Installation best practices

for SMART Board displays

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Chapter 1 **Welcome**

This document provides guidance for installing the following SMART products:

- SMART Board displays
- SMART accessories

It describes best practices and the standard tasks and equipment needed for a successful equipment installation.

> **Note**
>
> This document provides general guidelines for installing SMART Board displays and SMART accessories. See the support site page for your specific SMART product for installation instructions for that product.

This document also provides guidance for those who wish to deviate from a standard installation by including third-party equipment. SMART describes an installation that deviates from a standard equipment installation as a "non-standard installation."

Because SMART has no control over products manufactured by a third party, SMART can not make recommendations regarding the use of specific third-party equipment with SMART products.

Contact your installer, reseller or equipment manufacturer for support with equipment you use as part of a non-standard installation. SMART can not provide support beyond that which is presented in this document.

> **Important**
>
> - Modifications to any SMART products, accessories, components or included cables voids the products' warranty.
> - The use of any third-party product in combination with a SMART product is at your own risk.
> - SMART strongly recommends that you test third-party components or adapters before installation. Consult your certified reseller for assistance.

Chapter 2 **Installing a display**

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Moving a display to an installation site

After your organization receives a SMART Board interactive display, you need to move it to the place where you plan to install it.

On occasion, you might also need to move the display to another location after installing it initially.

Important

- Move the display at your own risk. SMART cannot accept liability for damages or injury that occur during the display's transportation.
- When moving the display:
  - Follow local safety regulations and standards.
  - Pack the display in its original packaging, including the pallet. Ensure the display's packaging is securely attached to the pallet.
  - Move the display so that its top frame faces up.
  - Do not place an unpacked display on its side as this might damage the display and void its warranty.
  - Have at least two people move the display.

Tip

Display packaging might be labeled to indicate which side is the front. Look for "FRONT" on the packaging to help orient the box during transportation.

Using transportation aides

You can use the following aides to move the display:

- Cart
- Furniture dolly
- Mechanical lift

Accommodating doorways, hallways, and elevators

In some situations, you might need to remove the display from its packaging to move it through narrow doorways or hallways or onto an elevator. In these situations, keep the foam pieces on the bottom corners of the display. These foam pieces protect the display if you need to set it down during transportation.

You might also need to rotate the display so that its top frame faces to the side. You can do this during transportation, but when you install the display, it must be in landscape orientation (with the top frame facing up). Do not place an unpacked display on its side.

Dealing with cracked, chipped, or shattered glass

The display contains safety-tempered glass. Although this glass is heat-strengthened to help withstand impacts, the glass can chip, or shatter if struck with enough force. (Safety glass is designed to break into small pieces rather than sharp shards if it is broken.) Temperature changes can also cause the glass to shatter if there's an existing crack or chip in the glass.

See › Shattered glass on an interactive display

If the display's glass is cracked or chipped, have it professionally inspected and repaired at a SMART authorized repair center. If the display's glass shatters, carefully clean up the area and have the display repaired or replaced.

> **Warning**
>
> For safety and to prevent further damage, do not continue to install or use the display if its glass is cracked, chipped or shattered.

Acclimating to new temperatures

If the display has been moved from a cold environment to a warmer one (for example, from storage to the installation site), let the display sit for a few hours to allow it to acclimate to the new temperature before connecting power to the display.

Saving the original packaging

Save the original packaging, including the display's pallet, and repack the display with as much of it as possible if you ever need to move the display after installation. This packaging was designed to provide the best possible protection against shock and vibration.

> **Note**
>
> If the original packaging isn't available, you can purchase the same packaging directly from your authorized SMART reseller (smarttech.com/where).

> **Caution**
>
> Move the display only in the original packaging or replacement packaging purchased from your authorized SMART reseller. Moving the display without correct packaging can lead to product damage and voids the warranty.

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Installing a display on a wall

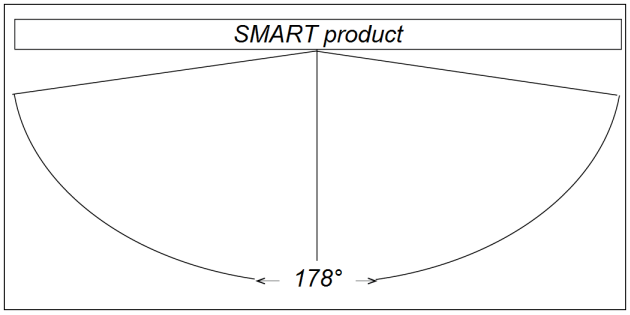
SMART Board interactive displays are typically installed on a wall in a classroom or meeting space.

Choosing a location

A display is typically installed at the room's focal point, such as at the front of a classroom or meeting space.

Selecting an appropriate location is crucial for ensuring the best possible experience with the display. Consider the following factors as you choose a location:

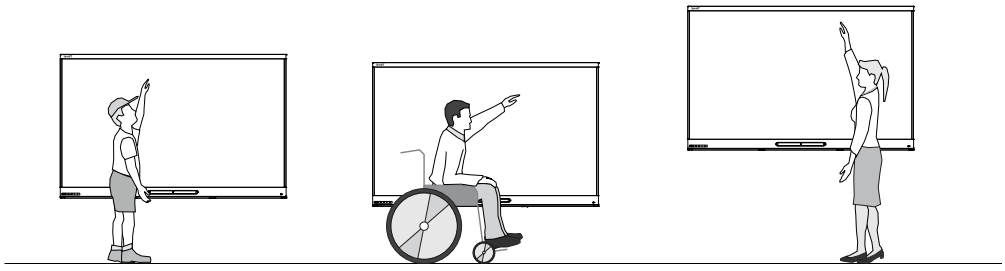
Factor	Considerations
Room setup	• The location allows users, including those in wheelchairs, access to the display. Refer to local regulations regarding accessibility. • The location allows for multiple users to access the display at the same time. • The location accommodates room traffic patterns, and there are no tripping hazards. • The display is not installed where it could be hit by a door or gate. • There are no nearby heating or cooling sources directed at the display, such as a radiator, heat vent, or air conditioner. • There are no nearby shelving units, desks, or other furniture that has doors or drawers that could hit the display. • Furniture, wall decor, and other room features, such as light switches and thermostats, do not block the display and are not blocked by it. (You might be able to move some of these room features to accommodate the display.)

Factor	Considerations
Power and other connections	• The location is close to: ◦ A power outlet ◦ A network outlet (if you plan to use a wired network connection) ◦ A room computer (if you plan to connect a room computer) ◦ External audio systems and other devices that you want to connect to the display **Notes** ◦ If the location is not near a power outlet, consult an electrician for the power setup you need. ◦ Determine if you'll need additional equipment, such as power bars, additional cables, or cable extenders. • The location is not where the mains power supply enters the building.
Visibility	The display's screen is clearly visible to all users in the room. SMART recommends users sit within a 178° viewing area:  **Note** The viewing area depends on the display's resolution and a variety of other factors. See › Recommended viewing distances and viewing angles for SMART Board interactive displays

Factor	Considerations
Lighting	The location is not near sources of bright light or invisible infrared (IR) light, such as windows or strong overhead lighting. Risks of light interference include: ◦ **Reduced visibility:** Light sources can cause glare on the display's screen, reducing its visibility. ◦ **Touch system interference:** Many displays use IR light as a key component of the touch system. Strong IR light that hits the display's screen can cause interference with the touch system and prevent the display from working properly. **Tip** To reduce light interference, install blinds or shades on windows or skylights and install switches to dim or turn off any lights that shine directly on the display's screen. Keep in mind that sunlight can come through windows at different angles at different times of the year.
Acoustics	The room has good acoustics. See › *Room acoustics* on page 23
Environment and ventilation	• The location meets the environmental requirements in the display's specifications. • The display isn't subjected to strong vibrations or dust. • Ventilation systems don't blow air directly on the display. • There is adequate ventilation or air conditioning around the display so that heat can flow away from it and the mounting equipment. SMART recommends at least 2" (5 cm) of space on all sides of the display for proper airflow. • If you plan to install the display in a recessed area, there must be at least 4" (10 cm) between the display and the recessed walls to enable ventilation and cooling.

Choosing a height

Consider the general height of the user community when you choose the height for the display.



SMART recommends that you mount the display so that its top is 6' 5" (1.9 m) from the floor.

> **Notes**
>
> - If participants will be sitting at a steep angle (such as in a lecture hall), you may have to adjust the installation height or angle.
> - When choosing a height for the display, consult the relevant regulatory guidelines when appropriate (e.g. *The Americans with Disabilities Act*).

Assessing the wall

Be sure the wall you're installing the display on can support the weight of the display and mounting equipment. If it can't, consider using a SMART wall stand to transfer some of the weight from the wall to the floor.

See › smarttech.com/accessories

> **Note**
>
> Refer to the display's specifications for its weight.

In some situations, you may need to complete a third-party engineering analysis to determine if the wall can support the display.

Wall flatness

Although a wall might appear to be completely flat, it might have a degree of variation, depending on how it is constructed. Installing the display on a wall with a large variance can lead to issues with the display's touch system, and in extreme cases can damage the display. The area of the wall where you will mount the display should be no more than 3/16" (5 mm) off plumb horizontally and vertically.

To evaluate the wall's flatness

1. Place an object that has a long flat edge of at least 3' (1 m), such as a meter stick or level, across the wall where the display will be mounted.
2. Look along the object to find places where there is a gap between the object's edge and the wall's surface.
3. Measure any gaps to see if they exceed 3/16" (5 mm). If a gap is wider than 3/16" (5 mm), this indicates the wall is not flat enough for mounting a display.

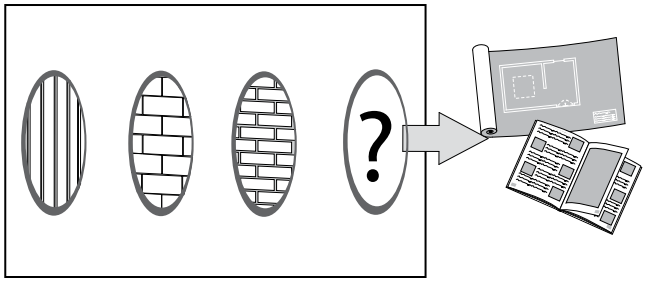
4. Repeat steps 1–3, this time placing the object's flat edge diagonally across the wall in the other direction (if you previously placed the object diagonally from the top-left to the bottom-right, place the object from the top-right to the bottom-left).

   > **Tip**
   >
   > Gaps located at the center of the object indicate a concave wall, while gaps located on both ends of the object indicate a convex wall (consequently, the object may make a "rocking" motion). Walls with a significant degree of concavity or convexity may require the use of shims with the mounting hardware.

Wall type
The type of wall affects how you can mount the display.

See › *Engineering analysis* below

Engineering analysis
The completion of a third-party engineering (structural) analysis may be necessary for determining if a wall can support the display. Get an engineering analysis if:



- You can not find the wall's studs using appropriate tools, such as a stud finder
- You are unsure of the wall's construction and the person in charge of the building can not answer your questions
- The wall is not connected at both the floor and ceiling
- The wall is a modular panel system
- The wall is also bearing the weight of additional hardware or furniture (such as cabinets or bookshelves)
- There are special zoning requirements (for example, earthquakes)
- The wall exceeds typical construction practices (for example, taller than 8' or 2.4 m)

Selecting mounting hardware

The mounting hardware required for installation varies according to the type of wall onto which the display is being mounted.

If you're using the SMART wall mount (WM-SBID-200), see the wall mount's illustrated installation instructions for information about the required mounting hardware (docs.smarttech.com/kb/171373).

This table describes different types of hardware and the types of wall on which it's appropriate for use.

Wall type	Mounting hardware	Details
Drywall over wood studs	Wood and lag screws	Threads on these screws are widely spaced. These screws have wider threads.
Drywall over steel studs	Toggle bolts and butterfly anchors	These bolts/anchors have "wings" that open inside a hollow wall, bracing against the wall to secure the fastener. **Important** SMART does not recommend using metal screws.
Solid concrete, concrete masonry unit or brick	Concrete screws and anchors	These screws typically have alternating high and low threads and can be designed for use with a sleeved insert.

Additional hardware may be required for the installation of the display. This hardware can include:

- Fasteners
- Washers
- Wall anchors

If possible, use the hardware that comes with the wall mount. Consult the installation instructions or the manufacturer of third-party mounting hardware for guidance on the type of hardware to use with the wall type.

> **Note**
>
> Some displays do not include mounting hardware. Consult the display's installation instructions for a complete list of included hardware.

Selecting tools

Tools commonly used in the installation of a display include:

- Drill and drill bits
- Level
- Stud finder
- Screw drivers
- Tape measure
- Pencil

Although displays typically don't include the tools used for installation, the installation instructions list the tools you'll need.

Selecting a wall mount

It is always best to mount the display on a wall. If the wall can't support the display's weight, you can use additional hardware to transfer some of the weight to the floor.

Some SMART displays come with a WM-SBID-200 wall mount, which ships separately or with the display. SMART recommends using this wall mount if supplied with a display.

If a display doesn't come with a wall mount (see the display's illustrated installation instructions), contact your authorized SMART reseller (smarttech.com/where) for information about SMART's mounting options (including height adjustable wall mounts).

If you choose a third-party option rather than one of SMART's mounting options, be sure the wall mount can accommodate the display's dimensions and support the display's weight as well as the weight of any attached accessories.

> **Important**
>
> It is crucial to correctly assess the load (weight) requirements of a system. SMART is not responsible for incorrect load assessments.

Although mounts for consumer-grade, non-interactive displays are often rated based on the display's size, the mounts might not be sufficient for interactive displays of equal dimensions. Interactive displays include additional internal components and may also have accessories (for example, audio systems and cameras) that add to the total size and weight.

Look for wall mounts that meet the following requirements:

Requirement	Details
Support the wall type	Determine the types of fasteners and mounting materials that are needed based on the wall's structure and the total weight (the display and its accessories and additional components). SMART makes the following recommendations to help you properly assess the wall: • Have a qualified technician assess the installation wall. • Talk to the building facilities group about the wall's construction. • If you're still not sure of the wall's suitability, consult a construction contractor or the wall's manufacturer. If you still can't get suitable answers, have an engineering analysis performed for the wall.
Approved by a regulatory body	Use only mounts that have an Underwriter Laboratories (UL) or similar approval marking. This approval indicates that an independent body has tested the mount for proper adherence to safety considerations. If the mount is not approved by a regulatory body, it may fail to support the display.
Allow for adequate ventilation	Consider air flow and ventilation when choosing mounting hardware. The display should have at least 2" (5 cm) of clearance on all sides or 4" (10 cm) if the display is installed in a recessed area.

Mounting the display

The electrical and mechanical components of a display are designed to work properly when the display is mounted in the orientation described in its installation instructions. Mounting the display in a different orientation can cause malfunctions and will void the display's warranty.

Displays are designed for vertical mounting only: 90° relative to the floor, plus or minus 10° for tolerance, depending on the display (consult the display's documentation). SMART doesn't support mounting displays at other angles or in a horizontal orientation (like a tabletop).

There are a number of potential hazards of mounting a display in a non-standard orientation or angle:

- Mounting a display horizontally (like a table) can cause the glass to sag, damaging the display or interfering with the display's touch system.
- Non-standard orientation can affect ventilation, creating hotpots in equipment, premature failures and, in displays that use projectors, exploding projector bulbs.

Installing a display on a stand

You can install the display on a stand if you want to move the display from place to place or if it's not possible to install the display on a wall.

Notes

- SMART does not recommend using mobile stands with displays that include multiple components and cables. Cables and table equipment (including microphones and speakerphones) can be damaged easily and are difficult to manage. Contact SMART Support for advice if you choose to use a mobile stand with components in addition to the display. Any damage to components that results from being mounted on a mobile stand will likely not be covered by the warranty.
- For users in Australia and New Zealand: SMART does not provide stands for use in Australia or New Zealand, nor can we provide recommendations for stands from other vendors.

Using SMART mobile stands

SMART mobile stands are designed for SMART Board interactive displays. Some are height-adjustable. Some models include a locking cabinet to secure equipment and casters that swivel and lock for easy movement.

See › *Room acoustics* on page 23

Using a third-party stand

You can install the display on a third-party stand as long as the stand meets the following requirements:

Requirement	Details
Supports the display's weight and size	The stand must support the combined weight of the display and all its accessories and components. Make sure the dimensions of the stand are also properly accommodated.
Provides adequate ventilation	If the stand has an equipment enclosure, the enclosure must provide adequate ventilation for the display and any accessories. Damage that results from overheating caused by improper installation is not covered by warranty and may also void the warranty.
Is approved by a regulatory body	Use only stands that have an Underwriter Laboratories (UL) or similar approval marking. This approval indicates that the stands have been tested for proper adherence to safety regulations. These regulatory tests go beyond the equipment's loading restrictions, helping to guarantee that the stand will be safe when used properly.

Requirement	Details
Has a lower center of gravity or adjustable height	A low center of gravity helps make the system more stable. The ability to reduce the height is useful during transport. **Note** Take care that equipment beneath the mounted display is not damaged when it is lowered. Movement of the display can also damage cables if the cables are pinched or bent.
Has large wheels	Large wheels make it easier to cross door thresholds and move the stand over a variety of surfaces.
Has handles	Using a stand with handles helps prevent the application of pressure directly to the display during transport. Applying pressure to the display's frame directly can twist the frame during transport.
Has a safety locking mechanism	Using a stand with locking wheels ensures the display stays in place while it's in use.
Has built-in equipment and cable management	Built-in equipment and cable management helps prevent damage to components and connections during transport. Shelving and mounting points are also useful for cable management.

If you use a third-party stand, consider the following guidelines when installing the display on the stand and moving the system:

Guideline	Details
Do not overload the stand	Putting too much weight on a stand, possibly by including speakers or other equipment, can make the stand unstable. Consider the system's total weight and not just the weight of the display.
Be aware of the system's center of gravity	When moving a display mounted on a mobile stand, tipping can be a concern. The addition of other components can increase this risk by affecting the system's center of gravity.
Use the stand's handles	SMART recommends using mobile stands that have handles. A display can become misaligned if it's moved using the display rather than the stand's handles. To avoid this, always use one hand to hold the display and the other hand to hold the mobile stand when moving the system. This prevents putting too much pressure on the display during transport. **Important** Displays damaged during transport on a mobile stand are outside of SMART's warranty terms and conditions.
Do not attach speaker brackets directly to the display	Attaching brackets directly to the display can twist the display's frame, causing issues with touch and potentially voiding the warranty.

Guideline	Details
Be careful of the placement of speakers and microphones	When mounting speakers on a mobile stand, consider their location relative to microphones to avoid issues with echo-cancellation. Make sure speakers are not too close to the microphone, and test the setup with a few outside callers.
Watch out for equipment and cable placement when using mobile stands that have motorized lifts	Equipment and cables beneath the display can be damaged if a stand that includes a motorized lift lowers the display onto the equipment. Movement of the display can also damage cables if the cables are pinched or bent.
Use best practices for cable management	Power and extension cables must be manageable during transport to prevent damage. Cables should be easy to wrap and store before moving the stand and display. Letting cables dangle or drag as you move the display can increase the risk of injury, product damage and damage to the cables.

Considering power management and room control systems

When installing the display, keep in mind its power management capabilities and features. In some situations, you might also want to integrate the display with a room control system.

About the display's power management capabilities

SMART Board displays feature advanced power-management capabilities. For more information about the power management capabilities of a particular display, refer to its documentation.

About presence detection sensors

Some displays include a presence detection sensor (also called a proximity sensor) that detects movement in the room and turns on the display or puts it in Ready mode. If the sensors detect no movement for a time, the display goes into Standby. The display's use of the proximity sensor can be adjusted or disabled in the display's settings. For more information about power states and power-management settings, refer to the display's documentation.

> **Note**
>
> When you install a display, remember that the display's proximity sensors might be able to detect movement through large windows or glass walls. Also, make sure that no obstructions prevent the proximity sensor from functioning correctly.

Integrating the display with a room control system

A room control system enables users to control a room's lighting, audio system, and possibly, the display. Some installations may require you to integrate the display with a room control system. Refer to the display's documentation to see if it works with an external room control system.

You can use the display's RS-232 connector to connect a third-party external control system to the display.

> **Note**
>
> Displays are not compatible with centralized remote control systems, such as a universal remote control.

Chapter 3 **Configuring a display**

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After a SMART Board interactive display is mounted and connected to power and source devices, it needs to be configured. Configuration includes:

- Orientation
- Configuring connected devices
- Audio set up
- Other configuration tasks

Orienting the display

Orient the display if the display is connected to a computer and the pointer appears a distance from the actual contact when you touch the screen.

See › Orienting your SMART interactive product

Note

Some earlier SMART Board interactive displays (such as the 6000 series; not the 6000S series) which used camera-based DViT touch systems required the touch system be calibrated to the optical properties of the display's installation environment before first use, after cleaning, and after any environment changes. For more information about touch system calibration, refer to the display's documentation.

Setting image resolutions and refresh rates on connected devices

Set connected computers and other devices to the resolutions and refresh rates recommended in a display's documentation to ensure the best possible image quality. See the documentation for connected computers or other devices for instructions.

Important

SMART does not assess, inspect, or test third-party products for compatibility with SMART products, and thus cannot guarantee, represent, or warranty that those products will be compatible with SMART's products or that they will perform as represented by the supplier. SMART recommends that you test third-party products to determine their suitability with your integration scenario. Contact the manufacturer of the third-party device or application for technical support.

Resolutions

Many displays support full high definition (FHD) 1080p and 4K ultra high definition (4K UHD) resolutions, provided the source device meets the minimum requirements for such resolutions.

Resolution	Pixels	Details
FHD (1080p)	1920 × 1080 (2.1 megapixels)	Most modern video devices (computers, laptops, DVD players and Blu-ray™ disc players) support FHD resolutions. Check a device's specifications to see which resolutions it supports. SMART recommends a digital HDMI®, DVI or Display Port connection for best results with FHD. Although an analog VGA connection might support FHD, the video quality may be degraded, particularly if the VGA cable is longer than 16' (5 m).

Resolution	Pixels	Details
4K UHD	3840 × 2160 (8.3 megapixels)	A 4K UHD display has greater pixel density than an FHD display. A 4K UHD display can show up to four times as much visual information as FHD displays. **Notes** • Some video hardware described as "4K" or "UHD" may be capable of displaying a 3840 × 2160 image but will not perform well with video at the same resolution. See › Minimum requirements for Ultra High Definition or 4K on your interactive flat panel • SMART software may have additional requirements. See › smarttech.com/downloads

SMART advises against the use of an analog video connection for displaying FHD or 4K UHD because analog video connections can not display high-resolution images with adequate picture quality. Use HDMI or Display Port connections (including DP-Alt mode via USB Type-C connections) when displaying FHD or 4K UHD.

Refresh rates (30 Hz versus 60 Hz)

Displays can support different refresh rates, typically 30 Hz or 60 Hz. Higher refresh rates can result in smoother, flicker-free video. This is most evident when using 4K UHD.

Most computers support a refresh rate of 60 Hz. Using the highest frame refresh rate possible will provide a better experience when using the display, provided the connected device supports the refresh rate. If it doesn't, you may need to set the device's display settings to a lower refresh rate or to a lower image resolution to maintain a higher refresh rate.

> **Note**
>
> To display 4K UHD at 60 Hz on the display, use the Display Port (if available) or HDMI 2.0 video sources as display inputs. HDMI 1.4 supports only 30 Hz at 4K UHD.

Supporting other resolutions

If the connected device doesn't support FHD or 4K UHD, refer to the display's documentation for other supported resolutions. Using a resolution other than the display's native resolution can cause the pixels to be scaled, resulting in slightly blurry text and images. If the connected computer is using a different aspect ratio than the display's, the image can appear stretched or compressed. The image might also appear in letterbox or pillar-box, with black bars beside or above and below the image. When this occurs, the touch location may not be accurate, and the user may need to orient the touch system to the displayed image by using the Orient procedure in SMART Product Drivers.

Configuring a display for the best audio performance

Consider these factors as you configure a display for the best audio performance:

- Room acoustics
- System gain
- Gain staging
- Ground loops
- Acoustic Echo Cancellation (AEC)
- Equipment placement

Room acoustics

The importance of room acoustics varies depending on the room's size and intended use. If you plan to enable voice conferencing in a large room, such as a board room or a lecture space, room acoustics are more important than they would be in a small classroom or meeting space where voice conferencing is not likely to be used often. Sound absorption might be required in large, open areas in which sound can echo freely.

Use this simple test to check the room's acoustics: Stand in different parts of the room and count to ten loudly. If you hear anything other than your own voice (such as a rattle, buzzing from elsewhere in the room or echoes), the room may require some modifications to improve the acoustics.

A number of features in a room can affect its acoustics:

Feature	Details
Hard surfaces	Hard surfaces in a room (such as brick, cement or glass) can cause sound to echo and distort, which can cause muffled or echoing audio during a voice conference.
Flooring	Tile, hardwood and laminate flooring are hard surfaces that can cause echoes and distortion. Carpeted floors offer more absorption of unwanted sounds.
Ceiling	A dropped ceiling with regular ceiling tiles can greatly change the acoustics of a room. Alternatively, a high, open or cavernous ceiling can also affect audio quality.

> **Note**
>
> Consult a sound reinforcement specialist before making changes to a room's acoustics.

There are a number of things you can do to improve a room's acoustics:

Improvement	Details
Install acoustic tiles or foam	Acoustic tiles or foam absorb and diffract sound waves, helping to minimize sound distortion (especially in rooms that have long parallel walls and hard surfaces).
Install ceiling tiles with better acoustic absorption	Although all types of ceiling tile offer a degree of sound absorption, some provide more sound absorption than others. Look for ceiling tiles that have a higher sound attenuation rating. This sound absorption ability is rated on a scale of 0 to 1 or as a Noise Reduction Class on the same type of scale. Higher numbers are better.

Volume control in audio systems

In audio systems, the input signal passes from the source device, such as a computer, through cables to (potentially) multiple devices. Each point within an audio system can introduce distortion or weakening of the audio signal, which in turn affects the system's audio quality. However, any audio system device that has a volume control can be used to adjust the system's gain. Each device with audio controls is considered a "gain stage" and can be used in a process called "gain staging" to provide the best possible audio.

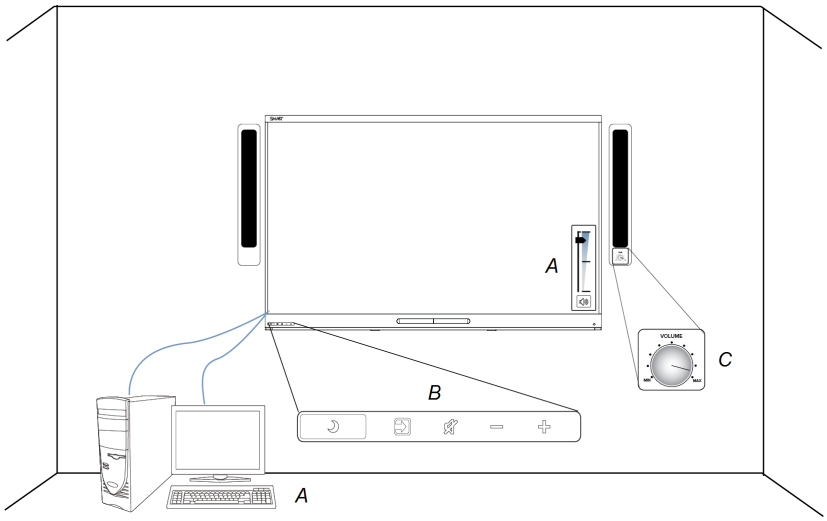
Gain staging

Gain staging involves adjusting the signal levels, such as audio, of a series of gain stages to prevent introduction of noise and distortion. Most in-room audio systems will require some sort of adjustment at each gain stage to provide the best audio.

Begin gain staging adjustments at the system's first adjustable volume control (likely at the audio signal's source, such as a computer), and end at the system's final volume control (such as a set of speakers).

To gain stage an audio system with a display

Set the volume on all but the last gain stage to 75%–95%. The following example demonstrates this procedure:



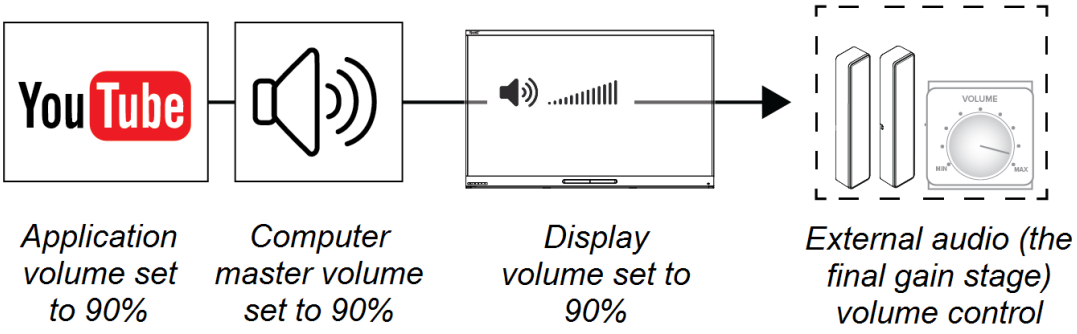
A	Audio signal source (a media player on the computer connected to the display)
B	Display
C	External audio (optional)

> **Note**
>
> Some speakers do not include a volume control.

This example includes four gain stages at which volume can be adjusted:

1. Volume control in the media player software
2. Volume control on the computer
3. Volume control on the display
4. Volume control on the optional external audio

Starting with the beginning of the audio signal (in this case, the media player), set the first three gain stages' volume controls to 75%–95% to push the clearest audio signal from the first gain stage to the last gain stage without overloading the system. Then, at the final gain stage, use the volume controls on the speakers to adjust the sound for the room.



> **Note**
>
> Avoid starting with a lower volume in the first gain stages and increasing the volume elsewhere, as this can amplify any bad qualities of the audio, such as noise.

Reducing gain stages

If a system includes multiple gain stages or a long path for the audio signal, audio latency and additional signal processing can result in issues with Acoustic Echo Cancellation (AEC). Reducing the number of gain stages in the system to shorten the audio signal's path may be helpful.

Ground loops

A ground loop may be experienced as a low buzzing or hum from the speakers. Ground loops can result when two pieces of equipment are plugged into two different outlets that are on different electrical breaker circuits.

The best way to avoid ground loops is to have all devices powered by the same power outlet. If this isn't an option, use an AC mains isolation transformer on the audio signal's source device (such as the computer). This will match the source's grounding to the display to which the audio source is connected.

> **Warning**
>
> Never remove the earth ground pin from an AC cable, as this can create the potential for electrical shock.

Acoustic echo cancellation (AEC)

Issues with AEC are among the most common that can arise in installations that employ both microphones and speakers, especially when installing a mix of devices from different manufacturers.

When AEC issues occur, both remote participants and participants in a classroom or meeting room will likely hear an echoing when others are speaking.

> **Note**
>
> If you hear an echo of your voice during a conference call with remote participants, the issue is likely with one of the remote participants' devices. Have individual participants mute their microphones one at a time to isolate which participant's system setup is causing the problem.

Equipment placement can help alleviate AEC issues.

Equipment placement

After you've determined that a room is acoustically acceptable, consider the relative placement of sound-recording devices (speakerphones, microphones, webcams, and so on) and playback devices. This helps to avoid AEC issues.

- If the speakers are above or below the display, maintain a line of sight between the speakers and the microphones.
- Test the setup by making a few calls.
- Never place a microphone immediately in front of speakers. Such microphone placement can cause audio issues or loud, unpleasant feedback.

Completing other configuration tasks

For more information about configuring a display, refer to the display's documentation.

Chapter 4 **Cleaning and maintaining hardware**

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Cleaning the screen 28
Cleaning the touch sensors 29
Maintaining ventilation 30
Preventing condensation 30
Replacing accessories 30
Removing and transporting the display 31

Checking the display installation

Inspect the display installation frequently to ensure that the display remains securely installed.

- Check the mounting location for signs of damage or weakness that can occur over time.
- Check for loose screws, gaps, distortions, or other issues that could occur with the mounting hardware.

If you find an issue, contact a trained installer.

Cleaning the screen

Follow these instructions to clean the screen without damaging its anti-glare coating or other product components.

> ⚠ **Caution**
>
> - Do not use permanent or dry-erase markers on the screen. If dry-erase markers are used on the screen, remove the ink as soon as possible with a lint-free, non-abrasive cloth.
> - Do not rub the screen with dense or rough material.
> - Do not apply pressure to the screen.

- Do not clean the screen using cleaning solutions or glass cleaners that are not approved by SMART. Non-approved cleansers can cause deterioration or discoloration of the screen.

Note

Avoid touching the reflective tape between the screen and the frame on earlier SMART Board interactive displays that use camera-based DViT touch systems. Damage to this strip affects touch interactivity.

To clean the screen

1. Turn off any connected computers.
2. Turn off the display.
3. Wipe the screen with a lint-free, non-abrasive cloth.

   Note

   You can also use a damp cloth with a drop of dish soap, or follow the instructions in the knowledge base article, How to clean SMART Board surfaces and accessories.

Cleaning the touch sensors

The display uses infrared (IR) transmitters and sensors around the display's perimeter between the screen and the frame. Dust buildup on these components can impair touch performance. Inspect these areas for dust and clean them every week.

Caution

- Do not use compressed air to clean the sensors or borders. Use a low-pressure air source, such as a camera style bellows bulb.
- Do not use water or cleaning agents to clean the touch sensors.
- Do not apply too much pressure when cleaning the display because you can damage the plastic.

To clean the IR transmitters and sensors

1. With a clean lint-free, non-abrasive cloth, gently wipe the plastic between the screen and the frame around the perimeter of the display's screen.
2. If dirt still remains, use 50% isopropyl alcohol (IPA) to clean the protective plastic between the screen and the frame.

Maintaining ventilation

The display requires proper ventilation. Dust buildup in the ventilation holes compromises cooling and can lead to product failure.

- Clean accessible ventilation holes monthly with a dry cloth.
- Use a vacuum cleaner with a narrow hose end fitting to clear the back ventilation holes regularly. You might have to remove the display from the wall.

See › *Removing and transporting the display* on the next page

⚠ Caution

Avoid setting up or using the display in an area with excessive levels of dust, humidity, smoke, or chemical fumes.

Preventing condensation

If the display has been moved from a cold environment to a warmer one (for example, from storage to the installation site), let the display sit for a few hours to allow it to acclimate to the new temperature. Failing to do so can cause humidity to build up in the space between the front glass and the LCD.

If condensation appears under the screen after you turn on the display, select an active video source and leave the display on for 48 hours. If the condensation doesn't dissipate, contact SMART support if the display is still under warranty.

If there is enough moisture between the layers to cause the moisture to drip and run, remove power immediately and contact SMART Support if the display is still under warranty.

Replacing accessories

To prevent damage to the display's anti-glare surface, replace pens, erasers, and other accessories that are worn or damaged. You can purchase replacement accessories from the Store for SMART Parts.

See › smarttech.com/Support/PartsStore

Note

For accessory part numbers, refer to the display's service parts diagrams.

Removing and transporting the display

If the display is wall mounted, you might need to remove it from its current location and transport it to another location on occasion.

To remove the display safely, use two or more trained installers.

Warning

- Do not attempt to move the display by yourself. The display is very heavy.
- Do not move the display by connecting a rope or wire to the handles on the back. The display can fall and cause injury and product damage.

Important

Follow any documentation included with the third-party mounting hardware.

To remove the display

1. Turn off connected computers.
2. Turn off the display.
3. Flick the switch on the back of the display to the OFF (O) position.
4. Remove all accessible cables, connectors, and antennas.
5. Remove any modules from the accessory slot.
6. Lift the display from its mounting location and insert it into its original shipping box.

   Warning

   Do not place the display on a sloping or unstable cart, stand, or table. The display could fall, resulting in injury and severe product damage.

   Caution

   Do not leave the display face up, face down, or upside down for an extended period. This could cause permanent damage to the screen.
7. Remove the mounting brackets.

To transport the display

See › *Moving a display to an installation site* on page 5

Chapter 5 **Display accessories**

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Use accessories that meet a displays' specifications to ensure that the display works as expected. This chapter describes the accessories' requirements and provides guidelines for selecting accessories for use with a display.

It is best practice to use accessories manufactured by established, reputable companies.

Important

SMART does not assess, inspect, or test third-party products for compatibility with SMART Board interactive displays, and thus cannot guarantee, represent, or warranty that those products will be compatible with displays or that they will perform as represented by the supplier. SMART recommends that you test third-party products to determine their suitability with your integration scenario. Contact the manufacturer of the third-party device or application for technical support.

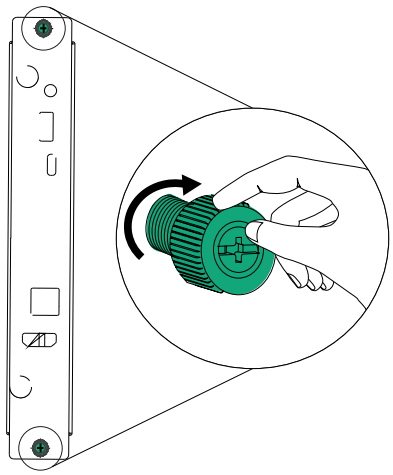
SMART OPS appliances

SMART offers a variety of OPS appliances that can be installed in the display's accessory slots.

Caution

- Only SMART-provided OPS appliances are supported in SMART Board interactive displays. Third-party OPS appliances are not supported, and their use can lead to poor performance or damage to the display.

- Do not install or remove the OPS appliance while the display is turned on. First make sure the power switch on the back of the display beside the AC power inlet is in the OFF (O) position. If you can't reach the power switch, use the front control panel's power button ⏻ to put the display in Standby mode, and then unplug the display's power cable from the power outlet.
- After you have turned the display's power switch off or unplugged it, wait at least 30 seconds before removing the appliance to allow its internal power supplies to discharge completely. You might also wait five minutes to give the appliance the opportunity to cool, if necessary.
- Make sure the OPS appliance is secured to the display with screws through the two anchor points. Inadequately secured appliances can damage the display. (An OPS appliance's anchoring screws are typically captive, although some simply include separate anchoring screws.)



Minimum requirements and guidelines

Use only OPS appliances that meet the following requirements:

Requirement	Details
Does not require active cooling	N/A
Can be adequately powered by the display's power supply	If an OPS appliance requires more power than the display was designed to dedicate to an OPS appliance, it may restrain your ability to power specific units. Make sure the power supply requirements of the OPS appliance are met by the supply capabilities of the display. Otherwise the OPS appliance will not function fully, and may not even turn on.

Requirement	Details
Meet the display's requirements for video output and connections types	Make sure the OPS appliance is compatible with the display's video resolution and connection types.
Comply with regulatory requirements	OPS appliance must comply with your area's regulatory requirements and must also meet IEC 60950-1 certifications for Fire Enclosures.

See › Open Pluggable Specification (OPS) computer disclaimer

Room cameras

Displays support USB cameras (both with and without an integrated microphone) to enable video and sound recording with the same component.

Notes

- Some software applications might use only the default camera.
- Do not connect a camera that includes built-in speakers to a SMART Board display. Such a camera should be connected directly to a computer that's connected to the display. SMART Board displays do not currently support USB audio output devices.
- Cameras with integrated microphones are not recommended for recording audio in large rooms. Separate microphones are better suited to such settings.

  See also › *Microphones* on page 36

Minimum requirements and guidelines

Use only room cameras that meet the following requirement:

Requirement	Details
Comply with the USB Video Class (UVC) specification	Cameras that do not comply with the UVC specification may introduce reduced image quality or incompatibility with other devices or might not work at all.
Compatible with Android operating systems	Cameras that are not compatible with Android operating systems might not work with camera and video conferencing applications on the display itself. However, these type of cameras should still work with a computer connected to the display.

In addition, look for room cameras that meet the following guidelines:

Guideline	Details
Compensate for the room's lighting	Image quality depends largely on optics and image compression. When choosing a room camera, consider the room lighting. If the room has only dim fluorescent lighting, consider a camera with higher-quality optics to allow better light sensitivity. Optics can not compensate for everything. Remember that bright, even light can make a significant difference in image quality.
Use high compression encoding (if network bandwidth is a concern)	A high compression encoding scheme helps maintain higher network speeds by sending less data. Different degrees and types of compression will affect the image quality. SMART recommends a camera that supports at least built-in H.264 SVC compression .
Are large enough to allow adequate range of focus or zoom	Smaller cameras can impose limitations on focus and zoom.
Have good optics	A camera with fine-polished glass lenses and a large aperture can provide better image quality than one with plastic lenses and a smaller aperture.
Have a high-resolution image sensor	Cameras with high-resolution image sensors can produce better images, particularly if digital-zoom features are used.
Have optical zoom	If you want to zoom the camera to narrow the field of view, optical (mechanical) zoom is recommended over a camera with only a digital zoom function. Digital zoom can reduce image quality, especially on cameras with lower resolution image sensors.
Have an appropriate focal range for the room's size	Use a camera with a defined focal range that is appropriate for the size of the room in which it will be used. Generally, the larger the room, the longer the focal range of the camera needs to be. For example, a camera with a focal range of 1'–5' (0.3–1.5 m) will not provide a good image of the room beyond 10' (3 m), and a camera with a focal range of 10'–40' (3–12 m) will not provide a good image of objects close to the camera.
Support SuperSpeed USB 3.x (5Gbps and above) connections, especially if using an FHD or 4K UHD camera.	USB 2.0 (480Mbps) connections can limit video resolution and frame rates and degrade video quality.

External audio systems

SMART Board interactive displays include internal speakers, but you might want to use an external audio system in some applications.

The speakers included with displays are designed to provide sound at the front of the room, not for projecting sound in larger spaces. If you want to use the display in a larger space, you'll need an external audio system.

In most cases, external systems should be connected to the display's audio output, but other setups can provide additional options for connecting external speakers. For example, a room computer connected to the display might also provide an audio connection.

See › *Configuring a display for the best audio performance* on page 23

Minimum requirements and guidelines

In small to medium sized rooms (rooms up to 20' × 30' or 6 m × 9 m), using speakers that meet the following suggested specifications as closely as possible should help to ensure good quality audio:

Frequency response	80 Hz to 10 kHz ± 3 dB
Total Harmonic Distortion (THD) at peak power	100Hz – 10kHz 1% Avg. 3% max.
Signal to noise ratio	Better than 60 dB
Sensitivity (1W/1m)	86 dBA Sound Pressure Level (SPL)

For rooms larger than 20' × 30' (6 m × 9 m), such as auditoriums, SMART recommends that you consult an audio specialist to help determine the best option for the space.

Important

If the speakers are used in conjunction with microphones (for example, as part of a classroom or meeting room conferencing system), place the speakers correctly in relation to the microphones, especially if you're using wireless microphones.

See › *Configuring a display for the best audio performance* on page 23

Note

USB audio output devices are not supported on SMART Board interactive displays. Connect these devices directly to a computer connected to the display.

Microphones

Microphones can provide audio recording for a classroom or lecture hall or function as part of a voice conferencing solution in a meeting room.

Some contemporary SMART Board displays include a built-in microphone array. Refer to the display's specifications to determine whether a microphone array is included.

Minimum requirements and guidelines

Look for microphones that meet the following guidelines:

Guideline	Details
Are appropriate for the room's intended use	The type of microphone (wireless or wired) that will best suit the system depends on how the room will be used. A wireless microphone might be better suited for a room used primarily for lectures or presentations, with one person speaking at a time and moving around the space. Wired table-top microphones might be better suited for a room used for video conferencing, in which a number of stationary people speak throughout a meeting.
Have a suitable polar (pickup) pattern	Select a microphone that has a suitable polar (pickup) pattern. An omnidirectional pattern is good for rooms set up for a single speaker, such as a lecture hall or presentation space. A unidirectional microphone is good for rooms set up for voice conferencing.
Are designed for normal speech	Microphones can be designed for different uses (musical recordings, lectures, speeches, and so on). Make sure you choose a microphone that has a frequency response and polar pattern suited for a speaking application.
Provide channel diversity (wireless)	If you use wireless microphones, be sure to choose a wireless microphone that provides enough channel diversity to support multiple wireless devices in one location, particularly if you plan to use wireless audio equipment in more than one location within a building.

Important

If the microphones are used in conjunction with speakers (for example, as part of a meeting room conferencing system or complete audio system), place the speakers correctly in relation to the microphones.

See › *Configuring a display for the best audio performance* on page 23

Room control systems

Although SMART does not offer room control equipment, you can use the display's RS-232 connector to connect a third-party external control system to the display. The RS-232 connector is featured on nearly all displays and allows for easy communication between an external control system and the display. To learn about a specific display's capabilities, command hierarchy and setup, refer to the documentation for that display.

Contemporary SMART Board displays with integrated iQ system software also support Crestron Connected V2 and Crestron XiO Cloud® systems via network connections.

See › SMART Board displays with iQ and Crestron

Minimum requirements and guidelines

Refer to the RS-232 room control information in the display's product documentation for connection and data communication requirements for the display.

Appendix A **Energy saving modes**

Current SMART Board displays feature the following energy saving modes:

Mode	Description
Off (power switch on the back of the display)	Lowest energy usage. The display is completely disconnected from mains power.
Standby (sleep)	A very low power state. This is the default state for all displays. You can turn on the display in a variety of ways: • Press the power button on the remote control, front control panel, or convenience panel • Plug in a computer or other data source • Trigger the occupancy sensor • Send a command through the RS232 interface (Some of these options are not available on every display)
Networked Standby	A low-power state. The display can also be turned on through WiFi or Ethernet LAN connections.

> **Note**
>
> SMART Boards comply with the Ecodesign for Displays Regulation requirements for digital interactive whiteboards.

Appendix B **Third-party product support**

> **Important**
>
> SMART does not assess, inspect, or test products manufactured by others for compatibility with SMART products, and thus provides no guarantee, representation, or warranty that third-party products will be compatible with SMART products or that they will perform as represented by the supplier.

If you experience any issues, SMART will not troubleshoot third-party products connected to SMART products. If troubleshooting is needed, you will very likely be asked to remove the third-party products as part of that process. Therefore, SMART highly recommends you set up and test a SMART product as it was shipped before you connect third-party products.

> **Important**
>
> SMART strongly recommends that you test any third-party products, including accessories, cables and adapters, before installation. Consult your certified reseller for assistance.

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docs.smarttech.com/kb/171035