# IEC 62680-2-1

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# INTERNATIONAL STANDARD

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## Universal serial bus interfaces for data and power –
## Part 2-1: Universal Serial Bus Specification, Revision 2.0

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER –

# Part 2-1: Universal Serial Bus Specification, Revision 2.0

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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.

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

| CDV | Report on voting |
|---|---|
| 100/2331/CDV | 100/2434/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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- withdrawn,
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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 to 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 62680-1-1, *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.

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**NOTE All Engineering Change Notice's (ECN) and Errata documents as of September 01, 2012 that pertain to this core specification follow the last page of the specification starting on page 635.**

# Universal Serial Bus Specification

**Compaq**
**Hewlett-Packard**
**Intel**
**Lucent**
**Microsoft**
**NEC**
**Philips**

**Revision 2.0**
**April 27, 2000**

Scope of this Revision

The 2.0 revision of the specification is intended for product design. Every attempt has been made to ensure a consistent and implementable specification. Implementations should ensure compliance with this revision.

## Revision History

| Revision | Issue Date | Comments |
|---|---|---|
| 0.7 | November 11, 1994 | Supersedes 0.6e. |
| 0.8 | December 30, 1994 | Revisions to Chapters 3-8, 10, and 11. Added appendixes. |
| 0.9 | April 13, 1995 | Revisions to all the chapters. |
| 0.99 | August 25, 1995 | Revisions to all the chapters. |
| 1.0 FDR | November 13, 1995 | Revisions to Chapters 1, 2, 5-11. |
| 1.0 | January 15, 1996 | Edits to Chapters 5, 6, 7, 8, 9, 10, and 11 for consistency.. |
| 1.1 | September 23, 1998 | Updates to all chapters to fix problems identified. |
| 2.0 (draft 0.79) | October 5, 1999 | Revisions to chapters 5, 7, 8, 9, 11 to add high speed. |
| 2.0 (draft 0.9) | December 21, 1999 | Revisions to all chapters to add high speed. |
| 2.0 | April 27, 2000 | Revisions for high-speed mode. |

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Please send comments via electronic mail to techsup@usb.org

For industry information, refer to the USB Implementers Forum web page at http://www.usb.org

Acknowledgement of USB 2.0 Technical Contribution

The authors of this specification would like to recognize the following people who participated in the USB 2.0 Promoter Group technical working groups. We would also like to thank others in the USB 2.0 Promoter companies and throughout the industry who contributed to the development of this specification.

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# UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER –

# Part 2-1: Universal Serial Bus Specification, Revision 2.0

## 1 Chapter 1 Introduction

### 1.1 Motivation

The original motivation for the Universal Serial Bus (USB) came from three interrelated considerations:

- Connection of the PC to the telephone

It is well understood that the merge of computing and communication will be the basis for the next generation of productivity applications. The movement of machine-oriented and human-oriented data types from one location or environment to another depends on ubiquitous and cheap connectivity. Unfortunately, the computing and communication industries have evolved independently. The USB provides a ubiquitous link that can be used across a wide range of PC-to-telephone interconnects.

- Ease-of-use

The lack of flexibility in reconfiguring the PC has been acknowledged as the Achilles' heel to its further deployment. The combination of user-friendly graphical interfaces and the hardware and software mechanisms associated with new-generation bus architectures have made computers less confrontational and easier to reconfigure. However, from the end user's point of view, the PC's I/O interfaces, such as serial/parallel ports, keyboard/mouse/joystick interfaces, etc., do not have the attributes of plug-and-play.

- Port expansion

The addition of external peripherals continues to be constrained by port availability. The lack of a bi-directional, low-cost, low-to-mid speed peripheral bus has held back the creative proliferation of peripherals such as telephone/fax/modem adapters, answering machines, scanners, PDA's, keyboards, mice, etc. Existing interconnects are optimized for one or two point products. As each new function or capability is added to the PC, a new interface has been defined to address this need.

The more recent motivation for USB 2.0 stems from the fact that PCs have increasingly higher performance and are capable of processing vast amounts of data. At the same time, PC peripherals have added more performance and functionality. User applications such as digital imaging demand a high performance connection between the PC and these increasingly sophisticated peripherals. USB 2.0 addresses this need by adding a third transfer rate of 480 Mb/s to the 12 Mb/s and 1.5 Mb/s originally defined for USB. USB 2.0 is a natural evolution of USB, delivering the desired bandwidth increase while preserving the original motivations for USB and maintaining full compatibility with existing peripherals.

Thus, USB continues to be the answer to connectivity for the PC architecture. It is a fast, bi-directional, isochronous, low-cost, dynamically attachable serial interface that is consistent with the requirements of the PC platform of today and tomorrow.

### 1.2 Objective of the Specification

This document defines an industry-standard USB. The specification describes the bus attributes, the protocol definition, types of transactions, bus management, and the

programming interface required to design and build systems and peripherals that are compliant with this standard.

The goal is to enable such devices from different vendors to interoperate in an open architecture. The specification is intended as an enhancement to the PC architecture, spanning portable, business desktop, and home environments. It is intended that the specification allow system OEMs and peripheral developers adequate room for product versatility and market differentiation without the burden of carrying obsolete interfaces or losing compatibility.

### 1.3 Scope of the Document

The specification is primarily targeted to peripheral developers and system OEMs, but provides valuable information for platform operating system/ BIOS/ device driver, adapter IHVs/ISVs, and platform/adapter controller vendors. This specification can be used for developing new products and associated software.

### 1.4 USB Product Compliance

Adopters of the USB 2.0 specification have signed the USB 2.0 Adopters Agreement, which provides them access to a reciprocal royalty-free license from the Promoters and other Adopters to certain intellectual property contained in products that are compliant with the USB 2.0 specification. Adopters can demonstrate compliance with the specification through the testing program as defined by the USB Implementers Forum. Products that demonstrate compliance with the specification will be granted certain rights to use the USB Implementers Forum logo as defined in the logo license.

### 1.5 Document Organization

Chapters 1 through 5 provide an overview for all readers, while Chapters 6 through 11 contain detailed technical information defining the USB.

- Peripheral implementers should particularly read Chapters 5 through 11.
- USB Host Controller implementers should particularly read Chapters 5 through 8, 10, and 11.
- USB device driver implementers should particularly read Chapters 5, 9, and 10.

This document is complemented and referenced by the Universal Serial Bus Device Class Specifications. Device class specifications exist for a wide variety of devices. Please contact the USB Implementers Forum for further details.

Readers are also requested to contact operating system vendors for operating system bindings specific to the USB.