

INTERNATIONAL STANDARD

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**Universal serial bus interfaces for data and power –
Part 1-1: Common components – USB Battery Charging Specification,
Revision 1.2**

**Interfaces de bus universel en série pour les données et l'alimentation
électrique –
Partie 1-1: Composants communs – Spécification de chargement des batteries
USB, révision 1.2**



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**UNIVERSAL SERIAL BUS INTERFACES
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USB Battery Charging Specification, Revision 1.2**

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The text of this standard is based on documents prepared by the USB Implementers Forum (USB-IF). The structure and editorial rules used in this publication reflect the practice of the organization which submitted it.

This first edition cancels and replaces IEC 62680-3 published in 2013. This edition constitutes a technical revision.

The text of this standard is based on the following documents:

CDV	Report on voting
100/2330/CDV	100/2433/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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IEC 62680-1-1, *Universal Serial Bus interfaces for data and power – Part 1-1: Common components – USB Battery Charging Specification, Revision 1.2*

IEC 62680-2-1, *Universal Serial Bus interfaces for data and power – Part 2-1: Universal Serial Bus Specification, Revision 2.0*

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

IEC 62680-2-3, *Universal Serial Bus interfaces for data and power – Part 2-3: 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.

CONTENTS

FOREWORD.....	2
INTRODUCTION.....	4
1 Introduction	13
1.1 Scope	13
1.2 Background.....	13
1.3 Reference Documents.....	13
1.4 Definitions of Terms.....	14
1.4.1 Accessory Charger Adaptor	14
1.4.2 ACA-Dock.....	14
1.4.3 Attach versus Connect.....	14
1.4.4 Charging Downstream Port.....	14
1.4.5 Charging Port	14
1.4.6 Dead Battery Threshold	14
1.4.7 Dedicated Charging Port.....	15
1.4.8 Downstream Port.....	15
1.4.9 Micro ACA	15
1.4.10 Portable Device	15
1.4.11 Rated Current.....	15
1.4.12 Standard ACA.....	15
1.4.13 Standard Downstream Port.....	15
1.4.14 USB Charger	15
1.4.15 Weak Battery Threshold.....	15
1.5 Parameter Values.....	16
1.6 OTG Considerations	16
1.7 Super Speed Considerations.....	16
2 Dead Battery Provision	16
2.1 Background.....	16
2.2 DBP – Unconfigured Clause.....	16
2.3 DBP – Configured Clause	17
3 Charging Port Detection	18
3.1 Overview.....	18
3.2 Charger Detection Hardware.....	19
3.2.1 Overview	19
3.2.2 VBUS Detect	20
3.2.3 Data Contact Detect	20
3.2.4 Primary Detection	23
3.2.5 Secondary Detection	30
3.2.6 ACA Detection.....	32
3.3 Charger Detection Algorithms	34
3.3.1 Weak Battery Algorithm	34
3.3.2 Good Battery Algorithm	35
3.4 Charger Detection Timing	36
3.4.1 Data Contact Detect Timing.....	36
3.4.2 Detection Timing, CDP	38
3.5 Ground Current and Noise Margins.....	40
4 Charging Port and Portable Device Requirements	40
4.1 Charging Port Requirements	40

4.1.1	Overshoot.....	40
4.1.2	Maximum Current	40
4.1.3	Detection Renegotiation	40
4.1.4	Shutdown Operation	41
4.1.5	Failure Voltage	41
4.1.6	Multiple Ports	41
4.2	Charging Downstream Port	41
4.2.1	Required Operating Range	41
4.2.2	Shutdown Operation	42
4.2.3	Undershoot.....	42
4.2.4	Detection Signaling.....	42
4.2.5	Connector.....	43
4.3	ACA-Dock	43
4.3.1	Required Operating Range	43
4.3.2	Undershoot.....	43
4.3.3	Detection Signaling.....	43
4.3.4	Connector.....	43
4.4	Dedicated Charging Port.....	43
4.4.1	Required Operating Range	43
4.4.2	Undershoot.....	44
4.4.3	Detection Signaling.....	44
4.4.4	Connector.....	44
4.5	Accessory Charger Adapter	45
4.5.1	Required Operating Range	45
4.5.2	Undershoot.....	45
4.5.3	Detection Signaling.....	45
4.5.4	Connector.....	45
4.6	Portable Device	45
4.6.1	Allowed Operating Range	45
4.6.2	Detection Signaling.....	46
4.6.3	Detection Renegotiation	46
4.6.4	Connector.....	47
5	Parameter Values	47
6	Accessory Charger Adapter	50
6.1	Introduction.....	50
6.2	Micro ACA	52
6.2.1	Micro ACA Ports	52
6.2.2	Micro ACA Connectivity Options	53
6.2.3	Micro ACA Architecture.....	53
6.2.4	Micro ACA Modes of Operation.....	54
6.2.5	Implications of not Supporting Micro ACA Detection	56
6.2.6	Micro ACA Requirements.....	56
6.2.7	Portable Device State Diagram.....	57
6.3	Standard ACA.....	59
6.3.1	Standard ACA Ports	59
6.3.2	Standard ACA Architecture	60
6.3.3	Standard ACA Modes of Operation	62
6.3.4	Implications of not Supporting Standard ACA Detection.....	62
6.3.5	Standard ACA Requirements	62

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IEC 62680-1-1:2015

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Figure 3-1 – System Overview	18
Figure 3-2 – Charger Detection Hardware	19
Figure 3-3 – Data Pin Offset	20
Figure 3-4 – Data Contact Detect, Not Attached.....	21
Figure 3-5 – Data Contact Detect, Standard Downstream Port.....	22
Figure 3-6 – Primary Detection, DCP	23
Figure 3-7 – Primary Detection, CDP	25
Figure 3-8 – Primary Detection, SDP	26
Figure 3-9 – Primary Detection, ACA-Dock	27
Figure 3-10 – Primary Detection, ACA	29
Figure 3-11 – Secondary Detection, DCP.....	30
Figure 3-12 – Secondary Detection, CDP.....	31
Figure 3-13 – ACA Detection	33
Figure 3-14 – Weak Battery Algorithm.....	34
Figure 3-15 – Good Battery Algorithm	35
Figure 3-16 – DCD Timing, Contact After Start.....	37
Figure 3-17 – DCD Timing, Contact Before Start.....	37
Figure 3-18 – DCD Timing, No Contact.....	38
Figure 3-19 – Detection Timing, CDP.....	39
Figure 4-1 – CDP Required Operating Range	42
Figure 4-2 – DCP Required Operating Range	44
Figure 4-3 – Portable Device Allowed Operating Range.....	46
Figure 6-1 – Accessory Charger Adapter	51
Figure 6-2 – Micro ACA Ports	52
Figure 6-3 – Micro ACA Architecture	54
Figure 6-4 – Portable Device State Diagram	58
Figure 6-5 – Standard ACA Ports	59
Figure 6-6 – Standard ACA Architecture	61
Table 5-1 – Voltages	47
Table 5-2 – Currents	48
Table 5-3 – Resistances	49
Table 5-4 – Capacitances	49
Table 5-5 – Times.....	50
Table 6-1 – Micro ACA Connectivity Options.....	53
Table 6-2 – Micro ACA Modes of Operation	55
Table 6-3 – Standard ACA Connectivity Options	60
Table 6-4 – Standard ACA Modes of Operation.....	62

**Battery Charging
Specification
(Including errata and ECNs through March 15, 2012)**

**Revision 1.2
March 15, 2012**

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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	<p>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.</p> <ol style="list-style-type: none"> 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.

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Revision	Date	Author	Description
			<p>20. Allow chargers to renegotiate current with PD by dropping and reasserting VBUS. Section 4.1.3.</p> <p>21. Require PDs to discharge their own VBUS input after VBUS drops to support charger port renegotiation request. Section 4.6.3.</p> <p>22. Allow PDs to disconnect and repeat Charger Detection multiple times while attached, with specified timing. Section 4.6.3.</p> <p>23. Reduce DCP input impedance between D+, D- to VBUS and ground from 1MΩ to 300kΩ. Section 4.4.3.</p> <p>24. Require CDPs to recover after over-current condition. Section 4.2.2.</p> <p>25. Allow greater DCP undershoot for large load current steps, to enable low quiescent current chargers required by Europe. Section 4.4.2.</p> <p>26. Define ACAs and ACA-Docks as types of Charging Ports. Section 1.4.5.</p> <p>27. Use session valid voltage range defined in EH and OTG Supplement rev 2.0. Section 3.2.2.</p> <p>28. Only devices that can operate stand-alone from internal battery power are allowed to use the Dead Battery Provision. Section 2.2.</p> <p>29. Allow compound PDs to draw ISUSP plus an responsible for protecting themselves against higher voltages on VBUS. BC1.1 Section 6.7.</p> <p>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.</p> <p>46. Change charger shutdown recovery time (TSHTDWN_REC) from 2 seconds to 2 minutes. Table 5-5.</p> <p>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.</p> <p>48. Remove statements regarding devices with multiple receptacles. Covered in Multiple Receptacle white paper at http://www.usb.org/developers/docs/.</p> <p>49. Improve readability by adding and updating drawings, re-structuring sections, and clarifying text.</p>
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.

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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

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UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER –

Part 1-1: Common components – USB Battery Charging Specification, Revision 1.2

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 [IDEV_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 IUNIT 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