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Schnittstellen des Universellen Seriellen Busses für Daten und Energie –**Teil 3: Festlegung für den USB-Batterie-Ladevorgang, Überarbeitung 1.2 (IEC 62680-3:2013);
Englische Fassung EN 62680-3:2013**

Universal serial bus interfaces for data and power –
Part 3: USB battery charging specification, Revision 1.2
(IEC 62680-3:2013);
English version EN 62680-3:2013

Interfaces de bus universel en série pour les données et l'alimentation électrique –
Partie 3: Spécification de chargement des batteries USB, révision 1.2
(CEI 62680-3:2013);
Version anglaise EN 62680-3:2013

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DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2013-09-27 angenommene Europäische Norm als DIN-Norm ist 2014-06-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62680-3:2013-03.

Für dieses Dokument ist das nationale Arbeitsgremium K 742 „Audio-, Video- und Multimediasysteme, -geräte und -komponenten“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

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Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 62680-3 veröffentlicht. Zu deren Unterabschnitt 1.4, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Nationaler Anhang NA (informativ)

NA.1 Abkürzungen

Für die Anwendung dieses Dokuments gelten die folgenden Abkürzungen.

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

ACA	Ladeadapter für Zubehör	(en: accessory charger adapter)
CDP	nachgeschalteter Ladeanschluss	(en: charging downstream port)
DBP	eine Maßnahme bei leerer Batterie	(en: dead battery provision)
DCD	Erkennung von Datenkontakten	(en: data contact detect)
DCP	fest zugeordneter Ladeanschluss	(en: dedicated charging port)
FS	volle Geschwindigkeit	(en: full-speed)
HS	hohe Geschwindigkeit	(en: high-speed)
LS	niedrige Geschwindigkeit	(en: low speed)
OTG	Bereitschaft	(en: on-the-go)
PC	Personal-Computer	(en: personal computer)
PD	tragbares Gerät	(en: portable device)
PHY	physikalische Ebenen-Schnittstelle für USB mit hoher Geschwindigkeit	(en: physical layer interface for high-speed USB)
PS2	Personal-System 2	(en: personal system 2)
SDP	nachgeschalteter Standardanschluss	(en: standard downstream port)
SRP	Anforderungsprotokoll für eine Sitzung	(en: session request protocol)
TPL	periphere Zielliste	(en: targeted peripheral list)
USB	universeller serieller Bus	(en: Universal Serial Bus)
USBCV	USB-Befehlsprüfer	(en: USB command verifier)
USB-IF	USB-Hilfsmittel-Forum	(en: USB Implementers Forum)
VBUS	Spannungsversorgungsleitung der USB-Schnittstelle	(en: voltage line of the USB interface)

NA.2 Begriffe

Dieser Unterabschnitt enthält Definitionen für einige in dieser Norm verwendete Begriffe.^{N1)}

1.4.1

Ladeadapter für Zubehör

ACA

(en: accessory charger adapter)

Adapter, der es ermöglicht, gleichzeitig einen USB-Anschluss mit einem Ladegerät und einem anderen Gerät zu verbinden.

Bei Verweisung auf einen ACA werden folgende Begriffe verwendet:

- ACA-A ein ACA mit einem ID-Widerstand von R_{ID_A} ;
- ACA-B ein ACA mit einem ID-Widerstand von R_{ID_B} ;
- ACA-C ein ACA mit einem ID-Widerstand von R_{ID_C} .

Siehe Abschnitt 6 für Einzelheiten zu ACA.

1.4.2

ACA-Dock

(en: ACA-Dock)

Dockingstation, die einen vorgeschalteten (en: upstream) Anschluss hat und null oder mehr nachgeschaltete (en: downstream) Anschlüsse. Der vorgeschaltete Anschluss kann mit einem PD (en: personal device) verbunden werden und kann den Strom ICDP an den PD senden. Ein ACA-Dock signalisiert dem PD, dass es ein ACA-Dock ist, durch Freigabe von V_{DM_SRC} bei USB-Leerlauf und durch Erdung von ID über den Widerstand R_{ID_A} . Siehe 3.2.4.4 für weitere Einzelheiten.

1.4.3

Anbinden – Verbinden

(en: attach versus connect)

diese Festlegung unterscheidet zwischen den Begriffen „Anbinden“ und „Verbinden“. Ein Gerät mit nachgeschaltetem Anschluss wird als angebunden an einen vorgeschalteten Anschluss bezeichnet, wenn ein physikalisches Kabel zwischen den beiden vorhanden ist.

Ein nachgeschaltetes Gerät wird als verbunden mit einem vorgeschalteten Anschluss bezeichnet, wenn es an den vorgeschalteten Anschluss angebunden ist und wenn das nachgeschaltete Gerät entweder die (D+)-Datenleitung oder die (D–)-Datenleitung über einen 1,5-k Ω -Widerstand auf null gezogen hat, um Meldungen mit niedriger Geschwindigkeit, voller Geschwindigkeit oder hoher Geschwindigkeit zu ermöglichen.

1.4.4

nachgeschalteter Ladeanschluss

CDP

(en: charging downstream port)

nachgeschalteter Anschluss an einem Gerät, der den Festlegungen von USB 2.0 für einen Host oder einen Hub entspricht, außer dass er die Leistungsmerkmale des in diesem Dokument festgelegten nachgeschalteten Ladeanschlusses unterstützen muss.

Ein CDP muss eine Spannung V_{DM_SRC} auf seiner (D–)-Leitung ausgeben, wenn er an der (D+)-Leitung eine Spannung größer als V_{DAT_REF} oder kleiner als V_{LGC} misst, ohne mit einem peripheren Gerät verbunden zu sein. Ein CDP darf keine Spannung V_{DM_SRC} auf seiner (D–)-Leitung ausgeben ab dem Zeitpunkt, an dem ein peripheres Gerät verbunden ist, bis zu dem Zeitpunkt, an dem das periphere Gerät abgetrennt wird.

1.4.5

Ladeanschluss

(en: charging port)

DCP, CDP, ACA-Dock oder ACA

^{N1)} Nationale Fußnote: Die Nummerierung der Begriffe aus IEC 62680-3:2013 wurde beibehalten.

1.4.6**Grenzwert bei leerer Batterie**

(en: dead battery threshold)

maximaler Ladepegel einer Batterie, unterhalb dessen sichergestellt ist, dass kein Gerät erfolgreich eingeschaltet werden kann.

Eine leere Batterie ist eine Batterie, deren Spannung unterhalb des Grenzwertes bei leerer Batterie liegt.

1.4.7**fest zugeordneter Ladeanschluss****DCP**

(en: dedicated charging port)

nachgeschalteter Anschluss an einem Gerät, das Leistung über einen USB-Steckverbinder ausgibt, aber nicht fähig ist, ein nachgeschaltetes Gerät zu spezifizieren. Ein DCP muss IDCP bei einer durchschnittlichen Spannung V_{CHG} liefern.

Ein DCP muss die (D+)-Leitung mit der (D-)-Leitung kurzschließen.

1.4.8**nachgeschalteter Anschluss**

(en: downstream port)

nachgeschalteter Anschluss, der entweder auf einen nachgeschalteten Standardanschluss oder auf einen nachgeschalteten Ladeanschluss verweist

1.4.9**Mikro-ACA**

(en: micro ACA)

Ladeadapter für Zubehör (ACA) mit einem Mikro-AB-Stecker am Geräteanschluss

1.4.10**tragbares Gerät****PD**

(en: portable device)

Gerät, das konform ist mit diesen Festlegungen und den USB 2.0-Festlegungen und das aus einem USB-Gerät einen Ladestrom ziehen kann

1.4.11**Bemessungsstrom**

(en: rated current)

Strom, den ein Ladeanschluss ausgeben kann unter Beibehaltung der VBUS-Spannung V_{CHG} . Der Bemessungsstrom eines DCP muss innerhalb von IDCP liegen, und der Bemessungsstrom eines CDP oder einer ACA-Dock muss innerhalb von ICDP liegen

1.4.12**Standard-ACA**

(en: standard ACA)

Ladeadapter für Zubehör (ACA) mit einem Standard-A-Stecker am Geräteanschluss

1.4.13**nachgeschalteter Standardanschluss****SDP**

(en: standard downstream port)

ein nachgeschalteter Standardanschluss (SDP) verweist auf einen nachgeschalteten Anschluss, der den Festlegungen von USB 2.0 für einen Host oder einen Hub entspricht. Ein SDP erwartet ein nachgeschaltetes Gerät mit einer guten Batterie, das abgeschaltet oder suspendiert durchschnittlich weniger als 2,5 mA Strom zieht und verbunden sowie nicht konfiguriert und nicht suspendiert maximal 100 mA. Ein nachgeschaltetes Gerät kann spezifiziert werden, wenn es mit einem SDP verbunden ist.

Ein SDP zieht die (D+)-Leitung und die (D-)-Leitung auf Masse über zwei (typischerweise) 15-k Ω -Widerstände.

Ein SDP kann die Fähigkeit haben zu erkennen, wenn ein PD die (D+)-Leitung auf VDP_SRC anhebt, und den Leistungsstatus entsprechend organisieren. PDs sind erforderlich, um die (D+)-Leitung auf VDP_SRC anzuheben, wenn diese mehr Strom ziehen als I_{SUSP} , während sie angehängt, jedoch nicht verbunden sind, wie im Abschnitt „leere Batterie“ beschrieben.

1.4.14

USB-Ladegerät

(en: USB charger)

Gerät mit einem fest zugeordneten Ladeanschluss (DCP), wie z. B. einer Steckdose oder einem Kfz-Ladestecker

1.4.15

Grenzwert bei schwacher Batterie

(en: weak battery threshold)

Mindest-Ladepegel der Batterie, so dass oberhalb dieses Grenzwertes ein Gerät mit Sicherheit erfolgreich eingeschaltet werden kann.

Eine schwache Batterie ist eine Batterie, deren Spannung oberhalb des Grenzwertes für leere Batterie, aber unterhalb des Grenzwertes für schwache Batterie liegt. Ein Gerät mit einer schwachen Batterie kann ein Gerät erfolgreich einschalten oder auch nicht.

Eine gute Batterie ist eine Batterie, deren Spannung oberhalb des Grenzwertes für schwache Batterie liegt.

**Universal serial bus interfaces for data and power –
Part 3: USB battery charging specification, Revision 1.2
(IEC 62680-3:2013)**

Interfaces de bus universel en série pour les
données et l'alimentation électrique –
Partie 3: Spécification de chargement des
batteries USB, révision 1.2
(CEI 62680-3:2013)

Schnittstellen des Universellen Seriellen Busses
für Daten und Energie –
Teil 3: Festlegung für den USB-Batterie-
Ladevorgang, Überarbeitung 1.2
(ICE 62680-3:2013)

This European Standard was approved by CENELEC on 2013-09-27. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CENELEC

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Foreword

The text of document 100/2157/FDIS, future edition 1 of IEC 62680-3, prepared by Technical Area 14 "Interfaces and methods of measurement for personal computing equipment" of IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62680-3:2013.

The following dates are fixed:

- latest date by which the document has to (dop) 2014-06-27
be implemented at national level by
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- latest date by which the national (dow) 2016-09-27
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The text of the International Standard IEC 62680-3:2013 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

The IEC 62680 series is based on a series of specifications that were originally developed by the USB Implementers Forum (USB-IF). These specifications were submitted to the IEC under the auspices of a special agreement between the IEC and the USB-IF.

The USB Implementers Forum, Inc. (USB-IF) is a non-profit corporation founded by the group of companies that developed the Universal Serial Bus specification. The USB-IF was formed to provide a support organization and forum for the advancement and adoption of Universal Serial Bus technology. The Forum facilitates the development of high-quality compatible USB peripherals (devices), and promotes the benefits of USB and the quality of products that have passed compliance testing.

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This series covers the Universal Serial Bus interfaces for data and power and consists of the following parts:

IEC 62680-1, *Universal Serial Bus interfaces for data and power - Part 1: Universal Serial Bus Specification, Revision 2.0*

IEC 62680-2, *Universal Serial Bus interfaces for data and power - Part 2: USB Micro-USB Cables and Connectors Specification, Revision 1.01*

IEC 62680-3, *Universal Serial Bus interfaces for data and power - Part 3: USB Battery Charging Specification, Revision 1.2*

IEC 62680-4, *Universal Serial Bus interfaces for data and power - Part 4: Universal Serial Bus Cables and Connectors Class Document Revision. 2.0*

This part of the IEC 62680 series consists of several distinct parts:

the main body of the text, which consists of the original specification and all ECN and Errata developed by the USB-IF;

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Revision History

Revision	Date	Author	Description
BC1.0	Mar 8, 2007	Terry Remple	First release
BC1.1	April 15, 2009	Terry Remple	Major updates to all sections. Added Data Contact Detect protocol, and Accessory Charger Adapter.
BC1.2	Oct 5, 2010	Terry Remple Adam Burns	Following items indicate changes from BC1.1 to BC1.2. References below to Section, Figures and Tables refer to BC1.2, unless BC1.1 is specifically indicated. 1. Allow DCPs to output more than 1.5A. Allows Portable Devices (PDs) with switch mode chargers to draw more power. Section 4.4.1. 2. Increase minimum CDP current to 1.5A. Without change, PDs had to draw less than 500mA, to avoid CDP shutdown. Table 5-2. 3. Indicate that ICDP max and IDCP max limits of 5A come from USB 2.0, and are safety limits. Table 5-2 note 1. 4. Allow PDs to draw up to 1.5A during HS chirp and traffic. Remove previous limits of 560mA and 900mA which was based on HS common mode ranges. Section 3.5. 5. Require CDPs to support 1.5A during HS chirp and traffic. Affects CDP common mode range. Section 3.5. 6. Reduce maximum PD current from 1.8A to 1.5A, to avoid shutdown when attached to CDP. Table 5-2. 7. Rename Docking Station to ACA-Dock, to avoid confusion with other types of Docking Stations. 8. Require ACA-Dock to differentiate itself from an ACA, by enabling VDM_SRC during no activity. Section 3.2.4.4. 9. Allow CDP to leave VDM_SRC enabled while peripheral not connected. Section 3.2.4.2. 10. Remove ICHG_SHTDWN. This was a recommended max output current for Charging Ports with VBUS grounded. BC1.1 Section 4.1. 11. Require VDP_SRC to not pull D+ below 2.2V when D+ is being pulled to VDP_UP through RDP_UP. Require VDM_SRC to not pull D- below 2.2V when D- is being pulled high. Required for ACA-Dock support. Table 5-1 notes 1 and 2. 12. Make DCD current source optional for PDs. Section 3.2.3. 13. Make DCD timeout required for PDs. Section 3.2.3. 14. Make Secondary Detection optional for PDs. Section 4.6.2. 15. Make Good Battery Algorithm required behavior for PDs. Section 3.2.4. 16. Remove resistive detection. BC1.1 Section 3.9. 17. Change PD Required Operating Range to include 4.5V at 500mA. Figure 4-3. 18. Allow any downstream port to act as a DCP. Section 4.1.3. 19. Require PDs to enable VDP_SRC or RDP_PU when charging from a DCP. Section 3.3.2. 20. Allow chargers to renegotiate current with PD by

Revision	Date	Author	Description
			dropping and reasserting VBUS. Section 4.1.3. 21. Require PDs to discharge their own VBUS input after VBUS drops to support charger port renegotiation request. Section 4.6.3. 22. Allow PDs to disconnect and repeat Charger Detection multiple times while attached, with specified timing. Section 4.6.3. 23. Reduce DCP input impedance between D+, D- to VBUS and ground from 1MΩ to 300kΩ. Section 4.4.3. 24. Require CDPs to recover after over-current condition. Section 4.2.2. 25. Allow greater DCP undershoot for large load current steps, to enable low quiescent current chargers required by Europe. Section 4.4.2. 26. Define ACAs and ACA-Docks as types of Charging Ports. Section 1.4.5. 27. Use session valid voltage range defined in EH and OTG Supplement rev 2.0. Section 3.2.2. 28. Only devices that can operate stand-alone from internal battery power are allowed to use the Dead Battery Provision. Section 2.2. 29. Allow compound PDs to draw ISUSP plus an responsible for protecting themselves against higher voltages on VBUS. BC1.1 Section 6.7. 45. Require ACAs to continue providing power to OTG device from Charging Port, even if ground offsets or USB reset cause D- to go below VDAT_REF. Section 6.2.6. 46. Change charger shutdown recovery time (TSHTDWN_REC) from 2 seconds to 2 minutes. Table 5-5. 47. Indicate that ACA-Dock is required to pull D+ to VDP_UP with RDP_UP when VBUS is asserted. Section 3.2.4.4. 48. Remove statements regarding devices with multiple receptacles. Covered in Multiple Receptacle white paper at http://www.usb.org/developers/docs/. 49. Improve readability by adding and updating drawings, re-structuring sections, and clarifying text.
BC 1.2 plus errata	Oct 12, 2011	Pat Crowe	Includes errata changes from Oct 12, 2011
BC 1.2 plus further errata	Mar 15, 2012	Pat Crowe	Includes errata changes from Mar 15, 2012: 1. Corrections to Micro ACA specification.

Acronyms

ACA	Accessory Charger Adapter
CDP	Charging Downstream Port
DBP	Dead Battery Provision
DCD	Data Contact Detect
DCP	Dedicated Charging Port
FS	Full Speed
HS	High-Speed
LS	Low-Speed
OTG	On-The-Go
PC	Personal Computer
PD	Portable Device
PHY	Physical Layer Interface for High-Speed USB
PS2	Personal System 2
SDP	Standard Downstream Port
SRP	Session Request Protocol
TPL	Targeted Peripheral List
USB	Universal Serial Bus
USBCV	USB Command Verifier
USB-IF	USB Implementers Forum
VBUS	Voltage line of the USB interface

1 Introduction

1.1 Scope

The Battery Charging Working Group is chartered with creating specifications that define limits as well as detection, control and reporting mechanisms to permit devices to draw current in excess of the USB 2.0 specification for charging and/or powering up from dedicated chargers, hosts, hubs and charging downstream ports. These mechanisms are backward compatible with USB 2.0 compliant hosts and peripherals.

1.2 Background

The USB ports on personal computers are convenient places for Portable Devices (PDs) to draw current for charging their batteries. This convenience has led to the creation of USB Chargers that simply expose a USB standard-A receptacle. This allows PDs to use the same USB cable to charge from either a PC or from a USB Charger.

If a PD is attached to a USB host or hub, then the USB 2.0 specification requires that after connecting, a PD must draw less than:

- 2.5 mA average if the bus is suspended
- 100 mA if bus is not suspended and not configured
- 500 mA if bus is not suspended and configured for 500 mA

If a PD is attached to a Charging Port, (i.e. CDP, DCP, ACA-Dock or ACA), then it is allowed to draw I_{DEV_CHG} without having to be configured or follow the rules of suspend.

In order for a PD to determine how much current it is allowed to draw from an upstream USB port, there need to be mechanisms that allow the PD to distinguish between a Standard Downstream Port and a Charging Port. This specification defines just such mechanisms.

Since PDs can be attached to USB chargers from various manufacturers, it is important that all provide an acceptable user experience. This specification defines the requirements for a compliant USB charger, which is referred to in this spec as a USB Charger.

If a PD has a Dead or Weak Battery, then the Connect Timing Engineering Change Notice (ECN) issued by the USB-IF on the USB 2.0 spec allows that device to draw up to I_{UNIT} while attached but not connected. The conditions associated with this ECN are contained in Section 2 of this specification, and are referred to as the Dead Battery Provision (DBP).

1.3 Reference Documents

The following specifications contain information relevant to the Battery Charging Specification.

- OTG and Embedded Host Supplement, Revision 2.0
- USB 2.0 Specification
- USB 3.0 Specification

1.4 Definitions of Terms

This section contains definitions for some of the terms used in this specification.

1.4.1 Accessory Charger Adaptor

An Accessory Charger Adaptor (ACA) is an adaptor which allows a single USB port to be attached to both a charger and another device at the same time.

The following terminology is used when referring to an ACA:

- ACA-A An ACA with ID resistance of R_{ID_A}
- ACA-B An ACA with ID resistance of R_{ID_B}
- ACA-C An ACA with ID resistance of R_{ID_C}

See Section 6 for details on an ACA.

1.4.2 **ACA-Dock**

An ACA-Dock is a docking station that has one upstream port, and zero or more downstream ports. The upstream port can be attached to a PD, and is capable of sourcing I_{CDP} to the PD. An ACA-Dock signals it is an ACA-Dock to the PD by enabling V_{DM_SRC} during USB idle, and by pulling ID to ground through a resistance of R_{ID_A} . See Section 3.2.4.4 for more details.

1.4.3 **Attach versus Connect**

This specification makes a distinction between the words “attach” and “connect”. A downstream device is considered to be attached to an upstream port when there is a physical cable between the two.

A downstream device is considered to be connected to an upstream port when it is attached to the upstream port, and when the downstream device has pulled either the D+ or D- data line high through a 1.5 k Ω resistor, in order to enter Low-Speed, Full-Speed or High-Speed signaling.

1.4.4 **Charging Downstream Port**

A Charging Downstream Port (CDP) is a downstream port on a device that complies with the USB 2.0 definition of a host or a hub, except that it shall support the Charging Downstream Port features specified herein.

A CDP shall output a voltage of V_{DM_SRC} on its D- line when it senses a voltage greater than V_{DAT_REF} but less than V_{LGC} on its D+ line when not connected to a peripheral. A CDP shall not output a voltage of V_{DM_SRC} on its D- line from the time that the peripheral is connected, to the time that the peripheral is disconnected.

1.4.5 **Charging Port**

A Charging Port is a DCP, CDP, ACA-Dock or ACA.

1.4.6 **Dead Battery Threshold**

The Dead Battery Threshold is defined as the maximum charge level of a battery such that below this threshold, a device is assured of not being able to power up successfully.

A Dead Battery is defined as one that is below the Dead Battery Threshold.

1.4.7 **Dedicated Charging Port**

A Dedicated Charging Port (DCP) is a downstream port on a device that outputs power through a USB connector, but is not capable of enumerating a downstream device. A DCP shall source I_{DCP} at an average voltage of V_{CHG} .

A DCP shall short the D+ line to the D- line.

1.4.8 Downstream Port

In this specification, a Downstream Port refers to either a Standard Downstream Port or a Charging Downstream Port.

1.4.9 Micro ACA

A Micro ACA is an ACA with a Micro-AB receptacle on the Accessory Port.

1.4.10 Portable Device

A PD as used in this specification is a device which is compliant with this specification and the USB 2.0 specification, and can draw charging current from USB.

1.4.11 Rated Current

The Rated Current of a Charging Port is the amount of current that a Charging Port can output and still maintain a VBUS voltage of VCHG. The Rated Current of a DCP is required to be within IDCP, and the rated current of a CDP or ACA-Dock is required to be within ICDP.

1.4.12 Standard ACA

A Standard ACA is an ACA with a Standard-A receptacle on the Accessory Port.

1.4.13 Standard Downstream Port

In this specification, a Standard Downstream Port (SDP) refers to a downstream port on a device that complies with the USB 2.0 definition of a host or hub. An SDP expects a downstream device with a good battery to draw less than 2.5 mA average when unconnected or suspended, up to 100 mA maximum when connected and not configured and not suspended, and up to 500 mA maximum if so configured and not suspended. A downstream device can be enumerated when it is connected to an SDP.

An SDP pulls the D+ and D- lines to ground through two 15 k Ω (typical) resistors.

An SDP may have the ability to sense when a PD is driving the D+ line to VDP_SRC, and then manage its power states accordingly. PDs are required to drive D+ to VDP_SRC whenever they draw more than ISUSP while attached but not connected, as described in the Dead Battery Provision.

1.4.14 USB Charger

A USB Charger is a device with a DCP, such as a wall adapter or car power adapter.

1.4.15 Weak Battery Threshold

The Weak Battery Threshold is defined as the minimum charge level of a battery such that above this threshold, a device is assured of being able to power up successfully.

A Weak Battery is defined as one that is above the Dead Battery Threshold and below the Weak Battery Threshold. A device with a Weak Battery may or may not be able to power up a device successfully.

A Good Battery is defined as one that is above the Weak Battery Threshold.

1.5 Parameter Values

Parameter names are used throughout this specification instead of parameter values. All parameter values are found in Section 5.

1.6 OTG Considerations

A PD with a Dead Battery cannot differentiate between a PC and an OTG A-device. Thus, a PD will treat both the same.

If an OTG A-device is connected to a PD with a dead battery, then the OTG A-device is under no obligation to provide any more current than it normally would to any device on its Targeted Peripheral List (TPL).

An OTG A-device is allowed to stop driving VBUS after a time of $T_{A_WAIT_BCON}$ (See OTG 2.0 Supplement for value) while waiting for the B-device to connect. Thus, a PD with a Dead Battery may not have time for significant charging when attached to an OTG A-device, if it does not connect.

1.7 Super Speed Considerations

SuperSpeed ports defined in USB 3.0 are allowed to implement the charger detection mechanisms defined in this spec. When a PD detects it is attached to a SuperSpeed port, then I_{CFG_MAX} changes to 900mA, and I_{UNIT} changes to 150mA.

2 Dead Battery Provision

2.1 Background

The USB 2.0 specification allows a downstream device to draw a suspend current of up to I_{SUSP} from a SDP when the device is not connected or when the bus is suspended. If the bus is not suspended and the device is configured, then USB 2.0 allows a device to draw up to I_{CFG_MAX} , depending on the configuration the host enables.

This limit of only I_{SUSP} when not connected can be problematic for PDs with a Dead Battery or a Weak Battery. Some PDs require more than I_{UNIT} for several seconds just to power up. Thus, PDs with Dead Batteries or Weak Batteries may not be able to power up when attached to an SDP if they can only draw I_{SUSP} when not connected.

USB 2.0 allows a PD that is a compound device to draw I_{SUSP} for each downstream port while attached but not connected or during suspend.

2.2 DBP – Unconfigured Clause

A PD with a Dead or Weak Battery is allowed to draw I_{UNIT} from a Downstream Port using the DBP while not configured, providing it behaves as follows:

- Reduces current to I_{SUSP} after timeout
 - If PD is not ready to connect and be enumerated within $T_{SVLD_CON_WKB}$ after attach, then it shall reduce its current to I_{SUSP}
- Enables V_{DP_SRC} when attached but not connected
 - PD shall enable V_{DP_SRC} within $T_{DBP_ATT_VDPSRC}$ of attach
 - PD shall connect within $T_{DBP_VDPSRC_CON}$ of disabling V_{DP_SRC}

- Uses current to power up and enumerate, or reach Weak Battery Threshold and enumerate, as soon as possible
 - PD shall not use the DBP current to perform unrelated tasks, such as:
 - Charging beyond the Weak Battery Threshold
 - Making a phone call
 - Playing a song, video or game
 - Establishing a wireless connection
 - Only devices that can operate stand-alone from internal battery power are allowed to use the DBP.
- Passes inrush test
 - PD with Dead or Weak Battery shall pass USB-IF compliance inrush test

The unconfigured state includes the time that the PD is attached and not connected, and the time that the PD is connected and not configured. A PD enters the configured state by receiving a SET_CONFIGURATION command from the host.

2.3 DBP – Configured Clause

A PD with a Dead or Weak Battery is allowed to draw its configured current, (which can be up to ICFG_MAX), from a Standard Downstream Port using the Dead Battery Provision (DBP) while configured, and not have to pass USBCV tests, providing it behaves as follows:

- Responds to received tokens
 - PD shall respond to any tokens addressed to it, with either a NAK or any other valid USB response
- Responds to USB reset
 - Upon receipt of USB reset, a PD shall reduce its current to IUNIT. PD is allowed to disconnect upon receiving a reset. While disconnected, PD is allowed to use the DBP – Unconfigured Clause.
- Responds to USB suspend
 - Upon receipt of USB suspend, PD shall either remain connected, and reduce its current to ISUSP, or it shall disconnect. While disconnected, the PD is allowed to use the DBP – Unconfigured Clause.
- Provides full USB functionality after timeout, or disconnects
 - After a time of TDBP_FUL_FNCTN from attach, a PD shall either remain connected and be able to pass USBCV, or it shall disconnect. While disconnected, the PD is allowed to use the DBP – Unconfigured Clause.
- Uses current to reach Weak Battery Threshold and provide full USB functionality as soon as possible
 - PD shall not use the DBP current to perform unrelated tasks, such as:
 - Charging beyond the Weak Battery Threshold
 - Making a phone call
 - Playing a song, video or game
 - Establishing a wireless connection
- Provides full USB functionality upon reaching Weak Battery Threshold
 - PD shall provide full USB functionality upon reaching Weak Battery Threshold if this occurs before TDBP_FUL_FNCTN after attach.