

**Let's talk about
what's possible.™**

Technology Design Standards

06/07/2023

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INTRODUCTION

Displays in Best Buy should help provide a Best in Class experience for customers to learn and interact with new technology. To best achieve this goal, the Technology Design Lab should be included as early as possible in the process. We can provide insight and guidance to help ensure a well-functioning and effective display is deployed into stores. By including the Technology Design Lab into the process early on will help avoid costly delays, part swap outs, and development time.

This document provides in-depth information on display functionality standards. While this document is created to provide rules and standards to create vendor displays, it is difficult to include every possibility as technology changes. Please reach out to your Project Manager or the Technology Design Lab if you have any questions on process or standards.

This document is an updated version of the Technology Design Standards as of January 2020. Standards

are subject to change at any time and are reviewed in six month cycles.

Technology Design Lab

We are experts in: Vendor Display Experiences, commercial technology (switching, video & audio distributions, etc.), electronic display security, and display experiences.

This experience includes testing new technology when it becomes available. Including: new products as they are released, new categories of products, high end audio and video, electronic sign labels, video monitors, electronic security, etc.

Displays

Every new display and updates to an existing display must be reviewed and approved by Best Buy. This is to ensure adherence to quality, standards and guidelines across all categories. Better designed and supported displays lead to a positive customer interaction with your brand and product when a customer chooses to interact with your display in a Best Buy store.

Design

Include the Technology Design Team early in your design process. We will assist to ensure compliance with standards and offer suggestions to improve designs for electronics, ease of maintaining (parts, content, experience), and the overall customer experience. This offers benefits in designing with the right parts, reducing delays, repeating work, and expedited shipping charges. Display reviews will go much smoother when details have already been brought in front of the right people. Displays need to be designed with an uptime of 95%, measured in 6 week increments, while running 24/7.

Testing & Approvals

When planning for testing, send a full set of electronics to the Technology Design Lab 11 weeks prior to deployment. During the testing period you may need to send new hardware, provide files, and instructions to update test hardware. Production samples are to be provided as soon as they are available. When possible these should arrive at least 6 weeks before deployment to stores. This provides a week of testing with the final hardware and software before deployment.

Test Display

Some displays will need to be setup, kept active, and functional during the life of the display. This will include sending content and system updates for testing and approvals.

Large or Complex Displays

If you are building a table or other large display, these standards must be adhered to for that larger display, there are also some other circumstances that will come up. These need to

be handled on an individual bases.

Contacts

For questions reach out to your Project Manager or the following email accounts:

Display Functionality & Electronics:

C7TechnologyTeam@BestBuy.com

Troubleshooting & Instructions:

TDT@BestBuy.com

The Best Buy Technology Design Lab reserves the right to request changes to a demo, display or feature that falls within standards, but has been determined to not be approved.

NETWORKING & CONNECTIVITY

Best Buy has a wired and wireless network in all stores that is dedicated to demo devices that require an Internet connection.

Items to consider:

1. Wired connections are preferred over wireless.
2. Best Buy cannot guarantee bandwidth availability or class of service.
3. Due to bandwidth usage (especially during peak hours), demo should be self contained and not require an Internet connection when possible.
4. The same SSID in stores is for both 2.4GHz & 5.0GHz connectivity.

Best Buy reserves the right to disable or decommission any device(s) not in compliance with Best Buy's security and connectivity standards, or that are found to negatively impact our in-store production or demonstration networks.

Devices cannot store or pass confidential, sensitive, personal or identifying information about Best Buy or its customers.

Wired Network Connections

Wired connections are more reliable as they don't have to deal with wireless interference. They do require more planning to get a wired network drop to the location that will have your fixture. Work with your Project Manager for details on cost and availability of a wired connection.

This wired connection cannot be connected to vendor provided switches, routers or hubs. If multiple connections are required, work with your Project Manager to determine feasibility of running multiple network drops or availability and cost of a Best Buy enterprise managed switch.

You will need to utilize this Internet connection on demo devices, media players and other electronics. There are many devices on this network and any traffic from a device that has been determined to have a negative impact on the network will be disconnected or will not be allowed to be connected in the first place.

Wireless Network Connections

Some demo devices such as phones, tablets and laptops may not have a wired network option.

MAC Address Must Be Registered

The Wi-Fi network utilizes a MAC address whitelist. The unique MAC address of any device connection must be entered into our system. If it is not entered into the system, the device will connect but not have access to the network.

A store employee can add a single device at the time of installation. This requires access to the wireless MAC address of the device.

Large numbers of already known MAC addresses can be provided 3 weeks prior to deployment and can be whitelisted. Contact the Technology Design Team for the excel file that the Vendor must update and submit. This will save time for the Vendor and Best Buy during install of the device. It also allows us to remove all the devices MAC addresses from the whitelist when the display is removed from the stores.

Connect Wi-Fi to 2.4 GHz

If your device only allows connection to 5GHz band Wi-Fi, you will have better results connected to the 5GHz band than the 2.4GHz band. In our stores 5GHz is more stable, there are less devices on this band, and it's cleaner.

Embedded Cellular Internet

A device is allowed to use 4G broadband service if:

- Embedded and does NOT use an external router or switch.
- No user accessible web browser.
- Does not download content updates.

This is often used to provide health status of a display in a small number of stores.

Bluetooth Connectivity

Bluetooth should be disabled by default on all devices on display. This should be automatically done when the device is placed into demo mode or retail mode.

Can be submitted for Approval:

- Stylus (computer or tablet)
- Headphone display with button activation and a 3 minute timeout where Bluetooth is disabled.

Not Approved:

- Portable Speakers
- Speakers (Home Theater, Boom

Boxes, Party speakers, etc.)

- Bluetooth devices that broadcast without approval

Approved, Passive Bluetooth
(Not actively broadcasting):

- Laptops, Tablets, Mobile Phones

Content & Updates

Any updates must go through the Technology Design Lab before they can be downloaded to any devices in our stores. This may include testing updates to determine the impact on our network.

Updates

Any updates must be controlled to limit the impact on the stores Internet and network quality.

- Download must occur for the stores time zone from 10pm to 6am.
- Download speed is throttled to prevent saturating the connection.
- Can be controlled based on critical or optional downloads.
- Able to turn updates on/

off at a device or server side.

Large 300MB+ Updates

Updates that exceed 300MB must be distributed through Best Buys internal network. Contact the Technology Design Lab for details.

Best Buy has the ability to push large updates to store servers for employees to download onto a USB drive and manually update devices.

Content Management Systems

The CMS used, must be approved by Best Buy. See Video Section for more information and details.

Streaming Services

Best Buy does not allow content streaming services like Netflix, Hulu, Spotify, etc. on demonstrations.

A demo mode must include a locally stored copy of the content that would be played instead of streaming it.

Heartbeat Analytics or Health Status

Connecting to update online status, ana-

lytics and logs can be done with approval from the Technology Design Lab.

- Data captured in Best Buy stores must be shared with Best Buy.

This does not include updating content.

Other Wireless Technologies

Any devices that use any other wireless spectrum must be tested by the Technology Design Lab.

Creating a Wireless Network

Devices are not allowed to create an Ad-Hoc network. This feature should be automatically disabled on the device when it is placed into demo or retail mode.

Routers that would create an SSID and wireless network are also not allowed in displays. Examples include TV's and Printers.

Special Circumstances

Vendor may want a specialized demo:

- Innovative and Wi-Fi only demo product
- Game demo trial day
- Demonstration weekend

These demos all need to be tested on a case by case basis to determine the true network impact and viability of it functioning in our stores.

SECURITY

InVue or MTI are the two security vendors approved for use in Best Buy stores. All security needs to be submitted to the Technology Design Lab for approval.

Submit for Approval

Start with a list of what is being done and new security must be submitted with sample of the hardware being secured and security used.

1. Security Parts List
2. Product being secured
3. Fixture Drawings

POWER

In most cases, the AC power Best Buy uses is a 20 amp circuit. Most vendor displays will plug into a quad box underneath the gondola's bottom rack. Other options exist for universal shelves and larger custom built fixtures.

All powered devices including lighting will need detailed power draw and device quantities. The total AMPs must not exceed 16 AMPs total (12 AMPs for a 15 AMP power strip).

All EMS will be on blue outlets or white outlets labeled controlled for future installations.



Cables that are outside the fixture need to be durable and able to withstand box stock bumping the cable and being tugged.

No exposed terminal blocks or exposed

wires. All power elements must be encased.

Power Strips and Plugs

Power strips need to be commercial grade, UL listed, full metal, 12-15' power cord, reset switch and a covered guard over rocker switch.

The end of the power cord should end in a straight grounded 3 prong plug, no 90 degree angled plug. These are plugged into a quad box typically and an angled plug may block one of the other power outlets.

Approved Power Strips

While this is not a complete list it is a good example of power strips that are approved.

Tripp Lite: UL24CB-15

Waber-by-Tripp Lite 6-Outlet Industrial Power Strip, 15-ft. Cord, Locking Switch Cover

MODEL NUMBER: UL24CB-15



Highlights

- 6 outlets
- 15 ft. cord
- 12.5" length
- All metal housing
- Lighted master switch

Package Includes

- UL24CB-15 Power Strip
- Warranty information
- Instruction manual

Extension Cords & Splitters

No extension cords, whips, Y-Splitters or other extra power cables. No daisy chaining of power strips.

Location

The power strip may need to go through a base-deck hole or be routed through a fixture. If using low voltage with an external wall-wart power supply, a barrel connection and good quality cable is required since the wall-wart will not fit through the hole in the base-deck.

EMS Circuit

EMS circuit is used for Lighting, Monitor/TV and other devices that can be turned off at night. DO NOT use on media players and other devices that should not be hard powered off.

LIGHTING

Lighting elements in a display include:

- Logo
- Fabric Graphic
- Acrylic riser under a demo product
- Lighting as part of a product

Best Buy design has additional details on requirements for where and how lighting (i.e., shelf, and product) can be utilized in a display.

Submitting Lighting for Review and Approval

The lighting electronics will need to be sent to Best Buy testing before final approval will be provided.

A Video of the full experience may be submitted to get confirmation that the lighting is following requirements and no changes appear to be needed.

Note: This is not for final approval.

Lighting that does not pass in-person testing at Best Buy will need to make the requested changes.

- Video of Attract Loop Portion (What it does when nobody is interacting with it.)
- Video of Interactions possible. Each interaction should be shown in its entirety with clear documentation on which interaction it is, along with what we should expect. (i.e., three music tracks and a fourth button to show the music syncing with lights feature.)

Lighting Elements

Color Temperature

The Kelvin measurement of a light determines the color. The higher the Kelvin rating (expressed in K) will result in a whiter light, while a lower rating will result in a more orange color. Best Buy requires lighting used in fixtures to

have a color temperature of 5,500K.

Testing LUX Ratings of Lighting

LUX ratings measure the total amount of visible light that the meter can detect.

Using a Digital Lux Meter hold the sensor flat against the lighted logo. Move around and find the highest reading as the results will vary depending on where on the logo it is held. The results will need to be under 5,000 LUX.

A DrMeter LX1330B, digital illuminance meter can be purchased for less than \$60.



LIGHTING

Flashing, Blinking and Changing Lights

No flashing, blinking, color, or brightness changes typically with the goal of Grabbing Attention.

Lighting Types

Illuminated Buttons

Buttons shall be solid white when waiting. Only buttons that can trigger the demo should be illuminated. (i.e., Buttons under demo product, Play/Pause button are illuminated, but Volume Up, Volume Down and Next Track buttons are off until demo is initiated by a customer.)

Once a demo has been started blinking of the light on the button used to trigger a demo device helps remind which device is the focus.

Shelf Lighting

Shelf lighting is typically not allowed.

Interactive Lighting

Options for interactive lighting need to be reviewed prior to prototyping.

Header Lighting and Logos

Inline Fixture Displays, End-cap Fixture Displays.

- 0' to 5'
- 2000 - 5000 LUX

Totems

- 5' to 10'
- 3000 - 6000 LUX

Perimeter Headers

- Over 10'
- 4000 - 7000 LUX

Fabric Backers and Lightboxes

- 2000 - 5000 LUX

Acrylic Risers and Shelving

Acrylic used with lighting needs to have the edges diffused to keep them from being too bright. This will distract from the fixture and experience.

Product has Lighting

Speakers with Lighting

Speakers with color changing lights can start as a steady unchanging color or slowly roll through colors. This should be approximately one color that is displayed for 5 seconds and changes to the next color or pattern over 2 seconds.

No flashing, blinking, or other color or brightness changes with the goal of Grabbing Attention.

Demo Customer Interactions

Once a customer has started a demo it can respond to music and have chang-

LIGHTING

ing colors. It must not flash or strobe as there are concerns with those sensitive to lights and triggering a seizure.

Light Bulbs on Display

If a demo includes controlling a light bulb through an app or panel it must follow network requirements.

- A self-contained demo that doesn't require a router or switch is preferred.
- Light bulbs on display must have an acrylic cover to prevent customers twisting, pulling, and breaking a light. The acrylic cover must provide adequate vents for airflow to prevent overheating.
- Light bulb components cannot be above 80 degrees Fahrenheit in temperature.
- Lights must not start at full brightness. Usually 35% - 50% of the bulb's maximum brightness for a 60 Watt bulb will

provide the proper starting brightness.

- Actual brightness level required will be provided after testing and prototype reviews.

AUDIO

Audio can be part of a display and may be handled differently depending on where it is located in our stores and what is being demonstrated. Headphones, computers, portable speakers, home theater equipment and Magnolia Home Theater can have additional requirements or exceptions.

Contact the Technology Design Team if you have questions on a specific audio experience updates and plans.

Default Demo State and Interacting

Audio is not allowed to play until a customer interacts with the display. This can be a press of a button or touch screen. It cannot be started with motion or proximity sensors of any kind. Pressing the button again should stop audio or after 90 seconds of no customer interaction the demo is required to timeout and stop the audio.

Measuring Volume Levels

Audio volumes will be validated by sending a full set of demonstration hard-

ware to the Technology Design lab.

Audio on the display may need to be adjusted once the Technology Design Lab reviews the volumes. These changes will need to be implemented and verified on hardware before it can be put into Best Buy stores.

Speakers

Default speaker volume must play at <70 dB(C) at 3 feet. Volume level can be adjusted by the customer interacting with buttons on the display. Audio level must reset back to the default volume after the demo resets.

Audio volume can be measured using the NIOSH SLM app on an iPhone. There are also dedicated sound meters that can be calibrated and provide accurate sound level measurements.

Headphones

Headphone volume should default to a volume of <55 dB(C) and a maximum of 92 dB(C). Audio level must reset back to

the default volume after the demo resets.

Audio Button Interactions

Speakers

- Always Powered On (if applicable)
- Input select disabled
- All buttons disabled, except volume
- No Bluetooth or Ad-Hoc Network (See Networking section)

Headsets

- All buttons and touch controls disabled.
 - Talk to the Technology Design Team with any special features you may want to showcase.
- No Bluetooth or Ad-Hoc Network (See Networking section).

Volume Interactions

On a demo with multiple speakers of similar products, the volume level should re-

main consistent across the speakers. This allows a customer to turn it up and hear the difference between the speaker models.

If the demo has multiple speakers of different usages (clock, portable audio, loud bass) the volume should reset to 70db when a new speaker is chosen.

Headphone Specifics

Headphones have a few specifications that help ensure a good demo and the ability to maintain a good experience.

Cables

Headphones cable should be 6' in length. If utilizing USB power it must be 6' from where the cable combines or splits apart (if utilizing power for noise canceling/lighting and 3.5mm audio jack) to the headphone.



If there is a volume/mute feature on the

cable it must be covered to prevent the volume from changing or a cable provided that does not have this feature. If covered, volume control needs to be in the highest volume position. If possible replace this cable with one that does not have the volume control.

Security

Headphones must be securely fastened to the cables to help reduce theft and being returned to the wrong position on the display.

Any removable microphones should be fixed in place and not removable.

VIDEO

Videos often are used to attract attention to a display and provide educational information to help inform a customer of the benefits and features a product offers.

Attract Loop

The video attract loop that runs constantly on the monitor is required to have no audio. If the display is built with customer interaction, after 90 seconds of no customer interaction the demo is required to timeout and return to the attract loop.

Customer Interaction

Once a customer interacts with the display using an approved button or touchscreen a video with sound can play up to 90 seconds after the last interaction before timeout and returning to the silent attract loop video. While 90 seconds is the maximum time it is rare for anyone to watch a video for that long. If you have multiple messages to share, having a button for each topic and displaying a 30 second video would

help ensure that your content is seen.

An example could be multiple buttons or a touchscreen display with an interface that will display videos about the different topics.

Hardware

Any monitor, media player or monitor with built in media player must be approved by the Technology Design Team.

Unless the TV is what is being demoed, a commercial rated display must be used.

Videos being played should be with a dedicated media player. No PC's, Non-Commercial Android players, iOS or Raspberry Pi/Orange Pi type devices. It is the desire to have a media player with a proven history of stability and ease of updating and content repair.

Commercial Displays

Display must be rated for operating 24/7 and be able to handle EMS powering off the display nightly and

powering on in the morning.

Small Screens

Tablets are not approved.

Use a small commercial display with a media player built in. (BrightSign for complex, Bluefin V Series for a video attract loop only.)

Batteries are not permitted in the screen.

Large Screens

Use Commercial displays.

Use a BrightSign media player. No PC's, Non-Commercial Android players, iOS or Raspberry Pi/Orange Pi type devices.

Touch Screen Interfaces

Tablets are not approved (iOS or Android).

Batteries are not permitted.

Commercial display with media player or built in.

Raspberry Pi, Orange Pi, Android/iOS & PC

Any display that is determined to require a Raspberry Pi, Orange Pi, Android/iOS and/or PC, requires extensive testing prior to approval. These would be an exception in instances they are allowed. This should be a last resort for the display over using a media player whenever possible.

Software

Reflect, Zynchro and BrightSign Network are the approved Content Management Systems. All other systems must be tested and approved by the Technology Design Lab.

Reflect is managed through Best Buy. Contact your Project Manager for information on pricing and timing.

Video Specs

Video content will match the resolution of the screen you are displaying on for best quality.

BrightSign Video Formats

Format	Codec	Container	Video Bit Rate	Audio
4K	H.265	HEVC	30-40 Mbps	AAC up to 288 Kbps
1080P	H.264	.mp4	25 Mbps	AAC up to 288 Kbps

VOICE ASSISTANT PRODUCTS

Voice assistant products include any device that responds to customer voice inquiries. As these interactions require an active Internet connection and have the possibility of playing unlicensed audio in our stores these must have a curated demo experience.

- All settings are locked to prevent customization.
 - Can be unlocked with admin access in app to make approved changes.
- Limited bandwidth mode.
 - This could include updating weather a couple times a day and storing it for use during a

customer demo interaction.

- Out of the box units during set-up automatically recognize it is in a Best Buy store and will only allow setup as an approved demo.
 - There can be a password driven override for Geek Squad setups and troubleshooting of customer units.
- Allows only approved interactions (skills, utterances, phrases, commands).
- Voice assistant will inform customers it is in a demo mode when customer asks for an unapproved skill.
- Streaming and offline audio playback

must time out per audio guidelines.

- All audio content that plays on the device must be licensed by the Vendor.
- All audio content, including streaming, must be able to be filtered.
- Person engaging the demo cannot build custom lists or ask for custom messages to be read back to them.
- Cannot dictate a shopping list or engage in a Simon Says interaction.

DISPLAY & FIXTURE

Serviceability Best Practices

Ease of Access to Electronics

The electronics inside the display must be accessible from the front and require no tools to access.

There are a number of ways to design a fixture to have tool-free access to the electronics from the front. Using pull open panels, drop down panels, lift up and open fixture tops and wing nuts. Vendors should consider when designing a display how many people it will require to access the electronics. Best practice is for one person to be able to access the electronics without difficulty.



Accessibility for Content Updates

SD card or USB ports that are needed for content updates must be easily accessible. Extension cords from the SD card or USB ports to an accessible area or a small door that opens to the port.



Electronic Component Updates

The display as a whole does not need to be certified, but all of the components utilized in the display must be certified by the UL or ETL.

Electronics, Cables and Mounting

Electronics and cables mounted in the display should be done with proper standoffs,

cable tie mounts, cable ties and enough clearance with easy access. Cables, connectors and electronics must be properly labeled and cleanly managed in the fixture. Any holes in the fixture with cables passing through it must be protected by a grommet.

Cable Ties Flush Cut

If using cable ties, also known as nylon zip ties, use flush cut wire cutters to keep the edges from becoming razor sharp.

Cable Breaks

Cables that have any breaks and connectors should not come loose easily and a connector should not run through a cavity in the fixture that is difficult to access. If a cable has the possibility of becoming disconnected, it must be easy to access and reconnect.

Ventilation

Electronics in displays will create heat and require proper ventilation to keep them under 90 degree Fahrenheit or 32 degree Celsius.

Heat rises and vents should be on the top with air intakes near the bottom of the display.

SUPPORT & MAINTENANCE

Best Buy reminds all display manufacturers & vendors it is their responsibility to support functionality for the life of the display. A non-functional display is a customer disappointment.

Best Buy reserves the right to remove displays that are not being properly maintained.

Maintainability of the whole display includes, **electronics, demo content, graphics,** and **products.** When the display

is being designed this should be kept top of mind always. A display in our stores will need maintenance as things break down, are damaged or disappear. **Instructions, part lists, troubleshooting guides, wiring diagrams** and **files** for content and demos will need to be provided in full to Best Buy.

DOCUMENTATION

Support Documentation

Best Buy will create support documentation for vendor provided displays in a store employee accessible system. To create these guides, the Technology Documentation Team (TDT) will need:

1. Wire diagrams
2. Instructions (InDesign or Illustrator packaged files preferred.)
3. Troubleshooting information
4. Support contact information

Send requested documents to TDT@BestBuy.com with the project title in the subject line.

Exit Strategy/End of Life

The disposal and recycling of all vendor displays exiting the store will be the responsibility of the vendor.

Your MPM can help with labor estimates, recycling requirements and assist if you would like your displays returned to you.