Errata for "On-The-Go and Embedded Host Supplement to the USB Revision 2.0 Specification, Revision 2.0, June 4, 2010", as of July 14, 2011

Chapter 1

Document references outdated

Background: The supplement explicitly refers to a particular .zip package of USB 2.0 when it should refer the latest errata and ECNs. Battery Charging 1.2 is the latest version. The Compliance plan will now be OTG&EH compliance plan version 1.0

Changes to section 1.2:

Replace the references:

[Micro-USB1.01]	*Universal Serial Bus Micro-USB Cables and Connectors Supplement to the USB 2.0 Specification,* revision 1.01.
[USB2.0]	*Universal Serial Bus R*evision 2.0 Specification including ECNs and errata as listed in the "usb_20_040908.zip". document package.
[USBBattery1.1]	*USB Battery Charging Specification, revision 1.1*.
[BC, OTG and EH Compliance2.0]	*USB Battery Charging, OTG and EH Compliance Plan, revision 2.0*

With the following:

[Micro-USB1.01]	Universal Serial Bus Micro-USB Cables and Connectors Supplement to the USB 2.0 Specification, revision 1.01.
[USB2.0]	Universal Serial Bus Revision 2.0 Specification including ECNs and errata.
[USBBattery1.2]	USB Battery Charging Specification, revision 1.2.
[OTG and EH Compliance1.0]	OTG and EH Compliance Plan, revision 1.0

Replace all references in the supplement to [USBBattery1.1] with references to [USBBattery1.2].

Replace all references in the document to [BC, OTG and EH Compliance2.0] with references to [OTG and EH Compliance1.0].

Add definition of A-host, B-host, A-peripheral, B-peripheral, B-port, and Pre-Session Calibration

Background: The supplement uses the terms A-host, B-host, A-peripheral, B-peripheral B-port and pre-session calibration but these terms are not defined.

Changes to section 1.3:

Add the following definitions:

A-host	A-device acting in host role
B-host	B-device acting in host role
A-peripheral	A-device acting in peripheral role
B-peripheral	B-device acting in peripheral role
B-port	USB port with a B plug inserted into its receptacle. This port acts as a B-device.
Pre-Session Calibration	ADP probe measurement taken when a pre-session measurement is not available. In this case, a measurement is taken, and a new session is initiated (or requested) to determine whether a remote device is attached.

Chapter 2

The term PC is used where standard Host should be used

Background: The supplement uses the term PC to refer to standard Hosts.

Changes to section 2.2:

Replace the section:

In this case, one device is an OTG device, and the other is a PC or Embedded Host. The OTG device meets all of the requirements of a standard USB peripheral. When the OTG device is attached to the PC or Embedded Host, the host queries the OTG device and treats it like a peripheral.

With the following:

In this case, one device is an OTG device, and the other is a standard Host or Embedded Host. The OTG device meets all of the requirements of a standard USB peripheral. When the OTG device is attached to the standard Host or Embedded Host, the host queries the OTG device and treats it like a peripheral.

Text is unclear in which devices are being configured

Background: Text for a Targeted Host configuring a B-device is unclear.

Changes to section 2.3:

Replace the section:

In this case, one device is a Targeted Host (OTG device or EH), while the other is a peripheral-only B-device. When the Targeted Host detects that a device is attached, the host responds by querying it. If the Targeted Host supports the peripheral-only B-device, it will make the peripheral-only B-device available to applications running on the host. When applications on the Targeted Host wish to use the peripheral-only B-device it will be taken into use.

With the following:

In this case, one device is a Targeted Host (OTG device or EH), while the other is a peripheral-only B-device. When the Targeted Host detects that a peripheral-only B-device is attached, the Targeted Host responds by querying the peripheral-only B-device. If the Targeted Host supports the peripheral-only B-device, it will make the peripheral-only B-device available to applications running on the host. When applications on the Targeted Host wish to use the peripheral-only B-device it will be taken into use.

Chapter 3

Clarify which products can use suspend

Background: Text is intended to indicate that EH and OTG-devices can use suspend mechanisms but does not mention anything about peripheral-only B-devices.

Changes to section 3.3.4:

Replace the 1st Paragraph first sentence:

An Embedded Host, OTG A-host or OTG B-peripheral may use the [USB2.0] mechanisms of suspend, resume and remote wakeup, including LPM, for power mangement.

With the following:

An Embedded Host, OTG A-host, OTG B-peripheral or peripheral-only B-device may use the [USB2.0] mechanisms of suspend, resume and remote wakeup, including LPM, for power management.

Clarify issues relating to supported products not on the TPL

Background: Intention of text is to ensure that Targeted Hosts do not report as unsupported products which are supported and operate correctly.

Changes to section 3.4.1:

Replace the 1st Paragraph last sentence:

When a supported peripheral, not declared on the TPL, connects to an OTG device this shall not be reported as a failure.

With the following:

A product which is not declared on the TPL, but which is otherwise supported by the Targeted Host (e.g. by class), shall not be reported to the user as an unsupported device.

Clarify non-support of OTG devices when HNP is not supported as a B-device

Background: Intention of text is to ensure that OTG devices which do not support HNP as a B-device ensure symmetry by not enumerating other OTG devices.

Changes to section 3.4.2:

Replace the 1st Paragraph 2nd to last sentence:

If an OTG device does not support HNP as B-device, it must not take in use any HNP capable device, including those which would otherwise be supported by class.

With the following:

If an OTG-device does not support HNP as a B-device, in this case when the OTG device is an A-device it is not allowed to support any OTG device in order to maintain symmetry.

Chapter 4

Clarify that IA_VBUS_RATED should be higher than 8mA

Background: The minimum value of $I_{A\_VBUS\_RATED}$ is 8mA however the value used in practice should be much higher. A footnote should be added to indicate this.

Changes to section 4.4, Table 4-1:

Add the following footnote to the 8mA minimum value of IA_VBUS_OUT:

8mA is the minimum value sufficient to signal the presence of V_{BUS}. Practical implementations are likely to need a select a value of $I_{A\_VBUS\_RATED}$ much higher than this minimum value. Note: at least 100mA is allowed to be drawn by an unconfigured [USB2.0] peripheral.

Clarify issues relating to VBUS becoming invalid on overcurrent

Background: Text needs to be amended to make clear that VBUS shall be turned off and a message presented to the user only when it becomes invalid, not just when more than IA_VBUS_RATED is drawn.

Changes to section 4.2.2:

Replace the 3rd Paragraph:

If an attached B-device draws more current than $I_{A\_VBUS\_RATED}$ after $T_{A\_VBUS\_RISE}$, then V_{BUS} may become invalid. The A-device shall turn off V_{BUS} and indicate to the user that the B-device is not supported.

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With the following:

If an attached B-device draws more current than $I_{A\_VBUS\_RATED}$ after $T_{A\_VBUS\_RISE}$, then V_{BUS} may become invalid due to an overcurrent condition. If an overcurrent condition occurs then the A-device shall turn off V_{BUS} and indicate to the user that the B-device is not supported.

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Chapter 5

Add clarification in the event of SRP failure

Background: Text needs to recommend that SRP is not re-initiated in the event of SRP failure to avoid unnecessary power drain.

Changes to Section 5.1.7:

Replace Section 5.1.7:

The B-device may initiate the SRP any time the initial conditions of Section 5.1.2 *are met. To avoid unnecessary power drain on the A-device, a B-device should only initiate SRP in response to a particular event (typically user interaction or an ADP change), and SRP should not be issued more than once per event.*

With the following:

The B-device may initiate the SRP any time the initial conditions of Section 5.1.2 are met. To avoid unnecessary power drain on the A-device, a B-device should only initiate SRP in response to a particular event (typically user interaction or an ADP change). SRP should not be issued more than once per event. An SRP failure should not lead to the re-initiation of SRP.

Clarify text for ADP calibration and startup

Background: Text is confusing for ADP calibration, especially how it relates to n vs. n-2 probe comparison and A-device startup.

Changes to Section 5.4.2:

Replace the last four paragraphs:

When doing ADP probing, a device is required to ignore any changes in capacitance that are less than C_{ADP_THR} min. This ensures that cable attachment is ignored when the remote end of the cable is not attached to a device. For a series of "n" probes if the capacitance changes by more than C_{ADP_THR}, between probe "n" and probe "n-2", the device shall detect that as an ADP change event. This ensures that it is possible to detect the attachment or detachment of a device presenting either C_{A_VBUS} or C_{ADP_VBUS} as its V_{BUS} bypass capacitance.

When an OTG A-device is ready to act in host or peripheral role or an EH is ready to act as host, and V_{BUS} is not present, V_{BUS} is required to reach $V_{OTG\_SESS\_VLD}$ within $T_{A\_VBUS\_ATT}$ of an ADP change event being detected by ADP unless an over-current condition is reached (see also Section 4.2.4).

If a B-device starts doing ADP probing after a session and it has already measured the ramp time before the session, then it shall perform SRP, within $T_{B\_ADP\_PRB\_SRP}$ of the last ADP probe, if the two ramp times differ by more than C_{ADP_THR}. Otherwise, it shall continue probing and if any two ramp times, "n" and "n-2", differ by more than C_{ADP_THR}, it shall perform SRP within $T_{B\_ADP\_PRB\_SRP}$ of the last ADP probe.

If a B-device starts doing ADP probing after a session and it has not measured the ramp time before the session, then it shall perform SRP within $T_{B\_ADP\_PRB\_SRP}$ of the first ADP probe. If no session begins within $T_{B\_SRP\_FAIL}$, it shall continue ADP probing and shall perform another SRP within $T_{B\_ADP\_PRB\_SRP}$ of the last probe if the two ramp times differ by more than C_{ADP_THR}. Otherwise, it shall continue probing and if any two ramp times, "n" and "n-2", differ by more than C_{ADP_THR}, it shall perform SRP within $T_{B\_ADP\_PRB\_SRP}$ of the last ADP probe.

With the following updated paragraphs and diagrams:

When a device begins probing after a session, it shall compare the first measurement taken after the session to the last measurement taken immediately before the session. For a B-device, the measurements shall also be compared before and after a session request. If the capacitance has changed by more than C_{ADP_THR}, the device shall detect that as an ADP change event. This is described in greater detail in the following paragraphs as well as in Figure 5-7 through Figure 5-9 below.

When doing ADP probing, a device is required to ignore any changes in capacitance that are less than C_{ADP_THR} min. This ensures that cable attachment is ignored when the remote end of the cable is not attached to a device. For a series of "n" probes if the capacitance changes by more than C_{ADP_THR}, between probe "n" and probe "n-2", the device shall detect that as an ADP change event. This ensures that it is possible to detect the attachment or detachment of a device presenting either C_{A_VBUS} or C_{ADP_VBUS} as its V_{BUS} bypass capacitance.

When an OTG A-device is ready to act in host or peripheral role or an EH is ready to act as host, and V_{BUS} is not present, V_{BUS} is required to reach $V_{OTG\_SESS\_VLD}$ within $T_{A\_VBUS\_ATT}$ of an ADP change event being detected by ADP unless an over-current condition is reached (see also Section 4.2.4).

If an A-device has a valid ADP probe measurement taken immediately before the session, it shall compare that measurement with the first measurement taken immediately after the session. If the two ramp times differ by more than C_{ADP_THR}, it shall initiate a session within $T_{A\_VBUS\_ATT}$ of the last ADP probe.

If a B-device starts doing ADP probing after a session (or session request) and it has a valid ADP probe measurement from immediately prior to the session (or session request), then it shall perform SRP, within $T_{B\_ADP\_PRB\_SRP}$ of the last ADP probe, if the two ramp times differ by more than C_{ADP_THR}. Otherwise, it shall continue probing and if any two ramp times, "n" and "n-2", differ by more than C_{ADP_THR}, it shall perform SRP within $T_{B\_ADP\_PRB\_SRP}$ of the last ADP probe.

If a B-device starts doing ADP probing after a session (or session request) and it does not have a valid ADP probe measurement from immediately prior to the session (or session request), then it shall perform SRP within $T_{B\_ADP\_PRB\_SRP}$ of the first ADP probe. The B-device may wait for TB_SRP_FAIL, and shall then start probing again, having now acquired a pre-session measurement, as described in the paragraph above.

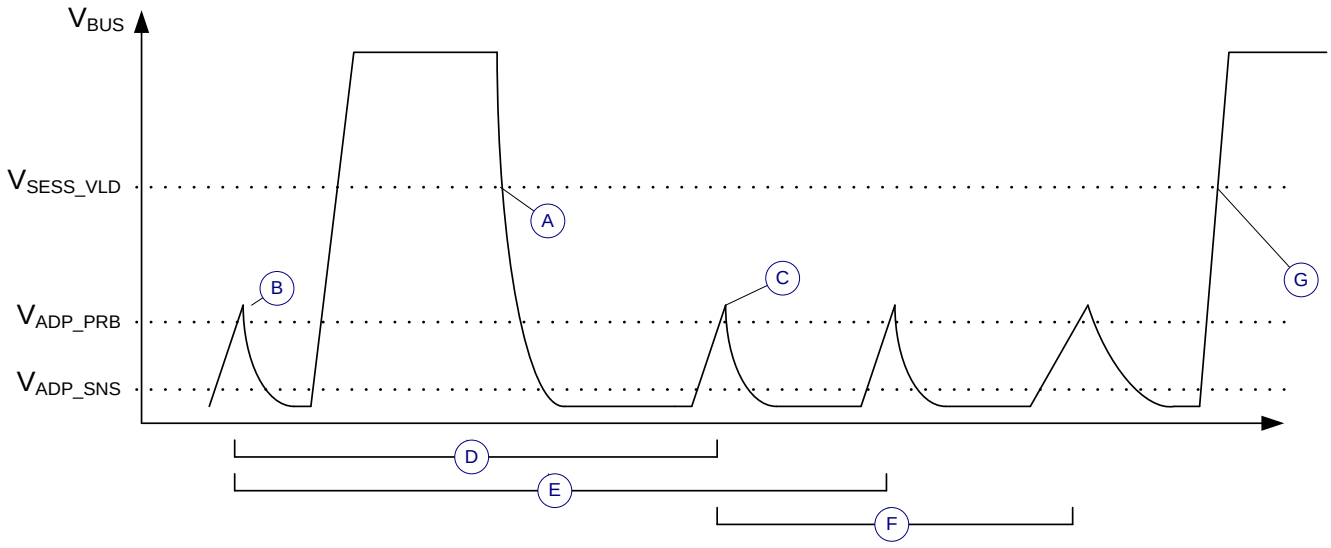

Figure 5-7: A-Device ADP

Steps in **Error! Reference source not found.**:

A. A-device ends session
B. A-device has pre-session calibration value.
C. A-device starts probing within $T_{A\_SSEND\_PRB}$ max of V_{BUS} going below $V_{OTG\_SESS\_VLD}$
D. The ADP ramp time after dropping V_{BUS} does not differ from the ramp time before asserting V_{BUS}.
E. A-device continues probing comparing n to n-2 ADP probes.
F. Next n to n-2 comparison (differs from C)
G. A-device again asserts V_{BUS} after detecting ramp time differ in F

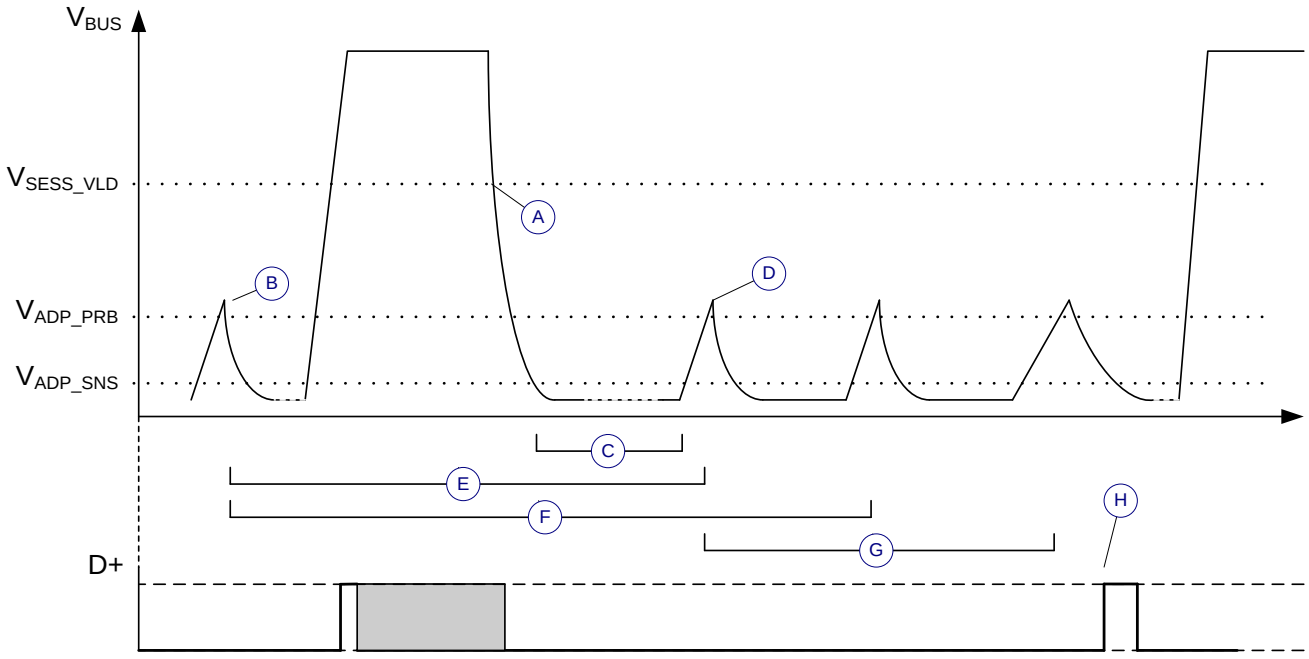

Figure 5-8: B-Device: ADP with pre-session calibration measurement

Steps in Figure 5 8:

A. B-device sees A-device end session
B. B-device had measured ramp time before session
C. B-device times out ADP sensing
D. B-device starts doing ADP probing, and it has already measured the ramp time before the session
E. B-device compares new ramp time with pre-session ramp time. Ramps not found to differ by more than C_{ADP_THR}
F. B-device continues probing and comparing n to n-2 (new ramp to pre-session ramp)
G. Probing continues until ramp times differ by more than C_{ADP_THR}.
H. As a result of ramp times differing in F comparison, B-device issues SRP pulse within $T_{B\_ADP\_PRB\_SRP}$

Note: Grey area for D+ line indicates indeterminate line state.

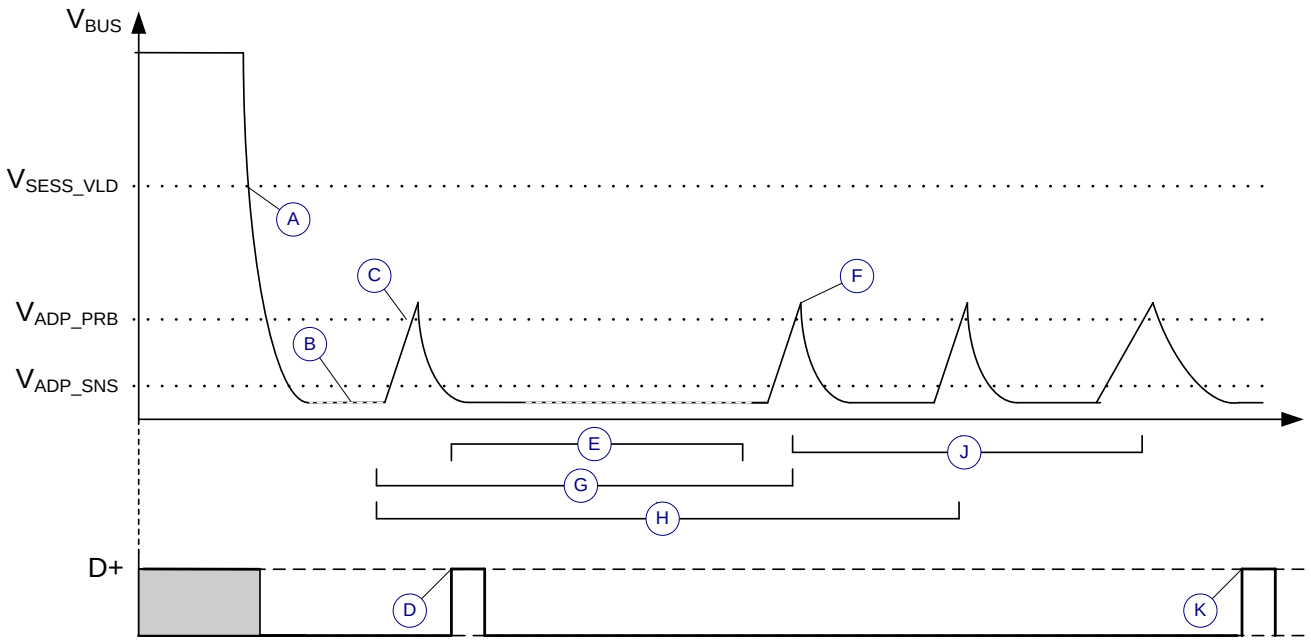

Figure 5-9: B-Device: ADP without pre-session calibration measurement

Steps in Figure 5 9:

A. B-device sees A-device end session
B. B-device times out sensing without detecting A-device ADP probes.
C. B-device starts doing ADP probing, but it has not measured the ramp time before the session
D. B-device performs SRP within $T_{B\_ADP\_PRB\_SRP}$ of the first ADP probe at C.
E. Optionally, B-device waits for session, but no session begins within $T_{B\_SRP\_FAIL}$.
F. B-device continues probing
G. B-device verifies two ramp times (F and C) before and after the failed session request do not differ by more than C_{ADP_THR}.
H. B-device continues probing comparing n to n-2 ramp times
I. Next n to n-2 ramp time comparison, ramp times differ by more than C_{ADP_THR}
J. B-device issues SRP within $T_{B\_ADP\_PRB\_SRP}$ of the last probe if the ramp times differ

Note: Grey area for D+ line indicates indeterminate line state.

The following illustrative example procedure could be used to implement the logic described above.

The ADP-capable device maintains a set of three probe sample stores, called n, n-1 and n-2.

The first probe value obtained after powering up the device is placed into all three sample stores, so that all the recorded samples are equal. As each new probe is made, sample n-1 is copied into n-2, sample n is copied into n-1, and finally the new sample is placed in n.

If, after recording a new sample, the sample n differs from n-2 by a sufficient amount positive or negative, equivalent to CADP_THR, then this represents a 'capacitance change'. The 'capacitance change' is signalled to the device, so that it can take the appropriate OTG action, and the sample n is copied into n-1 and n-2, so that once again all samples are equal.

Changes to Section 5.4.4 ADP Start Up:

Page 24 replace the first paragraph:

When an ADP-capable A-device is first powered up, it shall perform at least one ADP probe cycle in order to obtain an initial value for T_{ADP_RISE}. After this probe the A-device shall then turn on V_{BUS} within $T_{A\_VBUS\_ATT}$ to see if a B-device is attached. The delay from first power-up until V_{BUS} is turned on shall not exceed T_{PWRUP_RDY}. If a B-device does not connect within $T_{A\_WAIT\_BCON}$, min then the A-device shall turn V_{BUS} off within $T_{A\_WAIT\_BCON}$ max and shall then start ADP probing within $T_{A\_SSEND\_PRB}$ max of V_{BUS} going below $V_{OTG\_SESS\_VLD}$.

With the following:

When an ADP-capable A-device is first powered up, it shall perform at least one ADP probe cycle in order to obtain an initial value for T_{ADP_RISE}. After this probe the A-device shall then turn on V_{BUS} within $T_{A\_VBUS\_ATT}$ to see if a B-device is attached. The delay from first power-up until V_{BUS} is turned on shall not exceed T_{PWRUP_RDY}. If a B-device does not connect within $T_{A\_WAIT\_BCON}$, min then the A-device shall turn V_{BUS} off within $T_{A\_WAIT\_BCON}$ max and shall then start ADP probing within $T_{A\_SSEND\_PRB}$ max of V_{BUS} going below $V_{OTG\_SESS\_VLD}$. A-device ADP startup is shown in figure 5-10 below.

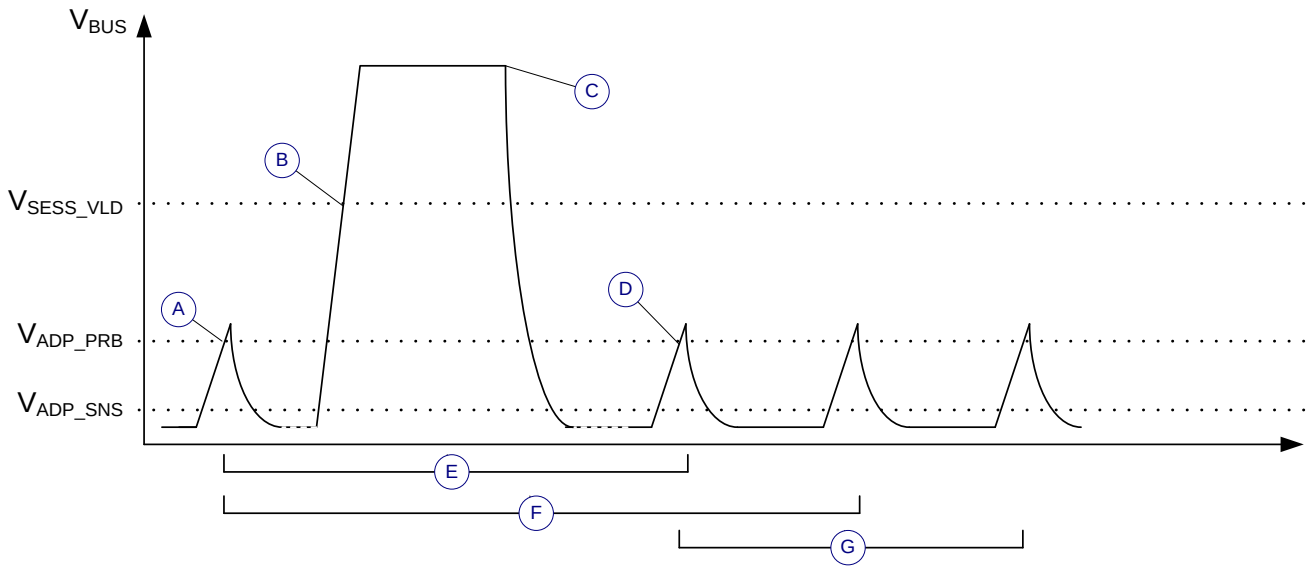

Figure 5-10: A-Device ADP startup

Steps in Figure 5 10:

A. When an ADP capable A-device is first powered up, it shall perform at least one ADP probe cycle in order to obtain an initial value of T_{ADP_RISE}.
B. After this probe, the A-device shall turn on V_{BUS} within $T_{A\_VBUS\_ATT}$ to see if a B-device is attached.
C. A B-device does not connect within $T_{A\_WAIT\_BCON}$ min, A-device shuts off V_{BUS} within $T_{A\_WAIT\_BCON}$ max.
D. A-device starts probing within $T_{A\_SSEND\_PRB}$ max of V_{BUS} going below $V_{OTG\_SESS\_VLD}$
E. The ADP ramp time after dropping V_{BUS} does not differ from the ramp time before asserting V_{BUS}.
F. A-device continues probing comparing n to n-2 ADP probes.
G. Next n to n-2 comparison

Replace the third and fourth paragraphs:

When an ADP-capable B-device is first powered up, and V_{BUS} is not present, it shall perform at least one ADP probe cycle in order to obtain an initial value for T_{ADP_RISE}. The B-device shall then perform SRP to see if an A-device is attached. The delay from first power-up until this SRP pulse shall not exceed T_{PWRUP_RDY}. If an A-device does not assert V_{BUS} within $T_{B\_SRP\_FAIL}$, then the B-device shall commence ADP probing within a further $T_{B\_ADP\_PRB}$ max.

If the ADP rise time after SRP differs from the ADP rise time before SRP by a time proportional to C_{ADP_THR} or more, then the B-device shall issue another SRP pulse.

With the following:

When an ADP-capable B-device is first powered up, and V_{BUS} is not present, it shall perform at least one ADP probe cycle in order to obtain an initial value for T_{ADP_RISE}. The B-device shall then perform SRP to see if an A-device is attached. The delay from first power-up until this SRP pulse shall not exceed T_{PWRUP_RDY}. If an A-device does not assert V_{BUS} within $T_{B\_SRP\_FAIL}$, then the B-device shall be performing ADP probing within a further $T_{B\_ADP\_PRB}$ max. A B-device need not wait for the A-device response to SRP pulse to continue probing. If the ADP rise time after SRP differs from the ADP rise time before SRP by a time proportional to C_{ADP_THR} or more, then the B-device shall issue another SRP pulse. Otherwise, it shall continue probing as described in section 5.4.2.

Relax the tolerance on $T_{B\_ADP\_DETACH}$

Background: The new upper limit of 3.1 seconds makes the tolerances too tight. The clock tolerance should be higher. Setting an upper limit of 3.4 seconds means a typical value of 3.2 seconds which is a tolerance of ~6% on the clock.

Changes to Section 5.5, Table 5-1:

Replace existing table entry:

B-device ADP detach time, sensing mode	$T_{B\_ADP\_DETACH}$	3.0	3.1	sec	5.4.3

With the following:

B-device ADP detach time, sensing mode	$T_{B\_ADP\_DETACH}$	3.0	3.4	sec	5.4.3

Mistake in description of T_{TST_VBOFF}

Background: Text refers to the 'otg_hnp_req' parameter in relation to TTST_VBOFF when 'otg_vbus_off' is actually the correct parameter as described in section 6.4.3.2.1.

Changes to section 5.5:

Replace TTST_VBOFF row in Table 5-5:

Time to switch off VBUS after tester disconnects with 'otg_hnp_reqd' set	TTST_VBOFF		5	sec	6.4.3.2.1

With the following:

Time to switch off VBUS after tester disconnects with 'otg_vbus _off' set	TTST_VBOFF		5	sec	6.4.3.2.1

Typo in the use of ms

Background: A couple of parameters use the unit msec instead of ms

Changes to Section 5.5, Table 5-1:

Replace instances of "msec" with "ms" for parameters TA_SSEND_PRB and TB_SNSEND_PRB.

Chapter 6

OTG Descriptor is mandatory

Background: Supplement is unclear in defining whether or not the OTG descriptor is mandatory.

Changes to section 6:

Replace Section 6.1 1st paragraph:

During enumeration, an A-device shall request the OTG configuration descriptor from the B-device. Any B-device that supports either HNP or SRP or ADP shall respond to a GetDescriptor(OTG) request with its OTG descriptor. This request shall be treated in the same way as any other GetDescriptor command such that it may be requested in the Default, Addressed or Configured state. A B-device which does not support the OTG descriptor shall stall the data stage of this request. When present, the OTG descriptor shall be present in all configurations. The B-device shall also return the OTG descriptor as part of a GetConfiguration request.

With the following:

During enumeration, an A-device shall request the OTG configuration descriptor from the B-device. Any B-device compliant with this supplement shall respond to a GetDescriptor(OTG) request with its OTG descriptor as defined in Table 6-1. This request shall be treated in the same way as any other GetDescriptor command such that it may be requested in the Default, Addressed or Configured state. The OTG descriptor shall be present in all configurations. The B-device shall also return the OTG descriptor as part of a GetConfiguration request.

Type of bcdOTG field in OTG descriptor is incorrect

Background: Type of OTG descriptor is given as “OTG” when it should be “BCD”.

Changes to section 6.1, Table 6-1:

Replace the bcdOTG row:

3	*bcdOTG*	2	OTG	OTG and EH supplement release number in binary-coded decimal (i.e. 2.0 is 0200H). This field identifies the release of the OTG and EH supplement with which the device and its descriptors are compliant.

With the following:

3	*bcdOTG*	2	BCD	OTG and EH supplement release number in binary-coded decimal (i.e. 2.0 is 0200H). This field identifies the release of the OTG and EH supplement with which the device and its descriptors are compliant.

Clarify that GetStatus of OTG Status Selector is mandatory

Background: Text is confusing as to whether GetStatus for the OTG status selector should or should not be supported. Clarified situation to indicate that this is mandatory for OTG B-devices.

Changes to section 6.2.3:

Replace the first two paragraphs of Section 6.2.3:

A host is required to use the GetStatus command (Table 6-3), with wIndex set to the OTG status selector (Table 6-4) to request the Host request flag (Table 6-5) from the peripheral (see Section 6.3). If the B-device is not HNP capable, it shall return a STALL if it receives a GetStatus command for the OTG feature selector.

A B-device that supports this feature shall be able to accept the GetStatus command in the Default, Addressed and Configured states. [USB2.0] states that requesting status in the Default state is unspecified. This supplement adds to the list of statuses that can be requested in the Default state and defines a non-zero value of wIndex.

With the following:

A host is required to use the GetStatus command (Table 6-3), with wIndex set to the OTG status selector (Table 6-4) to request the Host request flag (Table 6-5) from the peripheral (see Section 6.3). An OTG B-device shall be able to accept the GetStatus command in the Default, Addressed and Configured states.

[USB2.0] states that requesting status in the Default state is unspecified. This supplement adds to the list of statuses that can be requested in the Default state and defines a non-zero value of wIndex.

Clarify HNP polling process

Background: Intention of text is that HNP polling is not required if HNP is enabled during suspend. The current text implies that once you have done this HNP is not subsequently required. In addition there are a number of scenarios which are not adequately explained. Detailed explanation of each situation is required.

Changes to section 6.3:

Replace Section 6.3:

Whenever there is an active session between two OTG devices the host is required to execute a GetStatus() with a frequency of THOST_REQ_POLL in order to determine the state of the Host request flag as defined in the OTG status information (see Section 6.2.3). After the host has detected that the Host request flag is set to one the host shall allow the peripheral to take the host role within THOST_REQ_SUSP. If the Host request flag is reset to zero when an A-device has finished its activities it can end the session immediately. Unless an A-device enables b_hnp_enable before entering suspend, then after suspend it shall resume with a frequency of THOST_REQ_POLL, poll the status, and return to suspend. Polling shall not be required if the b_hnp_enable is set before entering suspend, since the B-device indicates its intention by commencing the HNP procedure.entering suspend, since the B-device indicates its intention by commencing the HNP procedure.

Table 6-6: HNP polling timing parameters

Parameter	Symbol	Min	Max	Units
Polling period for the event flags	*THOST_REQ_POLL*	*1*	*2*	*sec*
Time from detection of host flag until suspend	*THOST_REQ_SUSP*		*2*	*sec*

A peripheral device should warn its user of the possible consequences before using HNP polling to force a role swap in situations where a badly timed role swap may cause data loss or corruption. For example, a forced role swap in the middle of a long-running low-level disk copy using the Mass Storage Class could result in a corrupted Mass Storage Device. The peripheral device may choose to warn or not to warn the user based on knowledge of the current functions it is providing to the host, as some functions may be more robust to unexpected disconnections than others.

With the following:

6.3 HNP Polling Mechanism

6.3.1 HNP polling process

Whenever there is an active session between two OTG devices the host executes a GetStatus() with a frequency of THOST_REQ_POLL in order to determine the state of the Host request flag as defined in the OTG status information (see Section 6.2.3). After the host has detected that the Host request flag is set to one the host shall allow the peripheral to take the host role within THOST_REQ_SUSP.

Table 6-6: HNP polling timing parameters

Parameter	Symbol	Min	Max	Units
Polling period for the event flags	THOST_REQ_POLL	1	2	Sec
Time from detection of host flag until suspend	THOST_REQ_SUSP		2	Sec

6.3.2 OTG A-devices

During an active session, where the bus is not suspended and the connected OTG B-peripheral is capable of HNP in the B-device role (HNP support bit = TRUE), an OTG A-Host shall perform HNP polling as described in section 6.2.3[19]. An OTG A-host shall not be required to poll the Host request flag only in the case where it enables HNP, by setting b_hnp_enable within THOST_REQ_POLL max and suspends within a further THOST_SUSP_REQ max from the time that the OTG A-host reads the OTG descriptor.

If the OTG A-host determines that the Host request flag is set to one the OTG A-host shall allow the OTG B-peripheral to take the host role, by enabling HNP (setting b_hnp_enable) and then suspending the bus, within THOST_REQ_SUSP.

If the OTG A-host determines that the Host request flag is reset to zero when an A-device has finished its activities it may end the session immediately.

If the OTG A-device does not enable HNP by setting b_hnp_enable prior to suspend then it shall resume with a frequency of THOST_REQ_POLL, poll the status of the Host Request flag, and return to suspend. The OTG B-device can signal its intention to become host by setting the Host Request flag.

If the OTG A-device enables HNP by setting b_hnp_enable prior to suspend then it may not resume in order to poll the status of the Host Request flag. The OTG B-device can become host by initiating the HNP procedure directly. The OTG A-device shall start polling the Host Request flag whenever the USB bus resumes.

If the OTG A-device determines from the OTG descriptor that the connected OTG B-device does not support HNP (HNP support bit = FALSE) then it shall not poll the Host Request flag.

If the OTG A-host detects an unsupported HNP capable OTG B-peripheral (HNP support bit = TRUE) then the OTG A-host shall either:

- maintain the session and continue HNP polling or,
- enable HNP by setting b_hnp_enable and suspend the bus for at least TA_BIDL_ADIS min before ending the session (see Section 5.2.1)

An OTG A-peripheral shall respond to GetStatus() requests by setting the Host Request bit to one when it wishes to become host and by resetting the Host Request bit to zero at other times. An OTG A-peripheral shall not STALL a GetStatus() request from an OTG B-host.

[20] When connected to legacy HNP capable OTG B-peripherals HNP polling will not be possible. In this case the OTG A-host shall give the OTG B-peripheral the opportunity to take the host role before ending the session by setting b_hnp_enable and suspending the bus for at least TA_BIDL_ADIS min (see Section 5.2.1).

6.3.3 OTG B-devices

When an OTG B-device, which is capable of HNP in the B-device role (HNP support bit = TRUE) wishes to become host, it can signal its intention through the following mechanisms:

- *If there is an active session then the OTG B-device shall set the Host Request flag in response to the GetStatus() request from the OTG A-device (see Section 6.2.3). The OTG A-device will then enable HNP by setting b_hnp_enable and suspend the bus.*

- *If the bus is suspended and HNP has been enabled (b_hnp_enable = TRUE) then OTG B-device shall initiate HNP.*

An OTG B-device which is not capable of HNP (HNP Support bit = FALSE) shall STALL the GetStatus() request from the OTG A-device.

If an OTG B-host determines that the Host request flag is set to one the OTG B-host shall allow the OTG A-peripheral to take the host role, by suspending the bus, within THOST_REQ_SUSP.

6.3.4 Possible consequences of a role swap

A peripheral device should warn its user of the possible consequences before using HNP polling to force a role swap in situations where a badly timed role swap may cause data loss or corruption. For example, a forced role swap in the middle of a long-running low-level disk copy using the Mass Storage Class could result in a corrupted Mass Storage Device. The peripheral device may choose to warn or not to warn the user based on knowledge of the current functions it is providing to the host, as some functions may be more robust to unexpected disconnections than others.

Clarify which devices should support which test features

Background: Text does not clearly call out which test features are supported by which type of device.

Changes to section 6.4:

Replace Section 6.4 1st paragraph:

An A-device, B-device or EH shall recognize, and behave appropriately on encountering, a set of test devices, having VID=0x1A0A, and the PIDs defined in the following sections. It shall also respond correctly to the test mode feature bits defined in Section 6.4.3.

With the following:

An OTG A-device, OTG B-device or EH shall recognize, and behave appropriately on encountering, a set of test devices, having VID=0x1A0A, and the PIDs defined in the following sections. An OTG A-device, OTG B-device, peripheral-only B-device or EH shall also respond correctly to the test mode feature bits defined in Section 6.4.3.

Replace Section 6.4.2 1st paragraph:

A device with VID=0x1A0A, PID=0x0200 is defined to be a test device, required by the compliance test. An A-device, B-device or EH shall recognize this test device and behave accordingly as defined below.

The test devices shall continue to be recognized by retail examples of the devices, to permit subsequent audit.

With the following:

A device with VID=0x1A0A, PID=0x0200 is defined to be a test device, required by the compliance test. An OTG A-device, OTG B-device or EH shall recognize this test device and behave accordingly as defined below. The test devices shall continue to be recognized by retail examples of the devices, to permit subsequent audit.

Replace Section 6.4.3 1st paragraph:

The test mode feature bits defined in Table 6-8 shall be supported by an A-device, B-device or EH. . A USB bus reset received by a device which has any of these feature bits set, shall cause the feature bit to be cleared.

With the following:

The test mode feature bits defined in Table 6-8 shall be supported by an OTG A-device, OTG B-device, peripheral-only B-device or EH. A USB bus reset received by a device which has any of these feature bits set, shall cause the feature bit to be cleared.

Modify test requirements to cater for A-devices which don't do HNP polling

Background: Tests so far have assumed A-devices always do HNP polling. However, some A-devices may simply immediately enable HNP and suspend on detecting an OTG descriptor, particularly if they don't contain OTG devices on their TPL. Test device requirements needs to include this option.

Changes to section 6.4.2.1:

Replace Section 6.4.2.1:

6.4.2.1 Behavior of OTG A-device on Enumerating Test Device

An OTG A-device shall configure the test device to configuration 1, within TTST_CONFIG max of completing the bus reset.

When the OTG A-device under test enumerates the test device it shall set and/or reset its own OTG test mode feature bits as required, making use of information in the device descriptor.(see Section 6.4.3). Currently only one such bit, 'otg_vbus_off', is defined.

The OTG A-device shall then maintain a session for at least TTST_MAINT min during which time it shall allow at minimum IA_VBUS_RATED to be drawn, by the Protocol and Electrical Tester (PET), from VBUS. The OTG A-device shall perform HNP polling during this period.

If, within this period of TTST_MAINT such HNP polling finds that Host request flag is set, the A-device shall allow the B-device (the PET) to become host, in accordance with the HNP specification timings. After the B-device (the PET) stops acting as a host, the A-device shall become host again, rather than exercising its option of ending the session. This requirement to maintain the session remains in force until the B-device detaches.

If within the period of TTST_MAINT the Host is not HNP-capable, or the Host request flag is not set, a host able to recognize SRP shall, before TTST_MAINT max, end the session, and be prepared to accept SRP requests.

If the 'otg_vbus_off' feature bit gets set during enumeration then, if the PET disconnects before the end of the TTST_MAINT min period of configured state, the host shall turn off VBUS, if it is capable of doing so, and shall not perform any ADP probes for a period defined in Section 6.4.3.2.1.

A host which is not capable of turning off VBUS may, after the TTST_MAINT configured period, continue to send SOFs, or may suspend the B-device.

With the following:

6.4.2.1 Behavior of OTG A-device on Enumerating Test Device

An OTG A-device shall configure the test device to configuration 1, within TTST_CONFIG max of completing the bus reset.

When the OTG A-device under test enumerates the test device it shall set and/or reset its own OTG test mode feature bits as required, making use of information in the device descriptor.(see Section 6.4.3). Currently only one such bit, 'otg_vbus_off', is defined.

6.4.2.1.1 OTG A-device supporting HNP polling.

The OTG A-device shall then maintain a session for at least TTST_MAINT min during which time it shall not suspend the test device and shall allow at minimum IA_VBUS_RATED to be drawn, by the Protocol and Electrical Tester (PET), from VBUS. The OTG A-device shall perform HNP polling during this period.

If, within this period of TTST_MAINT such HNP polling finds that Host request flag is set, the A-device shall allow the B-device (the PET) to become host, in accordance with the HNP specification timings.

If within the period of TTST_MAINT the Host Request flag is not set, a host able to recognize SRP shall, before TTST_MAINT max, end the session, and be prepared to accept SRP requests.

If a role swap took place, then after the B-device (the PET) stops acting as a host, the A-device shall become host again, rather than exercising its option of ending the session. This requirement to maintain the session remains in force until the B-device detaches.

If the 'otg_vbus_off' feature bit does not get set during enumeration, and the PET disconnects before the end of the TTST_MAINT min period of configured state, the OTG A-device shall maintain the session for at least TA_WAIT_BCON min and end it within TA_WAIT_BCON max.

If the 'otg_vbus_off' feature bit gets set during enumeration then, if the PET disconnects before the end of the TTST_MAINT min period of configured state, the host shall turn off VBUS, if it is capable of doing so, and shall not perform any ADP probes for a period defined in Section 6.4.3.2.1.

A host which is not capable of turning off V_{BUS} may, after the T_{TST_MAINT} configured period, continue to send SOFs, or may suspend the B-device.

6.4.2.1.2 OTG A-device not supporting HNP polling.

If the PET has set its OTG descriptor HNP support bit, the OTG A-device under test shall set b_hnp_enable, and shall suspend the PET within $T_{HOST\_REQ\_POLL}$ max (2 sec) plus $T_{HOST\_REQ\_SUSP}$ max (2 sec), and shall allow the B-device (the PET) to become host, in accordance with the HNP specification timings.

If the PET has not set its OTG descriptor HNP support bit, the OTG A-device shall then maintain a session for at least T_{TST_MAINT} min during which time it shall not suspend the test device and shall allow at minimum IA_VBUS_RATED to be drawn, by the Protocol and Electrical Tester (PET), from VBUS. It shall then before T_{TST_MAINT} max, end the session, and be prepared to accept SRP requests.

If a role swap took place, then after the B-device (the PET) stops acting as a host, the A-device shall become host again, rather than exercising its option of ending the session. This requirement to maintain the session remains in force until the B-device detaches.

If the 'otg_vbus_off' feature bit does not get set during enumeration, and the PET disconnects before the end of the TTST_MAINT min period of configured state, the OTG A-device shall maintain the session for at least TA_WAIT_BCON min and end it within TA_WAIT_BCON max.

If the 'otg_vbus_off' feature bit gets set during enumeration (and the PET did not set its OTG descriptor HNP support bit) then, if the PET disconnects before the end of the T_{TST_MAINT} min period of configured state, the host shall turn off VBUS, if it is capable of doing so, and shall not perform any ADP probes for a period defined in Section 6.4.3.2.1.

A host which is not capable of turning off V_{BUS} may, after the T_{TST_MAINT} configured period, continue to send SOFs, or may suspend the B-device.

Chapter 7

Correct text relating to the interpretation of TA_BIDL_ADIS

Background: In section 7.1.6 (description of a_peripheral state) of OTG2.0 spec, "If no activity is detected after TA_BIDL_ADIS max the A-device shall transition back to the a_wait_bcon state". Table 5-1 and the timing diagram in 5.2.1 (Fig 5-3, timing item X3) and are really quite explicit that TA_BIDL_ADIS is the time to the D+ line going low.

Changes to section 7.1.6, 3rd paragraph, last sentence:

Replace:

If no activity is detected after $T_{A\_BIDL\_ADIS}$ max the A-device shall transition back to the a_wait_bcon state.

With the following:

The A-device shall transition back to the a_wait_bcon state before $T_{A\_BIDL\_ADIS}$ max of continuous idle is detected.

Clarify that ADP-capable B-devices are also included in state diagram

Background: The state diagram for SRP-capable peripheral-only B-devices also covers ADP-capable peripheral-only B-devices. This point needs clarifying as well as the consistent use of the term "peripheral-only B-device".

Changes to section 7.3:

Replace section 7.3:

7.3 SRP-capable peripheral-only, B-device

The state diagram relevant for SRP-capable peripheral-only B-devices is shown in Figure 7-4. It consists of three distinct states listed in Table 7-5 and uses the parameters listed in Table 7-6.

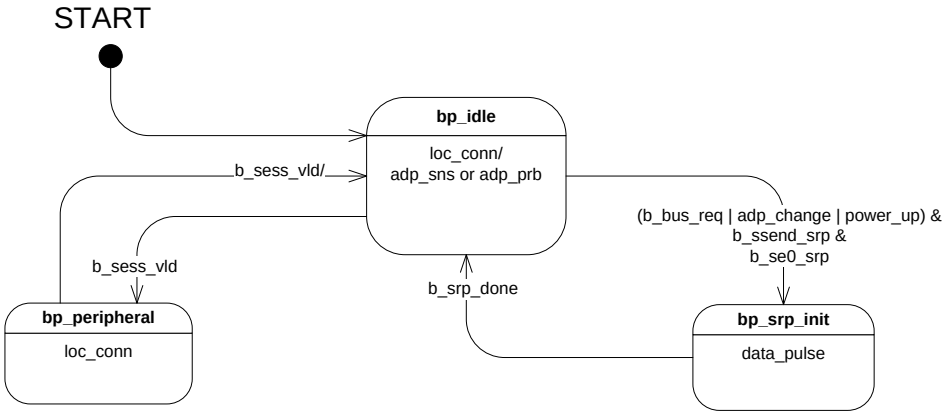

Figure 7-4: SRP-Capable Peripheral-Only B-device State Diagram

Table 7-5: SRP-capable peripheral-only B-device states

State	Description	Ref
bp_idle	*Wait for a session to start by monitoring if V_{BUS} rises above $V_{OTG\_SESS\_VLD}$*	*7.3.1*
bp_srp_init	*Attempt to initiate SRP*	*7.3.2*
bp_peripheral	*Acting as a peripheral*	*7.3.3*

Table 7-1: SRP-capable peripheral-only B-device state machine parameters

Parameter	Description	Ref
Inputs		
b_ssend_srp	*T_{RUE} when the V_{BUS} has been below $V_{OTG\_SESS\_VLD}$ for more than the minimum time before generating SRP*	*7.4.1.16*

Parameter	Description	Ref
b_sess_vld	TRUE when the B-device detects that the voltage on V_{BUS} is above $V_{OTG\_SESS\_VLD}$	7.4.1.17
b_se0_srp	TRUE when the line has been at SE0 for more than the minimum time before generating SRP	7.4.1.15
adp_change	TRUE when current ADP measurement (n) value, compared to the ADP measurement taken at n-2, differs by more than C_{ADP_THR}..	7.4.1.2
power_up	TRUE when the OTG device first powers up its USB system.	7.4.1.3
Internal variables		
b_srp_done	TRUE when the B-device has completed initiating SRP	7.4.3.2
Outputs		
data_pulse	TRUE when a B-device is performing data line pulsing	7.4.2.1
loc_conn	TRUE when the local device has signaled that it is connected to the bus.	7.4.2.3
adp_prb	TRUE when the local device is in the process of doing ADP probing.	7.4.2.5
adp_sns	TRUE when the B-device is in the process of doing ADP	7.4.2.6

7.3.1 bp_idle

This is the starting state for peripheral-only B-devices.
In this state, the SRP-capable peripheral-only B-device waits for a session to start by monitoring if V_{BUS} rises above the V_{BUS} Session Threshold (b_sess_vld = TRUE). If V_{BUS} rises above this threshold, the SRP-capable peripheral-only B-device enters the bp_peripheral state.
The B-device transitions from the bp_idle state to the bp_srp_init state:

- *if the Application indicates that it wants to start a session (b_bus_req = TRUE), or*
- *an ADP change has been detected (adp_change = TRUE) or*
- *the B-device has only just powered up its USB system (power_up = TRUE). Note: for an ADP-capable B-device ADP probing takes place immediately after power up in order to calibrate the measurement (see Section 5.4.4). In this case the power_up transition shall only be triggered after a reliable ADP measurement value has been obtained.*
- *and if V_{BUS} has been below the Session End threshold for at least $T_{B\_SSEND\_SRP}$ (b_ssend_srp = TRUE),*
- *and if the bus has been in the SE0 state for the minimum time before generating SRP $T_{B\_SE0\_SRP}$ min(b_se0_srp = TRUE).*

7.3.2 bp_srp_init

Upon entering this state, the SRP-capable peripheral-only B-device attempts to start a session via SRP defined. Upon completion (b_srp_done = TRUE) the B-device returns to the bp_idle state, to wait for the A-device to drive V_{BUS} above the Session Valid threshold (b_sess_vld = TRUE).

7.3.3 bp_peripheral

In this state, the B-device acts as a [USB2.0] compliant device.

If V_{BUS} drops below the Session Valid threshold (b_sess_vld = FALSE), then the device transitions to the bp_idle state.

With the following:

7.3 ADP-capable or SRP-capable peripheral-only, B-device

The state diagram relevant for ADP-capable or SRP-capable peripheral-only B-devices is shown in Figure 7-4. It consists of three distinct states listed in Table 7-5 and uses the parameters listed in Table 7-6. Note: any parameters relating to ADP (parameters starting "adp_..") do not apply to B-devices without ADP capability.

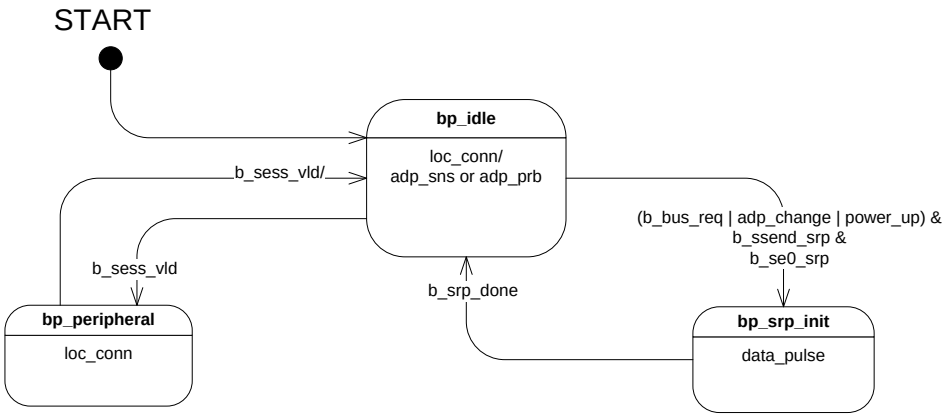

Figure 7-4: ADP-capable or SRP-Capable Peripheral-Only B-device State Diagram

Table 7-5: ADP-capable or SRP-capable peripheral-only B-device states

State	Description	Ref
bp_idle	*Wait for a session to start by monitoring if V_{BUS} rises above $V_{OTG\_SESS\_VLD}$*	*7.3.1*
bp_srp_init	*Attempt to initiate SRP*	*7.3.2*
bp_peripheral	*Acting as a peripheral*	*7.3.3*

Table 7-2: ADP-capable or SRP-capable peripheral-only B-device state machine parameters

Parameter	Description	Ref
Inputs		
b_ssend_srp	*TRUE when the V_{BUS} has been below $V_{OTG\_SESS\_VLD}$ for more than the minimum time before generating SRP*	*7.4.1.16*
b_sess_vld	*TRUE when the B-device detects that the voltage on V_{BUS} is above $V_{OTG\_SESS\_VLD}$*	*7.4.1.17*
b_se0_srp	*TRUE when the line has been at SE0 for more than the minimum time before generating SRP*	*7.4.1.15*
adp_change	*TRUE when current ADP measurement (n) value, compared to the ADP measurement taken at n-2, differs by more than C_{ADP_THR}.*	*7.4.1.2*
power_up	*TRUE when the OTG device first powers up its USB system.*	*7.4.1.3*
Internal variables		
b_srp_done	*TRUE when the B-device has completed initiating SRP*	*7.4.3.2*
Outputs		
data_pulse	*TRUE when a B-device is performing data line pulsing*	*7.4.2.1*

Parameter	Description	Ref
loc_conn	TRUE when the local device has signaled that it is connected to the bus.	7.4.2.3
adp_prb	TRUE when the local device is in the process of doing ADP probing.	7.4.2.5
adp_sns	TRUE when the B-device is in the process of doing ADP	7.4.2.6

7.3.1 bp_idle

This is the starting state for peripheral-only B-devices.

In this state, the ~~SRP-capable~~ peripheral-only B-device waits for a session to start by monitoring if V_{BUS} rises above the V_{BUS} Session Threshold (b_sess_vld = TRUE). If V_{BUS} rises above this threshold, the ~~SRP-capable~~ peripheral-only B-device enters the bp_peripheral state.
The B-device transitions from the bp_idle state to the bp_srp_init state:

- *if the Application indicates that it wants to start a session (b_bus_req = TRUE), or*
- *an ADP change has been detected (adp_change = TRUE) or*
- *the peripheral-only B-device has only just powered up its USB system (power_up = TRUE). Note: for an ADP-capable peripheral-only B-device ADP probing takes place immediately after power up in order to calibrate the measurement (see Section 5.4.4). In this case the power_up transition shall only be triggered after a reliable ADP measurement value has been obtained.*
- *and if V_{BUS} has been below the Session End threshold for at least $T_{B\_SSEND\_SRP}$ (b_ssend_srp = TRUE),*
- *and if the bus has been in the SE0 state for the minimum time before generating SRP $T_{B\_SE0\_SRP}$ min(b_se0_srp = TRUE).*

7.3.2 bp_srp_init

Upon entering this state, the ~~SRP-capable~~ peripheral-only B-device attempts to start a session via SRP defined. Upon completion (b_srp_done = TRUE) the B-device returns to the bp_idle state, to wait for the A-device to drive V_{BUS} above the Session Valid threshold (b_sess_vld = TRUE).

7.3.3 bp_peripheral

In this state, the peripheral-only B-device acts as a [USB2.0] compliant device.

If V_{BUS} drops below the Session Valid threshold (b_sess_vld = FALSE), then the peripheral-only B-device transitions to the bp_idle state.

a_sess_vld parameter is never used

Background: The a_sess_vld parameter referred to in Table 7-2 and section 7.4.1.7 is never used in the state diagrams. Both should be deleted.

Changes to section 7.1, Table 7-2:

Delete the following row:

a_sess_vld	TRUE if the A-device detects that the voltage on V_{BUS} is above $V_{OTG\_SESS\_VLD}$ threshold	7.4.1.7

Delete section 7.4.1.7:

7.4.1.7 a_sess_vld

The "A-device session valid" (a_sess_vld) input is TRUE if the A-device detects that the voltage on V_{BUS} is above its Session Valid threshold ($V_{OTG\_SESS\_VLD}$) (see Table 4-1).

Clarify starting states for B-devices

Background: Text relating to b_idle and bp_idle needs clarification that this is the starting state as is done for a_idle

Changes to section 7.2.1:

Add the following as the first paragraph:

This is the starting state for OTG B-devices.

Changes to section 7.3.1:

Add the following as the first paragraph:

This is the starting state for peripheral-only B-devices.