Design Practices for Intuitive User Experience

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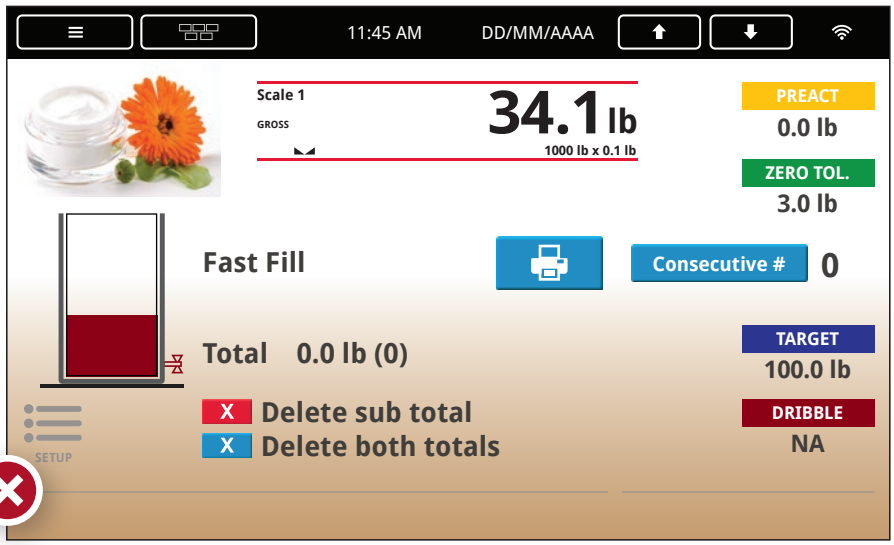
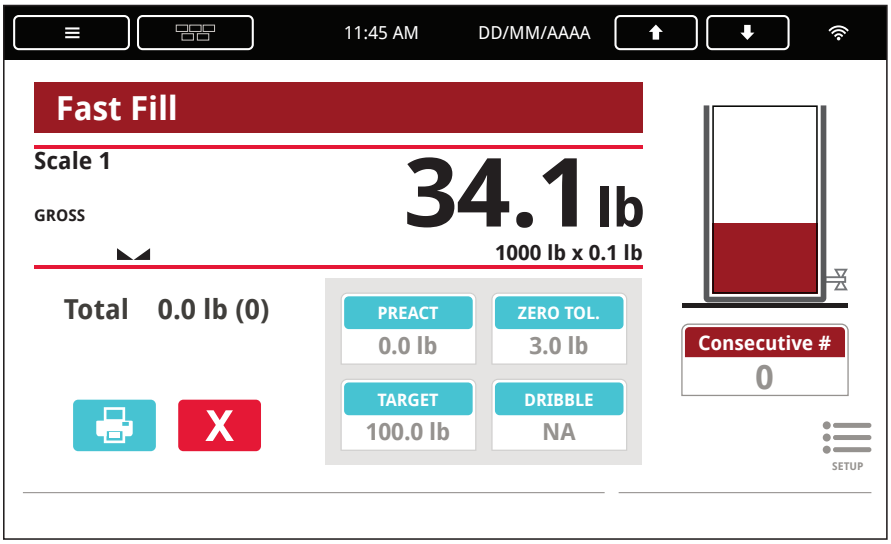
Are You Using Design Best Practices for User Interface Programming?

Strong graphic design is critical for programming usable software. The job of a program designer is to create the visible parts of software user interface (UI), guiding interaction between the user and a connected machine. Although UI is essentially a programming task, it relies heavily on design and graphic messaging for correct user operation. Effective UI improves the quality of the user's experience (UX) and reduces overall operation errors.

UI design principles are similar to graphic design principles; in fact, they have overlapping rules. However, the central purpose of UI design principles is to help the user accomplish their operation goals as easily as possible. Excellent UI design maximizes program usability for the operator.

In these examples, the top screen has a poor UI design—there are too many actions and distracting graphics in a disorganized layout. The second screen is an example of how this screen would look with an excellent UI design.





Questions to Ask Yourself Before You Begin

Who will be using this program?

Why are they using this program?

What are the user's goals?

What environment will the program be used in?

Have you defined the primary and secondary priorities of the program?

Does this program have a logical workflow?

Can the workflow be put in order of correct screen sequences?

This symbol indicates a poor example of user interface design.

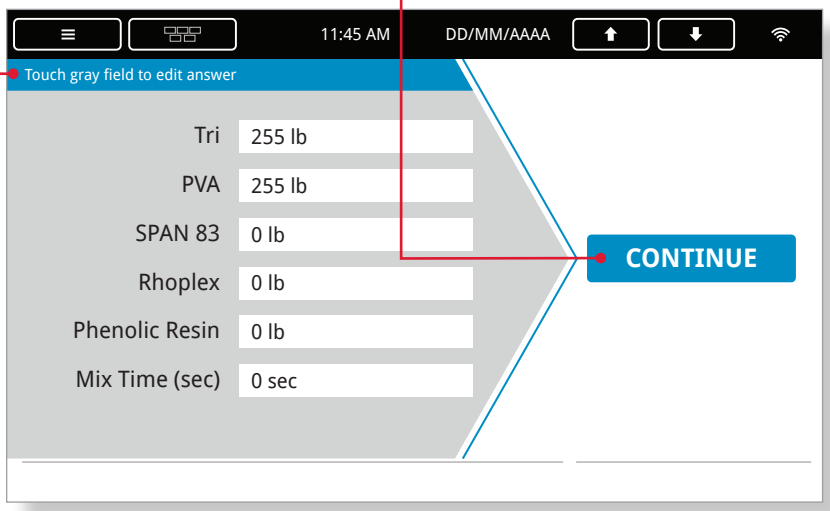
User Interface Design Principles

Clarity

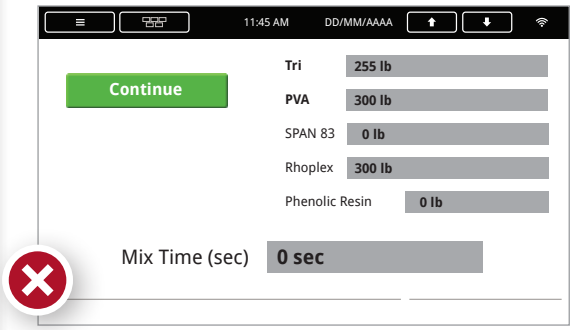
Clarity is the first priority when designing any UI (user interface). Design clarity allows information to be clearly and quickly conveyed so it can be easily understood by the user. Clarity helps the user interact with equipment and understand how programs and connected equipment will respond to user input.

Western cultures, like the United States, read left to right, top to bottom. This is why the first action is clearly stated in the upper left of the screen.

The final action should be on the far right of the screen. It should be clear what the user needs to do. In this case: fill in the information and select "CONTINUE."

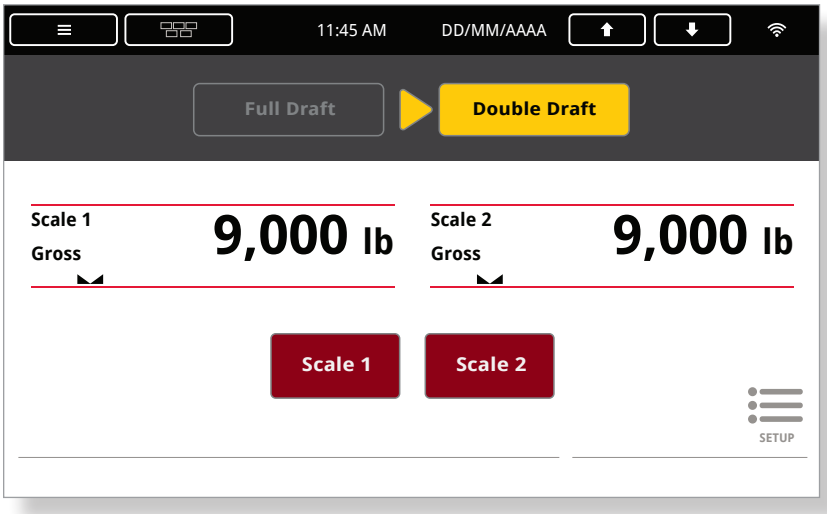


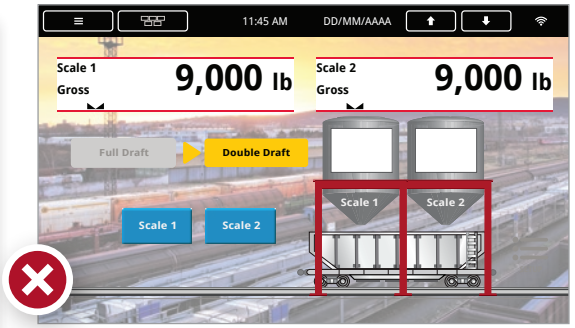
In the example below, it is unclear what actions the user needs to take and in what order.



Conserve Attention

UI design should focus the user's attention only on important screen elements. Conserve the user's attention by eliminating any features that could distract from screen functions. Unnecessary graphics, words or color can mislead the user or emphasize unimportant parts of the screen. For example, widgets and buttons may be put on a screen to orient the user. Direct the user's attention to prompts and downplay the purely symbolic elements.





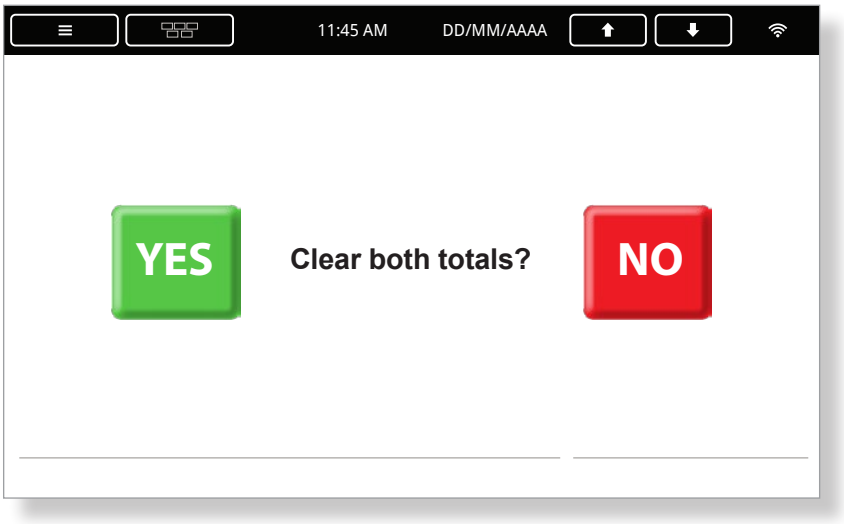
If graphics are used, they should not distract from the actions on the screen or make it more difficult to read, as shown above.

The screen to the left is an example of "conserving attention." The information is clear and the actions are easy to understand.

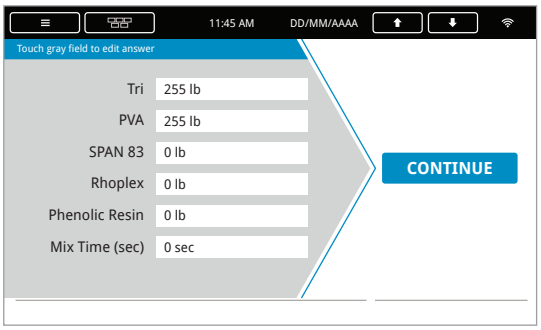
One Primary Action per Screen

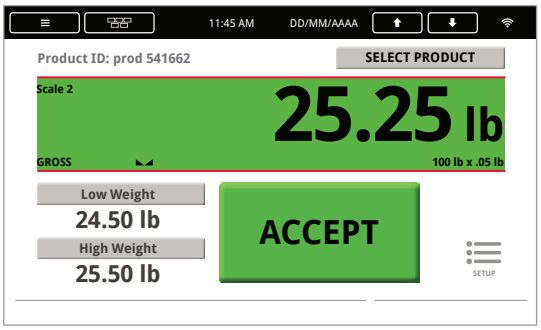
Each screen should demand only one primary action from the user. Effective graphic design controls the order of UI prompts, handling primary and secondary actions differently, and using sufficient screens to separate actions. This simplifies the UI for new users learning operation sequences. Use size and color to establish a graphic element's dominance as the primary action of a screen.

In the example below, the user has been taken to a separate screen so the required action is clear.



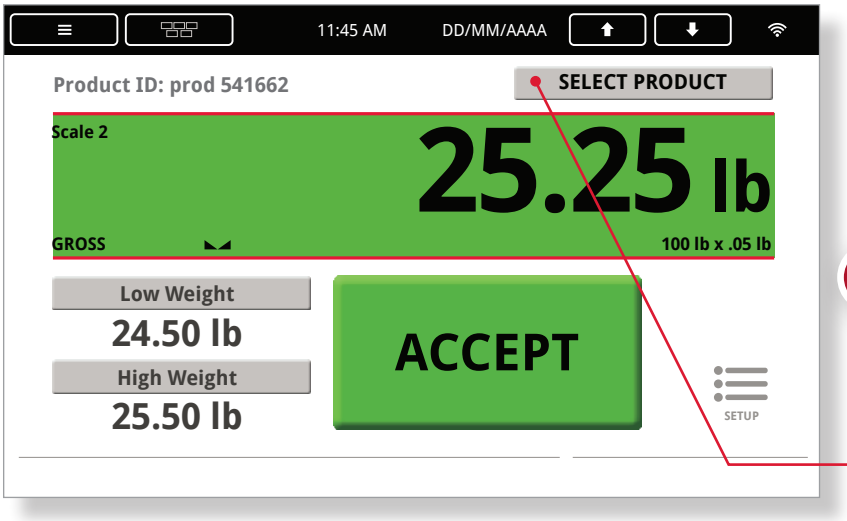
The examples below have multiple actions, but the use of color and size make the primary action clear.

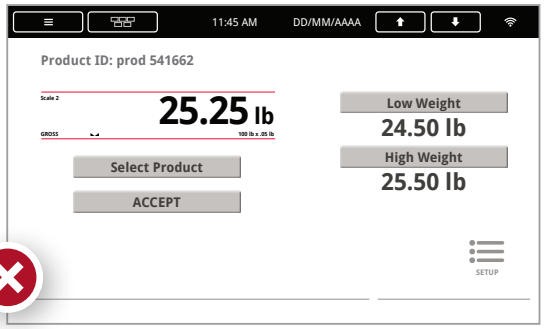




Reduce Visual Weight of Secondary Actions

Secondary actions are sometimes acceptable on screens with a single primary action. However, the secondary action should be visually minimized with a lighter graphic emphasis or visible only after the primary action is satisfied. For example, a large, colorful button carries more visual weight than a small gray button or plain text on the screen.



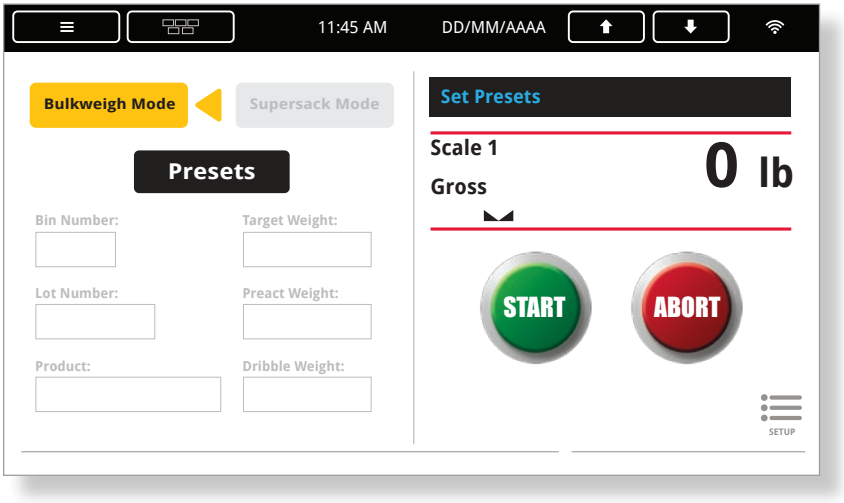


In the above example, it is unclear what the primary action is meant to be. Is it "Select Product?" Is it "ACCEPT?"

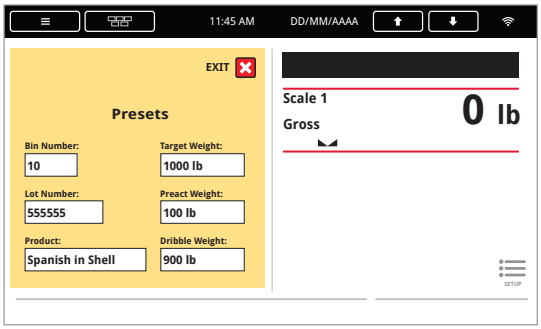
Here, the secondary action is indicated by a smaller, gray button. The primary action is "ACCEPT" and draws more attention through color, size and placement.

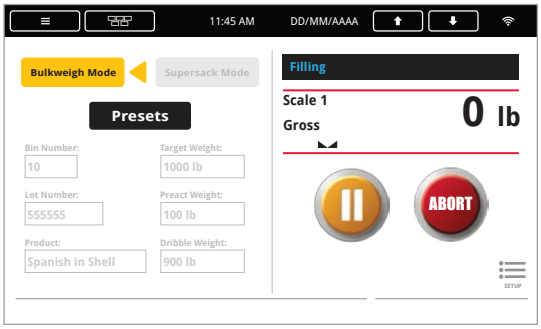
Viewing Hierarchies

Create a viewing hierarchy for the user. The more dominating a graphic element is, the higher it is in the hierarchy you are creating for the viewer. As a viewer progresses from screen to screen, they should see elements in the same hierarchical order whenever possible. An example of this is an input prompt always appearing in the center of the screen. Consistent hierarchy equals better understanding of what is important.



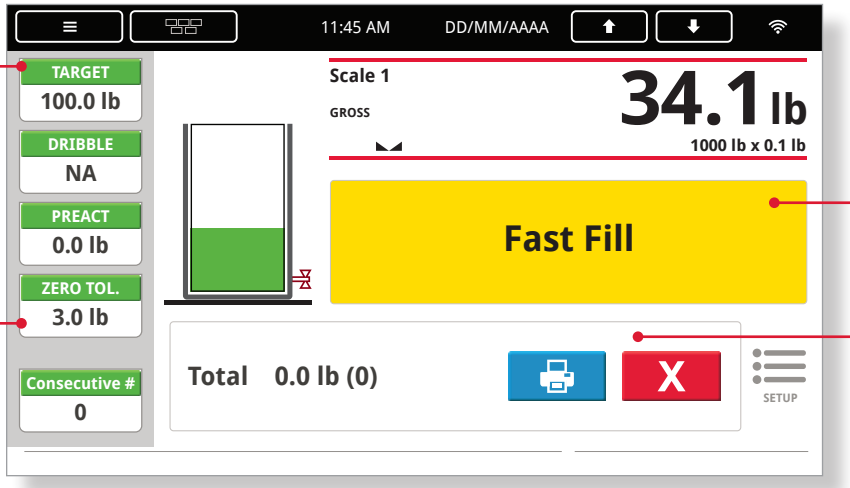
In these examples, the "Presets" options are gray until the "Presets" button is tapped. This opens an input screen to edit the presets.





Lighten the Cognitive Load

Graphics can help reduce the viewer's cognitive load. Content should leave very little for the viewer to reason through. Graphic elements have relationships to one another, shown by similarities, color, boldness and proximity to each other. Because of these relationships, the user will make assumptions about the interface. Good UI design controls the relationships of graphics.



The yellow background color alerts the user to important information.

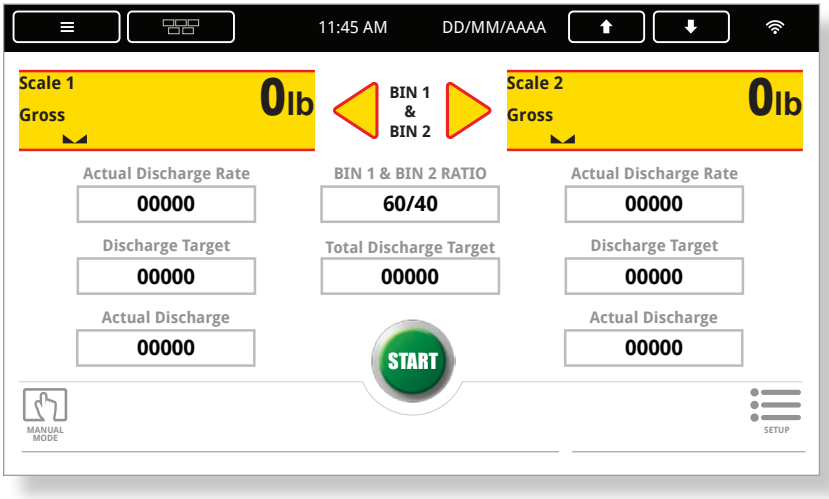
The "print" and "delete" buttons are in the Total box, so the user understands these buttons affect the entire report.

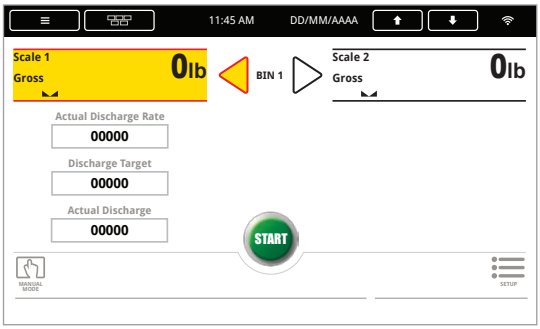
Because these buttons are grouped together and use the same color and style, the user intuitively expects these actions to be similar.

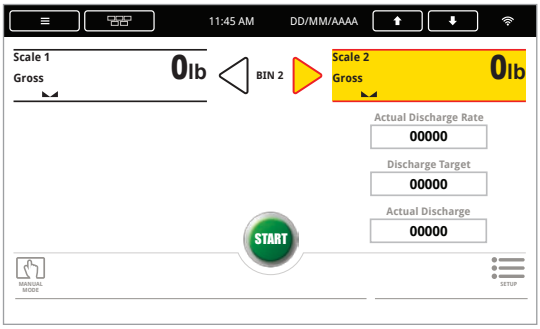
Consistency Counts

Buttons that prompt similar actions should look alike. Input prompts should also be placed in the same location on every screen. Graphic elements that behave the same way should look the same. Elements with different functions should also look different. These are ways consistency helps users understand what is needed from them.

This example shows how consistency adds clarity. Whether Bin 1, Bin 2, or Bin 1 and Bin 2 are being filled, the "START" button and secondary buttons are in the same place on every screen.

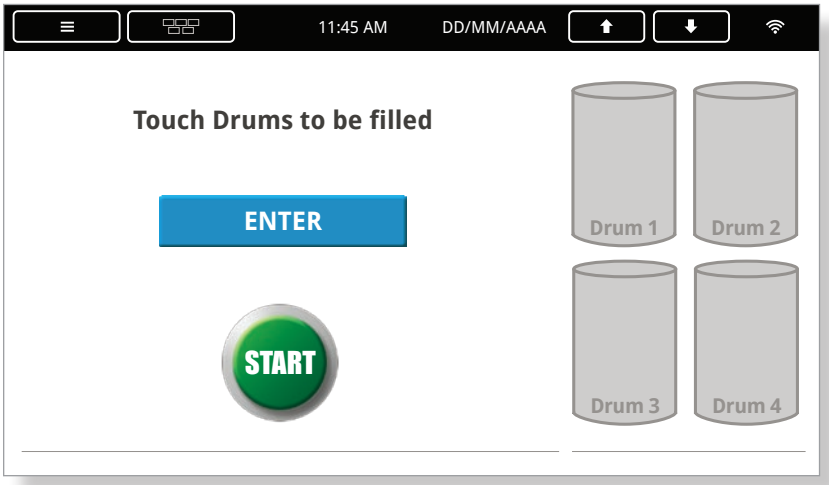


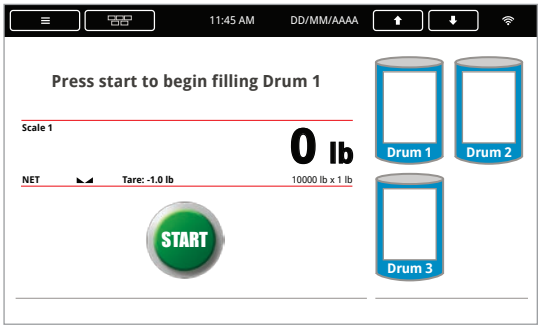


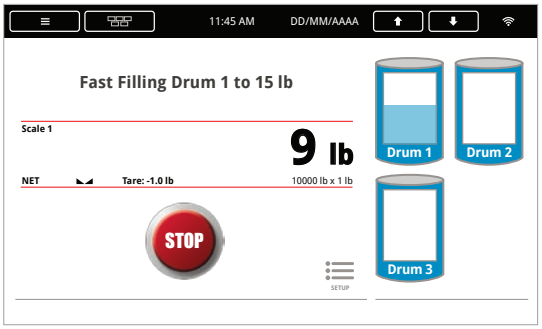


Display Graphics Selectively

Display only necessary graphics for the required actions on each screen. If users must select between actions or make a choice, give them enough information to choose, but save any extra information for the next screen. Remember to keep secondary actions on separate screens when possible.





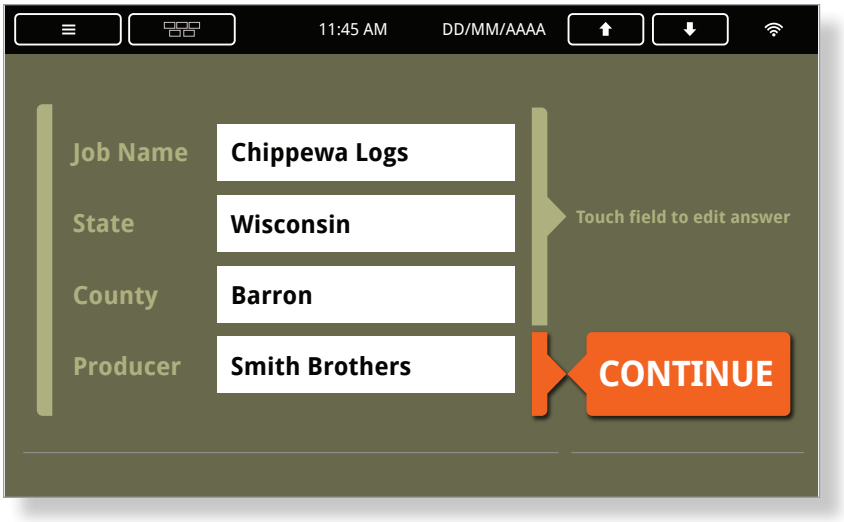


The above screen shows selection options for filling drums. Nothing is being weighed or filled on this screen. The screens to the right show the selected drums in the same places, but also include a "START/STOP" button and weighment information.

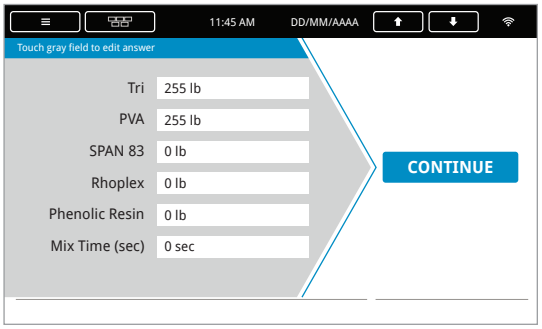
Natural Next Steps

When possible, follow screen actions with natural next steps for the user. Help the user anticipate the next screen or prompt by leading them with words, phrases or graphics.

Lead the user through the screen naturally by using color, arrows or words to indicate the next action.

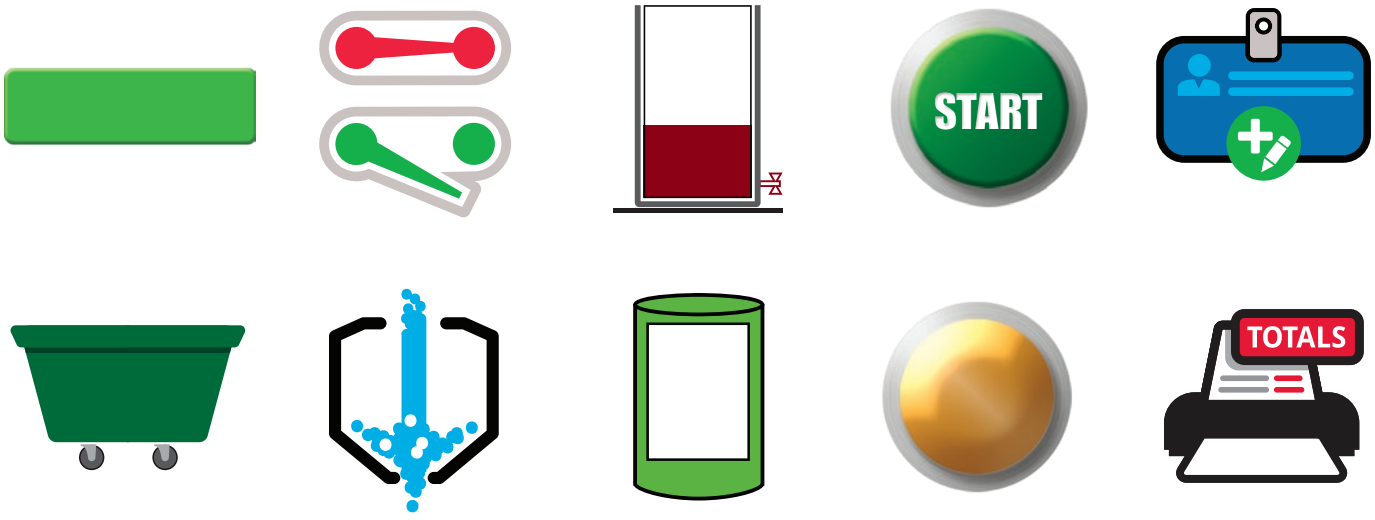


In the screen below, the gray background graphic forms an arrow and leads the user to select "CONTINUE" after filling in the information.



Appearance and Behavior

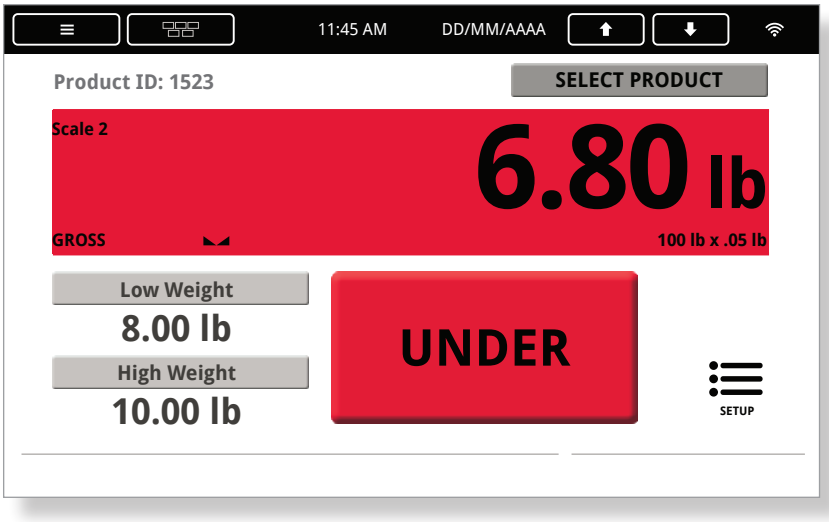
Graphical elements should behave in a way that is familiar to users. A filling widget should look like it is filling up and a dispensing widget should look as though it will empty completely. A button should look like you can press it, and when you do, it should behave the way a button is expected to.

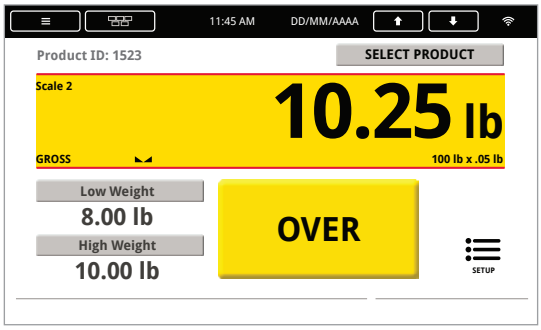


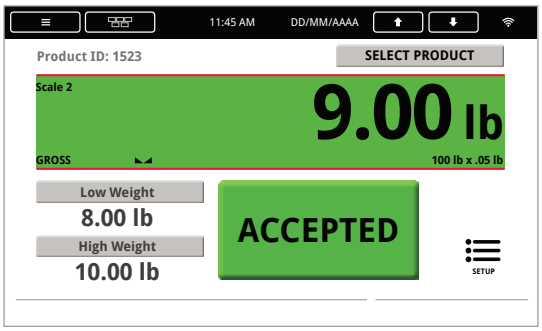
Color and Shape Rules

Colors and shapes often have pre-assigned meaning. Green and red colored shapes typically mean "go" and "stop." An arrow indicates direction or a progression to next steps. Designers need to consider hidden expectations of colors, shapes and lines to avoid confusing the user.

These are examples of "natural" or expected color assignments for different actions.



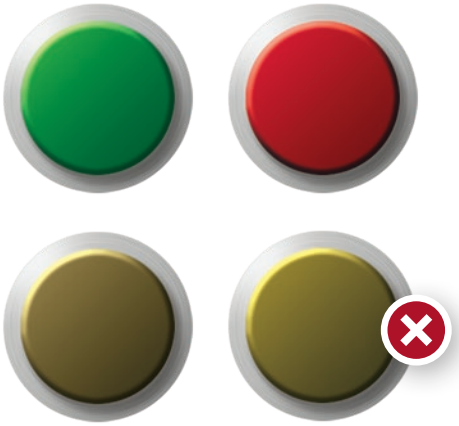




Color Caution

Sometimes designers have to reduce their dependency on color because of visibility issues. Human color blindness or environmental conditions affecting brightness and reflectivity can impact UI design. Additionally, if a screen will be viewed for long periods of time, use light or muted background colors and reserve bright colors for enhancement.

The above screen is an example of the types of colors best for dark environments or bright sunlight.



This example shows how someone who is red/green color blind might see these colors. Instead of relying only on colors, use additional indicators, like words, for action buttons.

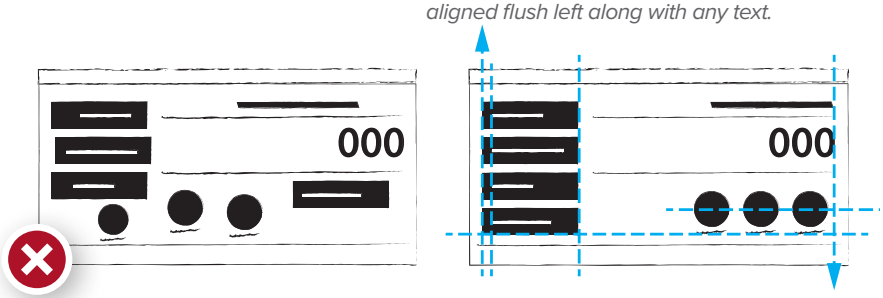
Graphic Design Principles

Graphic design does more than make information look good. Six graphic design principles provide a basic guide to help designers convey messages visually.

Alignment

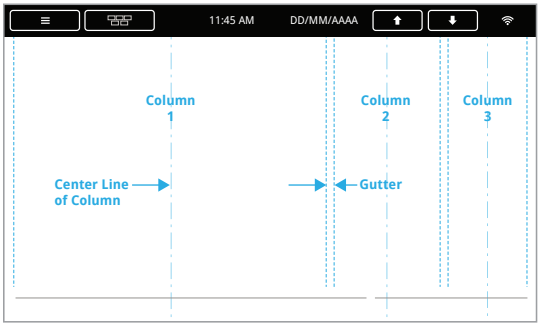
Alignment is critical for organizing designs. Graphic elements can be aligned along either invisible or visible borders to create an aesthetically pleasing design. Alignment can also organize text or graphics in sets, suggesting connections to similarly aligned content. Examples of alignment include flush-left, center, flush-right or bottom-edge alignment.

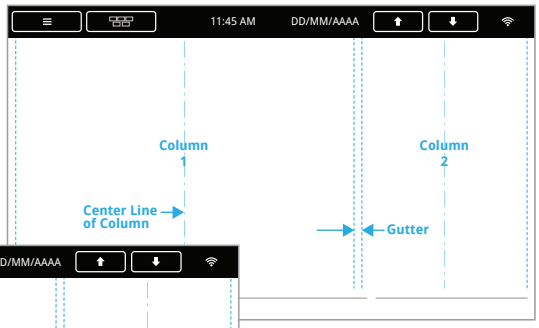
Buttons with similar functions are the same size, aligned flush left along with any text.

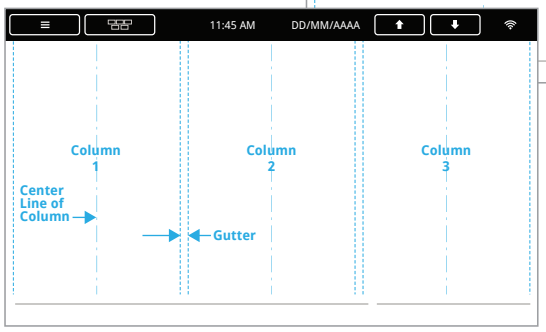


These round buttons are aligned on their center axis as well as flush right.

Grids are a useful way to organize information and graphics on a screen. Grids also make alignment, space and proximity easier to consider and use effectively.

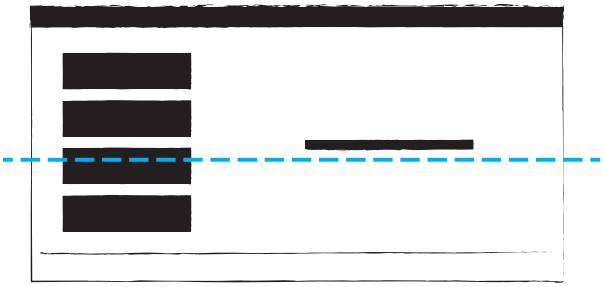


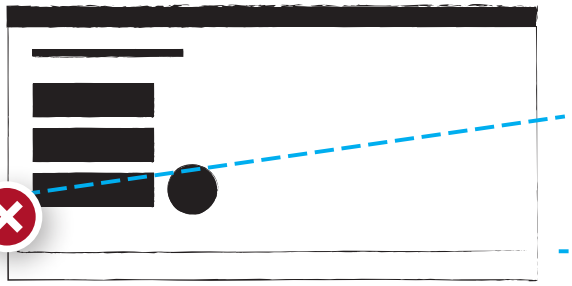




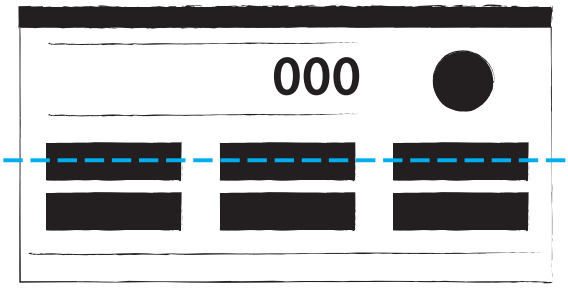
Balance

In design, balance refers to symmetry and visual equilibrium. Even screens with overly dominating focal points can feel balanced, depending on the placement of the focal point and other elements. Overall, the visual weight of the screen should seem balanced.





This is an unbalanced screen.

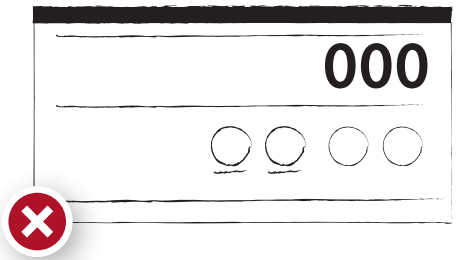


These are balanced screens. The objects are placed evenly and effectively use white space.

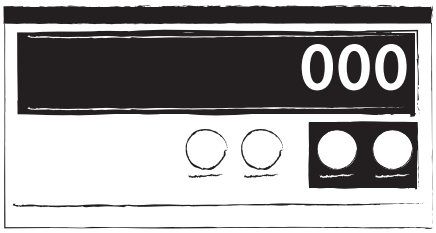
Contrast

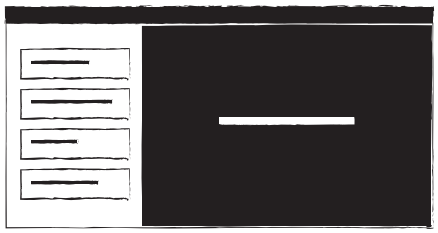
Designers use contrast as a tool to emphasize elements that need attention or to highlight elements that would otherwise blend in. Contrast intentionally groups together objects with few or no similarities. Purposefully opposite elements force viewers to compare information.

This screen does not use contrast.



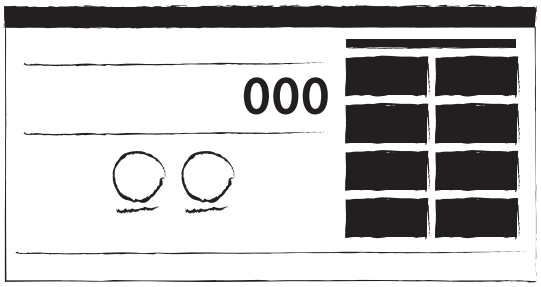
The contrast on these screens helps focus attention, establish groups and isolate information.





Proximity

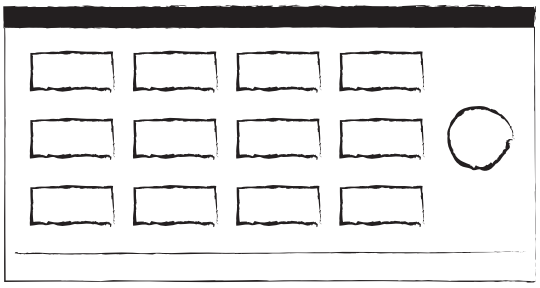
Proximity in design visually connects elements, not necessarily by close placement, but by a close, or proximate, relationship in the design space. Users are able to interpret meaning from proximity between elements. A scattered design can be used purposefully to show a weaker connection between elements.



These buttons have a similar color and placing them close together means they are visually linked.

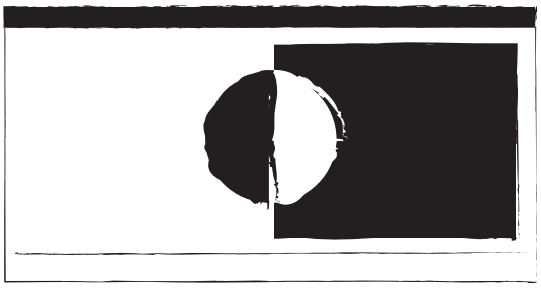
Repetition

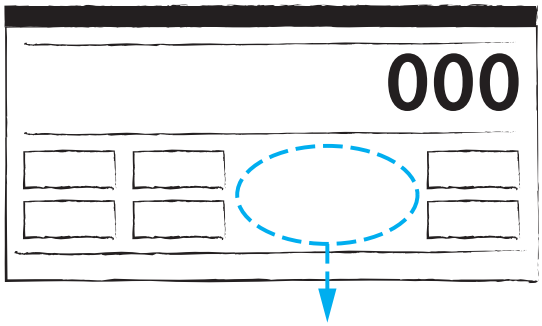
Repetition is important and provides association and consistency in design. Repetitive elements can help orient a user with a complicated, multi-screen UI and many process steps. Repetition also helps users predict how to input data and interact with an interface with knowledge gained from repeated exposure.



Space

Both positive and negative spaces are highly regarded tools in design. Space is inside a shape, outside a shape and between shapes. Positive space is almost always used as a focal area for the UI. Negative space is a space on the screen with no elements.





This important negative space makes these buttons two different groups.

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