

USB On-The-Go

Mechanical Presentation



Feb 26, 2002

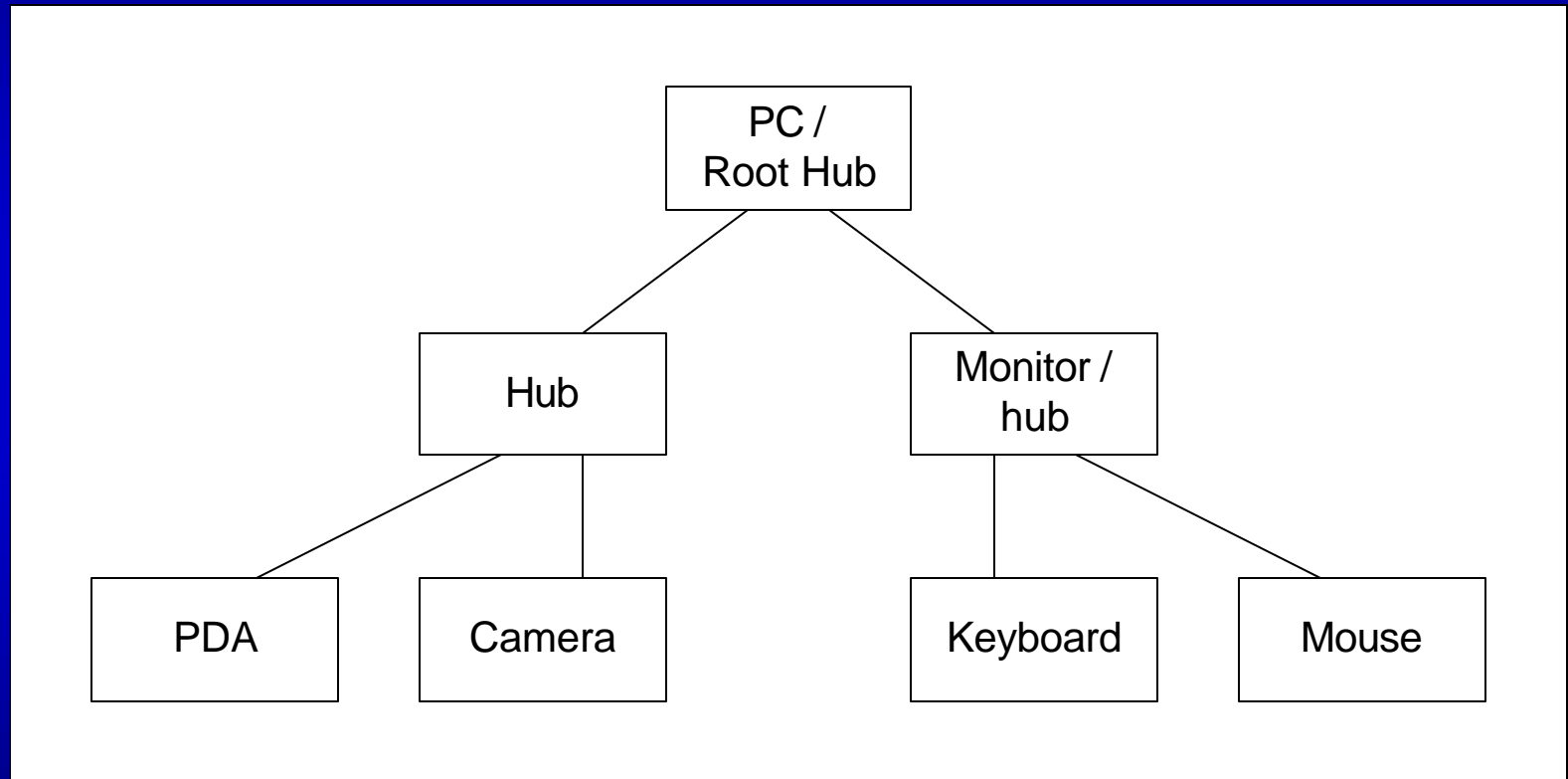
Agenda



- ◆ USB Topology
- ◆ Cables
- ◆ Adapters
- ◆ Connectors



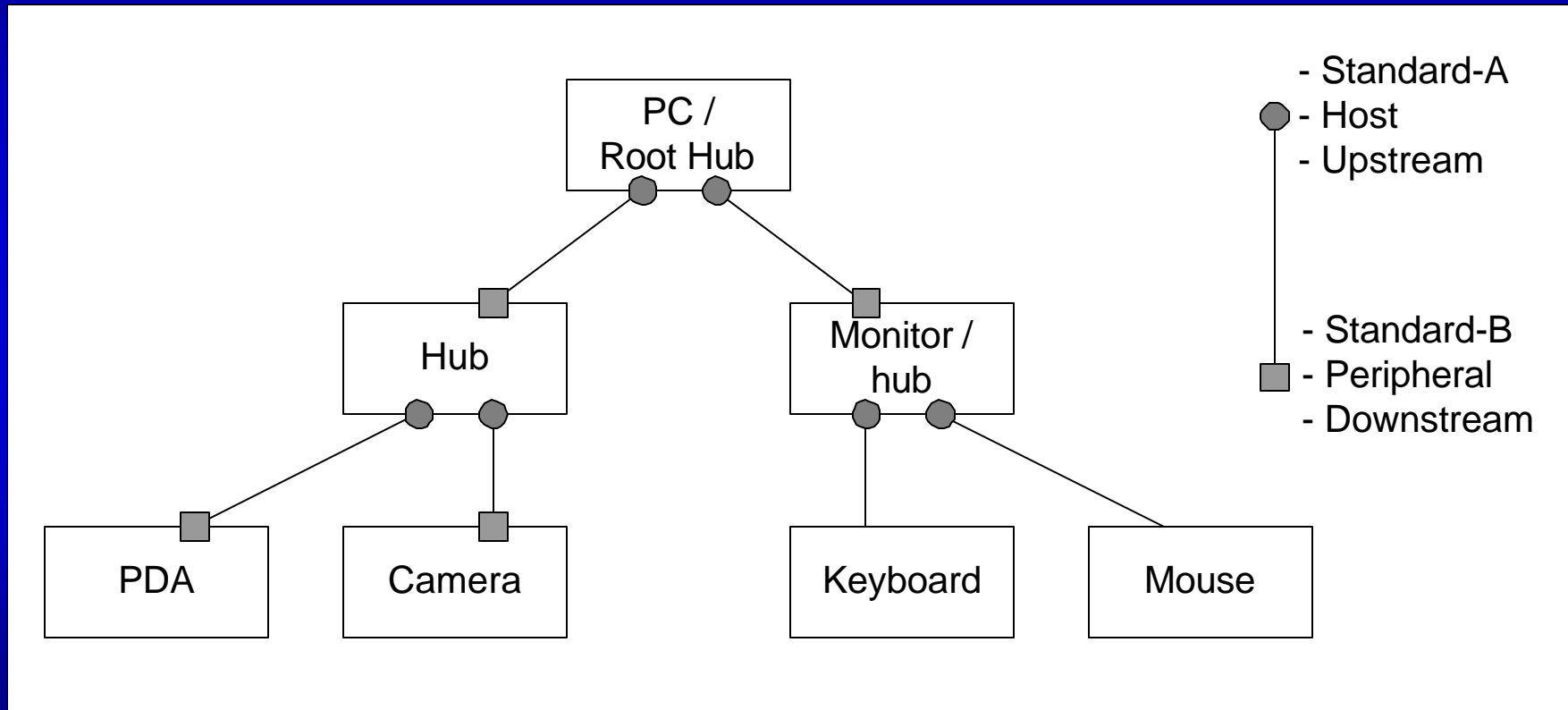
USB Topology - 1



- ◆ One host
- ◆ Multiple hubs and peripherals



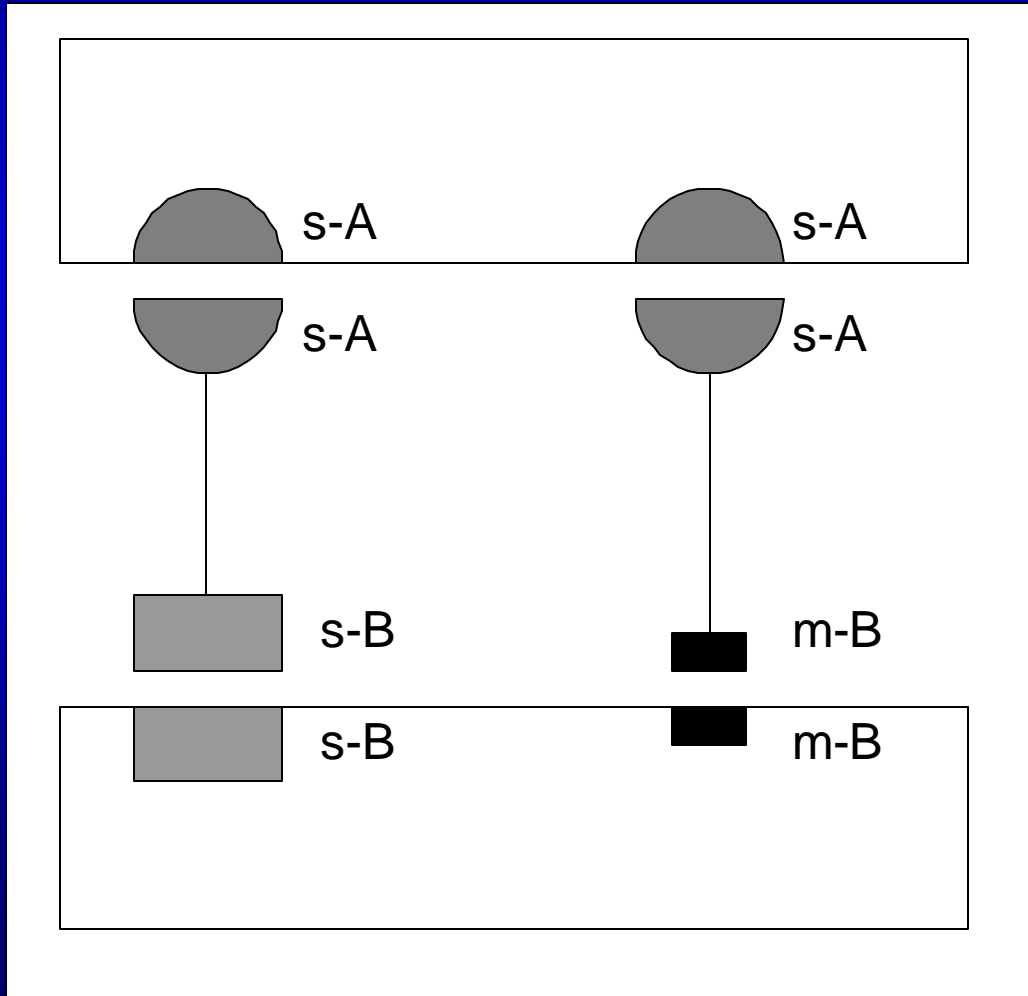
USB Topology - 2



- ◆ Cabling forces host to peripheral connection
- ◆ Can't connect PDA to camera



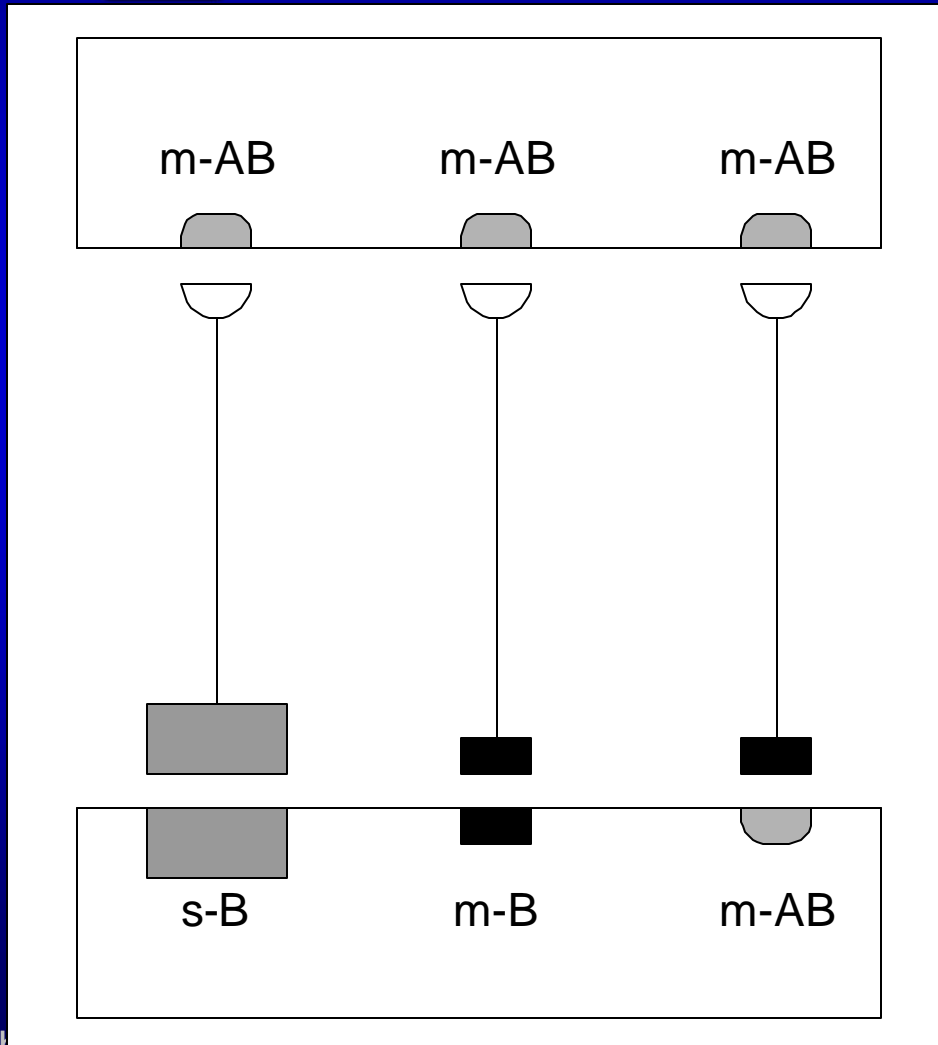
USB Cabling - 1



- ◆ Existing Cables
 - Std-A to Std-B
 - Std-A to Mini-B
- ◆ Mini-B added in Oct 2000 for smaller devices



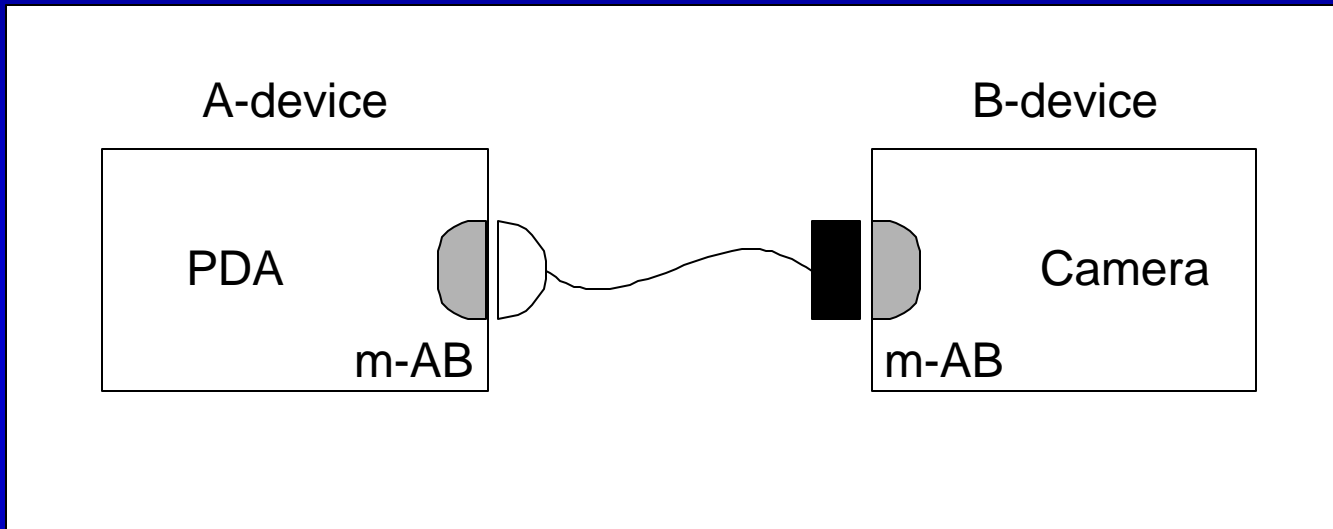
USB Cabling - 2



- ◆ OTG Cables
 - Added Dec 2001
 - Mini-A to Std-B
 - Mini-A to Mini-B
- ◆ Mini-AB receptacle
 - Accepts Mini-A plug
 - Accepts Mini-B plug
- ◆ Devices can't use Mini-A receptacle



Mini-AB Receptacle



- ◆ With Mini-AB, can connect PDA to camera
- ◆ A-device = device with Std-A or Mini-A plug
- ◆ B-device = device with Std-B or Mini-B plug

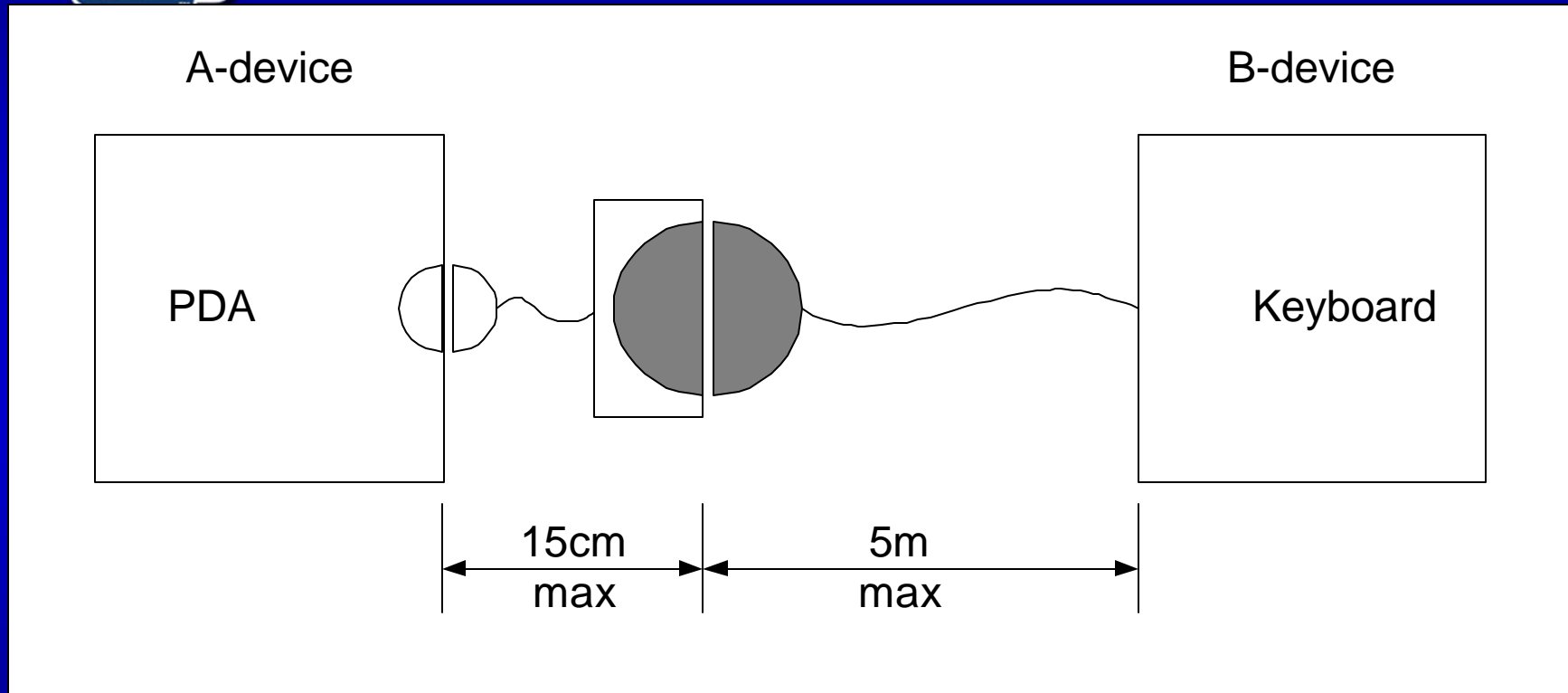


Cable Summary

- ◆ Four cables now specified
 - Std-A to Std-B 5m max
 - Std-A to Mini-B 5m max
 - Mini-A to Std-B 4.5m max
 - Mini-A to Mini-B 4.5m max

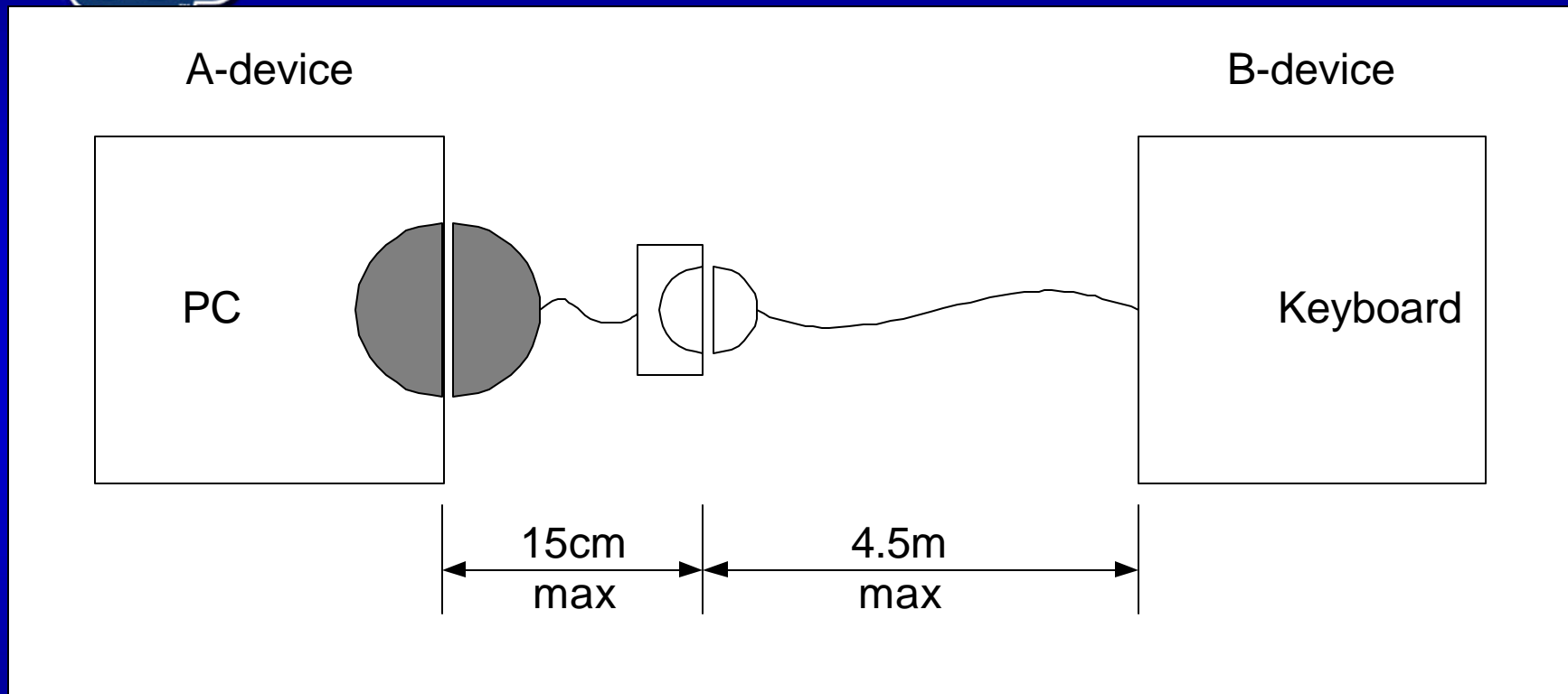
- ◆ Mini-A plug cables limited to 4.5m max
 - Longer lengths result in transmission delay failures when adding adapter

Adapters - 1



- ◆ Adapter: Mini-A plug to Std-A receptacle
- ◆ Purpose: Allow connection to captive cable devices
- ◆ Adapter can be used with non-captive cables

Adapters - 2



- ◆ Adapter: Std-A plug to Mini-A receptacle
- ◆ Purpose: Allow connection to captive cable devices
- ◆ Adapter can be used with non-captive cables



Adapters - 3

- ◆ Std-B and Mini-B adapters not allowed
 - Such an adapter will cause transmission delay failures

- ◆ Max adapter length = 15cm
 - Longer adapter will cause transmission delay failures
 - See OTG Supplement, Section 4.4

- ◆ Adapter is only legal use of Mini-A receptacle



Color Coding

- ◆ The following colors are mandated for the plastic inside the mini connectors

<u>Connector</u>	<u>Color</u>
◆ Mini-A receptacle	White
◆ Mini-AB receptacle	Gray
◆ Mini-B receptacle	Black
◆ Mini-A plug	White
◆ Mini-B plug	Black



Connector Features - 1

- ◆ 5-pin (one ID pin), 0.8mm pitch
- ◆ Smaller for portable devices
- ◆ Compliant with USB specifications
 - 500 mA power
 - 480 Mbps, high-speed



Connector Features - 2

- ◆ Increased cycle life
 - Mini: 5000 mate/unmate cycles
 - Standard: 1500 mate/unmate cycles
- ◆ Polarization features to prevent improper mating
- ◆ Shielding features for EMI protection



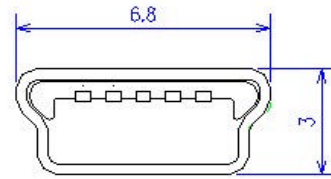
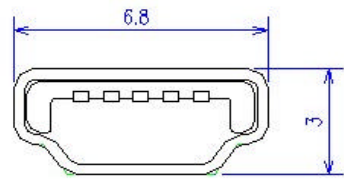
Mini USB Connector

Mini-A

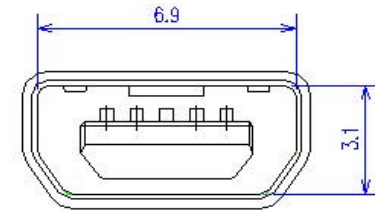
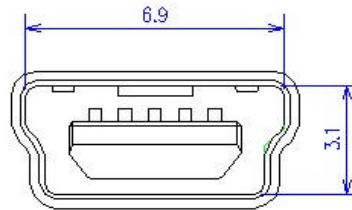
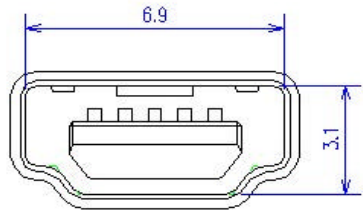
Mini-B

Mini-AB

Plug



Receptacle





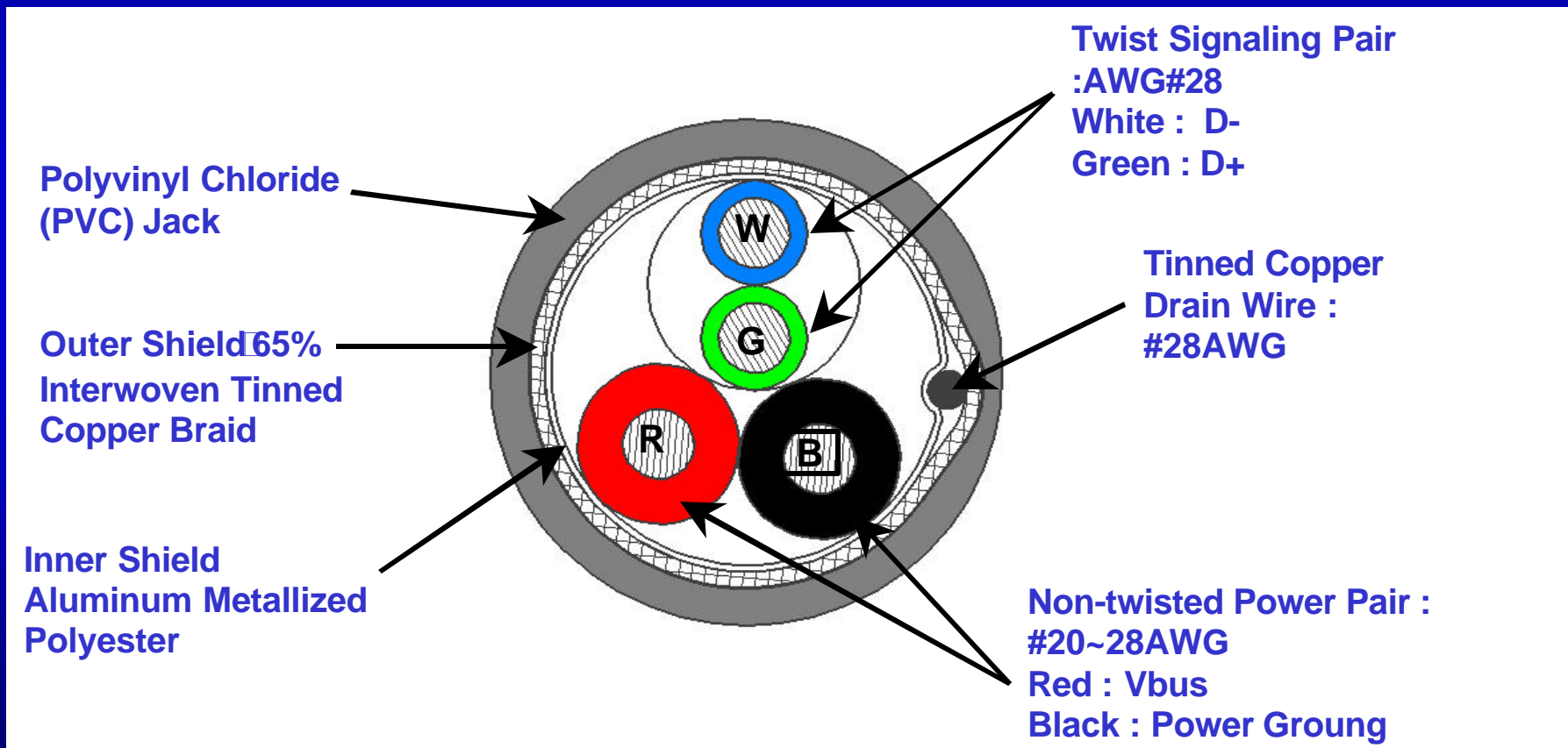
Wiring Assignment

Mini USB Connector - Assignment

<u>Contact Number</u>	<u>Signal Name</u>	<u>Typical Wiring Assignment</u>
1	VBus	Red
2	D-	White
3	D+	Green
4	ID	None
5	GND	Black
Shell	Shield	Drain Wire

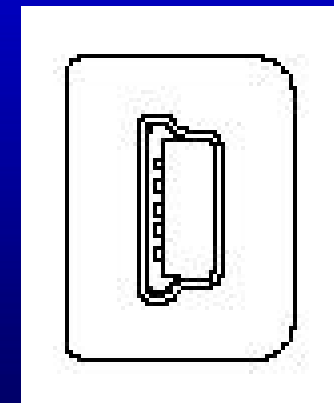
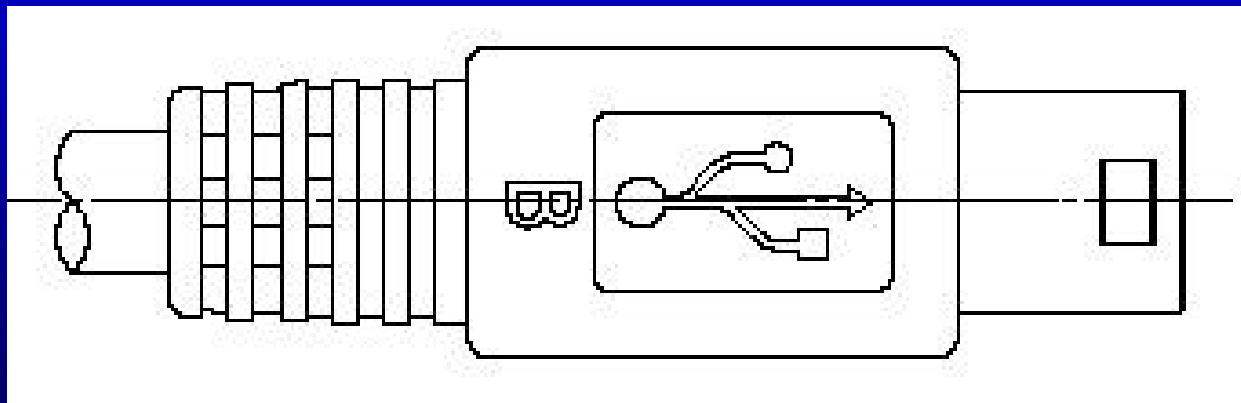
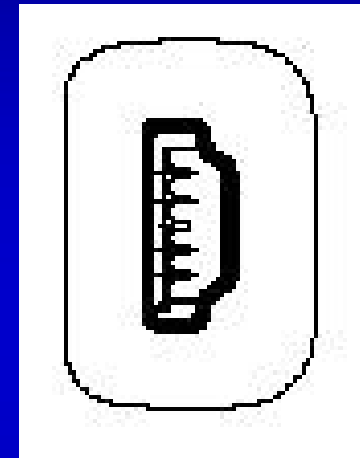
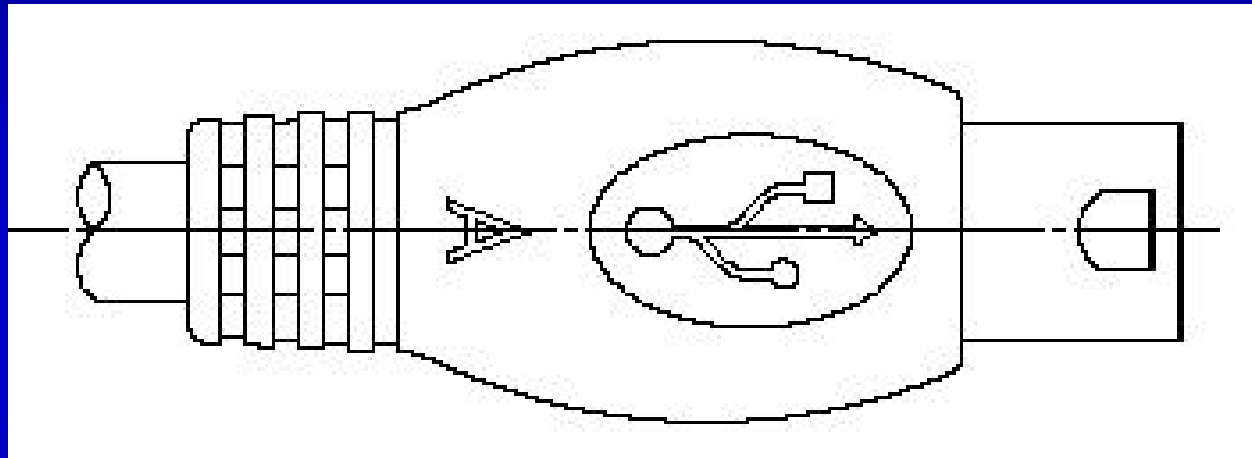


Cable Style Construction



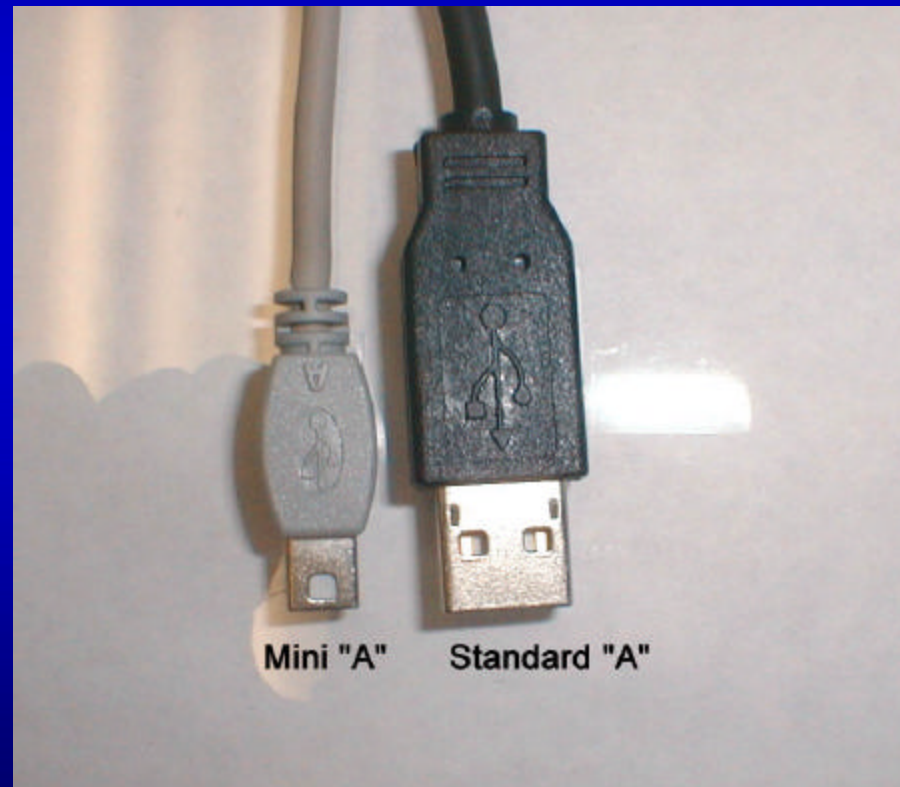


Mini-A and Mini-B Plugs





Standard-A & Mini-A



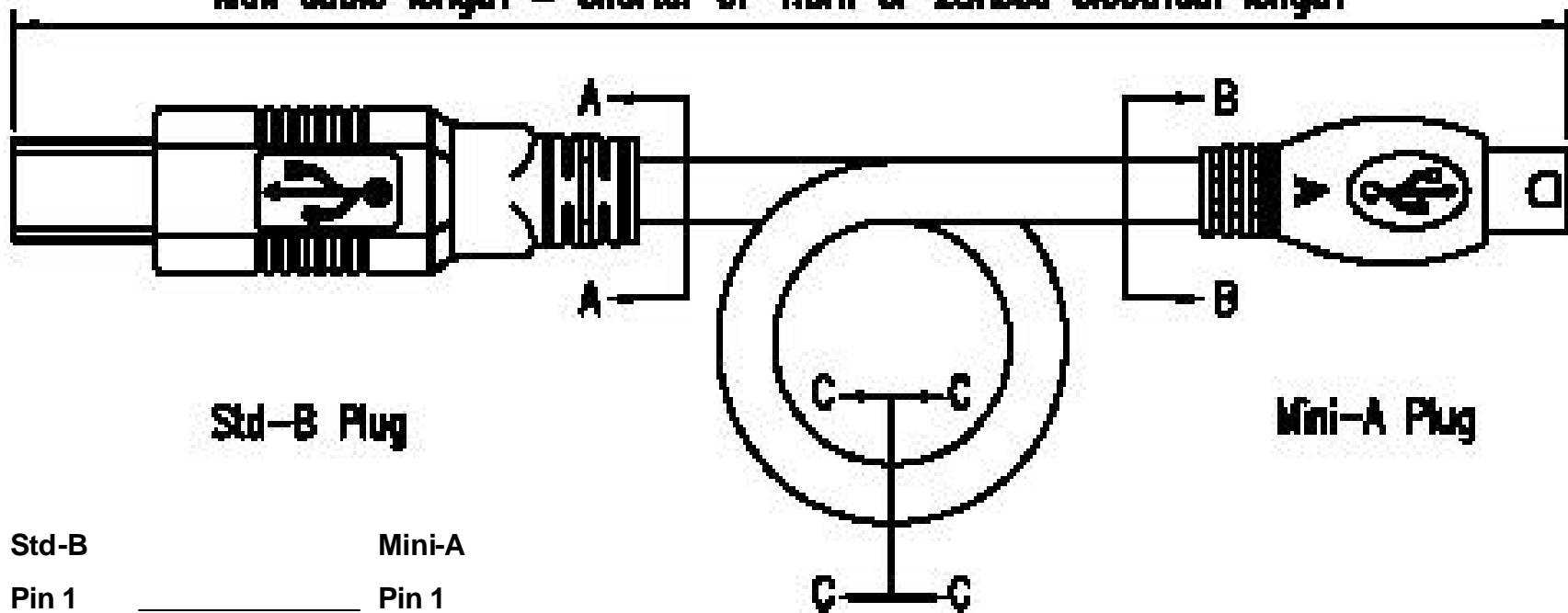
Mini "A"

Standard "A"



Standard-B to Mini-A

Max cable length = shorter of 4.5m or 25nsec electrical length



Std-B Plug

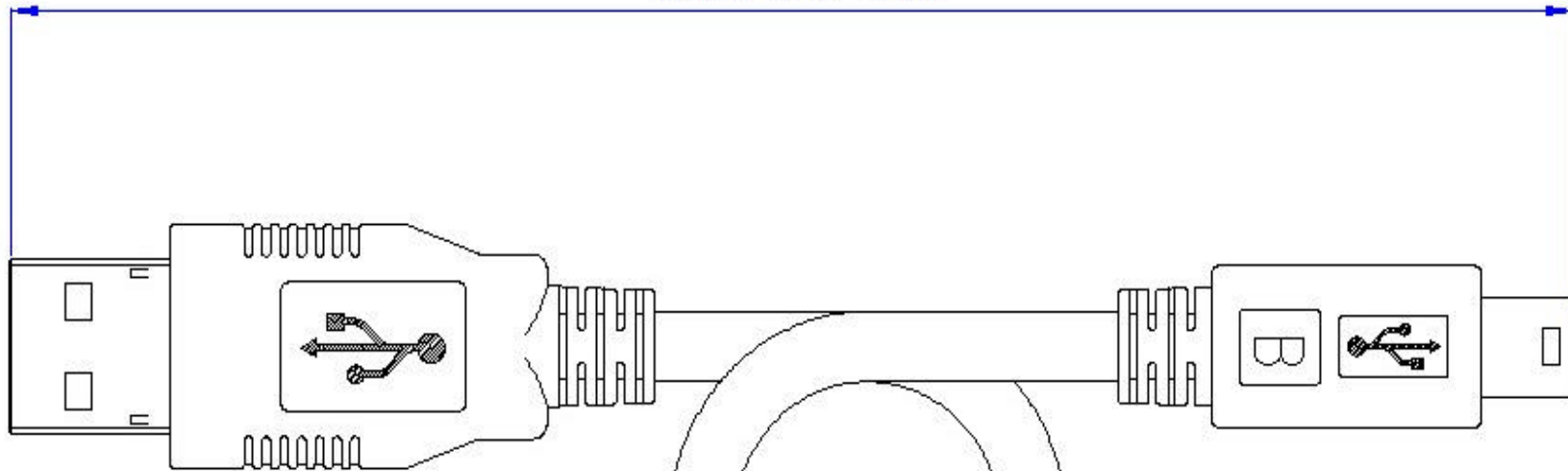
Mini-A Plug

Std-B		Mini-A
Pin 1	_____	Pin 1
Pin 2	_____	Pin 2
Pin 3	_____	Pin 3
		Pin 4
Pin 4	_____	Pin 5
Shell	_____	Shell



Standard-A to Mini-B

5,000 mm Max.

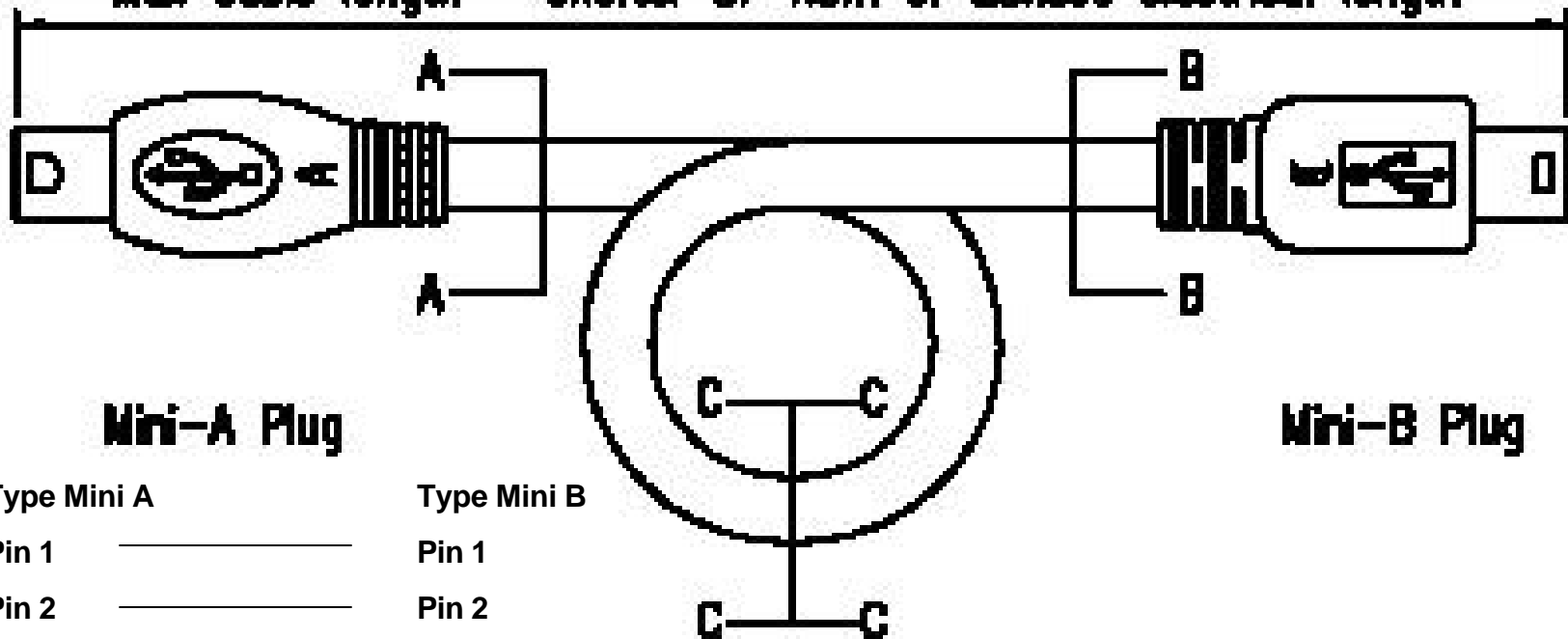


Std-A		Mini-B
Pin 1	—————	Pin 1
Pin 2	—————	Pin 2
Pin 3	—————	Pin 3
		Pin 4
Pin 4	—————	Pin 5
Shell	—————	Shell



Mini-A to Mini-B

Max cable length = shorter of 4.5m or 25nsec electrical length



Mini-A Plug

Type Mini A

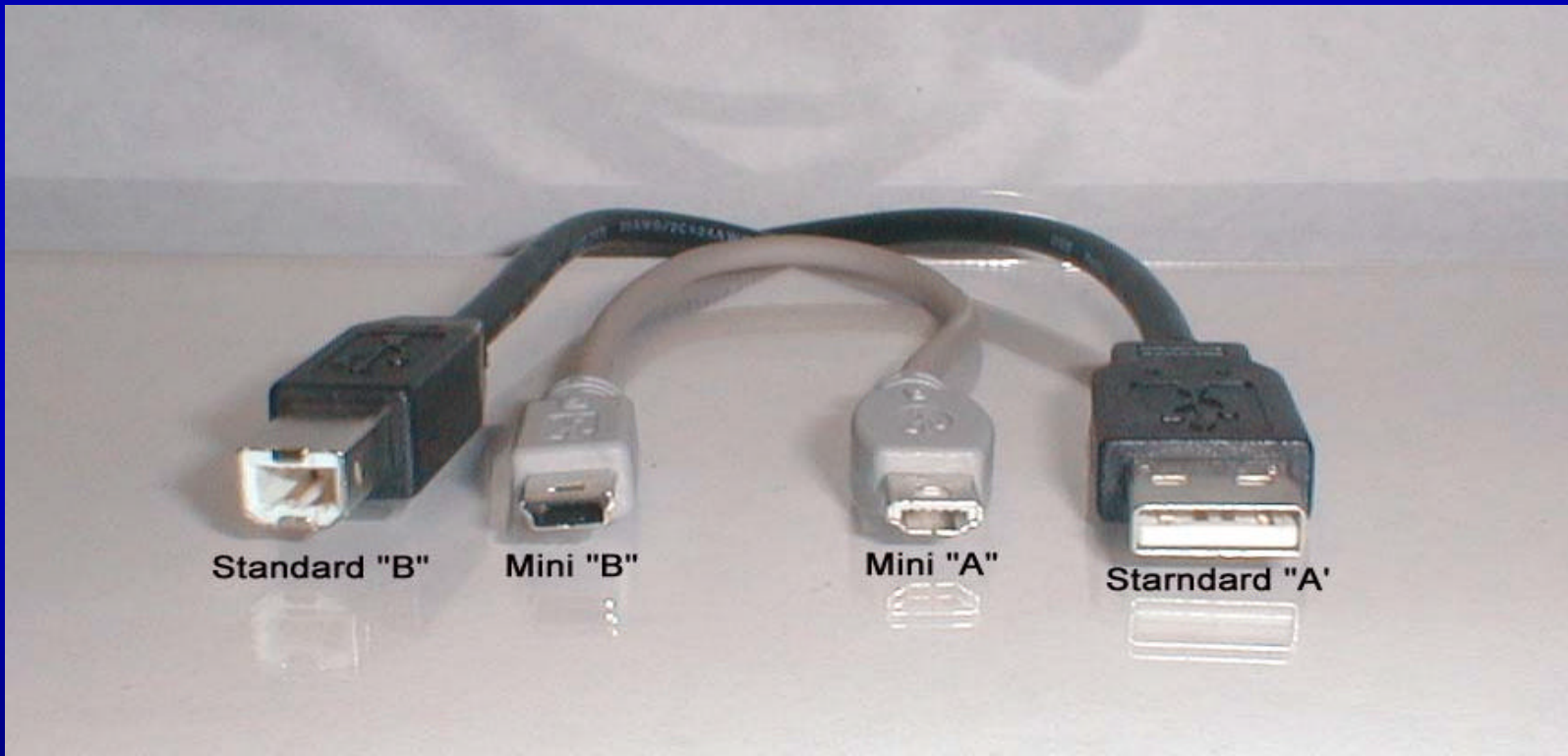
Pin 1	_____
Pin 2	_____
Pin 3	_____
Pin 4	┌_____
Pin 5	└_____
Shell	_____

Type Mini B

Pin 1	_____
Pin 2	_____
Pin 3	_____
Pin 4	_____
Pin 5	_____
Shell	_____

Mini-B Plug

Interface of Plugs



Standard "B"

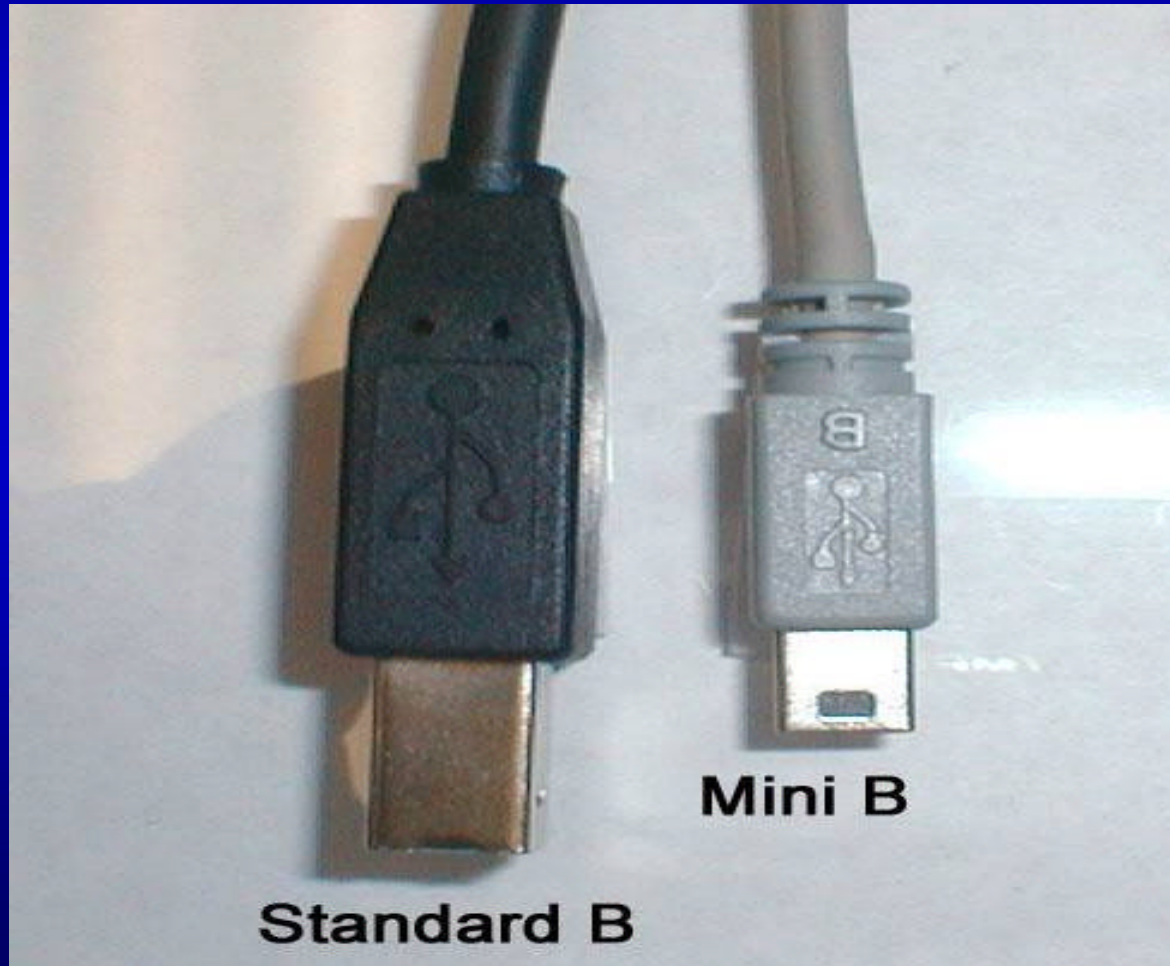
Mini "B"

Mini "A"

Standard "A"



Standard-B & Mini-B

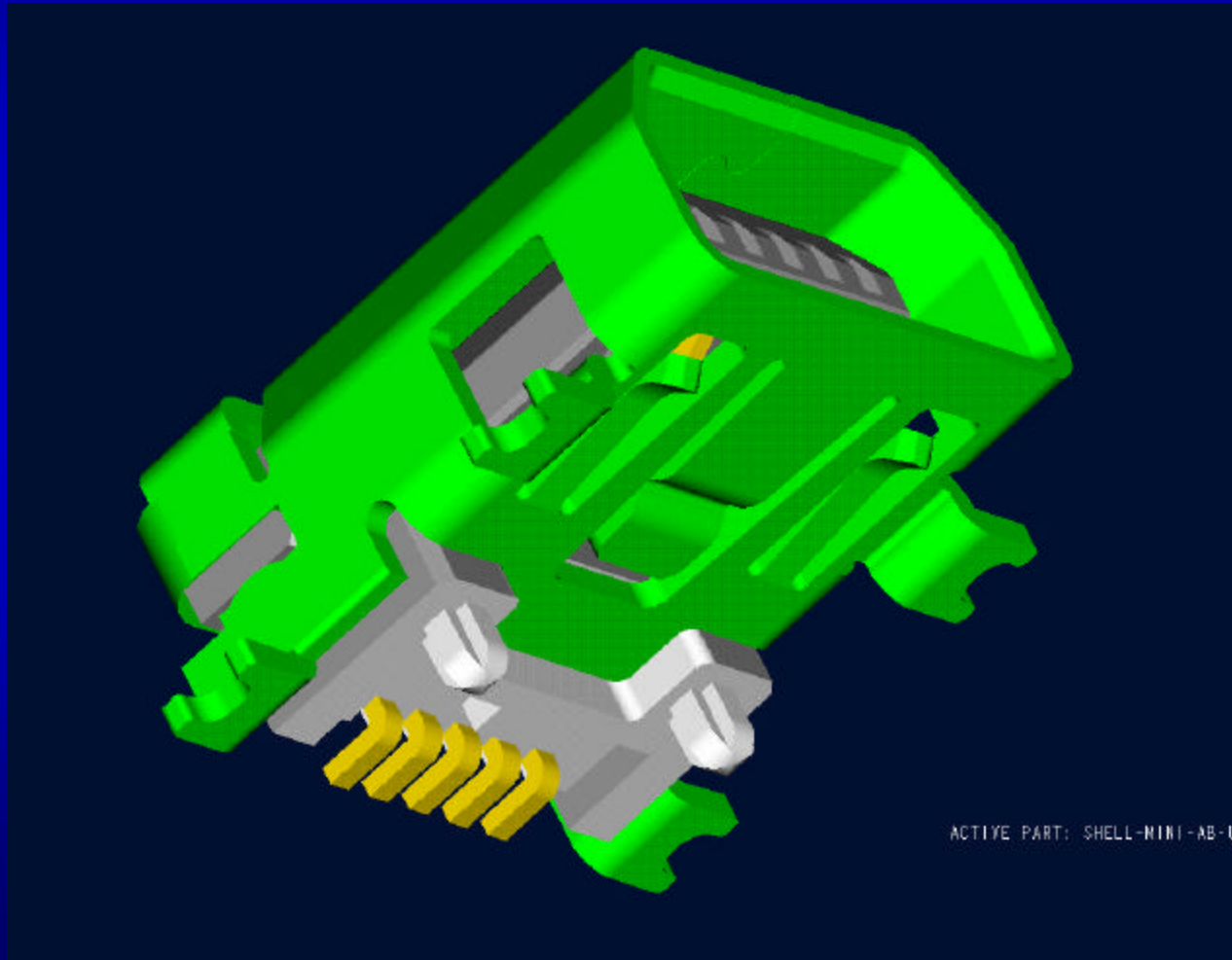


Standard B

Mini B



Upside Down Receptacle

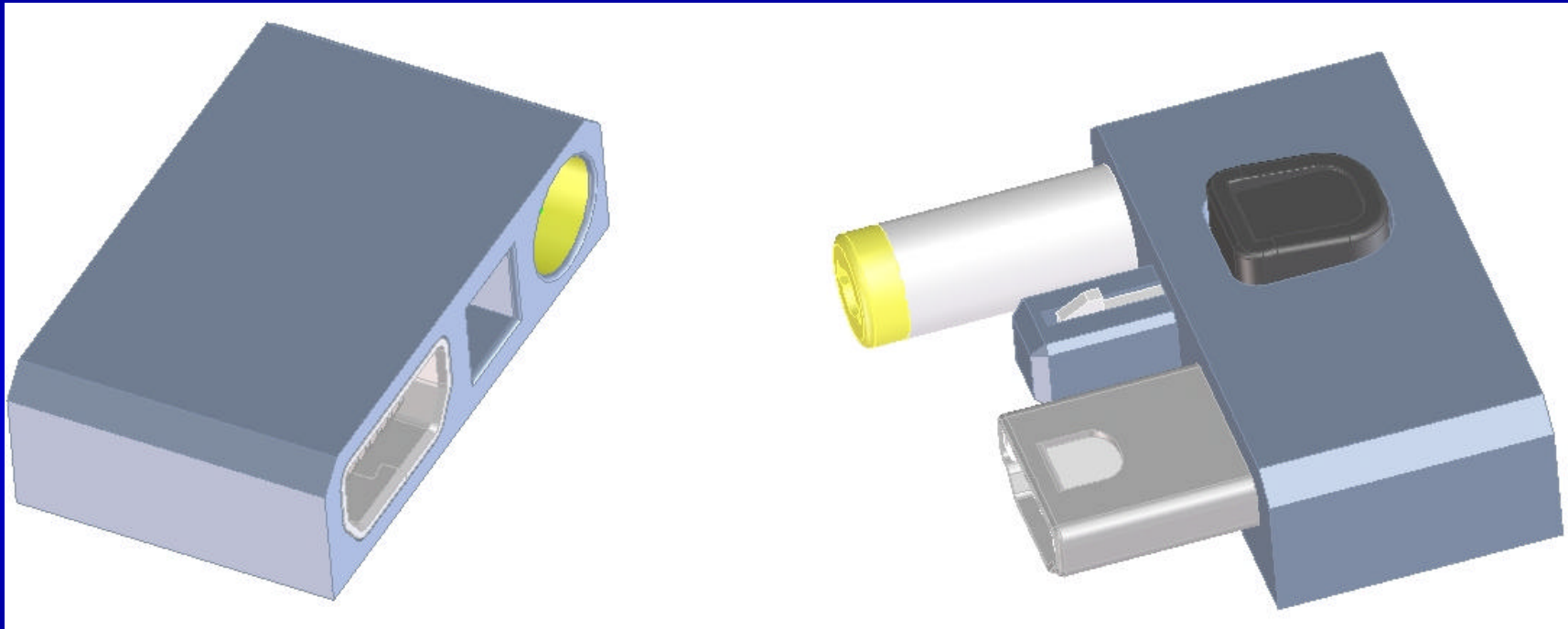


ACTIVE PART: SHELL-MINI-AB-UP

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Combo Connector



- ◆ Features - latching, power jack
- ◆ Possible application – cell phone

USB-IF Integrator's List



Listed Compliant Cable & Connectors
Approved by Certified Test Labs
Members Only Events