GUI development as well as provide insight into your users' expectations.

How does GUI Design fit into a Control Project Timeline?

A GUI needs to be constructed before configuration or programming can happen. This fact often leads to compressed timelines and hurried development. Ideally, a GUI will be constructed with regular feedback from the customer along with testing of multiple iterations on actual systems. More often, an initial set of conceptual ideas is collected from the client, the GUI is designed, and configuration and programming begins before the customer has fully signed off on the design details. The lack of customer and user feedback is always a problem, but by being aware of the implications of these kinds of development pressures, the most common pitfalls can be avoided. The following are a few things to mitigate the most common problems of compressed development timelines and allow for configuration or programming to begin as early as possible:

1. **Color and style expectations** — Ask the client early on if they have a specific color palette or design specification. It's also a good idea to ask the client if they have existing systems that can act as a guide for color and layout schemes. Remember that, to the end user, the interface is the product, so if they are expecting a branded experience, make sure you know what those specifications are. Especially if the client has a website, you should strive to make the GUI feel like part of the same piece. While it is always possible to copy resources from a website, the customer may already have a prepared sets of logos and some form of a style guide or color specifications.

2. **Layout compartmentalization** — There is a natural desire to create the entire GUI all at once. For small projects, this may be feasible, but for larger projects, you should structure your work such that as you finish each part, you can gain approval while working on something else. For instance, if your client specifies four options for display inputs, you should customize the popup page you expect to be used most commonly first, and use that one as an on-screen reference when designing the page on which it will be displayed. When you submit that page for feedback, you will likely get feedback regarding the popup as well. This allows you to incorporate design feedback for all the input popup pages without needing to redesign each one.

3. **Chunking** — This is a technique discussed in greater detail later in the guide. For now, consider arranging the GUI by setting aside areas or zones for items rather than placing objects in specific positions. For instance, if your inputs are all on the top, set aside the entire top area for inputs, even if this initially results in extra space. This will mean that adding a fifth input does not disrupt the existing design. In addition, popup page references with appropriate pages can be used to control smaller areas of the screen for especially-complex interfaces.

Takeaways

➜ Good design is not about stunning visuals or interactions – it's about solving the right problem.

➜ Do not begin configuration of the GUI before the client approves of the final designs.

➜ Ask the client early in the process for color and style expectations.

➜ If possible, design the layout in small, compartmentalized pieces. This way you can get feedback on specific pieces of the design and modify without re-designing the entire interface.

➜ Determine all buttons and functions with similar features and group them together.

Users and Where to Find Them

Users may include a range of stakeholders who interact with, invest in, budget for, technically support, and benefit from a control system. They have a vested interest in its successful functioning.

Control system users may be:

- Presenters, instructors, and students — both local and remote
- Researchers and medical professionals
- Corporate and office executives
- AV and IT technical support staff

Customer vs. End User

Note that the customer often has different motivations and goals from the individuals who will be interacting with your product on a regular basis. Customers of enterprise products are generally concerned with efficient use of resources, security, and ease of maintenance. On the other hand, end users are concerned with presenting and teleconferencing with minimal frustration. End users will do their best to support their employer's business goals if given a good experience to do so. In short, successful products meet the user goals first.

User Expectations

Users' expectations have changed dramatically by the introduction of smartphones and tablets. These devices affect the way people interact with technology. AV designers and integrators must consider the implications of existing and similar technologies when creating a control system user interface.

When interacting with a digital touch interface, users have come to expect:

- To only view relevant and contextual information
- Fast and informative feedback. The system must respond within one second of user input. Responses beyond one second frustrate the user and breaks their attention span. Responses that require 10 seconds or longer should include a progress indicator, such as a "percent-done" meter.
- Gestural and direct manipulation of the screen. Users will attempt to swipe, stretch, shrink, and drag items on screen whether there are signifiers there or not.
- Automation and syncing among many devices and platforms.

User Behavior in the Digital Landscape

One of the hardest lessons of usability is to recognize that the designer is never the target audience. In AV systems, the audience cares about one thing only: completing their task efficiently. The following behaviors help illustrate this point:

- Humans do not read, they scan. Do not place a heavy emphasis on directions or documentation, as they are unlikely to be read.

- Users often do not choose the best option available, they choose the first reasonable one. This means a lot of trial and error. Ensure the project is robust by accounting for user error and providing an easy way to “undo” or “go back.”
- Users are comfortable with conventions because it makes them feel confident and in control. Forgoing novelty and leveraging existing design patterns is an easy way to instill confidence in your system.

Number One Rule for Creating Usable Products

If you could only remember one rule of usability, let it be this: when a user looks at your product, it should be obvious what they can do. This is especially true for your user interface. The term “intuitive” is used frequently when describing interfaces and it is a crucial element to providing the best user experiences. In no circumstance should a user need to rely on a manual or any other outside guide to figure out how to interact with your interface. Remember - the best interface is one the user barely notices at all. Even upon their first introduction with the interface, it should feel comfortable and inviting.

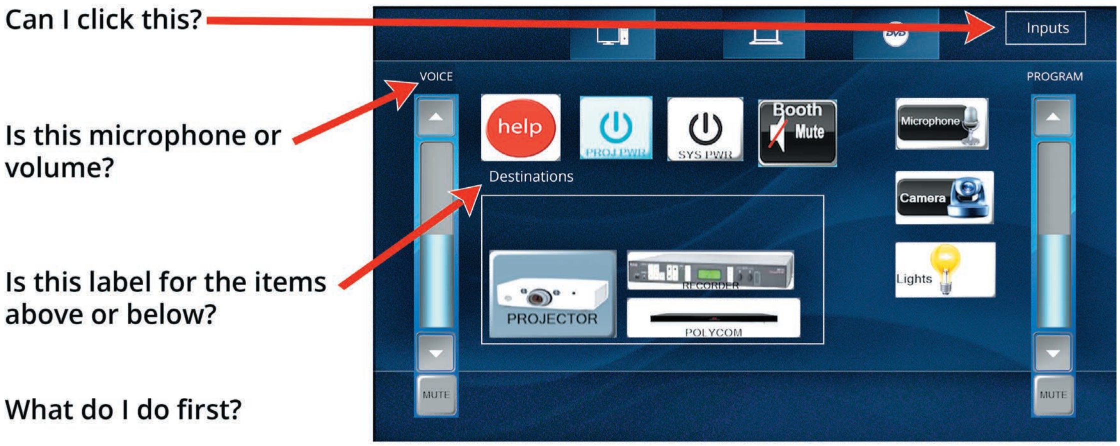


Fig 1 In situations where an interface forces the user to think too much about how to complete their task or rely on documentation, it is almost guaranteed they will fail.

Can There be ANY Questions About the Interface?

One or two questions seem harmless enough. But imagine a user had 5 or 10 questions piling up in their head every time they looked at a screen. This overwhelms the user and takes time away from completing their goal. The designer’s main task is to minimize questions and obstacles for their audience.

Final Thought on Users

There is a distinct difference in the way system errors and human errors are addressed. If the cause is determined to be a system malfunction, great effort is taken to address the problem. When the issue is determined user error, designers rarely consider why the human made the error in the first place.

If a human made an error, there is usually a good reason for it. If it was a mistake, the information was either incomplete or misleading. If it was a slip, it was likely caused by poor design or user distraction.

Imagine the user as simultaneously very intelligent, and very busy. Users deserve to complete tasks without feeling stupid or embarrassed. As an industry, we must avoid dismissing human error and work to create interactions that support user goals while preserving their dignity.

Takeaways

- ➜ All users have different needs and expectations about technology. Have a clear vision of the target audience.
- ➜ Common design patterns are your friends because your users will already know what to do. Do not break from convention unless you have a good reason.
- ➜ Users do not logically investigate every aspect of an interface – they quickly scan. Make sure your design makes sense at a glance.

Interaction Principles

Interaction Design delves into the relationship between humans and how they communicate with complex products. Buttons, scrollbars, and anything beyond static content falls under the umbrella of interaction design. This section provides the foundations of interaction design so that AV designers may successfully align interfaces to adjust for differences between human and computer behavior.

Gulfs of Evaluation and Execution

The gulfs of evaluation and execution are terms coined by Don Norman, a well-known author and advocate of user-centered design to represent the relationship between human cognition and information available in the world. Norman describes the concept in plain terms: “The basic idea is simple. To get something done, you have to start with some notion of what is wanted—the goal that is to be achieved. Then, you have to do something to the world, that is, take action to move yourself or manipulate someone or something. Finally, you check to see that your goal was made.” [Norman, p. 46.]

Figure 2 shows the goals and physical system disconnected by a wide gap to indicate that the designer must take special care to bridge these concepts for the user’s benefit.

This chart is useful for evaluating each user action in a system. For each action consider:

- Why does the user want to achieve this action?
- How do they know the action is available and can be achieved in this system?
- What happens after the user takes their action? How do they know if they have succeeded or failed?

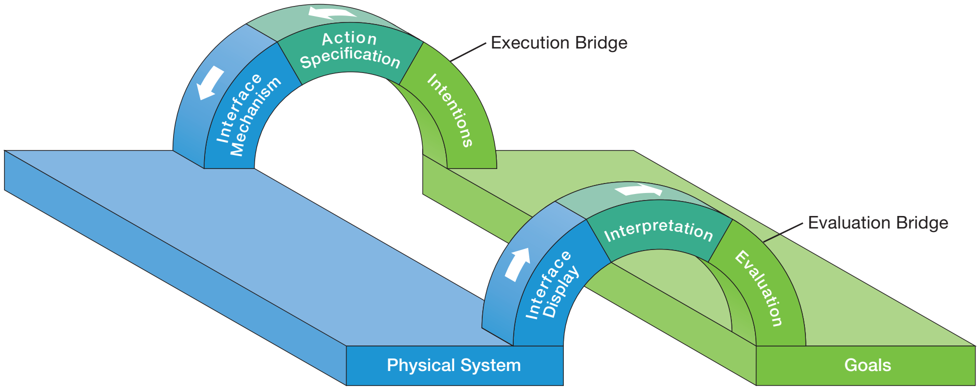


Fig 2 Gulfs of Evaluation and Execution as described by Don Norman in “Design of Everyday Things.”

Consider a typical action in an AV system, such as increasing the volume

Why does the user want to achieve this action?

They want people in the room to hear their presentation better.

How do they know the action is available?

There is a button with the label "volume" that looks like an object that can be pressed.

How do they know if they have successfully increased the volume?

The volume button changed states when pressed, the volume level on the side appeared to increase, and the actual audio volume increased.

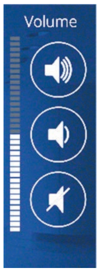


Fig 3.1 Volume bar before user interaction.

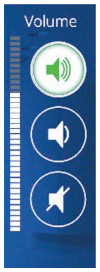


Fig 3.2 Adjusting the volume is a perfect example of showing what is available and providing obvious and immediate feedback to the user.

Takeaways

➜ When designing user controls consider three things:

1. Why does the user want to achieve this action?
2. How does the user know this action is available?
3. How does the user know if they completed their action?

Feedback

Every time a user taps a button, or attempts an action in an interface there must be a swift and obvious indication that: A) the system has recognized the request and B) the action was either successful or unsuccessful. If feedback is slow or unperceivable, the user enters an uncomfortable sense of limbo.

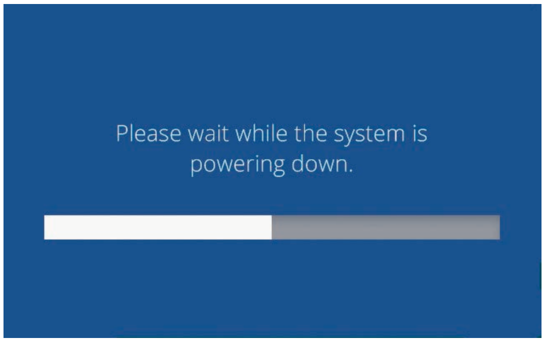
Expected Delay	Indication
> 5 seconds	Inform users of the potential length of wait. Use a progress bar or wait screen to let the user know the system cannot be used under certain conditions like System Startup or Shut Down.  Please wait while the system is powering down.

Fig 4 Delay feedback times and indicators.

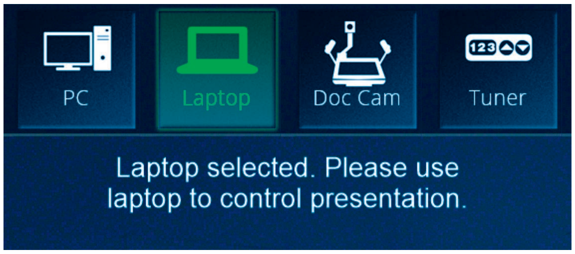
Designers can provide feedback with Extron products through two primary means, visual and auditory. Tapping a button might give the user a visual indication of success through a button state change, or it could emit a short noise also indicating success. Employing more than one means of feedback is a good way to reinforce communication between the system and the user and to provide a basic level of accessibility.

For instance, if the designer relies only on using color to inform the user, they run the risk of alienating audiences who are colorblind. Extron GUI Designer software provides a monochrome testing mode to encourage designers to consider color accessibility within their designs. Additionally, Extron templates use more than one form of feedback when a user presses a button.

As an example, when a user presses one of the source buttons:

- The button displays a change in the background color
- There is text displayed in the dynamic area confirming the selection

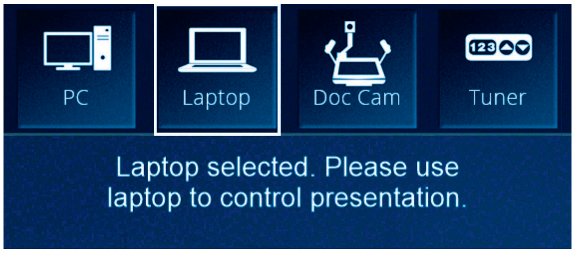
Do This



Laptop selected. Please use laptop to control presentation.

Fig 5.1 Changing the icon or background color of the button and including a secondary form of feedback such as text is an excellent way to convey what is selected.

Not That



Laptop selected. Please use laptop to control presentation.

Fig 5.2 Simply adding a border to a button to indicate it is selected is not obvious enough and could be missed by the user.

Takeaways

- ➜ Ensure all controls provide feedback to the user.
- ➜ Feedback must be quick, and must be easily noticeable.
- ➜ Providing feedback in multiple forms (auditory or visual) is a good way to ensure basic accessibility is met.

Provide Users the Feeling of Control

The best products provide audiences with the sense that they are in control of the application, as opposed to the product dictating the behavior of the audience. To provide a sense of control, interface designers should make actions reversible, allow users to define settings, and inform users of their current location and system status at all times.

Reversible Actions

Moving through an interface includes both forward and backwards movement. Audiences have become fearless on the web, armed with the "back" and "home" button. They are confident that regardless of where they go, they can always return to their starting point.

Software and applications offer less reassurance. The "undo" button offers an easy and often used feature in design and editing applications. The nature of AV design requires a slightly different approach since users do not use these devices to edit or modify content. Instead designers need to consider making the opposite actions accessible and preventing users from taking unintended actions.

Actions such as calling, muting, and presenting should always have the opposite feature readily available such as "end call" and "unmute" and "stop presenting". This ensures the audience will navigate freely through the interface without feeling trapped or locked into a specific function.

Requiring a confirmation prompt when users are about to make a costly action is an effective way to minimize mistakes and instill confidence. The "cost" of an action can be determined by the time and effort it takes to reverse. For instance, it may take several minutes to power off the projector and raise the projection screen, and several minutes to power the system back on. If the user accidentally hits the power button, a modal popup should always be used to avoid the user accidentally triggering a costly action.

Do This

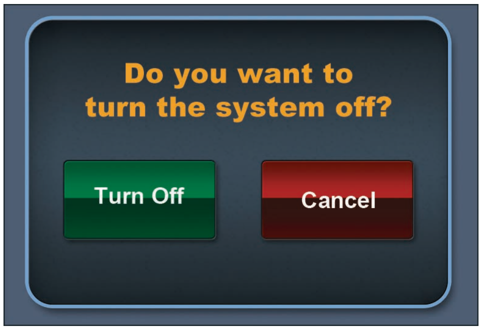


Fig 6.1 Adding a modal popup can help users avoid accidentally triggering an unwanted action.

Not That

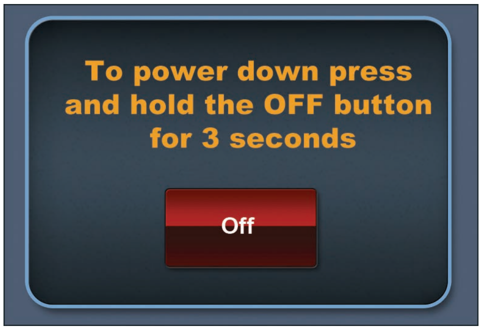


Fig 6.2 This user cannot cancel their action, and is trapped into turning the system off even if they accidentally hit the power button.

Allowing Users to Define Settings

Allowing users to adjust settings appropriate for their skill set is another way to instill confidence in a system.

Responsible control settings for typical end users include:

- Volume
- Lighting
- Automatic timers and clocks
- Integration with other technologies such as conferencing applications or calendaring systems

Settings that should only be available for advanced users or integrators:

- Restoring factory settings
- Uploading different GUI projects
- Adjusting the IP or DHCP settings

Knowing your audience is essential to providing appropriate setting options. Extremely advanced settings should not be easily accessible in most interfaces to avoid accidentally triggering them.

Takeaways

➜ Provide users a feeling of control by allowing them a way to easily reverse their actions.

➜ Give users the right amount of control by realistically determining their skill sets. The average end user will probably never need advanced settings such as restoring factory settings.

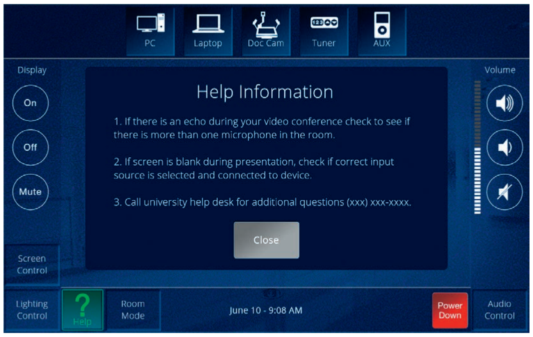
Navigation, System Status, and Hierarchy

Navigation and status messages are important to providing user context. Most designers assume that users will already know where they are in an application or what is happening based on their previous activity. The problem with this assumption is that:

- Users are often interrupted in the middle of a task and need to return to the system later.
- There might be multiple users engaged during a single session, such as multiple guest speakers presenting within the same meeting. A user should be able to walk up to an interface during any point, and know what is going on.

Status indicators such as highlighting what page the user is on, what activity is currently taking place, and providing a preview of content being shared or displayed are examples of effective communication.

Do This



Help Information

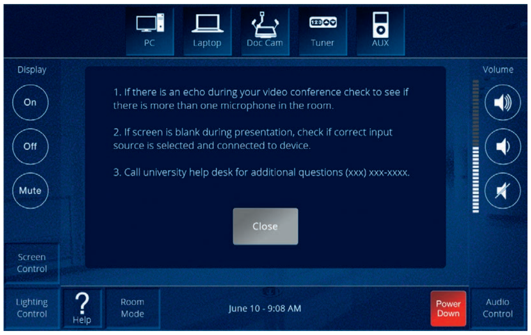
1. If there is an echo during your video conference check to see if there is more than one microphone in the room.

2. If screen is blank during presentation, check if correct input source is selected and connected to device.

3. Call university help desk for additional questions (xxx) xxx-xxxx.

Fig 7.1 By limiting button colors, the “Help” button state stands out clearly. Providing titles for popup pages and modals is also useful for understanding the user’s location.

Not That



1. If there is an echo during your video conference check to see if there is more than one microphone in the room.

2. If screen is blank during presentation, check if correct input source is selected and connected to device.

3. Call university help desk for additional questions (xxx) xxx-xxxx.

Fig 7.2 This GUI doesn’t communicate system status very well to the user. At first glance, it is difficult to know what screen the user is on.

Refer to the **Layout Principles** section on page 21 for more examples of navigation techniques.

Designers should also consider creating a hierarchy or prioritizing different features of the interface to improve the function. This is especially important when there are a large number of features within an interface. What is common for certain environments and users will vary, which is why it is essential that designers have a solid understanding of their audience.

Commonly used features:

- Adjusting volume, or muting the audio
- Presenting content
- Calling colleagues in a different location

Less commonly used features:

- Video mute
- Adjusting camera angle
- Choosing different backgrounds for the interface

Do This

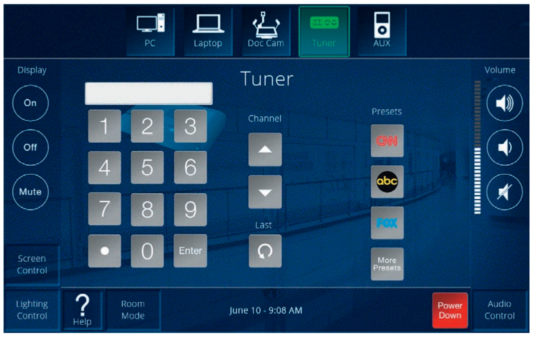


Fig 8.1 Hierarchy can be created through positioning, availability, or sizing of elements. This GUI indicates that Tuner controls are the most important part of this interface.

Not That

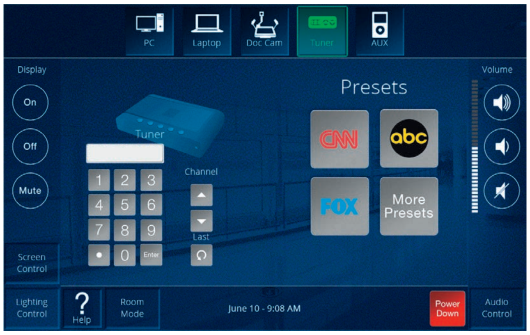


Fig 8.2 The different sized controls communicate greater importance to the arrow buttons which could be confusing to the user.

Takeaways

➜ Do not make a user remember their previous steps to determine their current location in an interface. Their current location and system status should be obvious.

➜ Create navigational hierarchy by making the most frequently used features larger, more visually prominent or immediately accessible. Lesser used functions can be placed in popup menus and/or should demand less attention than common features.

Discoverability – If the User Can’t Find it, it Doesn’t Exist

Seeking simplicity, some designers have opted to hide visual cues that control interfaces. Hiding controls can only increase the complexity and increase the reliance on a user’s memory to interact with the product. For example, assuming a user will “just know” that a picture is pressable is a recipe for failure and an easy problem to avoid.

Do This

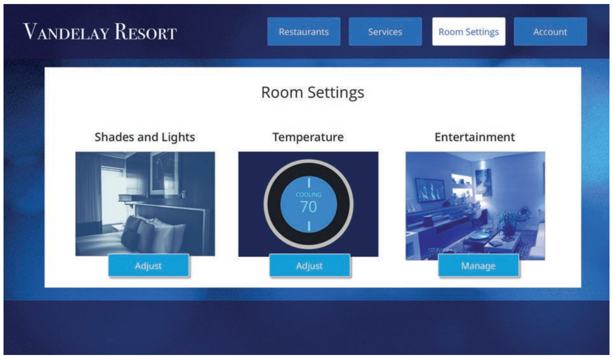


Fig 9.1 This interface makes it clear that the user can press a button to access controls dedicated to each room setting.

Not That

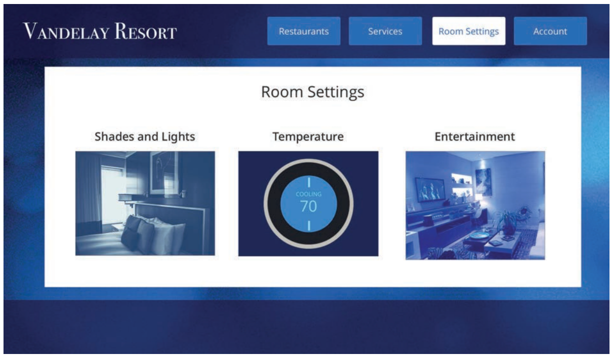


Fig 9.2 How will the users know they can adjust controls for each room setting listed in this GUI?

Takeaways

➜ Provide as many visual cues prior to interaction as possible. Do not assume the user will just know that they can press a flat object.

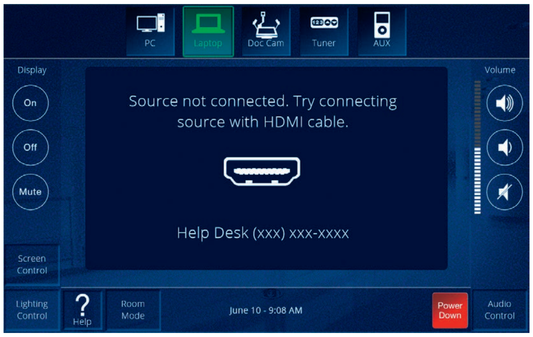
Errors

Errors and accidents happen regardless of how well an interface has been designed. While avoiding errors in the first place is the best defense strategy, creating meaningful error messages is necessary for error recovery.

Effective error messages:

1. Explain what is wrong in concise and appropriate language. Do not use acronyms or terminology your audience might not understand.
2. Tell the user what to do about it, or how to proceed.
3. Provide room that a larger system malfunction might be to blame and how to help.

Do This

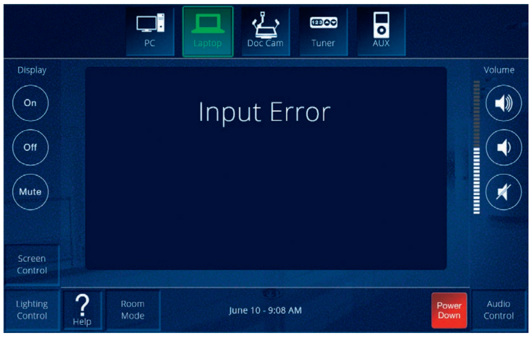


Source not connected. Try connecting source with HDMI cable.

Help Desk (xxx) xxx-xxxx

Fig 10.1 This error message explains the problem in clear terms and suggests a path to resolution.

Not That



Input Error

Fig 10.2 "Input Error" does not describe the problem in plain terms and doesn't provide users any direction on how to proceed.

Each interface will have different requirements, such as different inputs and ways of connecting sources to the system. While Extron's templates offer simple error messages and directions, the designer must ensure that error messages are accurate and tailored for individual projects. The more relevant and specific the error message, the greater chance of user success.

Takeaways

- ➜ Error messages need to:
  - ➜ Be easy to understand.
  - ➜ Inform the user what to do next.
  - ➜ Allow for the possibility that system malfunction is to blame.

Build and Implement

Layout Principles

Designing for Screen Size

Screen real-estate directly impacts the complexity of actions that users take as well as the number, sizing, and placement of objects on and off the screen. The varying sizes of touchpanel screens serve fundamentally different functions, often with different audiences in mind. This guide urges designers to program in a “context-first” mindset and align the strengths of each screen category with their intended purpose.

Touch Targets

Touch targets refer to the physical area that the users interact with in order to trigger a control. Unlike desktop software which has the help of a mouse to select objects, users much engage their hands and arms which is much less precise. Furthermore, touchpanels must accommodate a wider range of error than other traditional touch platforms such as mobile phones since users are unlikely to rest their hands on the device or hold a touchpanel in their hand.

The following section, and the Quick Reference Guide will help integrators select the most appropriate size of touch area and spacing between touch areas to avoid user frustration. While these references suggest the minimum size and spacing between touchable areas to ensure user accuracy, providing users with larger touch targets and more spacing is always helpful.

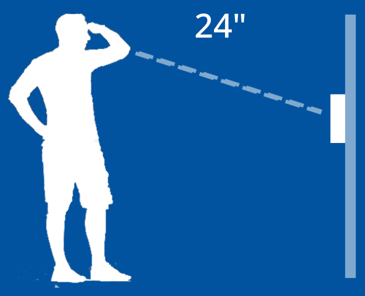
Touchpanel Model	Screen Size	Resolution	PPI	Minimum Target Size	Minimum Spacing Between Objects
TLP Pro 300M	3.5" / 89 mm	320x480	165	58px by 58 px	13px

Fig 11 Use the Quick Reference Guide in the back of this guide for recommended touch target sizing and spacing between objects.

Designing for **Small Screens**

Ideal For:
Status Messages
Single Tasks
Non-Complex Functions

Ensure all **icons, text** and **buttons** are **legible** from a reasonable distance.

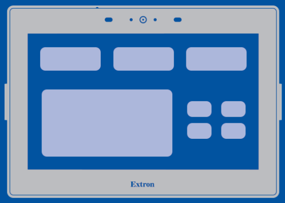


Touch targets need to be **9 mm or 3/8"** and above.

Designing for **Medium Screens**

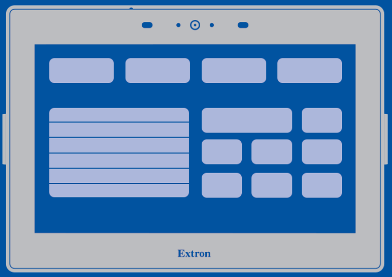
7"

10"



Ideal For:
Presentations
Single Display Rooms

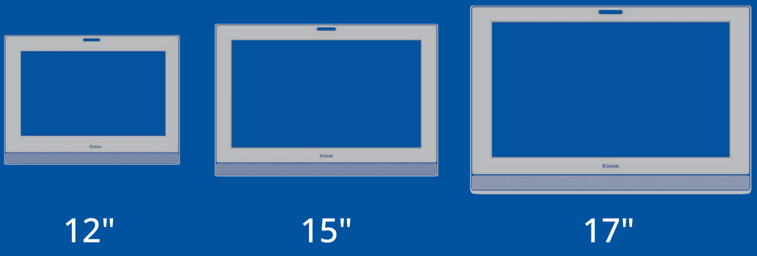
With more usable screen area, **provide additional functionality** if possible.

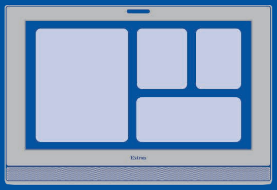


Touch targets need to be **9 mm or 3/8"** and above.

Do you wish to continue?
Cancel
Continue

Designing for **Large Screens**





Ideal For:
Showing Multiple Windows
System Overviews
Monitoring a Complex System

It's **easy to miss** information on large screens.

Make sure status messages **stand out.**

Touch targets need to be **9 mm or 3/8"** and above.

Designing for **Ultra-Wide Screens**

12"

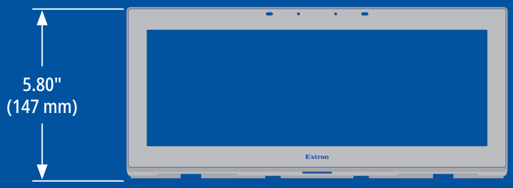
Ideal For:

Multiple tasks to be seen and managed on a single screen

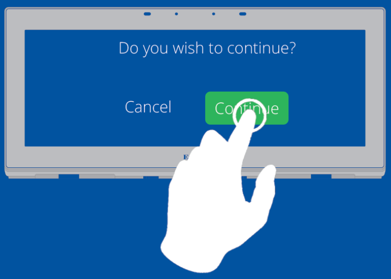
System overviews

Monitoring a complex system

Our low-profile design minimizes visual obstructions and improves collaboration engagement in a wide variety of applications



Touch targets need to be **9 mm or 3/8"** and above.



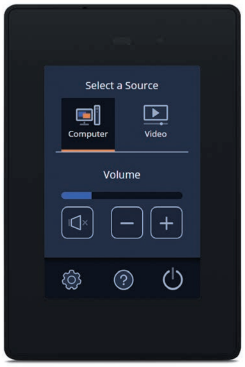


Fig 12.1 Small screens like Extron's 3.5" TLP Pro 300M touchpanel are best suited for simple tasks and system status messaging.

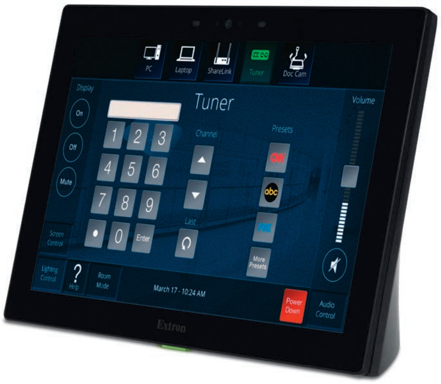


Fig 12.2 Medium screens like Extron's TLP Pro 1025 Series represent a good compromise between small and large screens. These are best suited for presentations and single display rooms.

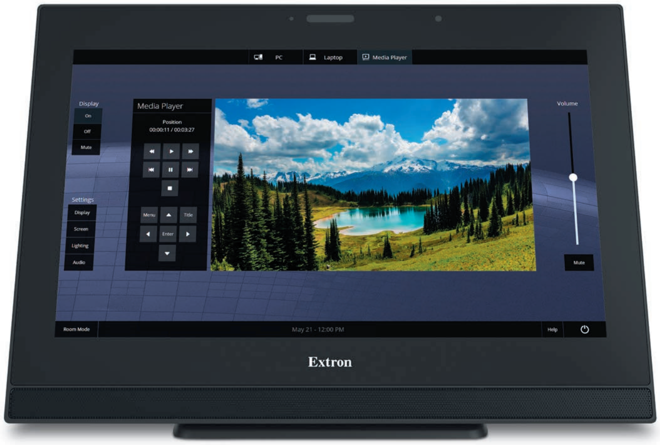


Fig 12.3 Extron's TLP Pro 1725TG is the largest touchpanel within the TouchLink Pro family. With a resolution of 1920x1080 pixels, the 17" model provides excellent display and the ability to have many control options within one screen without overwhelming the user.

Takeaways

➜ Small screens are best for small spaces, with limited functionality.

➜ Medium sized screens offer compromise between small and large screens in terms of the amount of information and features that they should contain.

➜ Large screens are best for monitoring a complex system or multiple processes running at a single time.

➜ Ultra-wide screens are best for allowing multiple tasks to be visible at the same time and managed on a single screen while reducing visual obstructions

Consistency

One of the most important design rules is consistency, and it is the rule most often broken. Extron stresses the importance of consistency throughout the user interface design. Consistency in colors, shapes, sizes, fonts, labels, and locations must be maintained in all aspects of the layout in every project. An interface designer should provide the same look and feel for every layout in a group of systems. This provides familiarity across all the rooms and minimizes the learning curve required to operate a system.

Do This

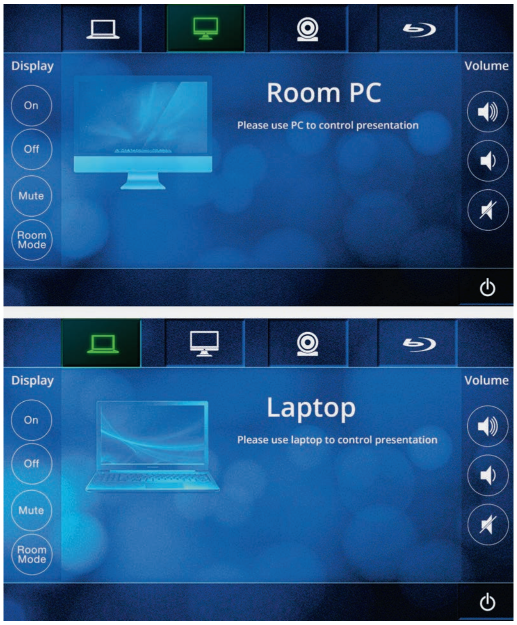

Display
Room PC
Please use PC to control presentation
Volume
On
Off
Mute
Room Mode
Display
Laptop
Please use laptop to control presentation
Volume
On
Off
Mute
Room Mode

Fig 13.1 This design is consistent across all pages, which makes it easier for users to concentrate and find exactly what they are looking for.

Not That

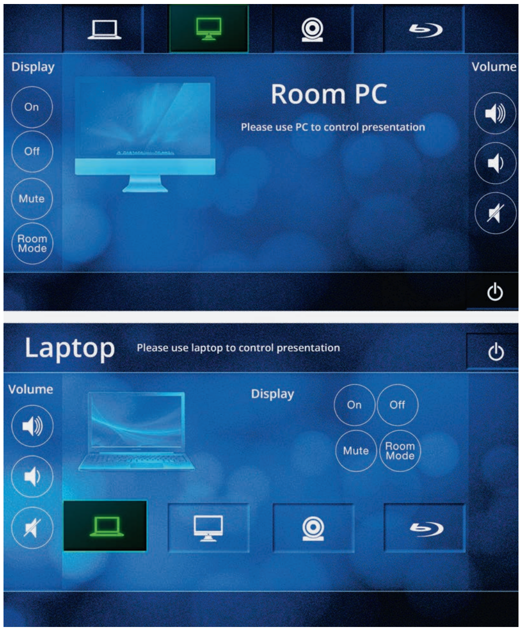

Display
Room PC
Please use PC to control presentation
Volume
On
Off
Mute
Room Mode
Laptop
Please use laptop to control presentation
Volume
Display
On
Off
Mute
Room Mode

Fig 13.2 Designers need to take care to be consistent with layouts, button arrangements, and standards within the same project, otherwise the user experience significantly suffers.

To this end, the designer must make the layout on all touchpanels consistent among pages in the same project. For example, media players and Blu-ray players have similar controls, so the common controls should be arranged similarly for all players. Furthermore, no matter where the user travels in the facility, the media player and Blu-ray control pages are familiar if they have the exact same appearance and layout.

Takeaways

➜ Keep appearance and layout consistent across all pages in a project to provide familiarity to a user. If creating multiple projects for interfaces within the same facility, take special care to keep as many aspects of the interface consistent among these projects.

Consistent Spacing and Alignment

Extron GUI Designer offers several spacing and alignment tools within an easy to reach toolbar. These tools are particularly helpful when working with multiple objects at a time.

These tools allow designers to work with precision. For example, a designer can select an object and click the “align horizontal center” tool to move the object to the direct center of a GUI, which eliminates guesswork and inconsistency.

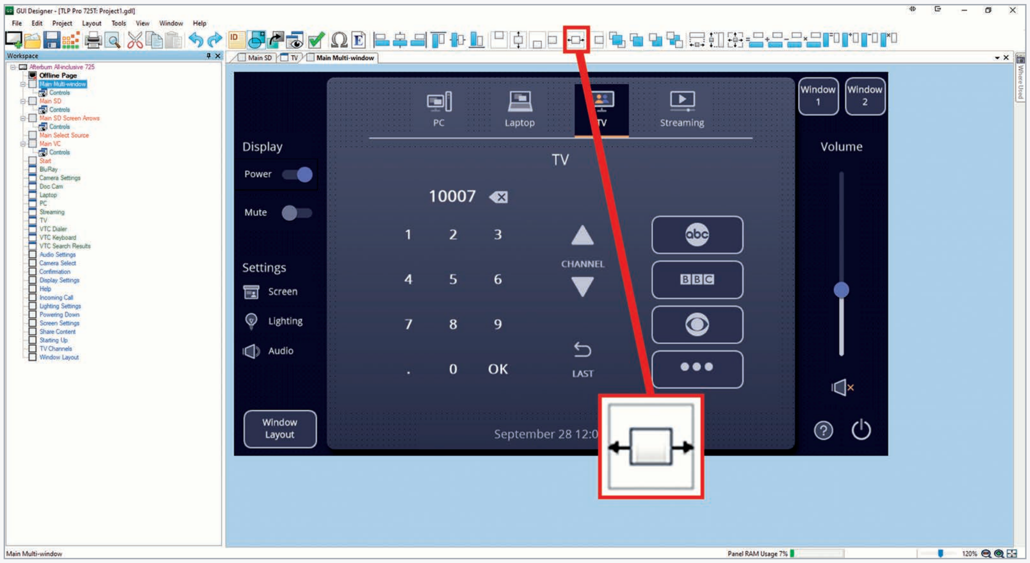
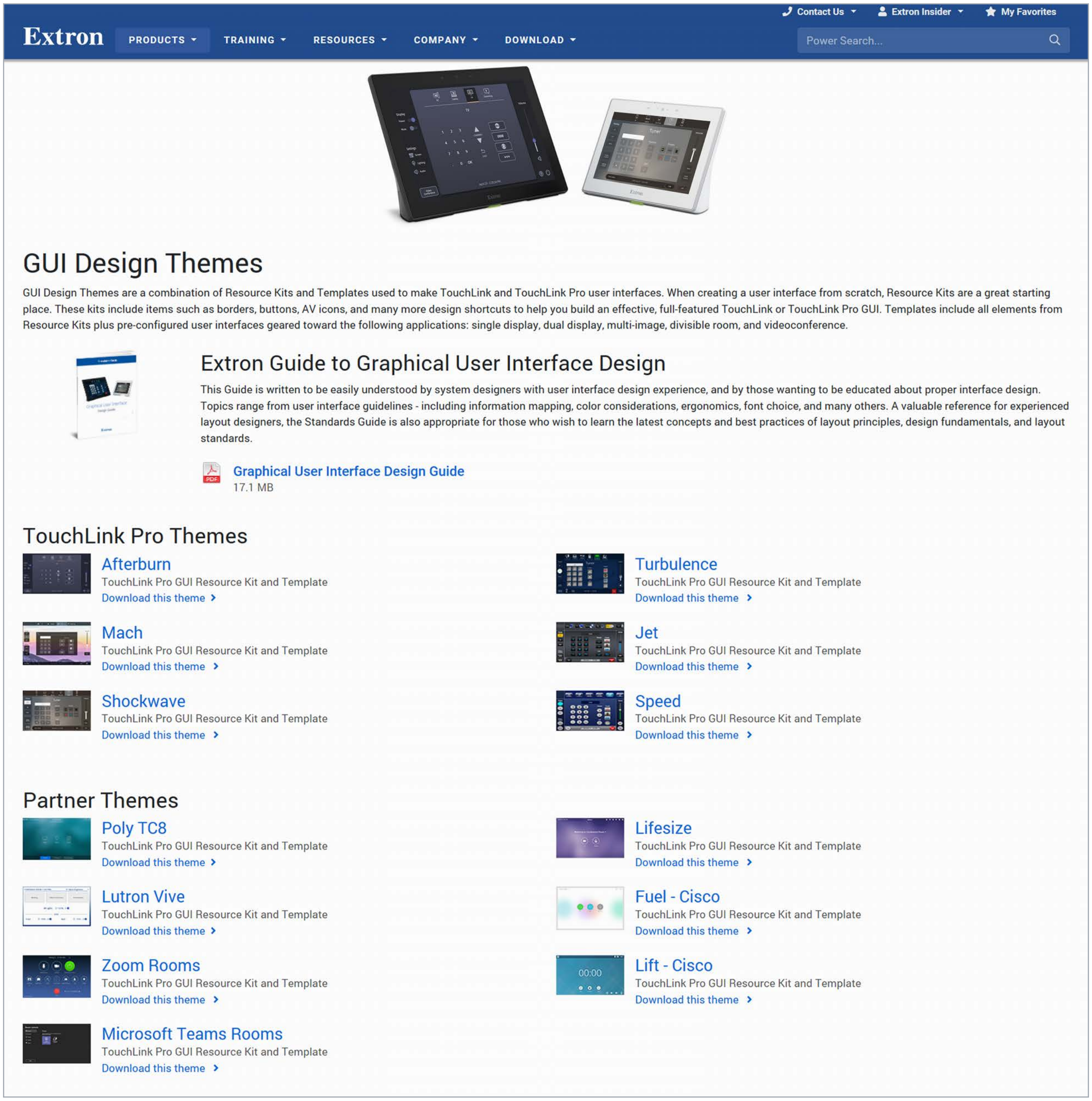


Fig 14 Using tools like the “align horizontal center” tool can expedite GUI development and ensure that objects are properly spaced and aligned.

Achieve Consistency with Extron

Extron offers a range of templates that allow interface designers to expedite their workflow. For more information on TouchLink design themes, templates, and resource kits, visit www.extron.com/guidesignthemes. These templates also showcase Extron's commitment to consistency within touchpanel interfaces. If modifying or beginning a project with a blank canvas, there are a few steps an interface designer can take to ensure consistency within their own design. Additionally, Extron offers a variety of partner themes designed to work seamlessly with third party technologies and applications.



GUI Design Themes

GUI Design Themes are a combination of Resource Kits and Templates used to make TouchLink and TouchLink Pro user interfaces. When creating a user interface from scratch, Resource Kits are a great starting place. These kits include items such as borders, buttons, AV icons, and many more design shortcuts to help you build an effective, full-featured TouchLink or TouchLink Pro GUI. Templates include all elements from Resource Kits plus pre-configured user interfaces geared toward the following applications: single display, dual display, multi-image, divisible room, and videoconference.

Extron Guide to Graphical User Interface Design

This Guide is written to be easily understood by system designers with user interface design experience, and by those wanting to be educated about proper interface design. Topics range from user interface guidelines - including information mapping, color considerations, ergonomics, font choice, and many others. A valuable reference for experienced layout designers, the Standards Guide is also appropriate for those who wish to learn the latest concepts and best practices of layout principles, design fundamentals, and layout standards.

Graphical User Interface Design Guide
17.1 MB

TouchLink Pro Themes

Afterburn
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Mach
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Shockwave
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Turbulence
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Jet
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Speed
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Partner Themes

Poly TC8
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Lutron Vive
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Zoom Rooms
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Microsoft Teams Rooms
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Lifesize
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Fuel - Cisco
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Lift - Cisco
TouchLink Pro GUI Resource Kit and Template
Download this theme ›

Visit our website to see the various GUI Design Themes we offer.

Affordance

Affordance is the quality of an object that provides a user with the visual cue to perform an action. The user should naturally perceive how to interact with touchpanel objects and quickly determine:

- How the user can interact with an object
- What can be pressed
- What areas need input
- What areas provide feedback

Button size, shape, and color are all used to communicate to the user that a button is an interactive element on the screen.

Do This

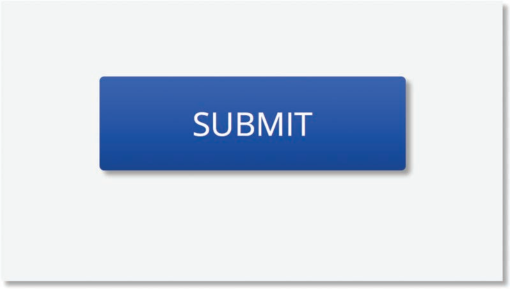


Fig 15.1 The subtle use of shadows provides enough affordance to easily indicate it is meant to be pressed, and suggests that this object is layered over the background.

Not That

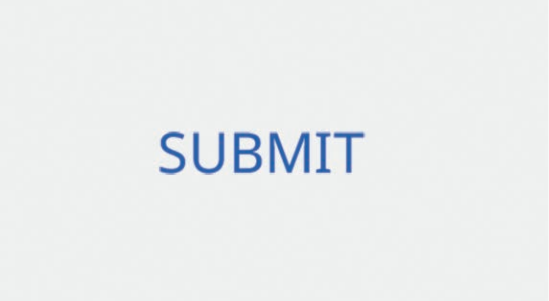


Fig 15.2 Without shadows or gradients this button offers much less affordance and could be overlooked by a user.

False Affordance

False affordance is just the opposite of affordance. False affordance is when the visual characteristics of an object intuitively imply the wrong functionality and use. An example of this is when a designer uses characteristics to make a button look like it can be pressed and then applies the same characteristics to a header or a text window. If an object is not intended to be pressed, never make it look like a button.

Do This

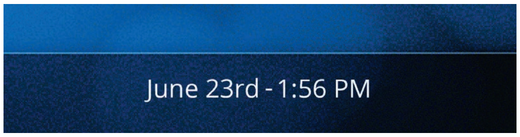


Fig 16.1 This date and time label is a better design in this case as it does not look like it can be pressed.

Not That

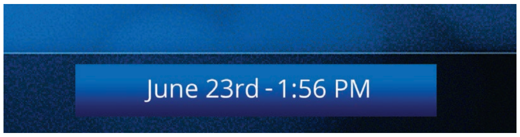


Fig 16.2 This date and time label is not an interactive object, but appears like it can be pressed.

Takeaways

- ➜ Ensure objects that require user interaction appear like objects that can be touched.
- ➜ Be careful to not make purely informational objects such as labels or time fields that resemble buttons.

Chunking

Chunking is a method of breaking large amounts of information into small, manageable, and relevant chunks. Chunking reduces the cognitive load on the user and the amount of time it takes to find a control when visually scanning a touchpanel interface.

The Extron standard screen layout applies this rule by dividing the screen into separate groups of control and feedback areas. Each of the standard control areas either has a specific function or is a logical group of common controls.

Do This

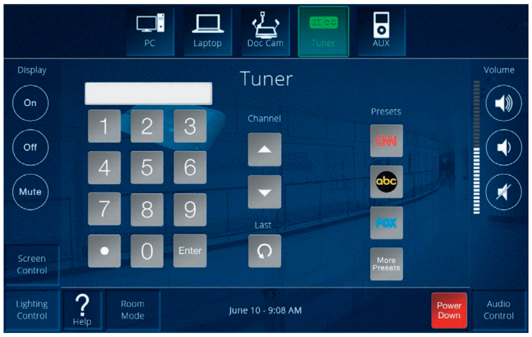


Fig 17.1 Chunk elements by their intended function to makes it easy for users to find the controls they seek.

Not That

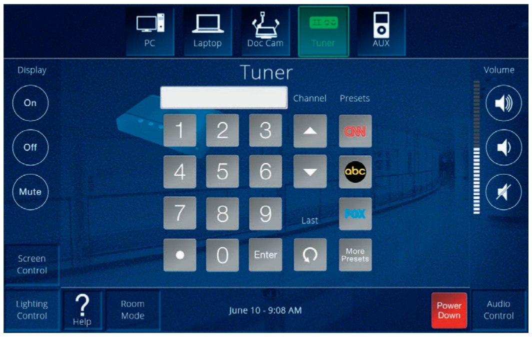


Fig 17.2 When button groups aren't chunked properly, it takes more time for the user to locate what they need.

Mapping

Mapping refers to the relationship between controls and their results. The idea is that with good design the controls to something will closely resemble the effect. Natural mapping should use physical analogies or cultural standards to inform the design. An example of good mapping between control and effect is the up and down arrows used to represent the up and down movement of the cursor, on a computer keyboard.

Do This

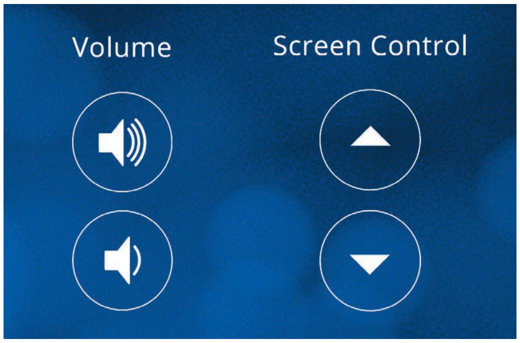


Fig 18.1 This button arrangement represents a more natural mapping pattern, which is easier to interpret for most users.

Not That

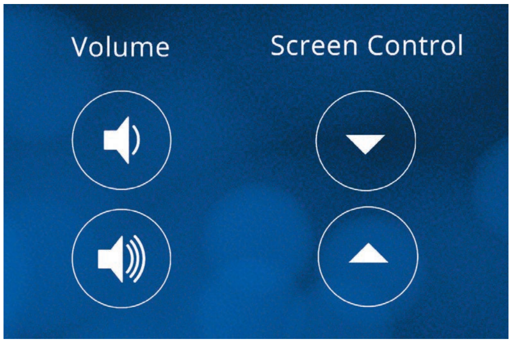


Fig 18.2 These volume buttons are mapped incorrectly. Most users associate increase with up, and therefore the volume increase button should be above the other options.

Diagrams as a Form of Mapping

Diagrams are a particularly intuitive example of the mapping concept as their visual representation closely resembles the physical location of different controls. Replicating the physical location and relationship makes it easy for users to understand what it is they will be controlling.

For rooms with multiple input sources or output destinations, it can be difficult for users to match the correct one referenced in the touchpanel interface. To help solve this problem, many designers have tried describing different elements with relational language such as “left display”, “back display”, and “inputs near wall”. While this is more helpful than simply describing as “input 4”, it still assumes that the terms on the touchpanel align to how the user views the room. For instance, the back and front, or left and right positional elements may change depending on the location of the touchpanel. Creating a virtual diagram of a room leverages the concept of natural mapping and is the ideal way to inform physical locations of inputs and outputs.

Do This

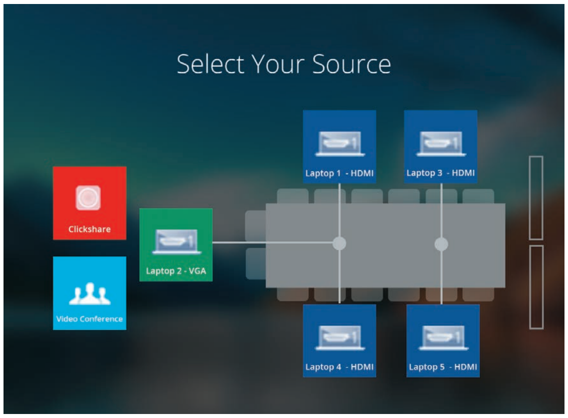


Fig 19.1 Using a simplified map of the room is a good way to inform users of what source they can share, and what displays are available in the room.

Not That

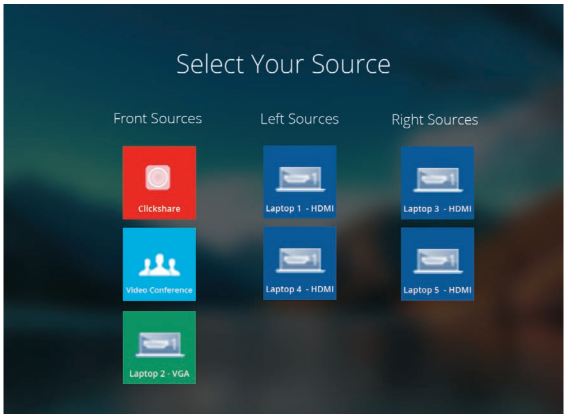


Fig 19.2 Using descriptors such as “left”, “right”, “front” and “back” is much more ambiguous than a diagram.

Takeaways

➜ Group related features together to reduce the amount of time it takes a user to locate an item.

➜ Consider incorporating the mapping technique to arrange items in a way that is the most logical to the user.

Identifying Control Locations

When designing a layout, it is important to first identify the controls that are needed for the system and the environment. Touchpanel interfaces should be designed using consistent, logical, and predictable layouts. Extron promotes a screen layout that divides the touchpanel into logical and easily understood sections consisting of feedback areas and groups of controls. The philosophy behind this layout is to create an interface that someone can quickly become familiar with and feel comfortable using. These sections comprise of two basic area types: static areas and dynamic areas.

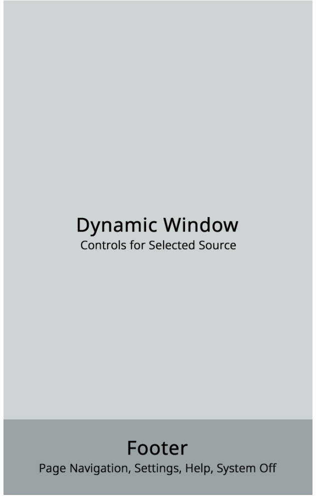

Dynamic Window
Controls for Selected Source
Footer
Page Navigation, Settings, Help, System Off

Fig 20.1 In Extron's smaller portrait style layouts, most of the screen is dedicated to dynamic content. Functions such as page navigation, settings, help, and system power are located in the footer.

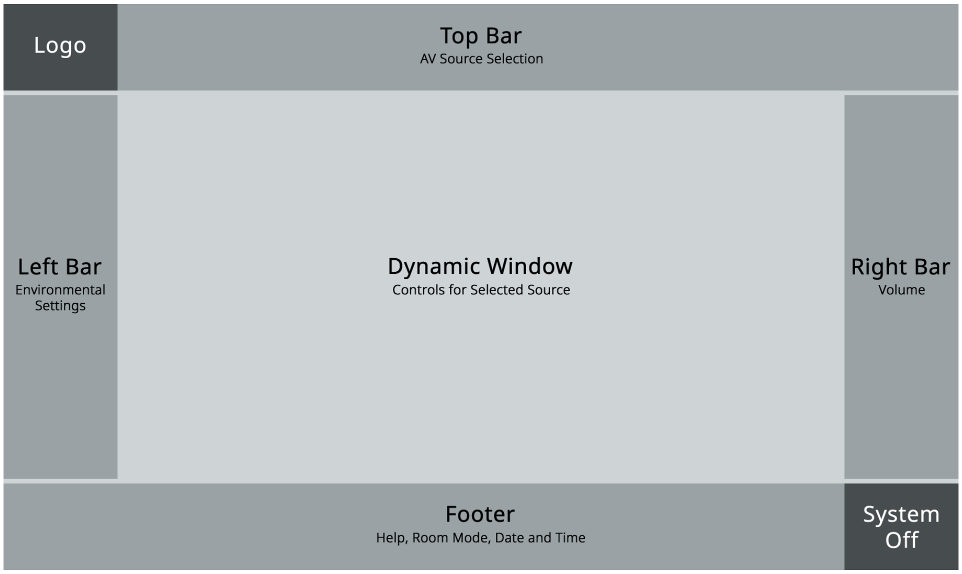


Fig 20.2 The Extron standard screen layout has static and dynamic areas in set locations, such as shown here for our 7-inch and 10-inch panels. The left and right bar areas both contain environmental controls. Items such as help, room mode, date and time, and system power typically belong in the footer.

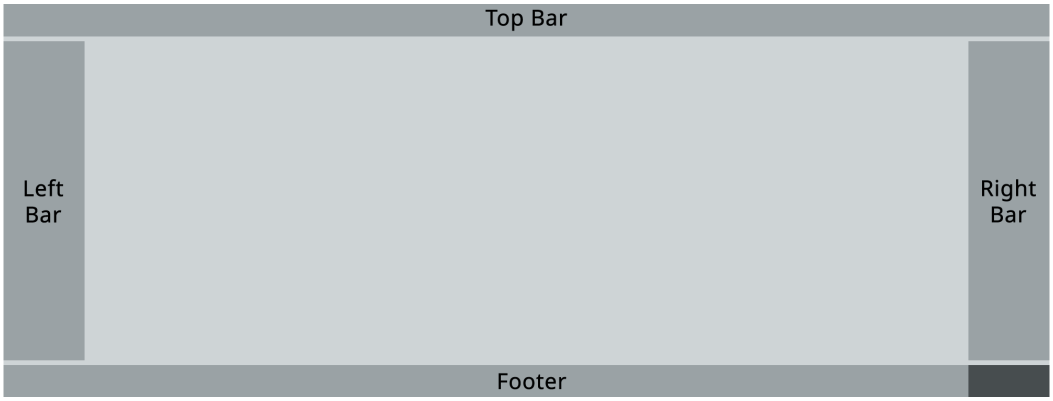


Fig 20.3 The Extron standard screen layout has static and dynamic areas in set locations, such as shown here for our 12-inch Ultra-wide panel. The left and right bar areas both contain environmental controls. This panel additionally supports a video preview window from an HDMI source. Items such as help, room mode, date and time, and system power typically belong in the footer.

Static Areas

Static areas of a user interface have pre-assigned conditions that do not change during the navigation of the interface or the execution of an action. These static areas include AV source selection, environmental control, menus, and specific status messages. Those particular elements are the most likely to remain present and visible, never changing in appearance or location.

A consistent approach in a static area enables a user to always know exactly where an environmental control or AV source is on every touchpanel page. Reassurance is found in knowing the type of controls found in the static areas do not move or disappear during operation. Moving common controls such as volume, to a different location on the screen or removing it altogether may lead to confusion.

The following illustration and table show the Extron standards for the chunking and placement of static areas in layouts for our medium and large touchpanels.

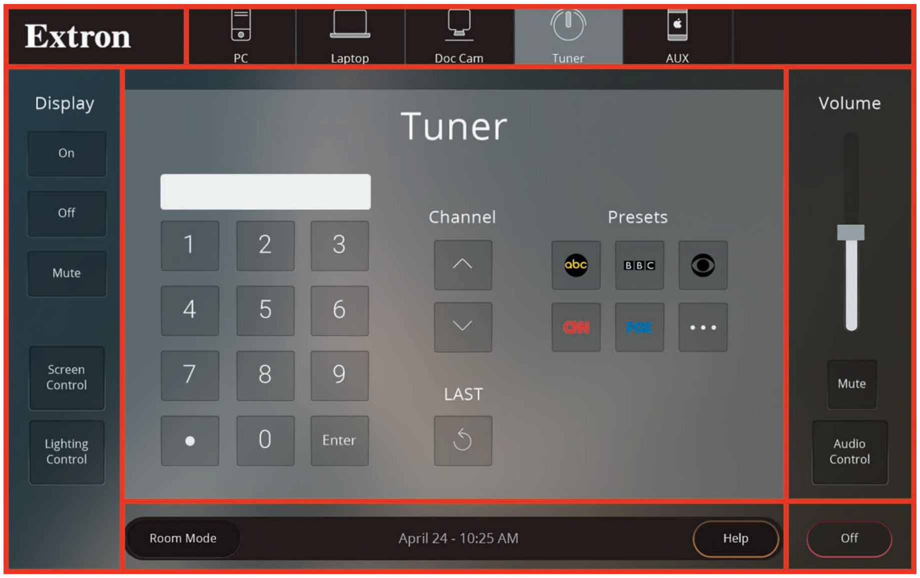
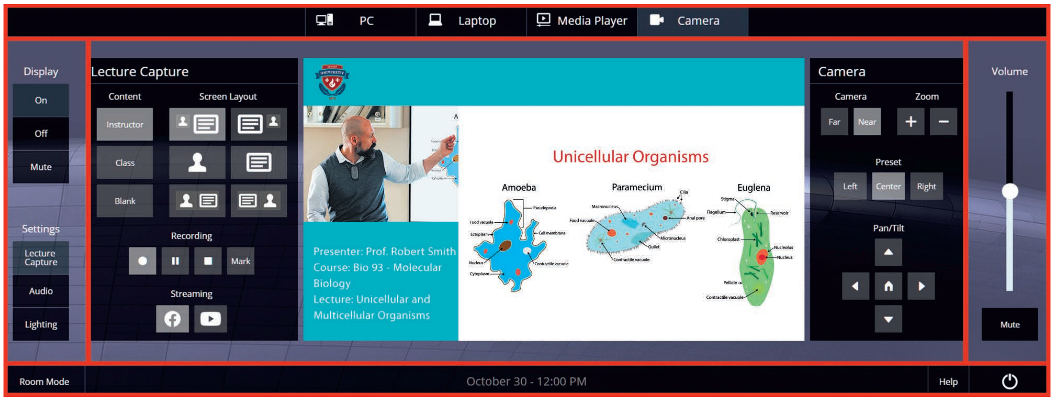


Fig 21.1 The Extron standards for static areas in layouts used for medium and large touchpanels: the area surrounding the dynamic area is divided into distinct areas, each with a unique function.



Presenter: Prof. Robert Smith
Course: Bio 93 - Molecular Biology
Lecture: Unicellular and Multicellular Organisms

Fig 21.2 The Extron standards for static areas in layouts used for ultra-wide touchpanels: the area surrounding the dynamic area is divided into distinct areas, each with a unique function.

Location	Purpose	Description
Top left corner	Logo	Location of company logo
Top right side	AV source selection	Location of AV sources: Tuner, PC, laptop, auxiliary input, etc.
Left and right sides	Environmental controls	Location of settings related to volume, lighting, display, audio, and screen control
Footer	Status	Location of help, room mode, as well as date and time information
Bottom right	System off	Location of system off button

Extron's smaller portrait style layouts maintain a logical and predictable placement of controls and feedback areas. The figure to the right depicts the static area in our portrait style layout.

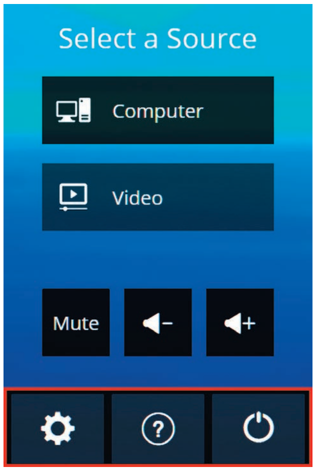


Fig 22 The Extron standard for static areas on our smaller portrait style layouts places navigation, settings, help, and system power in the footer area.

Dynamic Areas

Dynamic areas are reserved for content that varies based on the mode of the control or the conditions of the selected operation. Within dynamic areas, as with static areas, consistency must be maintained. A user should be able to anticipate the types of controls that appear in this region.

The controls for a selected source device would be available within a dynamic area of the touchpanel. When a different AV source is selected, the controls inside the dynamic area change to accommodate the new AV source. Be sure to place controls for different devices in a similar pattern. Grouping of the same button types, spacing, and colors allows the user to easily recognize and manage the features for each device similarly. The following figure shows the Extron standards for the layout of the dynamic area.

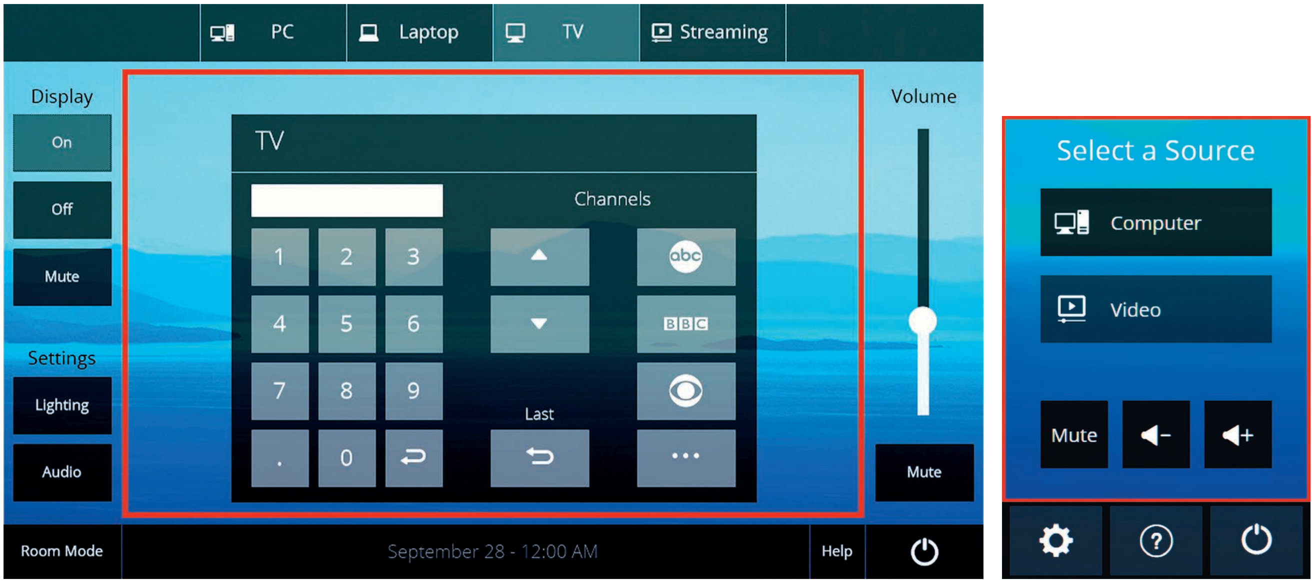
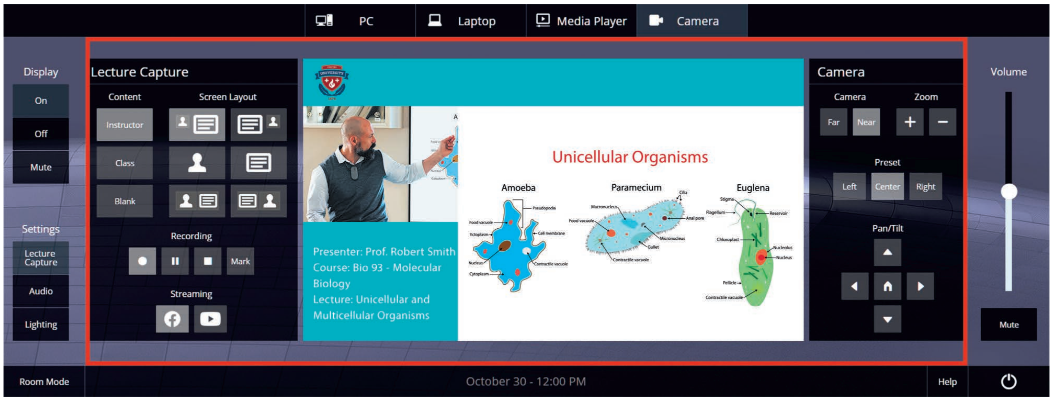


Fig 23.1 The Extron standards for dynamic areas: the name of the active source is shown near the top of the dynamic area, while the center displays the active source controls.



Presenter: Prof. Robert Smith
Course: Bio 93 - Molecular Biology
Lecture: Unicellular and Multicellular Organisms

Fig 23.2 The Extron standards for dynamic areas used for ultra-wide touchpanels: the name of the active source is shown near the top of the dynamic area, while the center displays the active source controls.

Takeaways

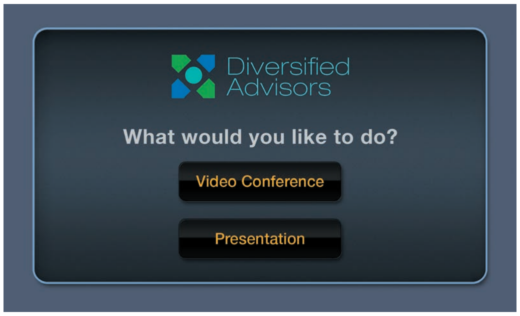
➜ Static areas within Extron's templates, around the perimeter of an interface, provide immediate access to common functions.

➜ Dynamic areas within Extron's templates, located in the middle of the interface, provide relevant information and controls depending on what mode the user has selected. Additionally, the large and ultra-wide touchpanels support a HDMI input that could be used to show a video preview along with the relevant controls in this area.

Navigation Principles

A well-designed interface is one that allows a user to recognize the context of available controls at a glance. An interface designer must understand the navigation principles and apply them appropriately.

Clear Entry Points



What would you like to do?

Fig 25 A welcome screen with selectable options provides clear entry points.

User interface navigation should always start with clear entry points. A clear entry point can be something as simple as a welcome page with a company or university logo and a button that says, “press here to begin.” The options should be what the user expects from the system. For example, the designer may offer the option to choose either Videoconference or Presentation from the welcome page. Once the selection is made, the main page is displayed with the selected mode of operation.

Global Navigation Principles

Global navigation is a method of presenting a complete control interface on a single page called the main page. The key to successfully creating an interface with global navigation is to never navigate the user away from the main page.

By using global navigation on a touchpanel the user quickly becomes accustomed to the controls, since the controls in the static areas and the overall layout of the main page never change. Utility can be easily added to the interface by taking advantage of the large dynamic window in the middle of the page. The dynamic window becomes part of the main page and does not require an explicit Close, Back, or Exit button.

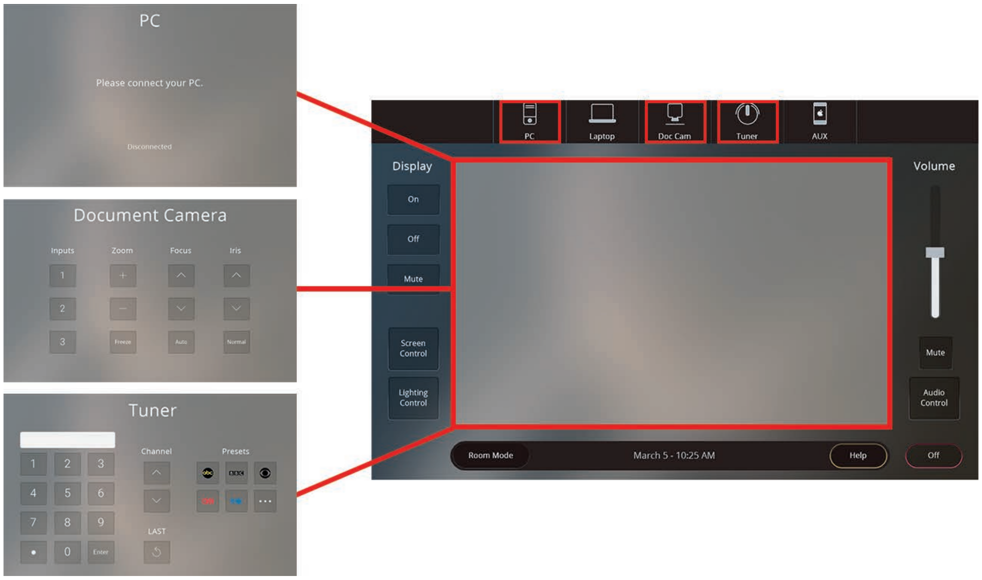


Fig 26 The dynamic area changes as each source is selected, but the user is never navigated away from the main page.

With global navigation, there is no complex navigation tree or hierarchy that the user needs to learn. The overall navigation approach is very flat, allowing most functions or controls to be no more than a few presses away.

Takeaways

- ➜ Start your project with a clear entry point to help orient users and give them an indication of features available in the interface.
- ➜ Simple projects, such as single display, benefit from flat navigation where most of the controls needed are one press away.

Aesthetics and Functionality

The balance between form and function determines an effective interface. Usability and visual design are two pieces that have an enormous impact on the overall experience of a product; one cannot exist without the other. A designer's main goal is to encourage user engagement with an inviting interface through careful application of fonts, color, shapes and spacing.

The screen should have a clean appearance, with each section distinctly separated and controls clearly labeled. Source buttons should be distinguishable not only by location, but also by button shape, size, color, text, and icons. Additionally, a user should be able to quickly see the difference between labels and buttons.

Use visual cues to convey information. An icon near text reinforces functionality of a button. In each TouchLink Pro resource kit, Extron provides several buttons with icons (such as the Tuner buttons shown here) and button labels for use in design layouts.

Do This

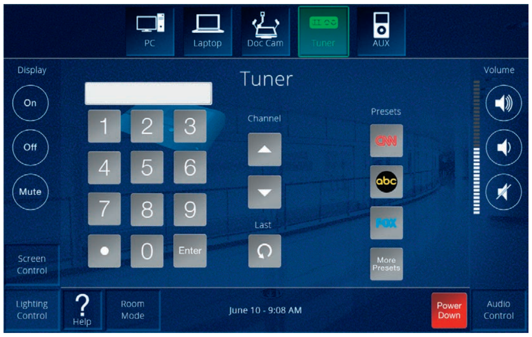


Fig 27.1 Extron standard templates provides both visual balance and functional user interfaces.

Not That

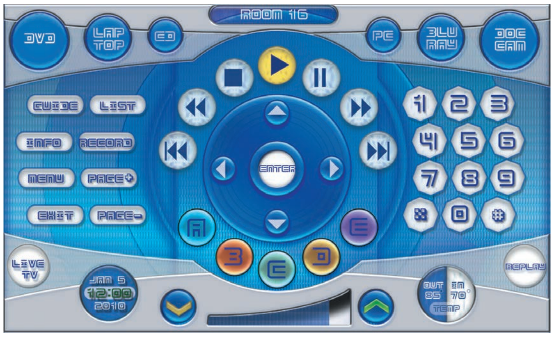
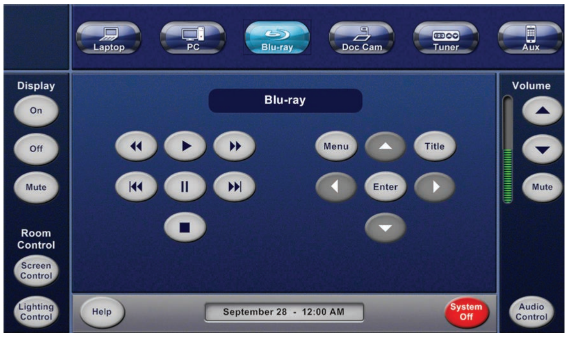


Fig 27.2 An example of an overly stylized interface. While technically this interface offers visual balance and symmetry, the arrangement of buttons and unusual font prevents users from efficiently completing their goals.

Evolution of Extron Templates and Resource Kits

The following images show how Extron GUI templates and resource kits have evolved over the years. Note how the styles have changed, yet they remain consistent in providing the right amount of information to encourage user interaction.

Old



New

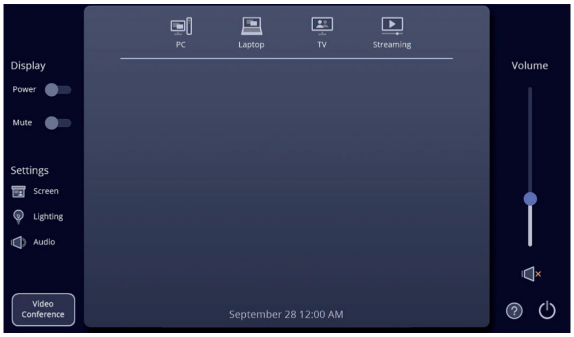


Fig 28 An example of the evolution of Extron templates and resource kits. While these templates and resource kits appear very different, they provide similar levels of control and common conventions that provide familiarity for the user.

Takeaways

- ➜ Visual design trends change. It is up to the designer to balance visual design with the usability of their interface.

Color Basics

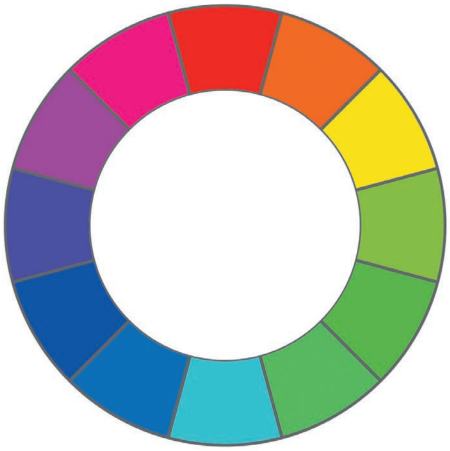
Selecting a color scheme or color palette is a core part of creating an appealing touchpanel user interface. Some color combinations are aesthetically pleasing while others are distracting and complicate the user experience. A basic understanding of color theory can help the designer apply appropriate principles and communicate their message effectively.

It is important to recognize that color varies from device to device, and the only way to ensure proposed designs look like the final product is to upload it to the intended touchpanel.

Using Colors in Design

RGB Color Wheel

The RGB color wheel is the color spectrum in a circle. The color wheel is a visual aid that presents a logical arrangement of a sequence of pure hues. The RGB color wheel shows the relationship between colors, and will help determine what colors are appropriate combinations to use in design.



Providing Contrast

Contrast is a powerful tool in design. Sufficient contrast is necessary for legibility and an important signifier of interactive objects. However, too much contrast can draw too much attention and can lead to anxiety in users.

Do This

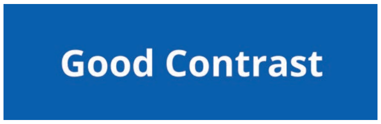


Fig 29.1 This font color provides appropriate contrast from the background.

Contrast Ratio: 5.80:1

Not That

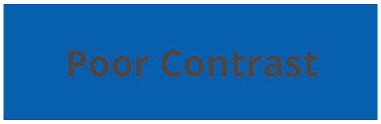


Fig 29.2 This font color does not have enough contrast from the background to make it easily perceptible.

Contrast Ratio: 1.08:1

Not That

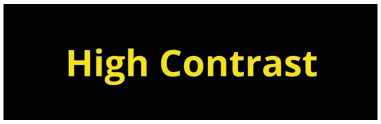
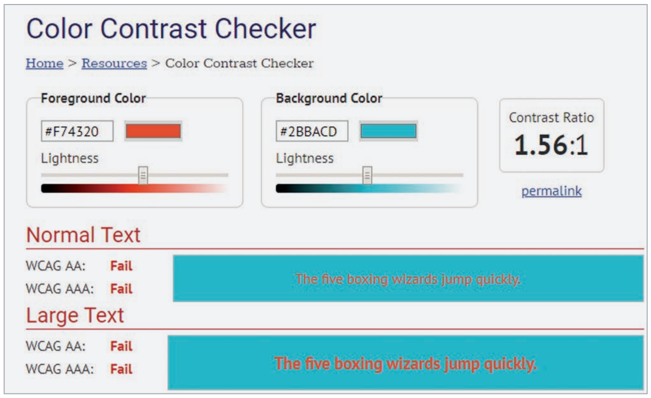


Fig 29.3 Yellow text on a black background creates too much contrast, which diminishes readability.

Contrast Ratio: 19.22:1


Color Contrast Checker

Home > Resources > Color Contrast Checker

Foreground Color: #F74320 Lightness

Background Color: #2BBACD Lightness

Contrast Ratio **1.56:1**

permalink

Normal Text

WCAG AA: Fail

WCAG AAA: Fail

The five boxing wizards jump quickly.

Large Text

WCAG AA: Fail

WCAG AAA: Fail

The five boxing wizards jump quickly.

Fig 30 By visiting webaim.org designers can test to see if their colors provide sufficient contrast to meet accessibility standards.

The contrast checker on webaim.org is a useful tool for determining whether colors provide sufficient contrast in an interface.

On a scale of contrast, designers should seek a minimum ratio of 4.5:1 to pass accessibility standards. 12.63:1 is optimal, and 16:1 is the highest recommended level.

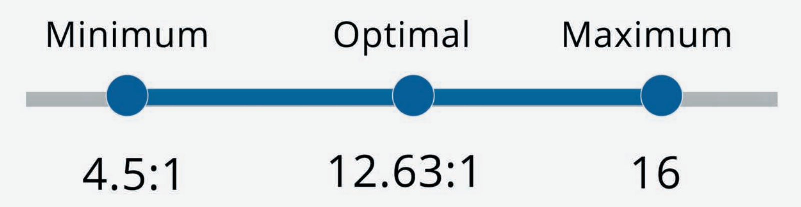
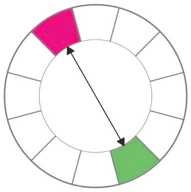


Fig 31 Designers should ensure all text and objects necessary for interaction meet a minimum contrast threshold of 4.5:1. The optimum contrast level hovers around 12.63:1, and the maximum level contrast you want in an interface is 16:1.

Complementary Colors

Complementary or contrasting colors are those on exactly opposite sides of the color wheel. Combining two complementary RGB colors creates white. Selecting a contrasting color makes colors such as yellow on a blue background, stand out more vibrantly. The opposite is true for text. Complementary colors do not work well with text.



Do This

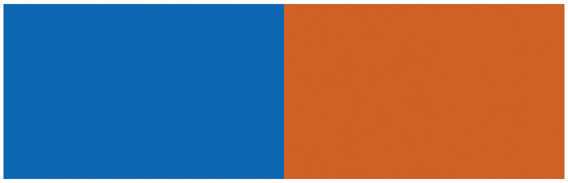


Fig 32.1 Complementary colors work well to make shapes stand out against each other.

Not That

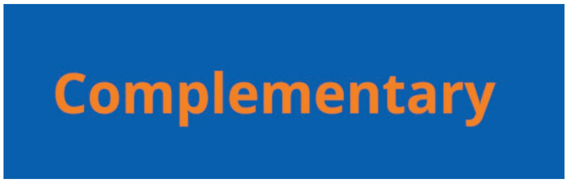
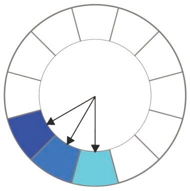


Fig 32.2 Complementary colors do not work well with text.

Analogous Colors



Analogous colors are next to each other on the color wheel and are closely related. For example, the two analogous colors for light blue are cyan and blue.

Analogous colors contribute to a harmonious color scheme. Where these colors meet, they blend seamlessly. Analogous colors can be used for background and shape elements, but should not be used for text, or interactive items because a user might not easily perceive them.

Do This

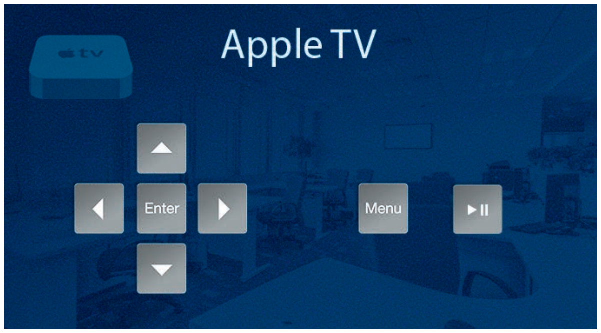


Fig 33.1 Analogous colors work well to harmonize background and shape elements.

Not That

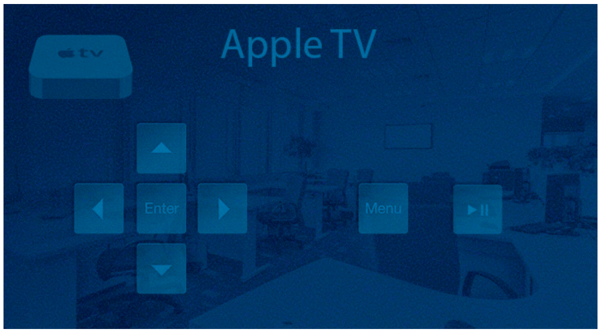


Fig 33.2 Analogous colors do not work well for text or buttons because they do not stand out against other elements.

Color Meaning

Different colors have cultural and semantic meanings associated with them. For instance, red can mean “bad” or “warning” in Western culture, yet have completely different associations in the Eastern hemisphere. Colors can also convey meaning within different branding systems. For instance, at a university where the primary branding color is red, that color might mean “success” instead of “failure”. Because there is a lack of universal meaning attached to color we recommend the following:

- Know your audience, and what they might expect from different colors.
- Provide a secondary source of feedback for those with color deficiencies. (see the **Monochrome Testing** section on page 46 for more information on this subject)
- Keep color decisions consistent. If a certain color conveys a meaning, do not use that color within the same project and expect users to interpret a different meaning from it.

Takeaways

- ➜ Color varies depending on the device. It is important to ensure final designs meet expectations by uploading the project to the touchpanel.
- ➜ Providing appropriate contrast is one of the most important ways to use color.
- ➜ Use complementary colors to bring attention to shapes and objects, but refrain from using with text.
- ➜ Use analogous colors to harmonize background elements.

Hue, Saturation and Brightness

All colors can be represented by their red, green, and blue (RGB) color values as well as their hue, saturation, and brightness (HSB) levels. The HSB model is a versatile color representation method commonly used by graphic designers because it is easier to pick a color and modify its shading with the HSB method than it is with the RGB method. HSB is based on the principle that each pure color is mixed with values of white and black to create various shades of the pure color. RGB and HSB values are simply two different ways to describe a specific color.

Hues

Hues are colors represented from the color wheel. A hue is a color that is pure and is represented in degrees: where 0° degrees is at the top of the color wheel representing red. Zero to 359° degrees represent all the colors hues of the color wheel.

Saturation

Saturation (or chroma) refers to how pure the color is. Highly saturated colors (for example, primary colors) look rich and full, and colors with low saturation look dull and grayish. A fully (100%) saturated color is the truest version of that color. Its saturation value decreases as chroma is removed, eventually leaving only the luminance (colorless cell) when the saturation value is 0%.

Brightness

Brightness (or luminance) is the measure of intensity of a hue. When the color is 100% pure, its brightness value is 100%. As the brightness value decreases to 0%, the intensity lowers until the color becomes completely black. If both saturation (chroma) and brightness (luminance) are 0%, then the result is black.

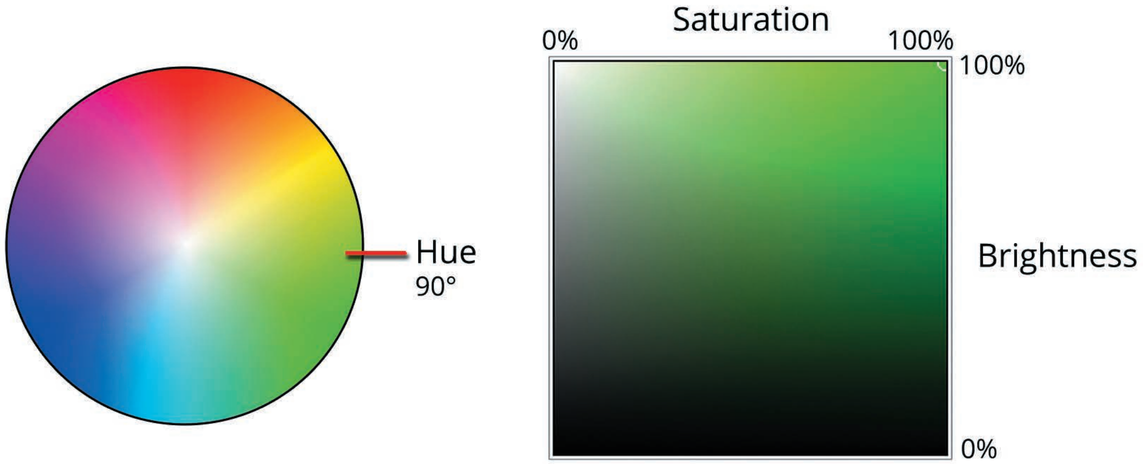


Fig 34 Hues are expressed in degrees on the color wheel, while saturation and brightness are expressed in percentages of color and intensity within the color.

Transparency (Alpha)

Transparency quantifies the extent to which a foreground color allows visibility of background colors and images. It is the opposite of opacity.

Opacity is the level of visual solidity, the depth or amount of a color within the pixels of an object such as a button or text box. Reducing opacity in the pixels of a foreground object allows a background object (a logo, for example) to become visible through the foreground object. Increasing opacity blocks out the view of the background. The greater the transparency, the lower the opacity.

Transparency and opacity are usually represented in percentages (0-100%) where:

- 0% transparency (100% opacity) indicates a solid, opaque foreground with no transparency
- 100% transparency (0% opacity) indicates full transparency, where the foreground object has no color

Note: In the GUI Designer RGB color picker, the color's opacity is referred to as the Alpha Level and has a range from 0 (transparent) to 255 (opaque).

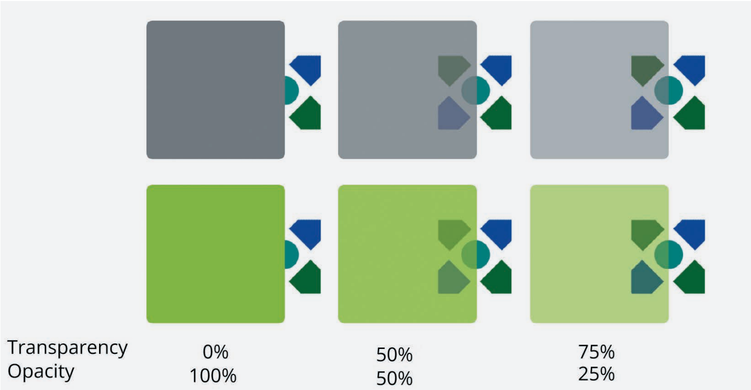
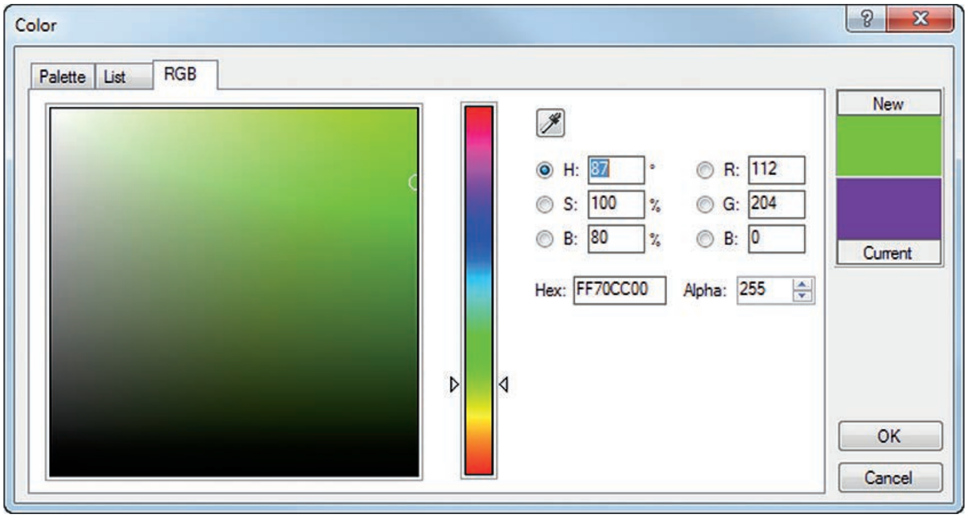


Fig 35 Understanding the difference between transparency and opacity is very helpful when you either want to show portions of the background or obscure the background for increased contrast.

Hexadecimal Codes

The RGB color value can be identified using a unique 6-character hexadecimal code This hexadecimal code can be entered directly into the color specifying window of a graphics program, making it easy to share a color value from one program to another by doing a copy and paste operation.



● H: 87 °
○ S: 100 %
○ B: 80 %
○ R: 112
○ G: 204
○ B: 0
Hex: FF70CC00
Alpha: 255

Fig 36 Screenshot of the color palette picker in GUI Designer. Identifying the exact hexadecimal code can make designs more consistent and can make it easier to share color values among projects, the last two characters indicate the alpha / transparency level.

Monochrome Testing

Monochrome testing in grayscale is a good way to validate the readability of a user interface design by those who are color blind or color deficient. Color blindness is a color deficiency where a person has trouble distinguishing between colors. A red-green deficiency is most common, although some individuals might have difficulty seeing the difference between blue and yellow. Only a limited number of people who are color blind see in black and white.

Monochrome testing strips away the chrominance from the design. When the chrominance is removed, it reveals the areas where the difference in luminance, or grayscale, is hard to perceive. If the layout is difficult to read in grayscale, then it may be unusable by a person who is color blind.

Do This

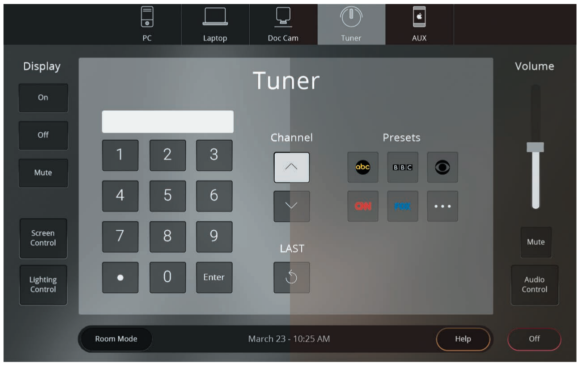


Fig 37.1 Example of a good color combination, The screen is readable when monochrome tested.

Not That

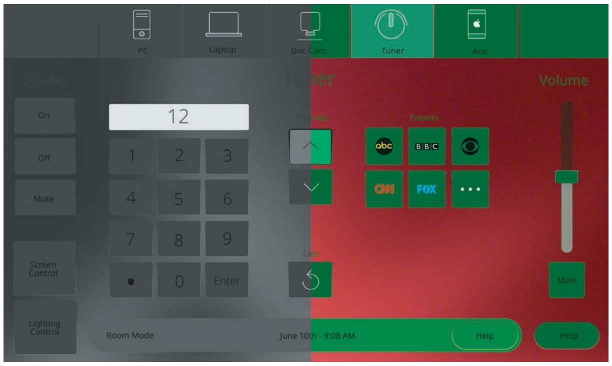


Fig 37.2 Example of a poor color combination screen is unreadable when monochrome is tested.

Takeaways

- ➜ Avoid using more than six colors within a project. Using too many colors can be distracting for users.
- ➜ Use grays, or colors having low brightness and saturation values for backgrounds.
- ➜ Use contrasting colors to draw attention to text or to buttons that must stand out.
- ➜ Avoid using too many saturated colors.
- ➜ Always maintain good contrast between elements, and especially for text.

How To Monochrome Test with Extron GUI Designer

Simply click the monochrome test icon to toggle between grayscale and color variations of the template in Extron GUI Designer software.

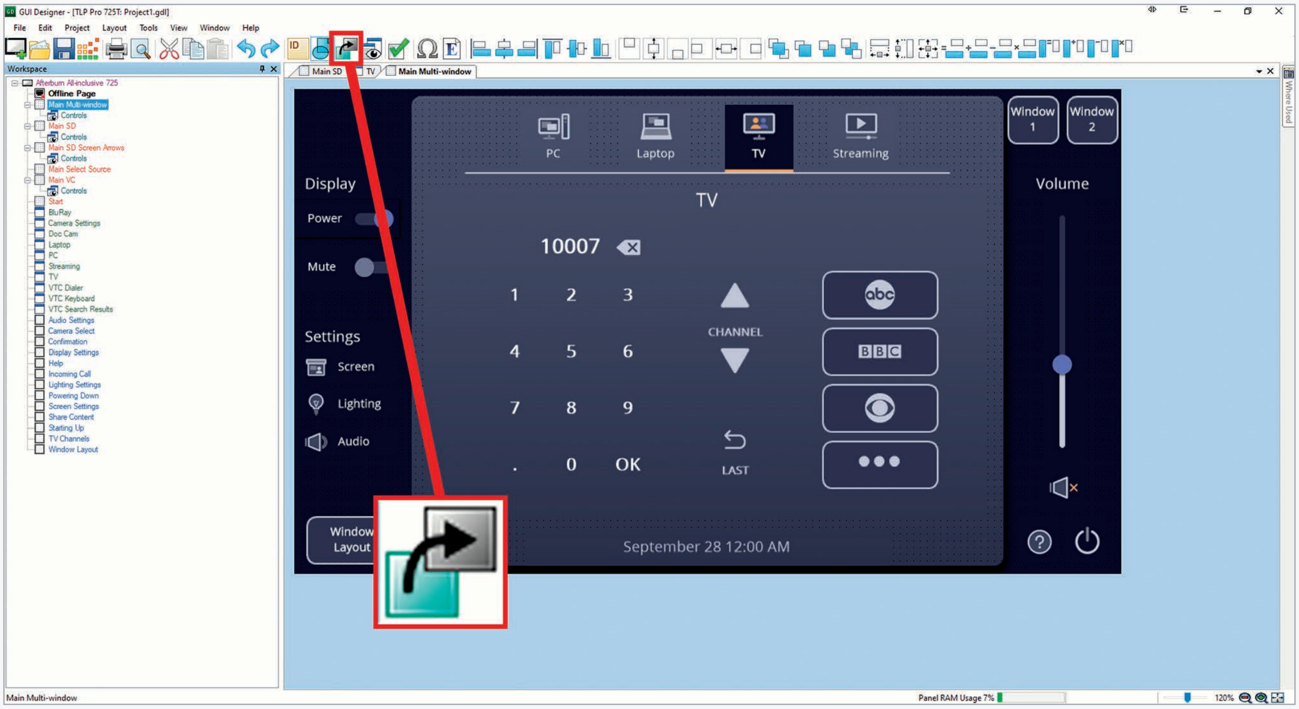


Fig 38 The monochrome test icon is located in the main toolbar in GUI Designer.

How To Choose Colors for a Custom GUI

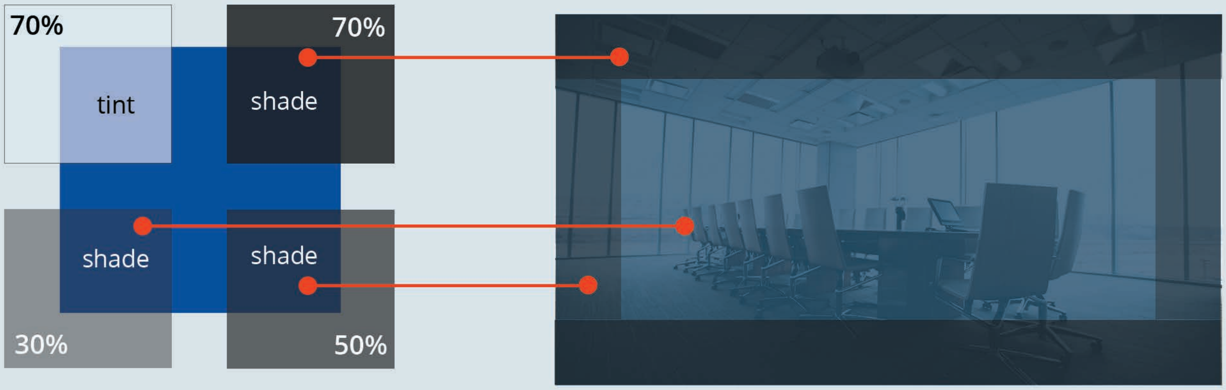
1 Determine Dominant Color

Look at company logos and branding guidelines.

Extron

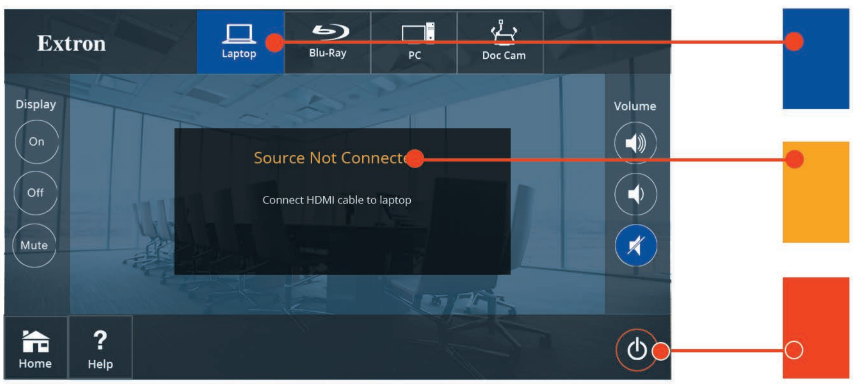
2 Create Background Elements

Add amounts of black or white to the dominant color to create shades and tints to use for shapes and background overlays.



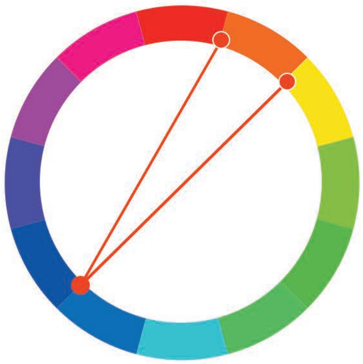
3 Add Accent Colors

Add contrasting colors to call attention to specific elements such as alert messages or selected objects. Use sparingly for maximum impact.



Source Not Connecte

Connect HDMI cable to laptop



Design Fundamentals

When designing a user interface, place great care on crafting easy to operate controls that are both familiar and intuitive. A user will want to get right down to the business of the meeting or presentation, needing to accomplish their desired task without distraction or hesitation.

Building Blocks

The building blocks are the fundamental tools the designer uses to create user interfaces. If used correctly, the blocks work together to create a harmonious and intuitive interface to provide a positive user experience. This next section of the guide offers guidelines to assist in the proper deployment of:

- Buttons
- Text and labels
- Fonts
- Shapes
- Backgrounds
- Images
- Pages

Button Affordance

Buttons are the primary means of interaction between the user and the touchscreen. A button must have visual properties that indicate it can be pressed. It should also visually change when pressed, providing accurate feedback of its state. Traditional buttons employ borders, gradients, and drop shadows to make the element stand out from the interface in a three-dimensional fashion. Organization, placement, and color contrast are also excellent ways to indicate a button, even with flat design. A button can also be defined by creating a containing shape around the button text. Ovals, squares, rounded rectangles, and circles are optimal choices.

Do This

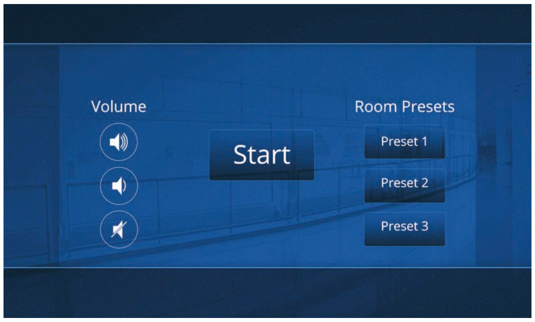


Fig 39.1 Buttons that have a containing shape and contrast from the background make easy targets for users.

Not That

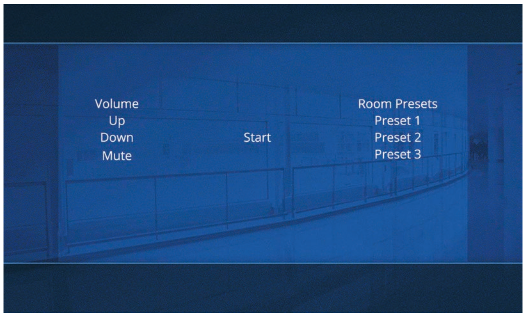


Fig 39.2 Buttons that are just text might not be obvious enough for users to know to touch them.

Button States

Typically, buttons have two states – on and off. Use different color choices on buttons to indicate unselected or selected states. Generally, the selected state draws more attention than the rest of the buttons and is a subtle way of informing the user that this function is on.

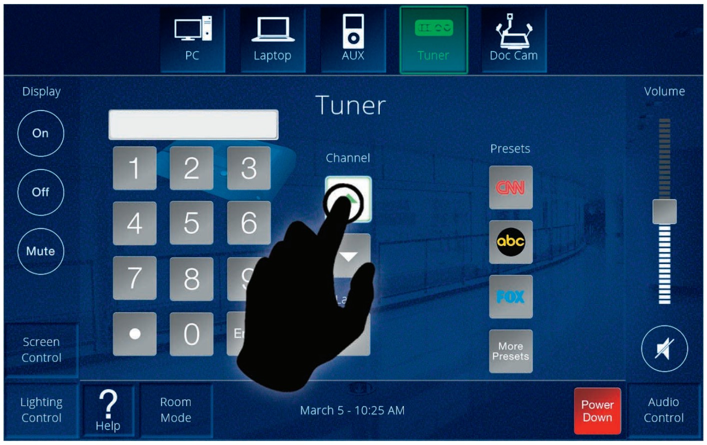


Fig 40 There are two examples of selected states in this design, the Tuner input and the Channel Up button. The Tuner input button remains in a selected state until the user changes the input. Other, more temporary, states such as Channel Up only appear selected when the user interacts with them, but are critical for providing feedback for the user.

Flip-Flop Buttons

With limited screen real estate there is a temptation to create dynamically changing button labels or icons, which ideally would combine two buttons into one. This is often seen on buttons with two states such as on/off and mute/unmute. This leads to a lot of confusion, as users are forced to wonder whether or not the button reflects the current state or what will happen when they press the button. Designers need to separate controls from system status.

Do This

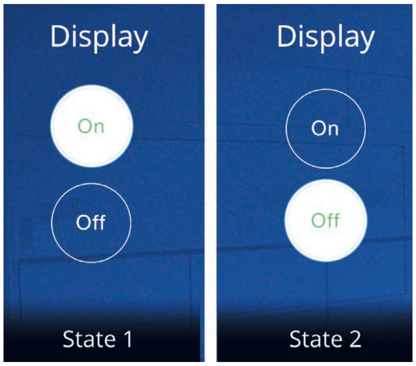


Fig 41.1 With these button options the user can clearly understand what the current state is, and what actions they can take.

Not That

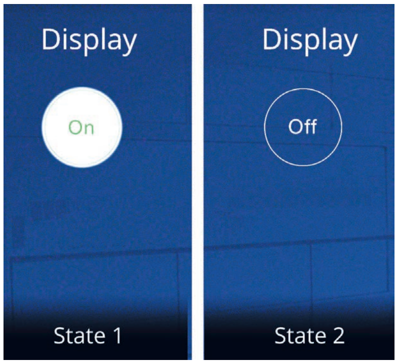


Fig 41.2 This flip-flop button arrangement indicates the current state of the system, but does a poor job of informing how to control the system.

Takeaways

- ➜ Buttons are the primary means of interaction with touchpanel interfaces. Style them appropriately with containing shapes to provide affordance.
- ➜ Buttons often need to convey separate things: how to control the interface and system status. Make sure you address both needs.

Buttons and Touch Target Size

Touch target refers to the area users can press to trigger a reaction in a touch interface. Touch targets are often associated with buttons, but apply to any area of touch interaction including links and input fields. Studies have shown that 9 mm x 9 mm or 3/8" x 3/8" is a reasonable touch target and 7 mm is the absolute minimum in mobile phone interfaces. Touchpanels require a bit more space since the user is further away when they interact with these screens. Leave at least 2 mm or 1/16" between elements to avoid accidental triggers.

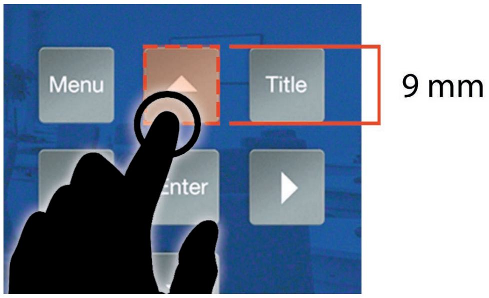


Fig 42.1 9 mm is the optimal touch target size.

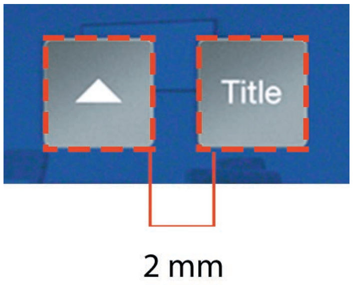


Fig 42.2 Leave at least 2 mm between touch targets.

Touch targets should increase on larger devices, to accommodate arm movement. While smaller devices require wrist and hand movement, larger touchpanels engage the arms which lead to less precise taps.

GUI design tools do not allow object dimensions to be entered in millimeters. Graphic tools use pixel counts as the reference for object dimensions. Display dot pitch varies from panel to panel and most manufacturers do not specify it, making it cumbersome to create the ideal button size.

See the **Quick Reference** section on page 88 at the back of this guide for our full line of touchpanels and minimum button touch targets for each as well as recommended spacing between targets.

Button Spacing

Buttons are also easier to press if there is a small amount of spacing between them. This helps minimize false presses. As a general rule for small buttons of 72 pixels or less, there should be at least 5 to 10 pixels between them. For GUI Designer versions 1.7 and later, each press of an arrow key will move an object by a default of 10 pixels. Try to maintain uniform spacing both horizontally and vertically. 2 mm is the suggested spacing between touchable targets to avoid accidentally triggering the wrong action.

Do This

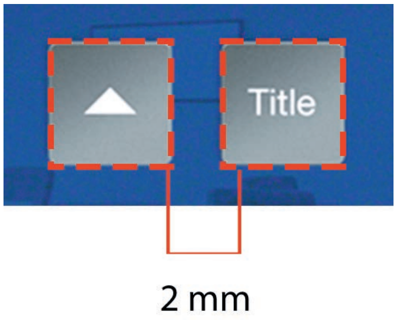


Fig 43.1 Leave at least 2 mm between touch targets.

Not That

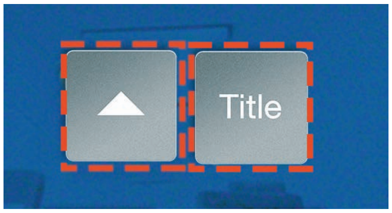


Fig 43.2 Don't arrange buttons directly next to each other.

Takeaways

- ➜ Buttons must have a minimum of 9 mm by 9 mm touch target in order to tap accurately.
- ➜ Additionally buttons grouped together must have a minimum of 2 mm spacing between them.
- ➜ Spacing varies depending on device resolution. Review the chart in the Quick Reference section for all touchpanel sizing.

Button Labeling

Identify buttons by using both icons and labels whenever possible. This provides the cues to button functionality. Very few icons are truly universally and internationally recognized. The intended meaning of an icon may be obvious to one person, but may have a completely different meaning to another. Many icons have multiple meanings depending on the perspective of the user. Always reinforce the meaning by using a label where space permits.

Do This

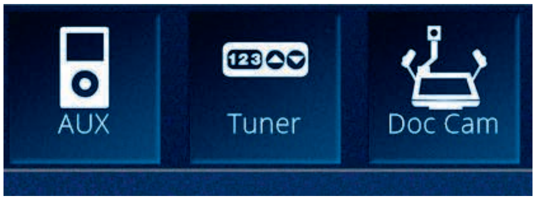


Fig 44.1 Reinforce the meaning of icons with labels.

Not That

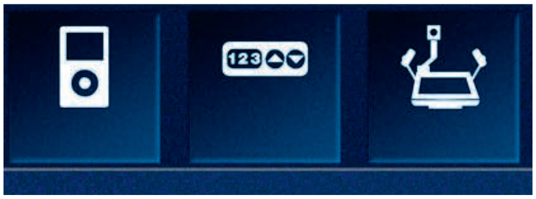


Fig 44.2 Icons without labels can easily be misinterpreted by the user.

Button Icons and Logos

Icons applied to buttons are quick to read and understand, provided the icon image does not appear overly complex. Simple icons are understood more quickly and scale better with button size changes than do three-dimensional, picture-like icons.

Logos can identify the function of a button quickly and easily if the logo is commonly recognized. Logos that are company or organizationally specific may work well for employees, but can be more challenging for visitors who use the system.

Do This

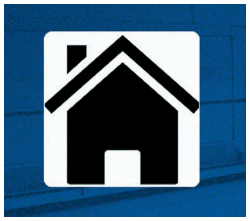


Fig 45.1 A simple, quick to read icon.

Not That

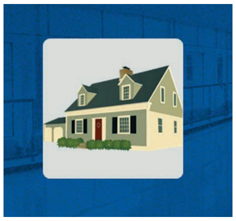


Fig 45.2 Complex icons are more difficult to understand.

Takeaways

- ➜ Always reinforce icons with labels when possible.
- ➜ Keep icons simple to make them easier to read.
- ➜ Choose icons wisely, as very few have universally understood meanings.

Button Orientation

When done correctly, button orientation enables the user to easily recognize the purpose of the buttons. An orientation that matches the action of the button clearly defines its use, and so increases its affordance. For example when navigating left, right, up, or down, it becomes easy to recognize the purpose of the buttons if they are positioned in their natural orientation (the up button at the top, the left button to the left, and so forth).

Do This

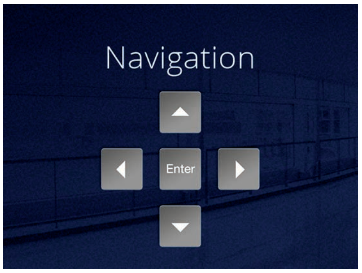


Fig 46.1 The navigation here is intuitively placed.

Not That

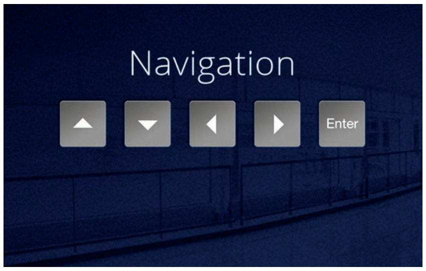


Fig 46.2 It takes more than one glance to find the left navigation button in this layout.

Button Chunking

Button chunking is the application of grouping buttons that perform similar functions. Each control area should contain no more than nine buttons in a group. A designer can break down a control area that has a large number of control functions by using button shapes, colors, text, and spacing.

Do This

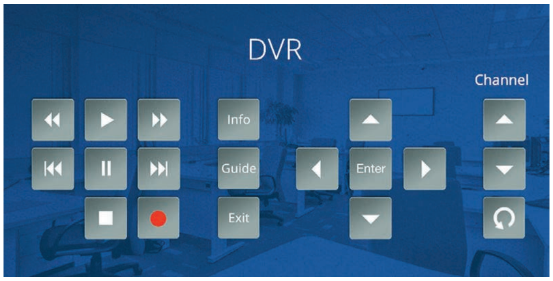


Fig 47.1 These buttons are separated by distance, and chunked by function so the user can easily see the different functions.

Not That

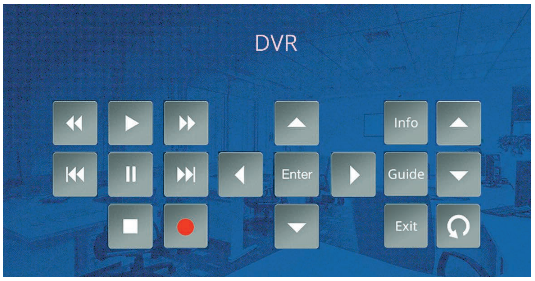


Fig 47.2 Although arranged correctly, these buttons all have the same amount of distance between them, which makes it difficult to determine the different functions at a glance.

Takeaways

➜ Follow natural button orientation to ensure users easily understand their purpose.

➜ Chunking groups related functions together to help users locate items in the interface.

Button Keypads

There are two standard numerical button keypads: the ten-key numeric keypad and the telephone keypad. The telephone keypad is the default standard for user interface design.

The ten-key numeric keypad is the button layout typically used on adding machines and calculators and is the number pad found on the right side of computer keyboards. This numeric keypad is used for mathematics and large amounts of data entry in certain fields like accounting. Do not use this keypad in user interface design.

The telephone keypad is the button layout based on International Telecommunications Union standard ITU-T E.161 and the American National Standards Institute ANSI TI-703. As well as being used for telephones, this keypad is also the universal keypad layout used for number entry, and can be found on many everyday devices like ATM machines, navigation systems, copiers, and consumer infrared remote controls.

The telephone keypad is the standard and should be used in user interface designs when a keypad is required. A PIN pad is acceptable for situations where numeric entry is possible, such as entering an authentication code.

Do This

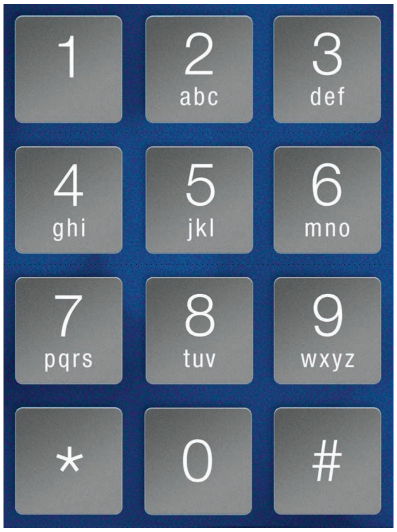


Fig 48.1 Always use the telephone keypad.

Not That

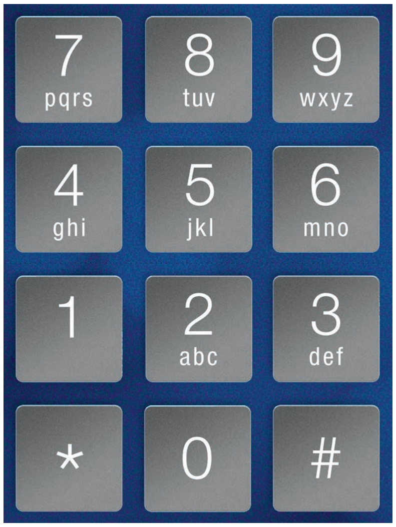


Fig 48.2 Do not use a keypad that is oriented inconsistently when compared to a telephone keypad.

Text and Labels

Text and labels are placed on top of or near an object or a group of objects. Their role is to:

- Give a description
- Provide instructions
- Clarify a purpose

Text and labels should never compete with each other or confuse or slow down the user. The text on a label or button should give a clear indication of what it represents. Be clear and concise. Do not hyphenate words to achieve word wrap. Hyphenated words are very difficult to read and understand.

Be consistent in your labeling of terms. Do not refer to the same thing in different ways. For example, if a personal computer is referred to as a "PC," refer to it as a "PC" throughout the project, and not a "Personal Computer" elsewhere.

Use Common Language

Acronyms, abbreviations, and technical terms should be avoided in most situations, as they are completely relative to the user's prior knowledge. Touchpanel products exist in a variety of environments, including medical, educational, and conference settings.

Acronyms such as "ALC" and "VTC" might mean one thing in the AV industry and have a separate meaning within a different environment. If size constraints force the designer to use an abbreviation or acronym, it is essential that they use common terms that the target audience will understand and/or accompany the acronym with an icon. The best way to ensure that the terminology aligns with the user expectation is to ask a member of the target audience.

Common acronyms that mean the same thing across environments:

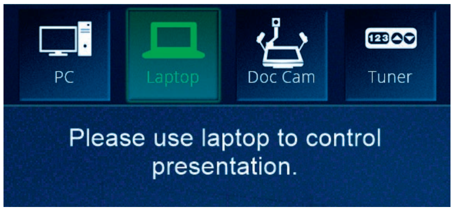
- HDMI
- DVD
- DVR
- AUX

Less common terms that might translate differently depending on the audience:

- VTC
- ALC
- Mute Video or Mute Display

Unless your audience is highly specialized, use plain language to communicate with your users. Simplified language is preferred over formal language or technical terms in most situations. Even highly educated users show improvements in task success rate, task time, and user satisfaction if terms and sentences are shorter and less complex.

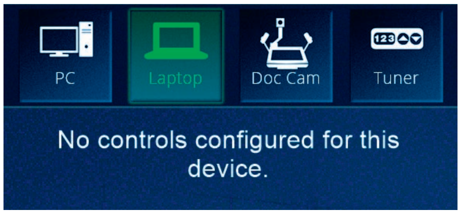
Do This



Please use laptop to control presentation.

Fig 49.1 Studies show that novices as well as experts have higher success and satisfaction when reading simplified language.

Not That



No controls configured for this device.

Fig 49.2 “No controls configured for this device” is a complicated way of telling users they need to use the laptop to control their presentation.

Takeaways

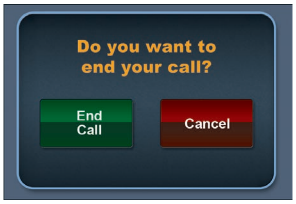
- ➜ Use button labels consistently throughout a project. If a label is “PC” on one page, do not refer to it as “Personal Computer” on a separate page.
- ➜ Use common language the user is familiar with and avoid acronyms or technical jargon whenever possible.

Text Considerations

Uppercase and Lowercase Text

When designing a user interface, a combination of uppercase and lowercase letters is preferred. This aids the user to quickly read the text and understand the function. Text in all lowercase letters or all uppercase (all caps) takes longer to read and should be used sparingly.

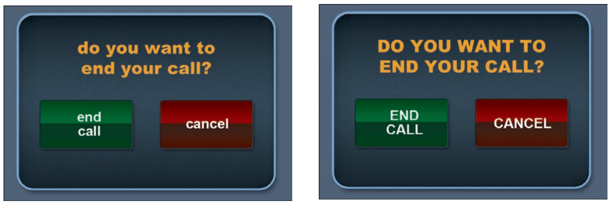
Do This



Do you want to end your call?

Fig 50.1 Mixing the casing of the characters enables the user to quickly read the text.

Not That



do you want to end your call?

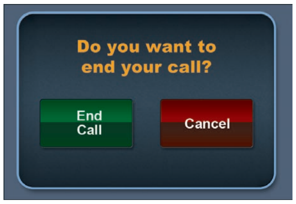
DO YOU WANT TO END YOUR CALL?

Fig 50.2 Users are less accustomed to reading all lowercase or uppercase letters, which is why it takes them longer to read and comprehend these sentences.

Action Text

Use action text (verbs) to describe the intended function of buttons instead of statements. For example, when powering down a system, confirm the request with an action term rather than a simple "Yes" or "No." The action text gives the user assurance that the selection is correct.

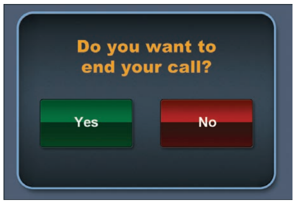
Do This



Do you want to end your call?

Fig 51.1 Action words verify the action to be taken.

Not That



Do you want to end your call?

Fig 51.2 Yes and no are vague and confusing.

Takeaways

➜ Combining uppercase and lowercase letters on buttons is preferred when creating buttons.

➜ Use descriptive verbs when creating buttons to reaffirm their purpose.

Text and Label Sizes

There should always be a visual hierarchy for label font sizes. Use larger fonts for group labels and smaller fonts for sub-labels. If the same size font is used for all labels, then the labels visually compete for attention.

Do This

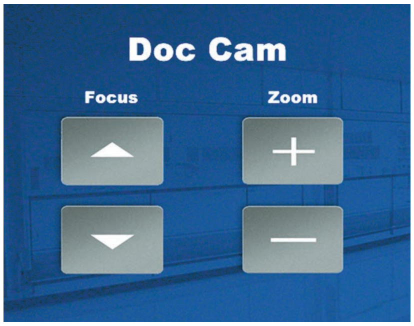


Fig 52.1 Different sizes provide visual distinction and hierarchy.

Not That

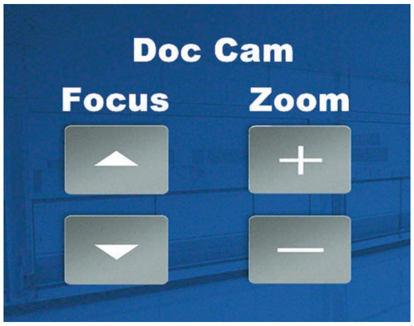


Fig 52.2 Labels that use the same font size compete for attention.

Text Proximity

Text spacing is critical. When identifying buttons that are in close proximity, be careful to move the text closer to the associated button. Spacing text evenly between two button groups can create confusion.

Do This

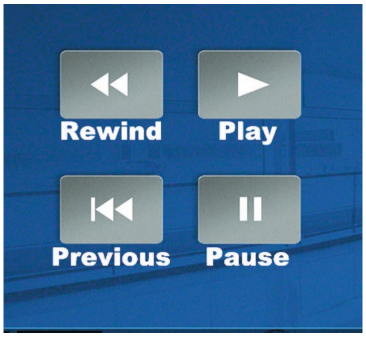


Fig 53.1 Placing text close to the appropriate button makes the button association more obvious.

Not That

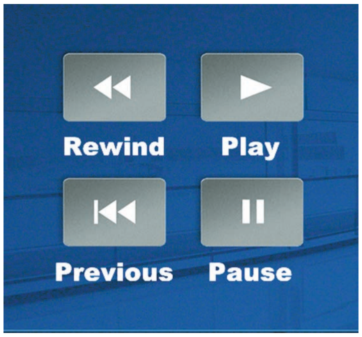


Fig 53.2 Centering text between buttons makes it difficult to determine the button association.

Redundant Text

A set of buttons that control a single device or that are used for a common control should always be grouped together. The set should share a common defining label, such as "Screen Control" or "Volume," with specific direction on the button itself. Giving each button its own detailed text is overwhelming and makes it difficult for the user to locate the correct button. Grouping common controls with a single label is a simple form of information mapping.

Do This

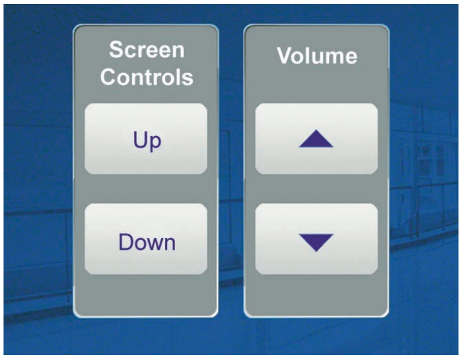


Fig 54.1 Use a defining label for grouped buttons that are used for a common control function.

Not That

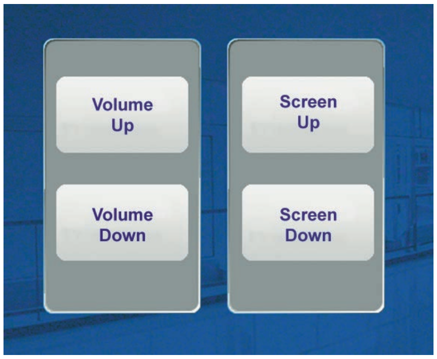


Fig 54.2 Too much information on buttons makes it difficult to locate the correct button.

Takeaways

- ➜ Use different font sizes to create hierarchy in button groups.
- ➜ Text and labels should always be in closer proximity to what they are describing than other text to avoid confusing the user.
- ➜ Avoid redundant text by moving repeated text out of buttons and into descriptive labels.

Font Selection

The purpose of any text on a touchpanel interface is to help users accomplish their goals. Font selection is a major part of the user's experience and the designer should prioritize legibility by:

- Choosing common fonts and avoiding overly stylized fonts.
- Limiting the number of different fonts within a project. Two is the maximum number recommended.
- Using regular and heavy line weights.

Fonts to avoid:

- *Script style fonts*
- Chalkduster
- Papyrus

Recommended Fonts:

- Arial
- Verdana
- Calibri
- Open Sans

Serif and Sans-Serif Fonts

All fonts are categorized as either serif or sans-serif: **Serif fonts** have little "tails" (serifs) at the tips of each character. Since displays have considerably lower dot pitch, or pixels per inch than printed materials, the small serif details tend to distort and become jagged with smaller font sizes, and are difficult to read.

Sans-serif fonts means "without serif." Sans-serif fonts do not have the serifs (tails), making it easier for displays with lower dot pitch to display them without distortion, and so are easier to read.

Do This

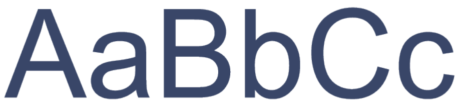


Fig 55.1 Sans-serif fonts are the safest font category when choosing fonts to display on screens.

Not That

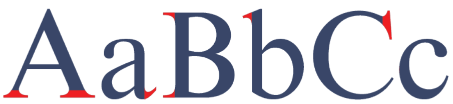


Fig 55.2 Devices with lower resolutions may distort serif fonts. In these cases, using only sans serif fonts such as Arial is recommended.

Font Size

Text labels applied onto buttons can help convey the meaning of the function for the intended button. Applied correctly, the text should fill the button without encroaching on the border of the button. If the text does not fit, consider making all of the buttons in the group larger or use a smaller font.

To ensure the text on the user interface is easy to read, choose the correct font size. Users often interact with touchpanels from a distance of 12" or further and recommended text sizes are 14pts or larger. A larger font is better, but do not let the text overlap the beveled edge of the button.

Do This

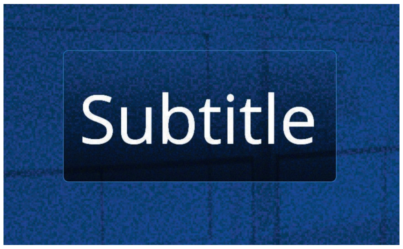


Fig 56.1 The font should fit well within the button container.

Not That

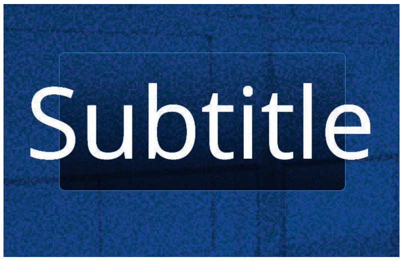


Fig 56.2 When the font overlaps the button container it is more difficult to read.

Consistency and balance are important aspects of label design. Always use the same size font when placing text on a group of buttons. This consistency naturally groups the buttons and helps to create information mapping. If one label does not fit, experiment with the button sizes or font sizes to achieve balance.

Do This

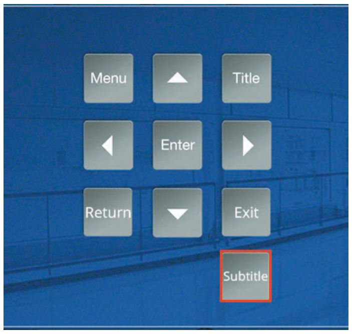


Fig 57.1 All the text sizes have been adjusted to fit neatly on all the buttons.

Not That

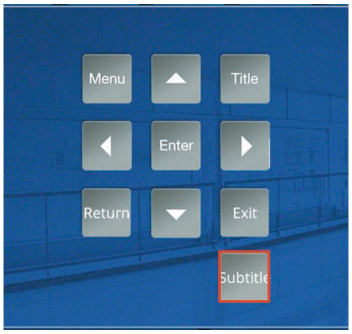


Fig 57.2 Here, "subtitle" is too large for the button.

Not That

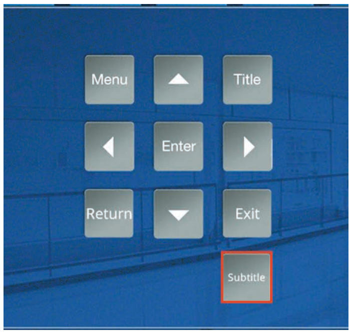


Fig 57.3 Here, "subtitle" is too small when compared to the other buttons.

Font Effects

Font style refers to regular, bold, italic, and bold italic. Extron recommends using a sans-serif, bold font.

Do not use:

- Italics or bold italics — These are more difficult to read on screen.
- Font effects — These are also difficult to read on a user interface screen.

DO NOT USE font effects such as:

Underlines   SMALL CAPS   Sub$_{script}$ ~~Strikethrough~~

Outline   Embossed   Super^{script} Narrow

Takeaways

- ➜ When it comes to font selection, avoid over stylized fonts or font effects to protect legibility.
- ➜ Keep the variety of fonts within one project to two or less.
- ➜ Recommended font sizes are 14pts and above.

How to Apply Symbol Fonts with Extron GUI Designer

GUI Designer versions 1.5 and above offer a new and easy method for adding symbols to a project.

1. Locate the “Character Map” icon within the toolbar and, while editing the desired text, click on it to bring up the character map menu.
2. At the top, select from the list of installed font sets to bring up different characters. “Extron GUI Configurator” is the default font set.
3. Select the desired character by clicking directly within the character map menu.
4. Click insert to directly add that symbol to your project.

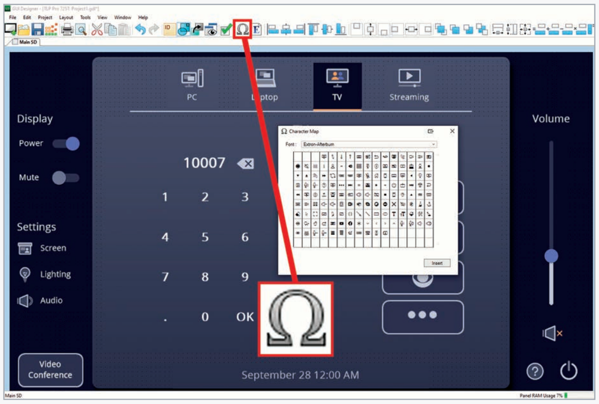


Fig 58 The character map menu makes it easy to add symbols to a project.

Symbol Fonts

Symbol fonts are a specialized font set that provides a convenient way to add character symbols to user interfaces. Extron GUI Designer includes several font symbol sets that provide the most common transport control and volume adjustment symbols. Included in the font set are several other basic symbols that are commonly used in audiovisual systems and can be used as an alternative to icons on buttons.

Shapes

Shapes are simple objects (for example squares, rectangles, and so forth) that can be added to any page to improve information mapping. They help by directing attention and providing division for the various groups of controls. Shapes can simply be outlines with variable edges, solid filled, or variably transparent. Be sure to maintain consistency with the look of the shapes within the project. Having shapes with different colors and styles on the same page is disruptive.

Do This

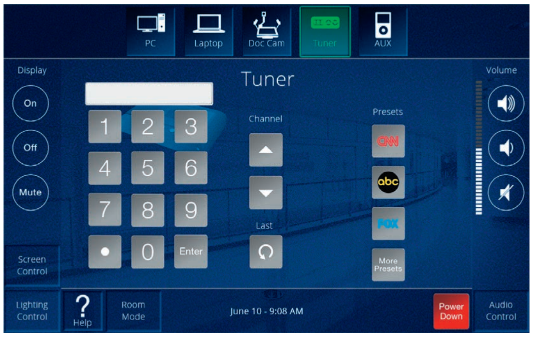


Fig 59.1 Shapes improve usability by clearly defining the various groups of controls.

Not That

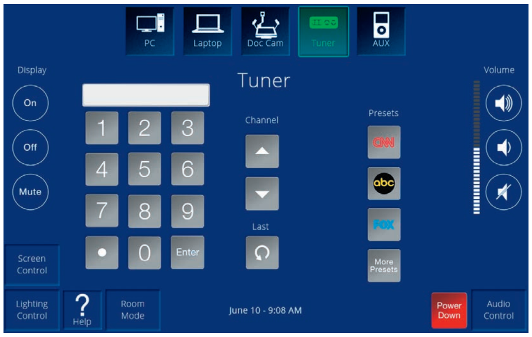


Fig 59.2 Lack of shapes to divide sections will cause a user to have difficulty finding the desired button.

Takeaways

➜ Use shapes to define different groups of controls and add organization to the design.

Pages

Main Page

Every user interface project must have default elements that apply to every page in the project. These elements contain essential controls such as navigation, and other pertinent information such as date, time and a company's logo. These act as an anchor that the user becomes familiar with and feels comfortable using.

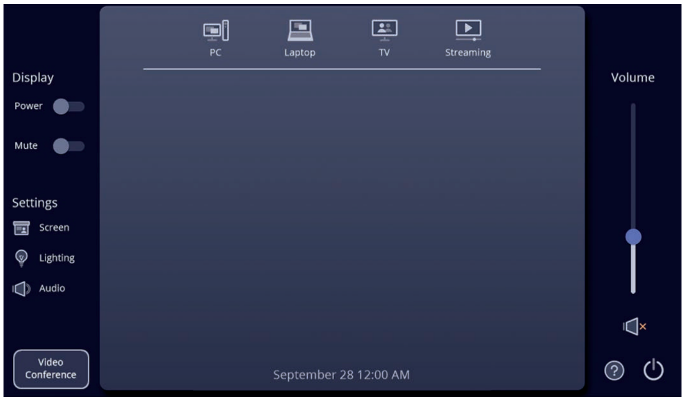


Fig 60 The main page contains essential controls, which are always directly accessible throughout the project.

Popup Pages

Popup pages are used to display contextual information and additional controls to the user as they navigate through the system. Dynamic areas help keep the main page interface uncluttered by providing a place for controls to be added only when needed. The middle portion of the screen should be designated for dynamic content, while keeping the default elements on the perimeter of the interface. In GUI Designer, popup pages are always displayed within a Popup Page Reference - PPR. The dimensions of the popup pages associated with a PPR always match the reference and only one popup within a reference may be displayed at a time. If you wish to switch between multiple popups within the same reference, you must assign the popup pages to a "Popup Page Group". This allows for easy switching between content for the dynamic area by simply changing the active popup for a single PPR.

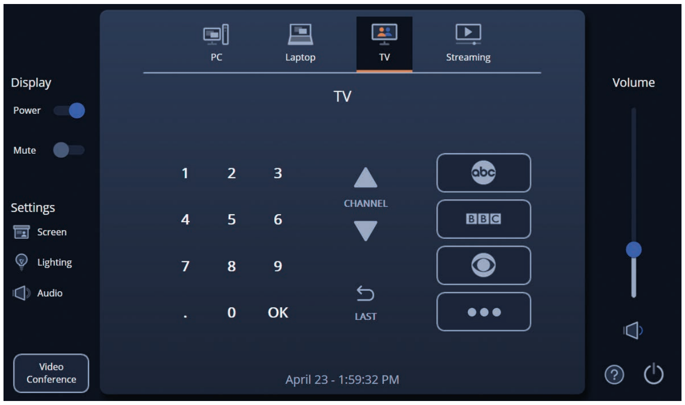


Fig 61 Main page with a Tuner popup page in the dynamic area.

Modal Popup

Modal popup pages act as speed bumps to the user, forcing the user to complete an operation or make a decision before the modal popup can be closed and they can continue back to the main page.

Similar to dynamic areas, modal popup pages bring additional controls to the user. When a modal popup page is active, the main page and any active popup pages are covered with a translucent window and are disabled. This brings the user's attention to the controls on the modal popup without visually leaving the main page.

The modal popup page is a great tool for controls that require confirmation, such as a power down command, or for controls that have granularity. For example, the main page always contains the master volume control, but in a system that may have a number of microphones occasionally needing separate adjustments, the modal popup page allows the user to make adjustments to each individual microphone.

Likewise, a system may have multiple lighting zones with separate presets that would otherwise clutter the main page. A modal popup page would bring up, in one view, all the individual lighting controls for the preset areas.

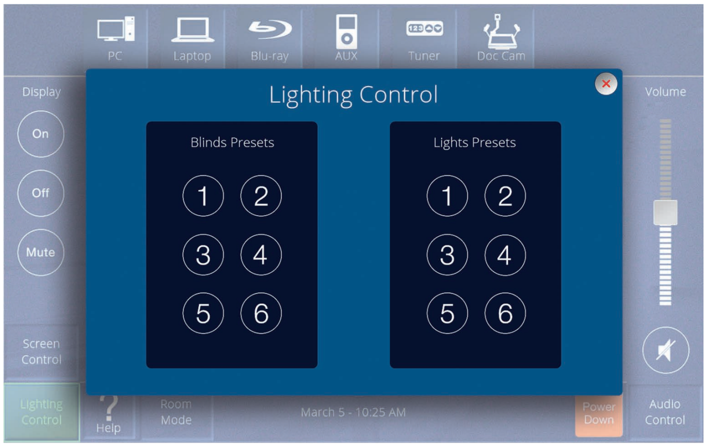


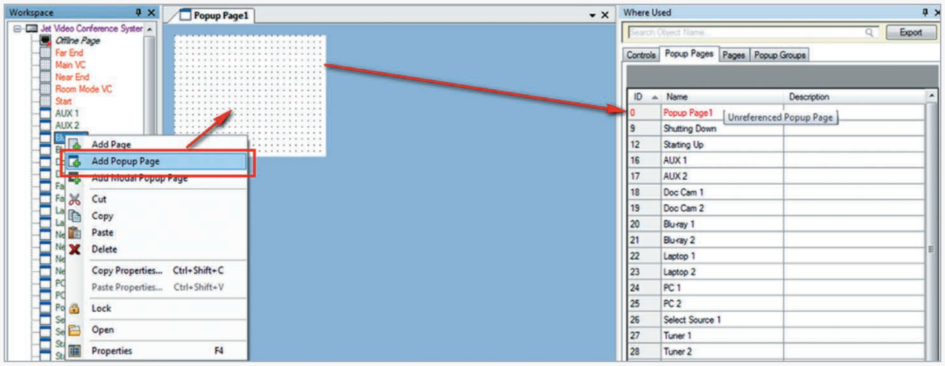
Fig 62 Modal popup page: This page overlays the main page and requires action prior to closing the window and returning to the main page.

Takeaways

- ➜ Organize your project with pages, popups, and modal popups. Pages act like an anchor that contain essential controls and other background information such as time and date.
- ➜ Popup pages bring contextual information to an interface through dynamically changing content.
- ➜ Modal popups act like speed bumps to the user and require user action before they can be closed.

How to Create Popup Pages in Extron GUI Designer

1. Right click on the project name in the workspace pane. A selection window appears.
2. Select “Add Popup Page”. A new popup page appears in the project window.
3. A new popup page appears in the Workspace area.
4. Change the name of the new page from the default “Unreferenced Popup Page” to keep it unique. It may be edited in the “Properties” window or in the “Where Used” list.



ID	Name	Description
0	Popup Page1	Unreferenced Popup Page
9	Shutting Down	
12	Starting Up	
16	AUX 1	
17	AUX 2	
18	Doc Cam 1	
19	Doc Cam 2	
20	Blu-ray 1	
21	Blu-ray 2	
22	Laptop 1	
23	Laptop 2	
24	PC 1	
25	PC 2	
26	Select Source 1	
27	Tuner 1	
28	Tuner 2	

Fig 63 Add dynamic content to your project by creating popup pages to fit within the main page.

5. If the popup is to be one of several that use the same Popup Page Reference, you must assign it a Group. In the Properties pane, you may enter a Group name, or select an existing Group name from the dropdown reference.

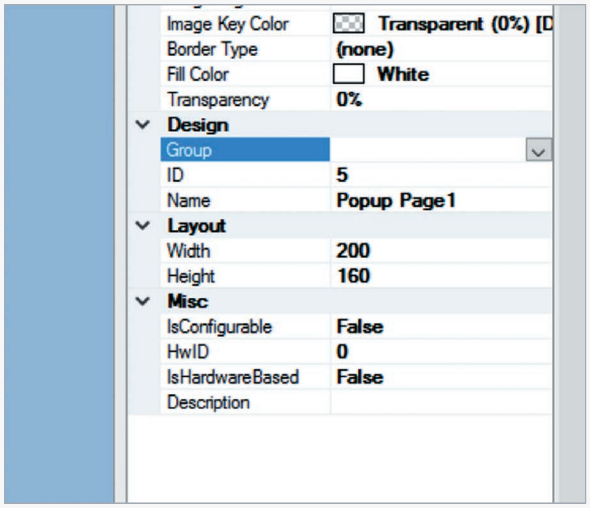
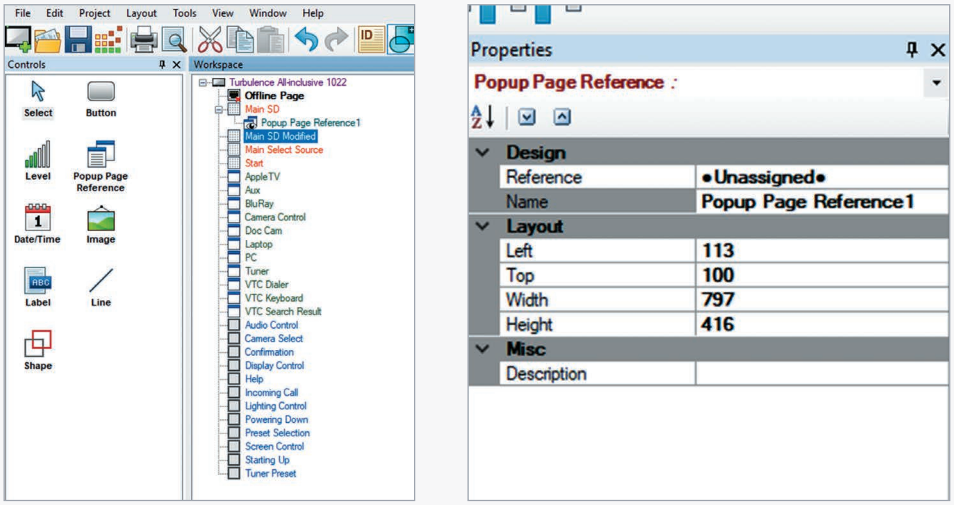


Image Key Color	▨ Transparent (0%) [D
Border Type	(none)
Fill Color	□ White
Transparency	0%
Design	
Group	
ID	5
Name	Popup Page1
Layout	
Width	200
Height	160
Misc	
IsConfigurable	False
HwID	0
IsHardwareBased	False
Description	

Fig 64 Assign a Group name to the popup page.

How to Create Popup References in Extron GUI Designer

1. While editing the page on which the Popup Page Reference is to be placed, select the Popup Page Reference from the Controls panel.
2. Drag the Popup Page Reference to the desired location on the design canvas.
3. Resize the Popup Page Reference as needed.
4. Rename it from the default "Popup Page Reference 1" to something unique.
5. In the "Reference" field, select the Popup Page or Popup Group that will appear in this reference.



Popup Page Reference :

Design	
Reference	•Unassigned•
Name	Popup Page Reference1
Layout	
Left	113
Top	100
Width	797
Height	416
Misc	
Description	

Fig 65 Adding a Popup Page reference.

How to Create Modal Popups in Extron GUI Designer

1. Right click on the project name in the workspace pane. A selection window appears.
2. Select Add Modal Popup Page. A new popup page appears in the project window.

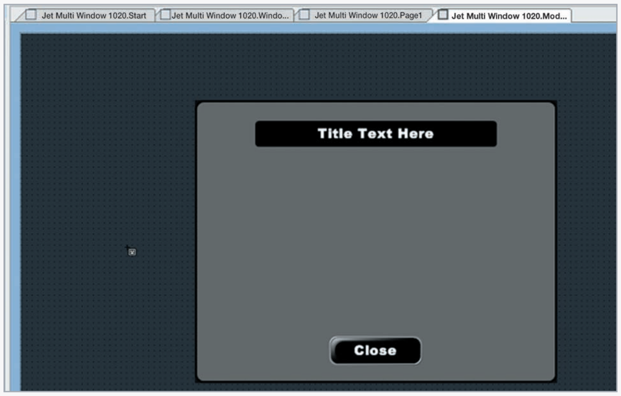

Jet Multi Window 1020.Start
Jet Multi Window 1020.Windo...
Jet Multi Window 1020.Page1
Jet Multi Window 1020.Mod...
Title Text Here
Close

Fig 66 The default design canvas for a Modal popup.

Backgrounds

The background on a touchscreen should act as a foundation on which to build a cohesively-designed interactive workspace. Backgrounds should consist of solid cool or neutral colors (such as black, whites, or grays), calm gradients, or muted textures. Remember, the primary objective for the user is to complete their task, and not to admire the graphic elements of your design. Backgrounds should never visually compete with the buttons or labels.

Do This

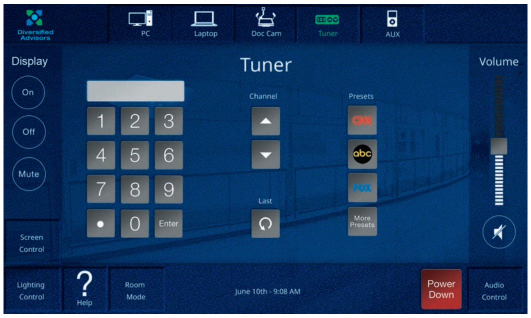


Fig 67.1 This background allows the user to focus completely on the task at hand.

Not That

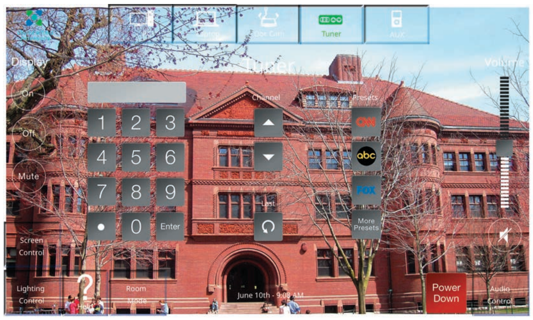


Fig 67.2 Example of a background image that visually competes for the attention of a user.

Background images require special attention to avoid distraction or visually competing for the attention of the user. Reducing the saturation, opacity, and contrast are ways to mute the image. Another way to ensure the background image truly blends in, is to overlay a neutral theme color. This will provide a more cohesive appearance. The best way to test whether the background is too much of a distraction is to step back about 10 feet from the design. If it is difficult to distinguish buttons or text from the background, adjust the interface to provide more contrast between the background and the other objects.

How to Apply An Overlay

Unedited photos are poor choices for backgrounds. Applying an overlay is an easy way to make your background less distracting for the user.

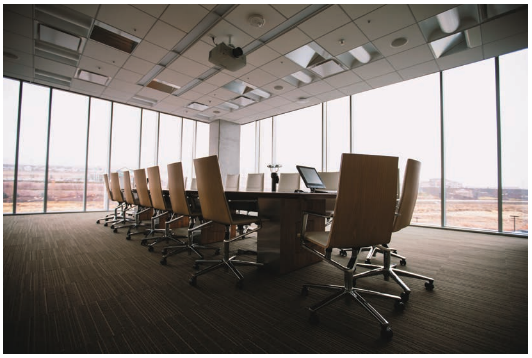


Fig 68 A background image that needs editing before using it in a user interface.

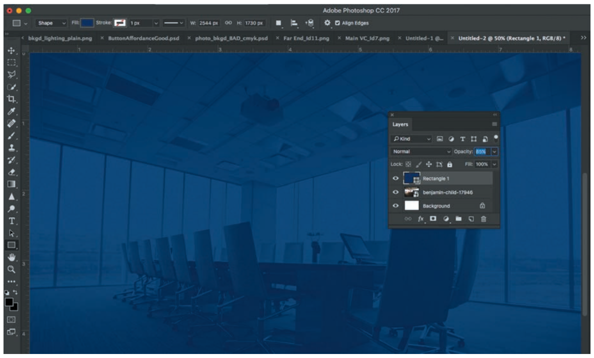
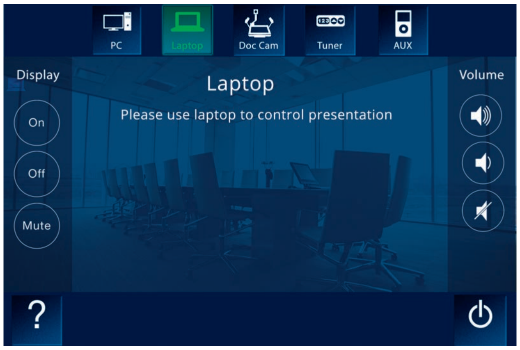


Fig 69 The image after applying a transparent overlay on top to reduce contrast within the background and to help the foreground elements stand out.

There are many ways to edit a photo to provide better contrast, but creating an overlay is one of the easiest methods.

1. Open your background photo in an image editor such as Gimp or Adobe Photoshop.
2. Draw a rectangle over your image. The rectangle should have a neutral color, one of your base colors applied, or an analogous color to your base color.
3. Adjust the opacity on the rectangle so that the background image is barely distinguishable. The higher the opacity, the easier it will be for your users to read text and buttons on your background. Opacity of 85% and above recommended.



Laptop

Please use laptop to control presentation

Fig 70 Creating overlays with colors that are analogous to shape colors is an excellent way to integrate images as backgrounds.

Images

Images such as logos on top of a background often contain a background color, typically white. When overlaid on a different colored background, this can look out of place and unprofessional.

There are many image editors, such as Gimp and Adobe Photoshop, that can be used to remove the background from an image and replace it with a transparent background.

Do This

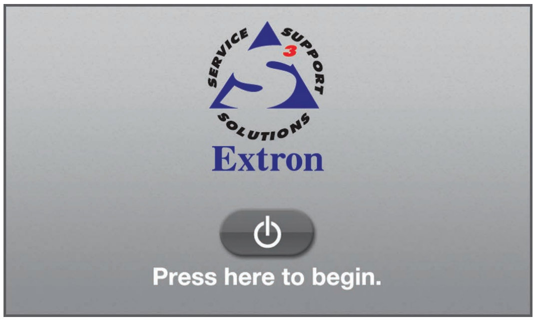


Fig 71.1 After editing image to remove background.

Not That

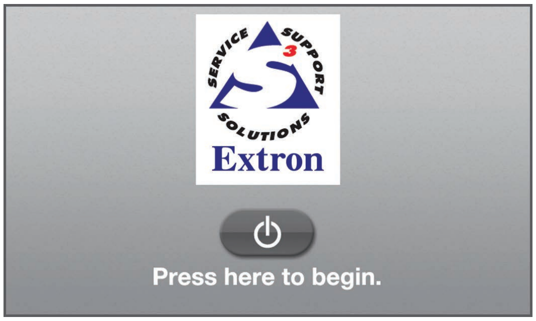


Fig 71.2 Before background was removed.

Takeaways

- ➜ Background images should never compete with the content of an interface. There are many image editors in the market that can be used to reduce the opacity or apply an overlay which will help make the background more subtle.
- ➜ Background colors from images should be removed in order to provide a more professional appearance.

Layout Standards

Graphical user interface device control consistency is of the utmost importance. As an example, the play button for the DVD transport controls page should be in the exact same place with the same exact orientation as the play button for the DVR. Users must be able to quickly identify a button and its capabilities without relearning the function for each new device control encountered.

Extron has developed the following standards for environmental and device control layouts: they are applied to all Extron templates. We believe if these unified standards were implemented by the AV industry, the resulting consistency would make touchpanel control less intimidating to the user.

Layouts for Environmental Controls

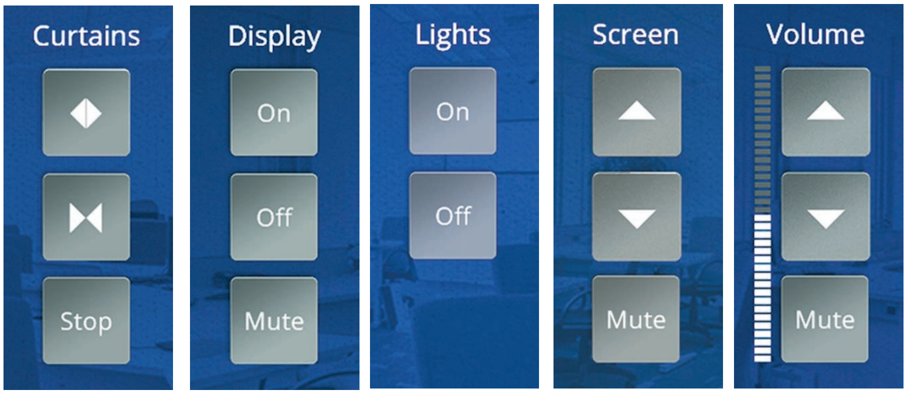


Fig 72 Use these standard vertical layouts for environmental controls.

Device Control Layouts for Limited Spaces

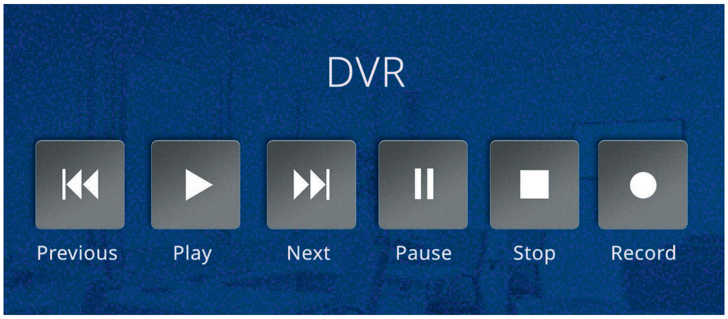


Fig 73 Use horizontal device controls if space is limited.

Keypad Layouts

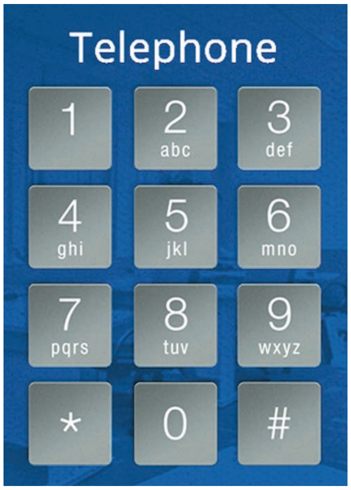


Fig 74 Use this keypad layouts for numeric entry.

Device Control Layouts for Large Spaces

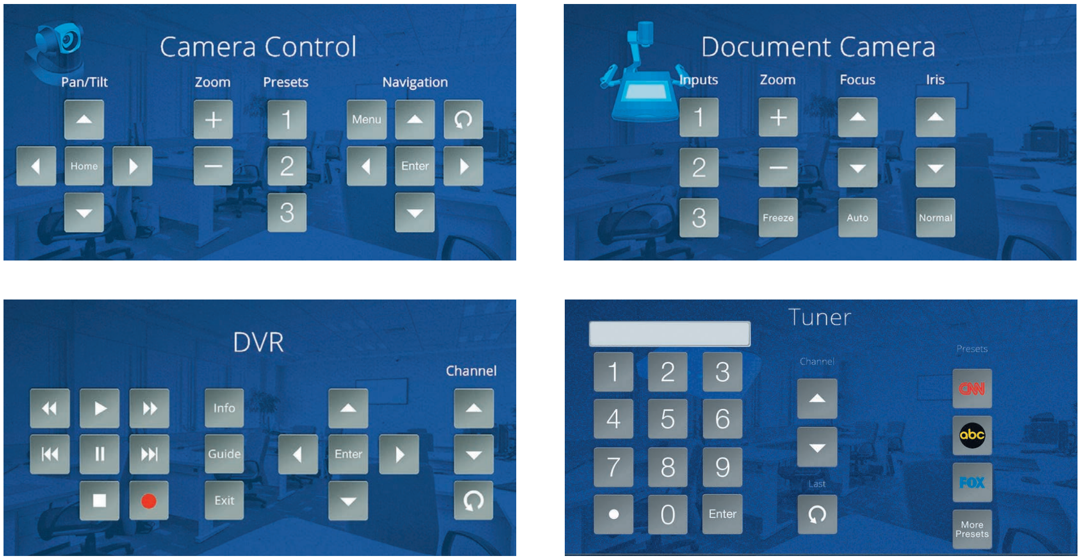


Fig 75 Use these device control layouts for medium and large screens such as 10" models and above.

Takeaways

➜ Use Extron's already defined button layouts whenever possible to create consistency throughout a project.

Defining Workflows

A clear, visible workflow that enables users to understand where they are and move either backward or forward in a process will increase task success and satisfaction. Designers tend to focus on one screen at a time, rather than the relationship between different screens in a process. While users can often overcome isolated usability issues, an inconsistent or confusing workflow can make it impossible for the audience to complete their task. Focusing on the steps within a process and the totality of the user experience can greatly improve usability.

It is important to note that users rarely complete tasks all at once or in an isolated environment. They can become distracted and temporarily abandon their workflow at any time due to something like an unexpected phone call or a question from the audience. A system needs to give enough information to the user so that they can return to the workflow, recognize where they are in their task process and know how to proceed.

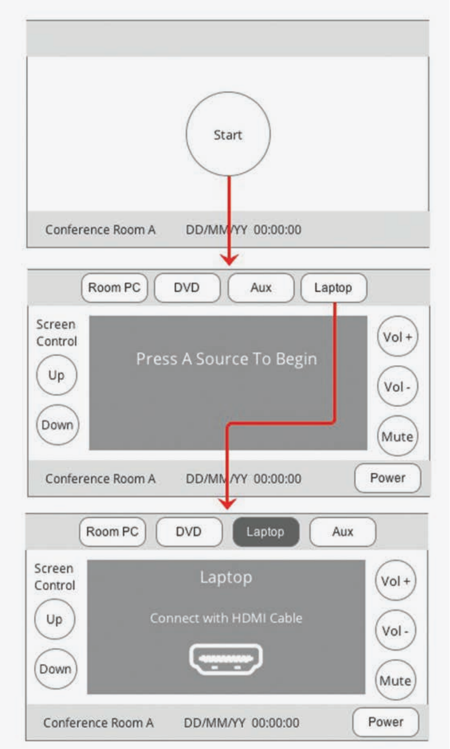


Fig 76 Visual depiction of workflow to display content from a laptop using HDMI. Wireframes help the designer quickly lay out objects and appearance before spending significant time in visual design or configuration.

How to Define Workflow

- Start with a common user task or goal.
- List steps users take to achieve the goal.
- Adjust the workflow if there are any obvious gaps, such as areas where failure is likely or the user might be unsure of how to accomplish the goal.

Example: The user wants to display a presentation from a laptop they have brought into a conference room.

1. User presses “Start” to gain access to controls.
2. User selects the “laptop” source.
    - User must connect laptop to the AV system using cable.
3. User sees presentation on the appropriate display, and has determined that they are successful.

Design for the Probable; Provide for the Possible

Designers with programming backgrounds often become bogged down with every possible exception and can struggle to simplify common workflows. While it is good practice to consider unusual situations, the point of workflows is to think about the big picture and determine what is appropriate for approximately 80 percent of the situations. Determine the best method for the majority of users first, and then work backwards to accommodate unlikely scenarios.

Takeaways

➜ Defining a workflow can reveal obvious gaps in understanding for a user.

➜ Prioritize the most likely scenarios when designing workflows. Accommodate edge cases when possible.

Testing User Interfaces

Usability testing is as integral to GUI design as quality testing is to good software development. Although terms like user centered design and UX are common vocabulary for most people working on user facing technologies, relatively few people spend the time to watch how people use their products. As a result, designs are usually the product of groups or individuals designing interfaces based on personal preferences.

Usability at a Discount

Running a usability test does not require expensive equipment, a dedicated lab, a usability expert or hundreds of participants. Useful results can be achieved with fairly low-tech solutions and a handful of users. Ideally, a designer should test about five people representative of the target audience, within a controlled environment. In a more realistic scenario, a designer asks a colleague, the client, or someone completely removed from the project and asks about their impressions.

When asking for feedback do:

- Ask users to complete a task and then watch how they do it.
- Ask users to "think out loud" to better understand their thought process.
- Ask users open ended questions.

When asking for feedback do not:

- Explain how something is supposed to work and then ask what they think.
- Ask leading, or yes or no questions.
- Discuss the technical challenges of the project.
- Indicate that the user is performing well or poorly.

What Testing Uncovers

Usability tests will not reveal with statistical certainty the best approach to interface design. It will uncover any glaring problems that users face when trying to interact with a design, as well as any perceptions or attitudes an individual has about the technology or graphical considerations.

Heuristic Evaluation

A heuristic evaluation is another way to determine effectiveness of an interface by comparing it against commonly accepted criteria. Heuristic analysis offers a quick and objective way to judge an interface, and can point to specific areas within the design that can be improved. Heuristic evaluations are not meant to replace usability tests, but are an excellent supporting assessment.

Heuristic	Grade	Explanation
Visibility of system status: Is there observable feedback within an appropriate amount of time?		
Match between system and the real world: Does the design use common language, visual metaphors, and concepts that make sense to the user?		

Fig 77 Use the Heuristic Evaluation Template in the back of this guide for control interface analysis.

Takeaways

- ➜ Usability testing does not have to be expensive, time consuming or difficult. Taking a few minutes to find a fresh perspective can save designers hours worth of time in creating the layout and configuration.
- ➜ Heuristic evaluations are an additional tool for testing and a good way to objectively examine an interface.

Conclusions

This guide was written to enable interface designers to create intuitive, functional, and well-designed graphical user interfaces for touchpanels for AV control systems. As our technological potential and our expectations for our own capabilities continue to evolve, one thing remains the same: the need for communicative interfaces and interactions.

Within this guide are the design fundamentals and considerations that are essential to a successful user interface design for every AV control system application.

Summary of the key concepts:

Consistency — Maintaining consistency (using fonts, shapes, placement, sizes, and colors) in the interface allows the easy recognition and location of each component of the system.

Affordance awareness — Affordance is the visual cue to the function of an object. If an image is intended to be a button that can be pushed, make it look like one. If it is not, then avoid making it look like one (false affordance).

Provide feedback — The results of every user action should be immediately perceivable by the customer. Effective feedback is swift, easy to detect, and does not rely solely on color to accommodate all users.

Static and dynamic areas — Logical use of static (unchanging) and dynamic (variable content) areas provides constant access to commonly-used functions, and the ability to use controls specific to a selectable source or operation. This changeable content ensures the user sees only what they need in a specific context.

Navigation and pages — Start with clear entry points. Use uncomplicated navigation to get the user to where they want to be without leaving the main page and without introducing page flips. Use popup and modal popup pages wisely but sparingly.

Button design — Button size and shape, aspect ratio and orientation, spacing and chunking, labels and icons, are all important when creating controls for the interface.

Clutter and color — Avoid clutter. Too many options on a page are a distraction. Keep it as simple as possible. Use colors that “work”; start with analogous, harmonious colors and avoid using clashing colors (red and green for example). Be mindful of users who may have visual impairments.

Text and font styles — Never use serif fonts or italic styles, and avoid text effects (for example embossing, underlines, or outlines).

Backgrounds — Avoid backgrounds that visually compete with buttons or labels. Use solid, cool or neutral colors, or muted textures or images.

Customer focus — Be mindful of the needs and expectations of the end user. Provide a well-conceived, recognizable layout that presents the user with everything necessary and easily accessible to operate the AV system.

Confirm assumptions — What makes sense to designers might not make sense to the customer. Testing the design, language, and tasks with representative users is the best way to determine the effectiveness of an interface.

Resources

Perhaps the single most important contributing factor to the successful graphical user interface design and integration is knowledge. Systems designers and integrators are encouraged to seek out training, seminars, technical articles, white papers, and other publications from industry organizations and trusted manufacturers. See the reference material and links below for additional graphical user interface design resources.

Books

Cooper, A., Reimann, R., and Cronin, D. (2014). *About Face: The Essentials of Interaction Design.*
Wiley Publishing, Inc.

Krug, S. (2014). *Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability.* New Riders.

Mullet, K. and Sano D. (1994). *Designing Visual Interfaces: Communication Oriented Techniques.* Prentice Hall.

Norman, D. (1988, 2002). *The Design of Everyday Things.* Basic Books.

Tidwell, J. (2005). *Designing Interfaces: Patterns for Effective Interaction Design.* O'Reilly.

Whelan, Bride M. (1994). *Color Harmony 2: A Guide to Creative Color Combinations.* Rockport Publishers.

Wigdor, D. and Wixon, D. (2011). *Brave NUI World: Designing Natural User Interfaces for Touch and Gesture.* Morgan Kaufmann.

Color, Graphics, and Language Resources

https://www.gimp.org

http://www.paletton.com

https://www.colorhexa.com/

https://thelogocompany.net/logo-color-choices/

http://www.degraeve.com/color-palette/

https://webaim.org/resources/contrastchecker/

https://plainlanguage.gov/guidelines/words/use-simple-words-phrases/

https://www.nngroup.com

Extron Resources

TouchLink Pro Touchpanels

Extron TouchLink Pro touchpanels are fully-customizable touchpanels available in a variety of sizes and mounting options to accommodate a broad range of applications. Visit www.extron.com/touchlinkpro for more information.

TouchLink Design Themes

TouchLink design themes include templates and resource kits. Templates are ready to use graphical user interfaces carefully matched to the most common AV applications. Resource kits are available to create a customized graphical user interface from scratch, with all the backgrounds, icons, buttons, and sounds included. For more information on TouchLink design themes, templates, and resource kits, visit www.extron.com/guidesignthemes.

Reference Guide to Design Themes

The reference guide provides valuable information on Extron ready-to-use design templates and resource kits for TouchLink touchpanels. For more information on this guide visit www.extron.com/guidesignthemes.

Training Website

The Extron training website at www.extron.com/training is the central resource for education and certification information. Here you will find program descriptions, course schedules by location, support material, and administrative information such as transcript verification.

Below is a list of some of the programs offered:

- Extron Control Specialist Certification
- Extron Control Professional Certification
- Extron Authorized Programmer Certification
- Extron Institutes for instructor-led courses
- Customized on-site training for instruction at your facility
- E-Training On Demand for online training

Extron S3 Control Systems Support Hotline

For direct access to “top tier” support for control systems, call the S3 Control Systems Support Hotline at 1.800.633.9877 for configurable systems and 1.800.633.9871 for programmable systems. Our large group of dedicated applications engineers stands ready to answer all your control system questions and help you with system design, technical troubleshooting, configuration and programming assistance, remote product or system diagnostics, repair/advance replacement services, and general product support.

Checklist For A Better Graphical User Interface

Design

□ Is the GUI design refined, uncluttered, and free of distracting elements?

□ Does it have visual balance in terms of object placement, button groupings, and graphical elements?

□ Is there a consistent approach in defining the static and dynamic areas of the user interface?

□ Does all text fit within the boundaries of buttons, windows, and banners without overcrowding?

□ Are objects centered where expected, aligned to each other within groups, and consistent, page to page?

□ Are flashing or blinking elements used sparingly?

□ Have the best practices of affordance been applied, so that buttons are easily discernible from labels?

Color Use

□ Does the client have an existing control system?

□ Does the client have an existing or prominent corporate identity?

□ Are the chosen colors aesthetically pleasing and suitable for the application?

□ Is the color scheme used consistently throughout all the pages of the interface?

□ Have the design and colors met the needs of users with visual impairment or color blindness?

□ Is color used only to enhance functions, and not used as the sole way to convey information?

Interaction Design

□ Do the symbols and icons used on buttons easily identify and appropriately reflect the button function?

□ Do the buttons work as would be expected?

□ Does button feedback correctly indicate when a button is pressed, or the function state?

□ Are all the buttons, labels, and headings labeled correctly?

□ Is the correct case and capitalization used for all button, label, and heading text?

□ Is the spelling of all static text words correct, and are abbreviations used only where space is limited?

□ Are any label names used more than once on the same page?

□ Does the interface use plain and common language easily understood by the target audience?

□ Do all popup and modal popup windows operate correctly without leaving the main page?

Operation and Performance

□ Is it easy to turn on and turn off the system?

□ Is the navigation approach suitable for the intended application?

□ Is visual and aural feedback present where and when expected, and is that feedback consistent?

□ Are there clearly understood confirmation prompts where appropriate?

□ Is the grouping of function buttons consistent among devices with similar controls?

□ Is there a way for a user to seek help?

Testing

□ Are users able to complete their primary tasks successfully?

□ Is the interface easy to navigate and understand without much training?

□ Can users easily identify and recover from errors?

Heuristic Evaluation Template

This template is specific for heuristic evaluations of control interfaces.

Heuristic	Grade	Explanation
Visibility of system status: Is there observable feedback within an appropriate amount of time?		
Match between system and the real world: Does the design use common language, visual metaphors and concepts that make sense to the user?		
User control and freedom: If the user makes a mistake, is it easy to undo? Is it easy to move backwards and forwards through the navigation?		
Prioritize user tasks: Common and frequent tasks should be given visual priority over less used tasks.		
Consistency and standards: Buttons, colors, labels and actions should mean the same thing within the interface. Follow standards as much as possible.		
Error prevention: Does the system prevent users from accidentally triggering unwanted actions?		
Discoverability: Are critical controls needed to operate the interface visible at all times?		
Aesthetics and the amount of options: Is the user overburdened by the design or amount of options?		
Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language, describe the problem and suggest a solution.		
Help and documentation: Is there any available documentation for using the system?		
	/100	

Quick Reference

Touch Target Sizing and Spacing Recommendations

Touchpanel Model	Screen Size	Resolution	PPI	Minimum Touch Target Size	Minimum Spacing Between Objects
TLP Pro 300M	3.5" / 89 mm	320x480	165	58px by 58px	13px
TLP Pro 320 Series	3.5" / 90 mm	320x240	114	40px by 40px	9px
TLP Pro 520M, TLC Pro 521M, TLP Pro 525M, TLC Pro 526M	5" / 127 mm	800x480	187	66px by 66px	15px
TLP Pro 720 Series	7" / 179 mm	800x480	134	47px by 47px	10px
TLP Pro 725 Series, TLC Pro 726M	7" / 179 mm	1024x600	170	60px by 60px	13px
TLP Pro 1020 Series	10" / 254 mm	1024x600	118	42px by 42px	9px
TLP Pro 1022 Series	10" / 254 mm	1024x600	118	42px by 42px	9px
TLP Pro 1025 Series, TLC Pro 1026M	10" / 257 mm	1280x800	149	53px by 53 px	12px
TLP Pro 1220 Series, TLP Pro 1225 Series	12" / 305 mm	1280x800	125	45px by 45px	10px
TLP Pro 1230WTG	12.3" / 305 mm	1920x720	166	59x by 59px	13px
TLP Pro 1520 Series, TLP Pro 1525 Series	15" / 381 mm	1366x768	100	37px by 37px	8px
TLP Pro 1720 Series, TLP Pro 1725 Series	17" / 432 mm	1920x1080	128	46px by 46px	10px

Other: Extron offers control solutions for customers that want to use their own devices (Android, iOS, 3rd-party touch-enabled screens, and browser-based). For these devices, you will need to calculate the target size manually.

Common GUI Designer Shortcuts

Function	Keyboard Shortcut
Project	
New Project	[CTRL] + N
Open Project	[CTRL] + O
Close Project	[CTRL] + W
Save	[CTRL] + S
Save As	[CTRL + SHIFT] + S
Save and Build	[CTRL + SHIFT] + "B"
Control Palette	
"Select" control	[CTRL] + F2
Insert Button control	[CTRL] + F3
Insert Level control	[CTRL] + F4
Insert Popup Reference control	[CTRL] + F5
Insert Date / Time control	[CTRL] + F6
Insert Image control	[CTRL] + F7
Insert Label control	[CTRL] + F8
Insert Video Window control	[CTRL] + F9
Insert Line control	[CTRL] + F10
Insert Shape control	[CTRL] + F11

Function	Keyboard Shortcut
Canvas Controls	
Move selected object by 10 pixels	(Arrow Key)
Move selected object by single pixel	[CTRL] + (Arrow Key)
Move to Back	(With object selected) [ALT] + "-"
Move to Front	(With object selected) [ALT] + "+"
Move Backward	(With object selected) "-"
Move Forward	(With object selected) "+"
Fit to Screen	[CTRL] + 0
Zoom to 100%	[CTRL + ALT] + 0
Zoom In/Out	[CTRL + SHIFT] + Scroll Wheel
Zoom In/Out 10%	[CTRL] + ("+" or "-")

Extron

Extron Satisfaction Guarantee

As a leading manufacturer in the AV industry, we are committed to engineering and manufacturing our products to the highest standards of quality, performance, and value. From our advanced product design, manufacturing and quality control procedures to our friendly and knowledgeable support teams, our commitment to satisfy you is paramount. In every interaction with Extron, you can be confident you will receive our S3 commitment to Service, Support, and Solutions. For 39 years, our objective has been to ensure that every customer is completely satisfied with every purchase.

To underscore this commitment, we offer our Satisfaction Guarantee. This means we will work diligently to resolve any issue you have with your purchase until you are completely satisfied. Extron employees are prepared to do whatever it takes to make certain that the entire process of doing business with us is a positive and professionally rewarding experience for you.

I'm so confident in our ability to deliver on this pledge that I back it personally. If you are not satisfied with any part of your transaction with Extron, I want to know. Please contact me at president@extron.com. I will personally address any unresolved customer issue. We greatly appreciate your business. It is our intent to keep you as a customer for life.

Andrew C. Edwards
President

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Rev. E
English - NP