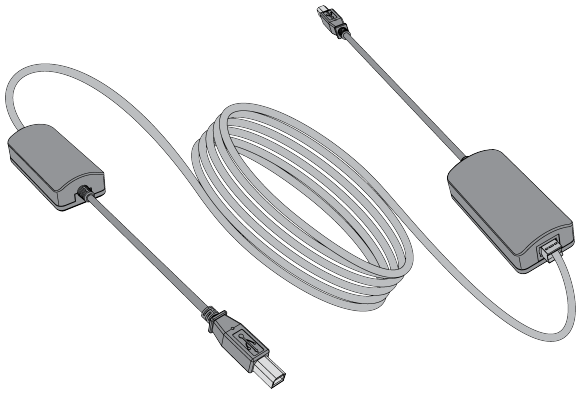


Extending USB Connections

SMART Board® 800 series interactive whiteboards and systems

Extraordinary made simple®

FCC warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

April, 2012

Contents

Chapter 1

Extending the USB of SMART Board 800 series interactive whiteboards

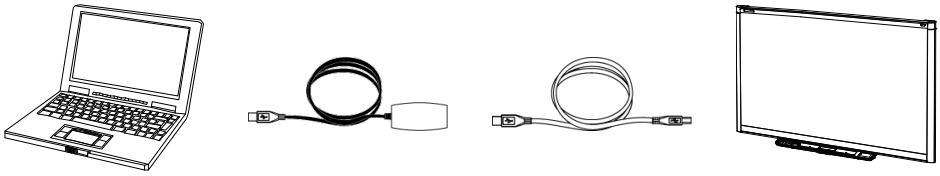
This section illustrates how you can extend the USB connection between your computer and your SMART Board® 800 series interactive whiteboard.

If you're extending the USB connection to a SMART Board 800i series interactive whiteboard system, see *Extending the USB of SMART Board 800i series interactive whiteboard systems* on page 7.

Extending the USB with a bus-powered (active) extension cable

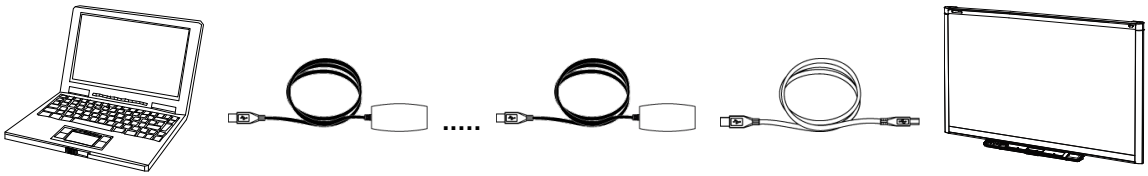
You can use the SMART USB-XT extension cable to extend the 16' (5 m) USB cable included with your interactive whiteboard.

Using a single USB-XT extension cable



Computer | USB-XT | USB cable | Interactive whiteboard

Using multiple USB-XT extension cables



Computer | USB-XT | ..... | USB-XT | USB cable | Interactive whiteboard

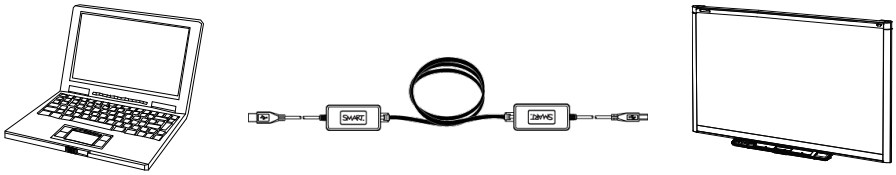
NOTES

- These aren't plenum-rated solutions. Don't route multiple USB-XT extension cables where they aren't accessible, for example, inside walls or ceilings.
- USB cable length must not exceed 16' (5 m). See *USB connectors and cables* on page 19
- The computer's USB interface must provide sufficient power for the bus-powered extension cables. A laptop might not provide sufficient power while running on battery power.
- Don't connect more than three USB-XT extension cables. The combined length of the extender cables results in too much voltage drop to power another extender.

Extending the USB with a CAT5-XT-1100 (active) extender

You can use the CAT5-XT-1100 extender to replace the 16' (5 m) USB cable included with your interactive whiteboard.

Using a SMART CAT5-XT-1100 extender



Computer

CAT5-XT-1100
Cat 5 cable < 131' (40 m)

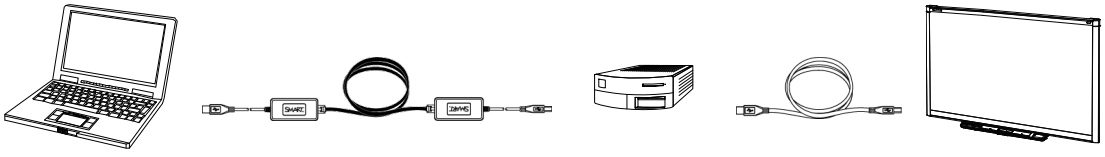
Interactive whiteboard

NOTES

- The maximum Cat 5 cable length in this configuration is 131' (40 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered CAT5-XT-1100 extender. A laptop might not provide sufficient power while running on battery power.

Using a CAT5-XT-1100 extender and a self-powered USB hub

If you need to extend the cable from the CAT5-XT-1100 remote extender unit (REX) to the interactive whiteboard, you must use a self-powered hub. CAT5-XT-1100 extenders don't provide sufficient power for a bus-powered USB extender.



Computer

CAT5-XT-1100
Cat 5 cable < 92' (28 m)

Self-powered USB hub

USB cable

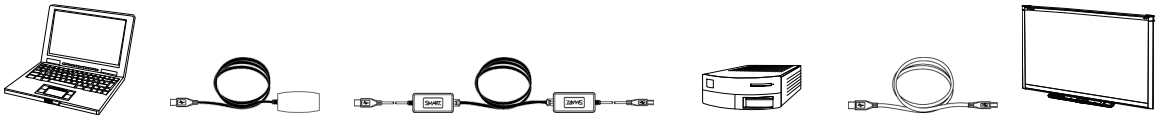
Interactive whiteboard

NOTES

- Each USB hub or extender used with the CAT5-XT-1100 extender reduces the maximum Cat 5 cable length by 40' (12 m). The Cat 5 cable in this configuration is limited to 92' (28 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered CAT5-XT-1100 extenders. A laptop might not provide sufficient power while running on battery power.
- The length of the USB cable that connects the self-powered hub to the interactive whiteboard must not exceed 16' (5 m). See *Extending USB connections* on page 21.

Using a USB-XT extension cable or a SMART GoWire™ auto-launch cable with a CAT5-XT-1100 extender and a self-powered USB hub

You can extend the USB connection from the computer to the CAT5-XT-1100 local extender unit (LEX) using a USB-XT extension cable. You can substitute the SMART GoWire cable for the USB-XT extension cable.



Computer | USB-XT or SMART GoWire cable | CAT5-XT-1100 Cat 5 cable < 52' (16 m) | Self-powered USB hub | USB cable | Interactive whiteboard

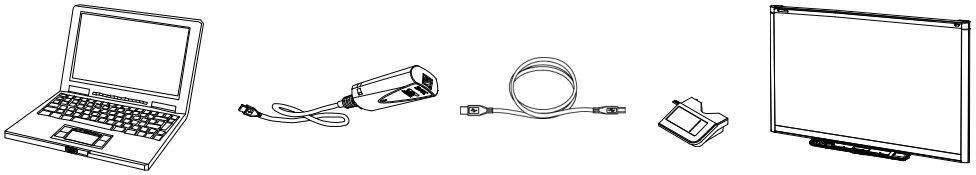
NOTES

- Each USB hub or extender used with the CAT5-XT-1100 extender reduces the maximum Cat 5 cable length by 40' (12 m). The Cat 5 cable in this configuration is limited to 52' (16 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered USB-XT extension cable and the bus-powered CAT5-XT-1100 extenders. A laptop might not provide sufficient power while running on battery power.
- The length of the USB cable that connects the self-powered hub to the interactive whiteboard must not exceed 16' (5 m). See *USB connectors and cables* on page 19.

Extending the USB with an SBX800 CAT5-XT extender

You can use the SBX800 CAT5-XT extender to extend the USB interface of your 800 series interactive whiteboard.

Using an SBX800 CAT5-XT extender



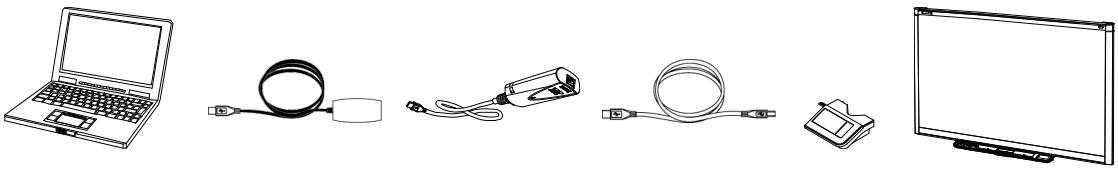
Computer | SBX800 CAT5-XT extender | Cat 5 cable < 50' (15.25 m) | Pen tray extender module | Interactive whiteboard

NOTES

- The maximum Cat 5 cable length in this configuration is 50' (15.25 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the USB connection adaptor. A laptop might not provide sufficient power while running on battery power.

Using a SMART GoWire cable with an SBX800 CAT5-XT extender

You can connect the computer to the SBX800 CAT5-XT remote extender unit (REX) using the SMART GoWire cable.



Computer | SMART GoWire cable | SBX800 CAT5-XT extender | Cat 5 cable < 50' (15.25 m) | Pen tray extender module | Interactive whiteboard

NOTES

- The maximum Cat 5 cable length in this configuration is 50' (15.25 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered SMART GoWire cable and the USB connection adapter. A laptop might not provide sufficient power while running on battery power.

Chapter 2

Extending the USB of SMART Board 800i series interactive whiteboard systems

This section illustrates how you can extend the USB connection between your computer and your SMART Board 800 series interactive whiteboard system.

SMART interactive whiteboard systems combine a SMART Board interactive whiteboard with a SMART short throw or ultra-short-throw projector, a multiuser pen tray and a control panel that enables teachers to manage all classroom technology products from the front of the classroom.

If you're extending the USB connection to SMART Board 800 series interactive whiteboards that aren't connected to a SMART projector, see *Extending the USB of SMART Board 800 series interactive whiteboards* on page 1.

Extending the USB with a bus-powered (active) extension cable

You can use the USB-XT extension cable to extend the 16' (5 m) USB A to mini-B cable included with your interactive whiteboard system.

IMPORTANT

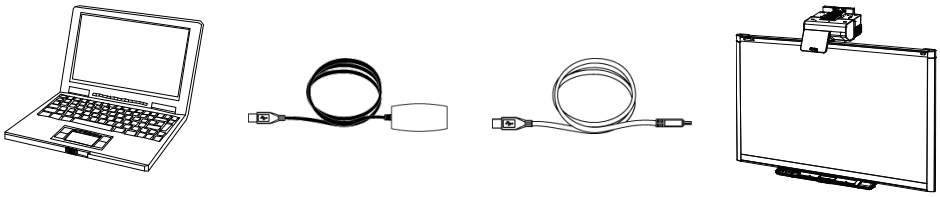
Connect your USB cables or extenders to the USB1 receptacle on the interactive whiteboard's extended control panel (ECP) module. Do not use the USB2 receptacle.

NOTES

- You can connect the USB cable or extender to the SMART Board 800 series interactive whiteboard system's ECP module using the included USB A to mini-B cable or using a standard USB cable with the mini-USB to USB adapter included with your system.
- SMART Board 800 series interactive whiteboard systems have a USB hub integrated into the ECP module and are therefore compound devices. See *USB topology* on page 17.

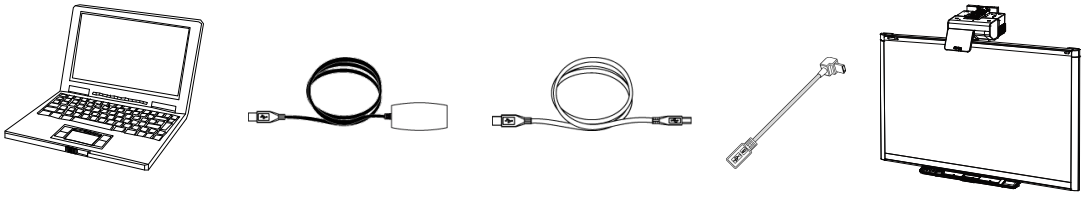
Using a single USB-XT extension cable

Using the USB A to mini-B cable



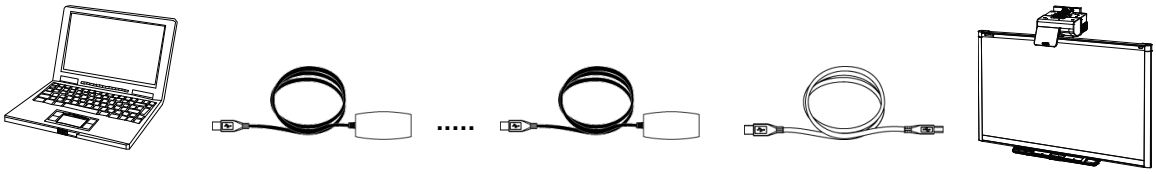
Computer | USB-XT | USB A to mini-B cable | Interactive whiteboard system

Using a standard USB cable with the USB adaptor



Computer | USB-XT | Standard USB cable | USB adapter | Interactive whiteboard system

Using multiple USB-XT extension cables



Computer | USB-XT | ..... | USB-XT | USB A to mini B cable | Interactive whiteboard system

NOTES

- These aren't plenum-rated solutions. Don't route multiple USB-XT extension cables where they're inaccessible, for example, inside walls or ceilings.
- USB cable lengths must not exceed 16' (5 m). See *USB connectors and cables* on page 19.
- The computer's USB interface must provide sufficient power for the bus-powered extension cables. A laptop might not provide sufficient power while running on battery power.
- Don't connect more than three USB-XT extension cables. See *Extending USB connections* on page 21.

Extending the USB with a CAT5-XT-1100 (active) extender

You can use the CAT5-XT-1100 extender to replace the 16' (5 m) USB A to mini-B cable included with your interactive whiteboard.

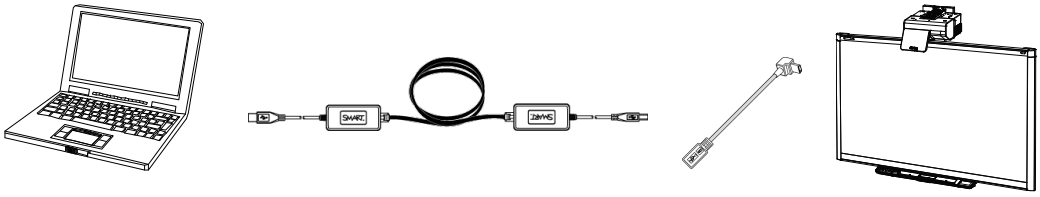
IMPORTANT

Connect your USB cables or extenders to the USB1 receptacle on the interactive whiteboard's ECP module. Do not use the USB2 receptacle.

NOTES

- You can connect the USB cable or extender to the SMART Board 800 series interactive whiteboard system's ECP module using the included USB A to mini B cable or using a standard USB cable with the mini-USB to USB adaptor included with your system.
- SMART Board 800 series interactive whiteboard systems have a USB hub integrated into the ECP module and are therefore compound devices. See *USB topology* on page 17.

Using a CAT5-XT-1100 extender



Computer

CAT5-XT-1100
Cat 5 cable < 92' (28 m)

USB adapter

Interactive whiteboard system

NOTES

- The maximum Cat 5 cable length in this configuration is 92' (28 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered CAT 5-XT-1100 extenders. A laptop might not provide sufficient power while running on battery power.

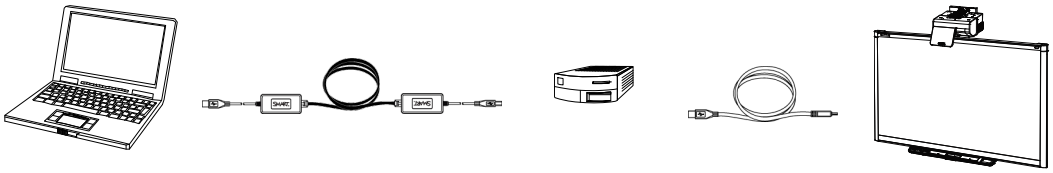
Using a CAT5-XT-1100 extender and a self-powered USB hub

If you need to extend the cable from a CAT5-XT-1100 remote extender unit (REX) to the interactive whiteboard, you must use a self-powered hub. CAT5-XT-1100 extenders don't provide sufficient power for a bus-powered USB extender.

NOTE

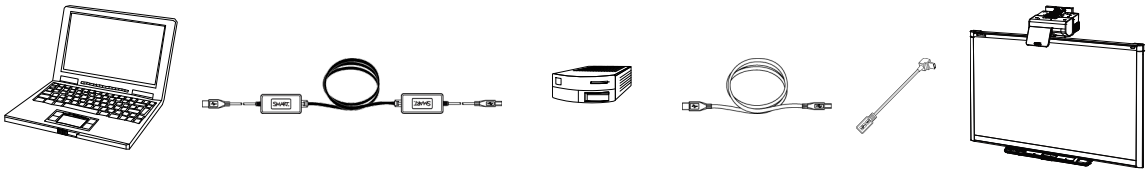
You can connect the USB cable from the hub to the SMART Board 800i series interactive whiteboard system's ECP module using the included USB A to mini-B cable or using a standard USB cable with the mini USB to USB adapter included with your system.

Using the USB A to mini-B cable



Computer | CAT5-XT-1100 Cat 5 cable < 40' (12 m) | Self-powered USB hub | USB A to mini-B cable | Interactive whiteboard system

Using a standard USB cable with the USB adaptor



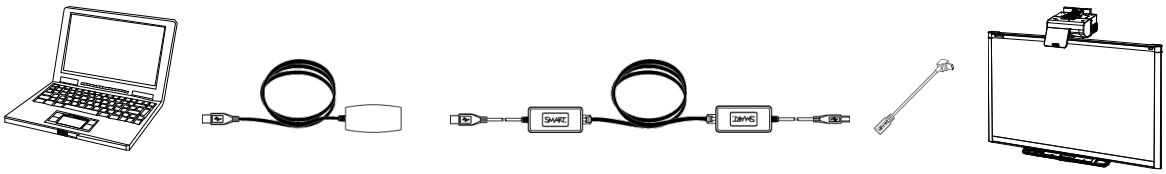
Computer | CAT5-XT-1100 Cat 5 cable < 40' (12 m) | Self-powered USB hub | Standard USB cable | USB adapter | Interactive whiteboard system

NOTES

- Each USB hub or extender used with the CAT5-XT-1100 extender reduces the maximum Cat 5 cable length by 40' (12 m). The Cat 5 cable in this configuration is limited to 52' (16 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered CAT5-XT-1100 extenders. A laptop might not provide sufficient power while running on battery power.
- The length of the USB cable that connects the self-powered hub to the interactive whiteboard must not exceed 16' (5 m). See *Extending USB connections* on page 21.

Using a USB-XT extension cable or a SMART GoWire cable and a CAT5-XT-1100 extender

You can extend the USB connection from the computer to a CAT5-XT-1100 extender local unit (LEX) using a USB-XT extension cable. You can substitute the SMART GoWire cable for the USB-XT extension cable.



Computer | USB-XT or SMART GoWire cable | CAT5-XT-1100 Cat 5 cable < 52' (16 m) | USB adapter | Interactive whiteboard system

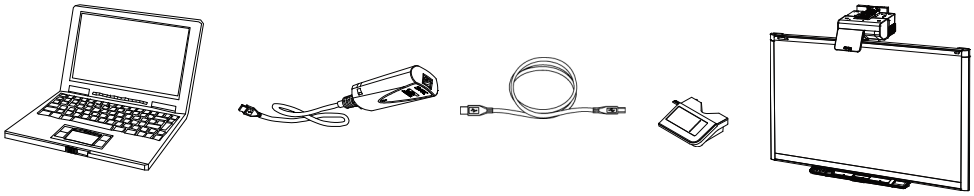
NOTES

- Each USB hub or extender used with the CAT5-XT-1100 extender reduces the maximum Cat 5 cable length by 40' (12 m). The Cat 5 cable in this configuration is limited to 52' (16 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the bus-powered USB-XT extension cable or SMART GoWire cable and the bus-powered CAT5-XT-1100 extenders. A laptop might not provide sufficient power while running on battery power.

Extending the USB with an SBX800 CAT5-XT extender

You can use the SBX800 CAT5-XT extender to extend the USB interface of your SMART Board 800i series interactive whiteboard system.

Using an SBX800 CAT5-XT extender



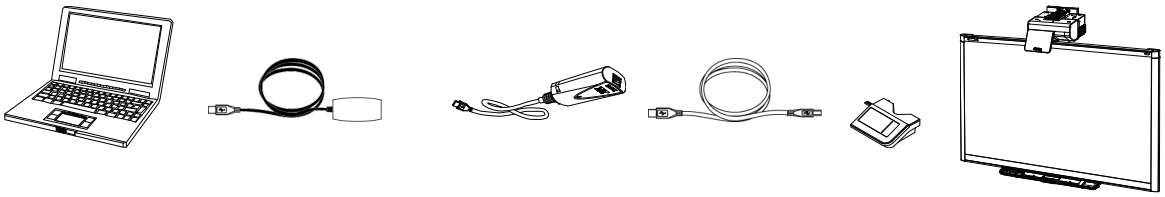
Computer | SBX800 CAT5-XT extender | Cat 5 cable | Pen tray extender module | Interactive whiteboard system

NOTES

- The maximum Cat 5 cable length in this configuration is 50' (15.25 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB interface must provide sufficient power for the USB connection adapter. A laptop might not provide sufficient power while running on battery power.

Using a SMART GoWire cable with an SBX800 CAT5-XT extender

You can connect the computer to the SBX800 CAT5-XT remote extender unit (REX) using the SMART GoWire cable.



Computer | SMART GoWire cable | SBX800 CAT5-XT extender | Cat 5 cable | Pen tray extender module | Interactive whiteboard system

NOTES

- The maximum Cat 5 cable length in this configuration is 50' (15.25 m) (not included).
- You can use plenum-rated Cat 5 cable, if required.
- The computer's USB port must provide sufficient power for the bus-powered SMART GoWire cable and the USB connection adaptor. A laptop might not provide sufficient power while running on battery power.

Appendix A
USB 2.0 specification primer

You can use this section as a reference to common Universal Serial Bus (USB) 2.0 terms, rules and conventions.

USB terminology

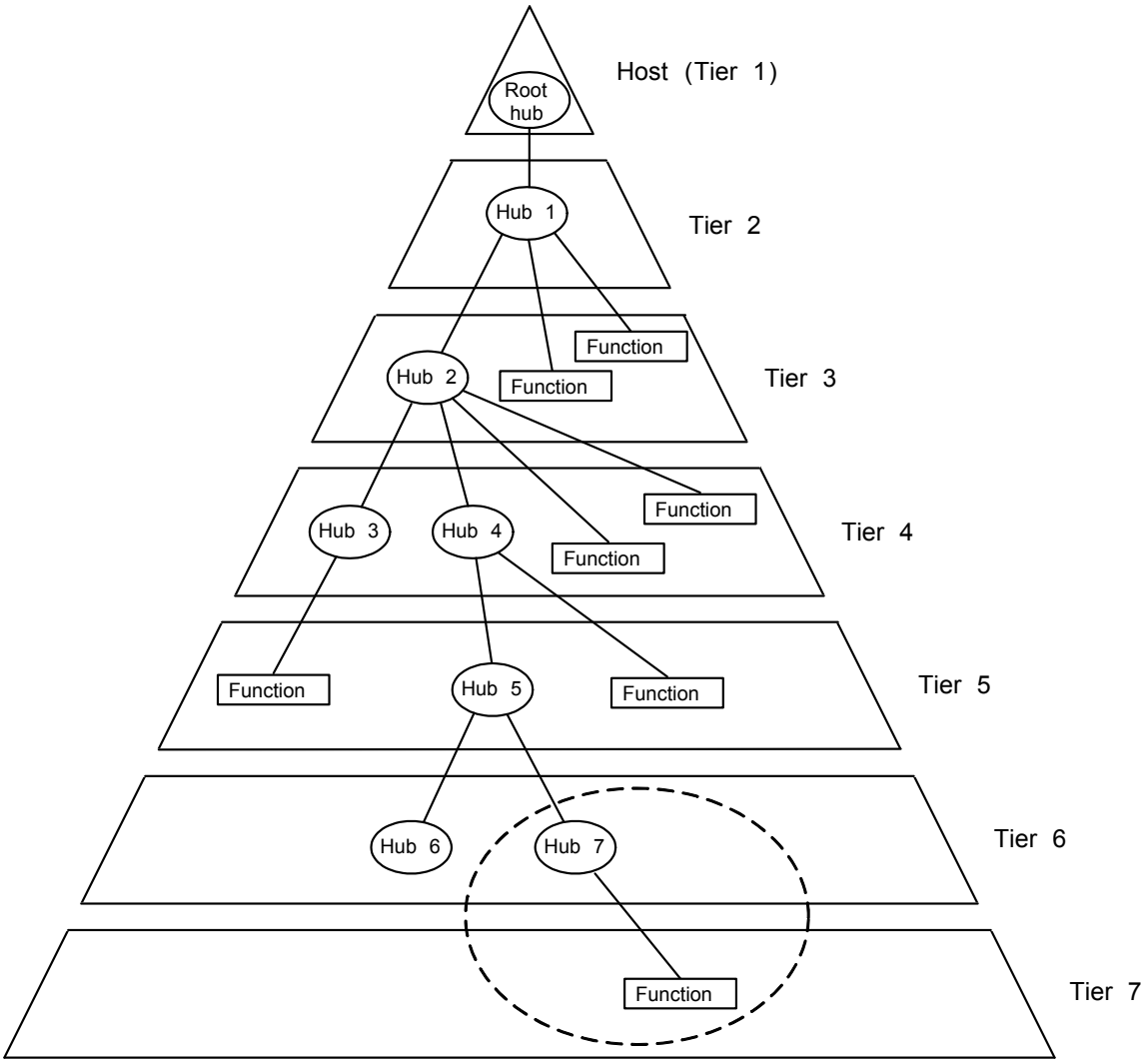
These definitions are derived from the *Universal Serial Bus Specification, revision 2.0*, and are used in this document.

Term	Definition
Active (device)	A device (hub or extension cable) with circuitry for regenerating the USB signals. For more information, see *Powering USB devices* on page 18.
Device	A logical or physical entity that performs a function. The actual entity described depends on the context of the reference. At the lowest level, *device* may refer to a single hardware component, as in a memory device. At a higher level, it may refer to a collection of hardware components that perform a particular function, such as a USB interface device. When used in a non-specific reference, a USB device is either a hub or a function.

Term	Definition
Downstream	The direction of data flow from the host or away from the host. A downstream port is the port on a hub electrically farthest from the host that generates downstream data traffic from the hub. Downstream interfaces receive upstream data traffic.
Full-speed	USB operation at 12 Mbps
Function	A USB device that provides a capability to the host, such as a keyboard, interactive whiteboard or speakers.
High-speed	USB operation at 480 Mbps
Host	The host computer system where the USB host controller is installed. This includes the host hardware platform (CPU, bus, etc.) and the operating system in use.
Host controller	The host's USB interface hardware and software
Hub	A USB device that provides additional connections to the bus
Low-speed	USB operation at 1.5 Mbps
Passive (extension cable)	An extension cable that has no active electronic components. For more information, see *Prohibited cable assemblies* on page 20.
Physical device	A device that has a physical implementation; for example, speakers, microphones, and CD players.
Port	A USB hub's downstream connection point where a USB device is attached
Root hub	A USB hub directly attached to the host controller
Upstream	The direction of data flow toward the host. An upstream connector on a device is electrically closest to the host that generates upstream data traffic from the hub. Upstream interfaces receive downstream data traffic.

USB topology

The USB physical network is a tiered star topology. A hub is at the center of each star. Each wire segment is a point-to-point connection between the host and a hub or function, or a hub connected to another hub or function. This figure illustrates the topology of a USB network.



Timing constraints for hub and cable propagation times allow a maximum of seven tiers, including the root tier. In seven tiers, a maximum of five non-root hubs can be supported in a communication path between the host and any device. Note that a compound device occupies two tiers; therefore, it cannot be attached at tier seven where only functions can be used.

Connecting USB devices

USB attachment points are provided by a special class of USB device known as a hub. The additional attachment points provided by a hub are called **ports**.

A host includes an embedded hub called the **root hub** that can provide one or more attachment points. Hosts may also have other non-root internal hubs to provide further expansion capability. These internal non-root hubs are tier 2 devices, and limit the number of external hubs that you can use in a path.

Powering USB devices

A USB host can supply power for USB devices that are directly connected. USB devices that rely on power from the cable are called **bus-powered** devices.

USB devices that have their own externally connected power supplies are called **self-powered devices**.

When a bus-powered device connects to the host's USB interface, the host allocates power in increments called unit loads. A unit load is defined to be 100 mA. A device may be either a low-power device using one unit load or a high power device, consuming up to five unit loads. When connecting, all devices default to low-power. If required by the device, the host's software controls the transition to high-power by ensuring that adequate power is available. Hosts that are externally powered must be able to supply up to five unit loads (500 mA) of power but may supply significantly more. Battery powered hosts may supply from one to five unit loads but may limit the power to conserve battery power.

USB connectors and cables

USB connectors

There are two types of full-size USB connectors: Series-A and Series-B, also known as Type-A and Type-B, respectively. Either connector type can be a receptacle or a plug.

- Series-A receptacles are used as outputs from host systems and hubs.
- Series-B receptacles are used as inputs to hubs or devices.
- Series-A plugs are always oriented toward the host system and connect to Series-A receptacles.
- Series-B plugs are always oriented toward a USB hub or device and connect to Series-B receptacles.

NOTE

Smaller versions of the Series-A and Series-B connectors, called mini-A and mini-B, and micro-A and micro-B, are available and conform to the same rules as full-size USB connectors.

TIP

Although USB 2.0 specifications require that USB connectors can be “hot plugged” (for example, you can insert a USB connector with power on without damage to the circuitry), we recommend that you connect all your devices and cables before you turn on the power. If you connect a device when the power is already on, and the system doesn’t work correctly, disconnect the power from all active devices in the USB circuit, and then connect the power again.

USB cables

For full-speed and high-speed connections, USB 2.0 specifications allow two types of cable assemblies:

- a standard detachable cable that is terminated on one end with a Series-A plug, and terminated on the opposite end with a Series-B plug
- a captive cable that is terminated on one end with a Series-A plug, and has a vendor-specific connection on the opposite end for the peripheral
- a standard detachable cable that is terminated on one end with a Series-A plug, and terminated on the opposite end with a Series-B plug
- a captive cable that is terminated on one end with a Series-A plug, and has a vendor-specific connection on the opposite end for the peripheral

IMPORTANT

Any other cable assemblies are prohibited.

Prohibited cable assemblies

USB 2.0 specifications prohibit specific cable assemblies. Prohibited cable assemblies may work in some situations, but they cannot be guaranteed to work in all instances.

An example of a prohibited cable is the “extension cable.” This type of cable assembly has a Series-A plug and a Series-A receptacle or a Series-B plug and a Series-B receptacle. This “passive” extension cable allows you to connect multiple cable segments, possibly exceeding the maximum permissible cable length.

Another example of a prohibited cable is one with both ends terminated in either Series-A plugs or Series-B receptacles, allowing two upstream ports or two downstream devices to be connected together.

USB cable length

The maximum allowable USB cable length is determined primarily by signal attenuation and propagation delay. A USB cable also carries VBUS and GND wires on each segment to deliver power to bus-powered devices. VBUS is nominally +5V at the source, and the GND lead provides a common ground reference between the upstream and downstream devices. The voltage drop across the VBUS and GND leads can also limit the maximum cable length.

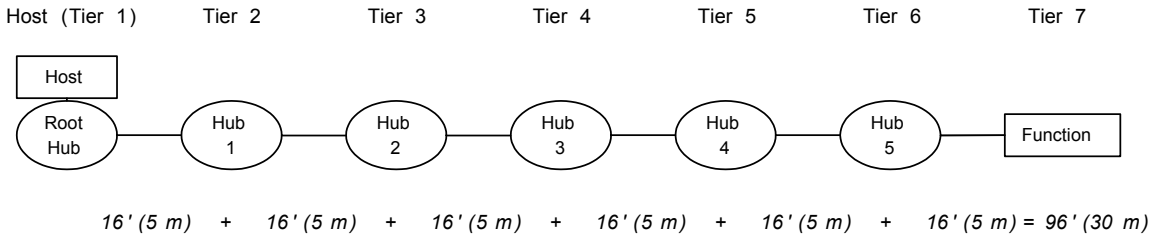
You can purchase or manufacture cables using commonly available wire that conforms to USB 2.0 specifications to a maximum length of approximately 16' (5 m).

Extending USB connections

In USB topology, the hub is the only device that you can use to link USB devices. The distance between hosts and devices, therefore, is limited by the maximum USB cable length allowed between devices and the maximum number of hubs allowed in a path.

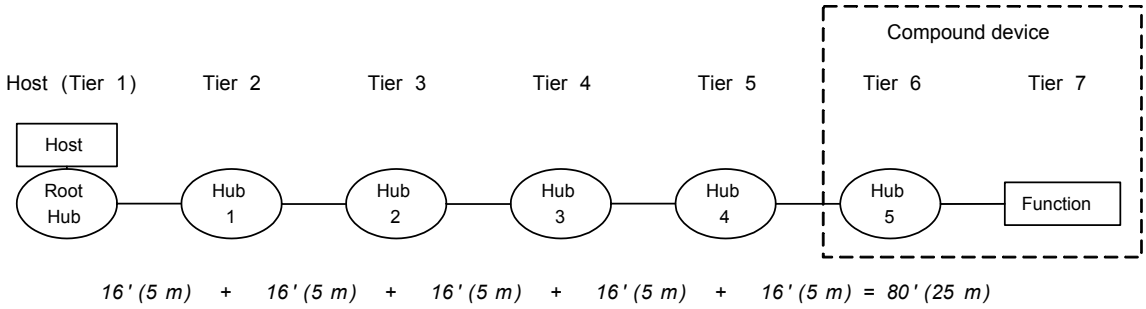
Basic USB connection

In the following diagram, you can see that if all USB hub connections use 16' (5 m) cables, the maximum distance between a host's root hub and a function is 6 × 16' (5 m) = 96' (30 m).



Compound device connection

In this diagram, you can see that connecting a compound device limits the maximum distance to 5 × 16' (5 m) = 80' (25 m).

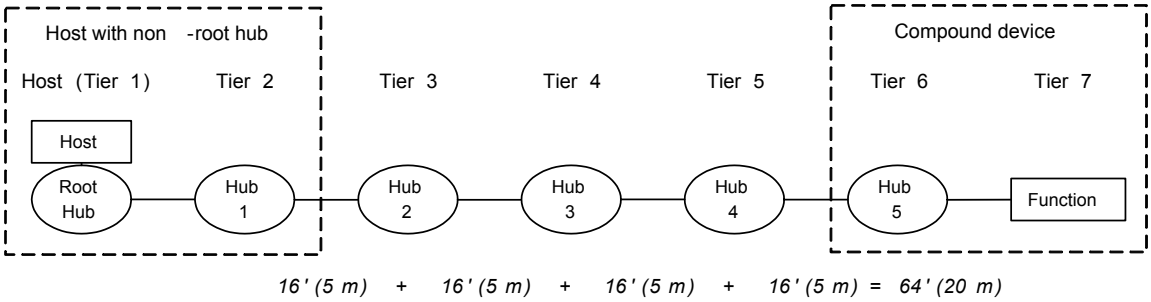


NOTE

SMART Board 800 series interactive whiteboard systems are compound devices.

Host with internal non-root hub and compound device connection

In this diagram, you can see that connecting a compound device and a host with an internal non-root hub further limits the maximum distance to 4 × 16' (5 m) = 64' (20 m).



Index

SMART Technologies

smarttech.com/support

smarttech.com/contactsupport