

Gold Suite Summary Test Procedure

The following procedures are used at USB sponsored compliance workshops and are tailored for the candidate gold-tree system.

Device Information

1. Locate device ID number in database. Verify database information matches [DUT] (vendor, model number)
2. Disconnect tree from [HubHS#1]
3. Run USBCV
4. Connect [Current Dongle] with [DUT] to [HubHS#1]
5. Run Device Framework test and select “Device Summary” test.
6. Enter the summary data about the [DUT] into the database
7. Examine [DUT] USB connector. Select OTG if appropriate

Device Framework (USBCV) Tests:

1. Disconnect tree from [HubHS#1]
2. Connect [Current Dongle] with [DUT] to [HubHS#1]
3. Run USBCV and select “Chapter 9 Tests”. Record result in database
4. If the [DUT] contains a Hub, then execute Hub tests and record the result
5. If supports HID class, run HID tests and record result
6. If OTG device, run USBCV OTG tests and record result
7. If [DUT] supports the Mass Storage Class, run USBCV MSC tests and record result
8. If [DUT] supports the USB Video Class, run USBCV UVC tests and record result
9. Obtain un-configured current
10. Obtain configured current

Test Attachment Points

Interoperability

1. **EHCI test:**
 - A. Connect the high-speed tree to [motherboard USB root port] through [HSHub#1] and connect the full-speed tree (USB Keyboard) to [motherboard USB root port]
 - B. Check operation of entire gold-tree
 - C. Examine and verify all connectors on [DUT]
 - D. If [DUT] is self-powered, attempt to enumerate [DUT] under bus-power
 - E. Plug the [DUT] in [HS#5]
 - F. Check operation of device
 - G. Interoperability Test:
 - H. Hot plug test:
 - I. Warm Boot test:
 - J. Remote Wake-up Tests:
 - K. S3 Active Standby Tests:
 - L. Root port test:
 - M. S4 Active Hibernate Test:
2. **UHCI Full-speed Operation Test:**
3. **OHCI Full-speed Operation Test:**
4. **Operating Current test**
5. **Suspend Current test**

Battery Powered Devices

Battery Test Procedures:

1. Attach the DUT to an average current draw test fixture
2. Select a known good device and attach it to a root port of an EHCI system
3. Using HSET, suspend the known good device.
4. Replace the known good device with the with the average current draw test fixture that has the DUT attached.
5. Ensure that VBus is valid on the suspended port.
6. The measured current must not exceed ICCINIT (100mA) while attached to a suspended port.
7. Attempt to power-on the DUT and measure current drawn.

Topology Chart

Gold-tree Device List

Gold Suite Detail Test Procedure

Device Information

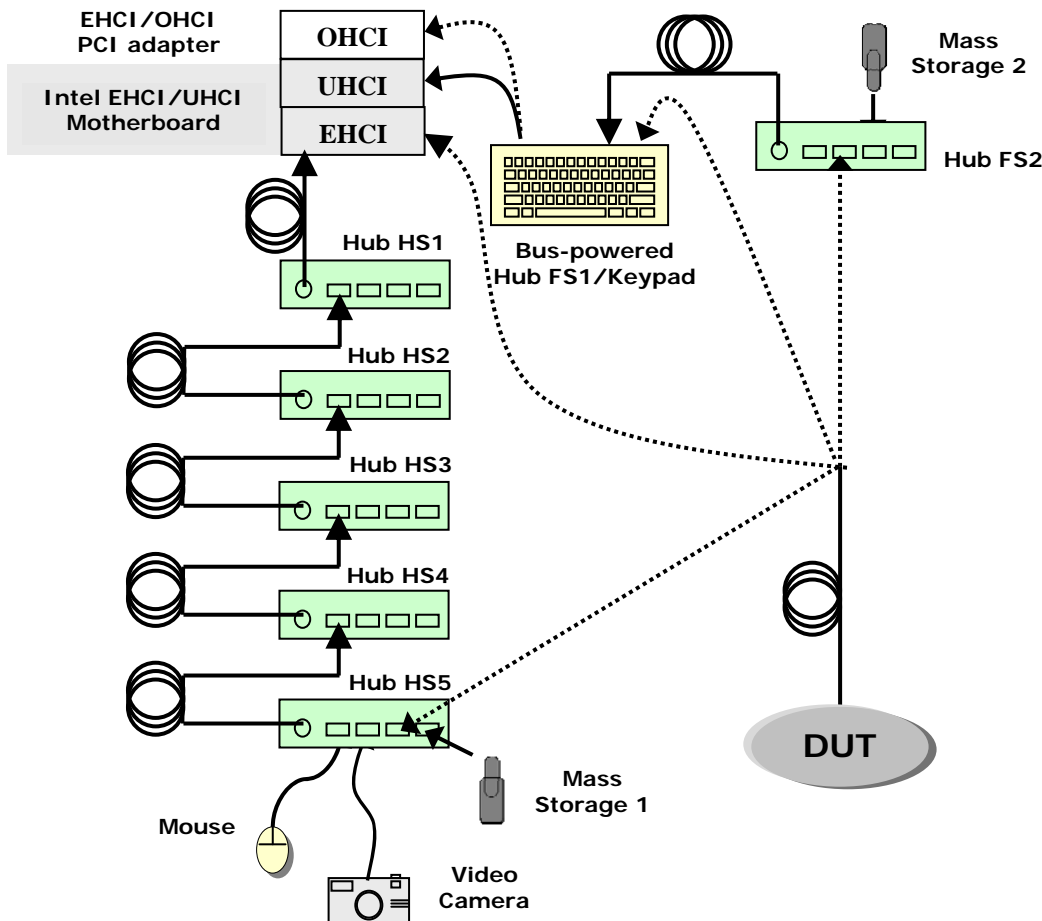
1. Locate device ID number in database. Verify database information matches [DUT] (vendor, model number)
2. Disconnect tree from [HubHS#1]
 - i. Connect [HubHS#1] to [Onboard System Port]
 - ii. Connect [DUT] to [Current Dongle]
3. Run USBCV
4. Connect [Current Dongle] with [DUT] to [HubHS#1]
5. Run Device Framework test and select “Device Summary” test.
6. Enter the summary data about the [DUT] into the database
 - i. Record the [DUT] VID and PID
 - ii. Enter the operating speed
 - iii. Enter MaxPower value
 - iv. Record whether the device is tested self- or bus-powered in “Power Source”
 - v. Check if the [DUT] has a battery
 - vi. Check if remote wakeup is supported
 - vii. Enter the number of Interfaces
 - viii. Record if the [DUT] is compound in “Peripheral Type”
7. Examine [DUT] USB connector. Select OTG if appropriate

Device Framework (USBCV) Tests:

USBCV is to be executed at *each* supported speed and against each embedded USB peripheral of compound devices. Record worst case result and note speed in comments box

1. Disconnect tree from [HubHS#1]
 - i. Connect [HubHS#1] to [Onboard System Port]
 - ii. Connect [DUT] to [Current Dongle]
 - iii. Run USBCV
2. Connect [Current Dongle] with [DUT] to [HubHS#1]
3. Run USBCV and select “Chapter 9 Tests”. Record result in database
4. If the [DUT] contains a Hub, then execute Hub tests and record the result
5. If supports HID class, run HID tests and record result
6. If OTG device, run USBCV OTG tests and record result
7. If [DUT] supports the Mass Storage Class, run USBCV MSC tests and record result
8. If [DUT] supports the USB Video Class, run USBCV UVC tests and record result
9. Obtain un-configured current
 - i. If the [DUT] is self-powered, test again under bus power. Pull the power plug from the device.
10. Obtain configured current
 - i. If the [DUT] is self-powered, test again under bus power. Pull the power plug from the device.

Test Attachment Points



Interoperability

It is necessary to have the following registry entry in order to enable S3 remote wakeup via USB.
 HKLM\SYSTEM\CurrentControlSet\Services\usb\USBBIOSx=DWORD:00000000

1. EHCI test:

- A. Connect the high-speed tree to [motherboard USB root port] through [HSHub#1] and connect the full-speed tree (USB Keyboard) to [motherboard USB root port]
- B. Check operation of entire gold-tree
- C. Examine and verify all connectors on [DUT]
 - i. Ensure USB connectors are not proprietary (extra pins, unusual shape, etc.)
 - ii. Verify all non-USB receptacles do not accept a standard, mini and micro USB plugs
 - iii. Verify all non-USB plugs do not insert into standard, mini and micro USB receptacles
 - iv. Each and every USB connection must be tested
- D. If [DUT] is self-powered, attempt to enumerate [DUT] under bus-power
 - i. **If enumeration occurs under bus-power, the device must be tested, henceforth, as bus-powered.** Otherwise, test the device under its self-powered mode.

- E.** Plug the [DUT] in [HS#5]
 - i.** DO NOT PRELOAD VENDOR'S SOFTWARE OR DRIVER
 - ii.** If OS does not possess a native driver, follow OS instructions
 - 1. If driver still does not load – install software as directed by vendor
 - 2. If driver loads – PASS with waiver but strongly recommend the driver load via .INF file
- F.** Check operation of device
- G.** Interoperability Test:
 - i.** Operate all devices simultaneously
 - 1. Operate [DUT]
 - 2. Transfer a large file between the Mass Storage Drive 1 and Mass Storage Drive 2
 - 3. View live video from the USB camera
 - 4. Strike keys on the USB keyboard
 - 5. Move mouse
 - 6. Hot plug the mouse
- H.** Hot plug test:
 - i.** Stop operation of [DUT]
 - ii.** Disconnect and re-connect [DUT]
 - iii.** Check operation of all USB devices including [DUT]
- I.** Warm Boot test:
 - i.** Stop operation of all devices
 - ii.** Start→Turn Off Computer→Restart
 - iii.** Check operation of all USB devices including [DUT]
- J.** Remote Wake-up Tests:
 - i.** If the [DUT] supports remote wake-up, enable the [DUT] to wake the system; otherwise, go to step K - S3 Active Standby Tests
 - ii.** Place the system in standby (wait 5 – 10 seconds after monitor is dark)
 - iii.** Use the device under test to wake the system
 - iv.** Check operation of all USB devices including [DUT]
- K.** S3 Active Standby Tests:
 - i.** Disable remote wake-up on all USB devices, including DUT
 - ii.** Operate the [DUT] while placing the system in standby (wait 5 – 10 seconds after monitor is dark)
 - iii.** Wake the system
 - iv.** Check operation of all USB devices including [DUT]
- L.** Root port test:
 - i.** Stop operation of [DUT]
 - ii.** Plug [DUT] into a root port of the system's motherboard
 - iii.** Check operation of all USB devices including [DUT]
- M.** S4 Active Hibernate Test:
 - i.** Stop operation of all devices
 - ii.** Plug DUT into a root port of the system's motherboard
 - iii.** Operate the [DUT] while the system enters hibernation (wait 5 – 10 seconds after monitor is dark)
 - iv.** Turn-on the system
 - v.** Check operation of all USB devices including [DUT]

2. UHCI Full-speed Operation Test:

- i. Stop operation of [DUT]
- ii. Attach [DUT] to the Keyboard [HubFS#1];
High-power [DUT's] must enumerate without an overcurrent error -- A "bus power exceeded message" is expected and acceptable.
- iii. Move high-power [DUT] to self-powered [HubFS#2]
- iv. Check operation of all USB devices including [DUT]

3. OHCI Full-speed Operation Test:

- i. Stop operation of all devices
- ii. Connect the Keyboard [Hub#FS1] test tree to a root port on the [PCI Card Port]
- iii. Check operation of all USB devices including [DUT]

4. Operating Current test

- i. Connect [DUT] to [Current Dongle]
- ii. Connect [Current Dongle] to [HubHS#1]
- iii. Connect [HubHS#1] to [Onboard System Port]
- iv. Measure operating current [device is operating during measurement] and record as Operating Current in Power Measurement section

5. Suspend Current test

- i. Enable [DUT] as wake device, if supported
- ii. Connect [DUT] to [Current Dongle]
- iii. Connect [Current Dongle] to [HubHS#1]
- iv. Connect [HubHS#1] to [Onboard System Port]
- v. Place the system in standby
- vi. Measure the current and record as Suspend Current in Power Measurement section [2500uA (2.5mA) maximum allowed for all devices]

Battery Powered Devices

1. All battery powered devices must test with a dead battery. A dead battery is defined by a device that is unable to successfully power on when not attached to an external power supply (such as USB or an AC adapter).
2. Once the device has asserted its pull-up, it must fully comply with the USB 2.0 Specification.
3. When unconfigured, the upstream port must never consume more than ICCINIT (100mA)
4. When configured, the upstream port must never consume more current than its active bMaxPower value. If current draw exceeds 100mA, the device must report itself as bus-powered during enumeration.
5. If a peripheral is unable to connect (assert its pull-up) due to a dead battery, it must never consume more than ICCINIT (100mA) including when attached to a suspended downstream port.
6. If a peripheral is able to connect (assert its pull-up) with a dead battery, it must fully abide by the USB 2.0 Specification and the USB-IF Compliance Program rules in regards to power draw.
7. The peripheral must pass Inrush tests with a dead battery.
8. If the peripheral is not able to charge its batteries from USB with a dead battery, then the battery is permitted to be charged to the point where it is able to power on using its battery. The peripheral is permitted to be tested from a low battery state, but with the peripheral turned off.
9. If the peripheral is not able to charge its batteries from USB with a low battery while in an off state, then the peripheral is permitted to be tested with a low battery while turned on.
10. A device that uses USB to charge its batteries must enumerate as a USB device on the host system.

Battery Test Procedures:

Suspend: The average suspend current draw test is performed by attaching the device with a dead battery to an already suspended downstream port that has VBus powered.

1. Attach the DUT to an average current draw test fixture
2. Select a known good device and attach it to a root port of an EHCI system
3. Using HSET, suspend the known good device.
4. Replace the known good device with the with the average current draw test fixture that has the DUT attached.
5. Ensure that VBus is valid on the suspended port.
6. The measured current must not exceed ICCINIT (100mA) while attached to a suspended port.
7. Attempt to power-on the DUT and measure current drawn.

Gold-tree Device List

Item	Description/Model	TID	Qty
USB Host System	Intel D945GCZ motherboard , Pentium D, 1GB RAM, CD/DVD Drive		1
EHCI/OHCI PCI Based Adapter	Adaptec, model AUA – 4000 PCI adapter (NEC host controller μ PD720101, TID:80000026)	51000237	1
	OR ADS Tech USB Turbo 2.0, model USBX-2000 (NEC host controller μ PD720101, TID:80000026)	53000205	
HS Hub (Self-powered)	Belkin F5U233 (SMSC hub controller USB2504, TID:30000553)	20000008	5
FS Hub (bus-powered) with integrated USB Keyboard	Targus Numeric Keypad with 2-port Hub, model PAUK10U	10004001	1
USB mouse	Microsoft Basic Optical Mouse	10001150	1
HS Mass Storage Drive 2	Memorex TravelDrive model 32509051	11000412	1
HS Mass Storage Drive 1	SanDisk Cruzer Micro model SDCZ4-512	10002185	1
Video/Audio Camera	Logitech QuickCam Ultra Vision, P/N 961471-0403	10000363	1
average current draw test jig	[test fixture acquired through USB-IF]		1
one meter (or shorter) USB cables	any listed on USB-IF Cables and Connectors Integrators List		1
five meter USB cables	any listed on USB-IF Cables and Connectors Integrators List		8

Notes:

Devices that are both self-powered and bus-powered must be tested using bus-power.

Self-powered devices should have a test run to see if they can operate on bus power. If the self-powered device can run on bus power, then that is the configuration it must be tested.

Hubs:

When testing hubs, attach them to the highest operational tier level. Typically, that will be tier level 4. If the HUT contains an embedded hub, then attach to tier level 3. Move gold tree devices to any exposed downstream ports on the HUT.

Hubs with no embedded devices:

- Run USBCV chap 9 and 11 on the hub
- Run interoperability with gold device(s) attached.

Hubs with embedded devices (compound):

- Run USBCV on the hub and each embedded device
- Run interoperability run on all embedded devices

Isochronous Devices:

- High-speed isochronous DUTs are simply added to the tree. They do not replace the video camera.