

USB Power Delivery Specification Reorganization Guide

USB Power Delivery - Informative Document

DRAFT - UNOFFICIAL BUILD

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This document describes the reorganized USB Power Delivery (USB PD) Specification structure. The specification has been restructured to improve clarity, logical flow, and ease of navigation. The new organization separates concerns, groups related topics, and provides intuitive progression from foundational concepts to detailed technical requirements.

Objectives of the Reorganization

- Maintain technical equivalence to previous revision
- Eliminate redundancy and make statements concise
- Remove redundant **"Shall"** statements
- Resolve ambiguity and conflict in the specification
- Reorganize content for logical flow
- Improve searchability
- Relocate orphaned information to appropriate sections
- Split informative content into whitepapers (Alternate BMC Receiver Design Examples).
- Split requirements that are not part of USB PD into separate specs (PDUSB Status and States).

Chapter 1: Introduction

Foundational overview of USB Power Delivery technology and capabilities.

- USB PD feature overview
- Port roles, power negotiation, role swapping, and alternate modes
- Architectural overview including physical layer, protocol layer, and policy engine

Chapter 2: Glossary

Common terminology and references.

- Document conventions, notation, and normative references
- Terms, abbreviations, and key concepts

Chapter 3: Power Rules

Power delivery capabilities and requirements.

- Source and Sink power requirements and capabilities
- Power negotiation rules and contract establishment
- Extended Power Range (EPR) for delivery beyond 100W
- **Dynamic** power and shared power across multiple ports

Chapter 4: PD Electrical Requirements

Electrical characteristics and behavior.

- Source requirements: bulk capacitance, voltage regulation, transitions, and protection (OCP/OVP/OTP)

- PPS and AVS operation including CV and CL modes
- Sink requirements: bulk capacitance, standby operation, and protection
- Dual-Role Port requirements, Power Role Swap, and Hard Reset sequences
- Electrical parameter tables

Chapter 5: PD Communications Physical Layer

Physical layer signaling and encoding.

- CC wire signaling and Biphasic Mark Coding (BMC) encoding
- Transmission and reception requirements
- Physical layer parameters and electrical specifications

Chapter 6: PD Communications Protocol - Message Definitions

Structure, content, and behavior rules for all USB PD protocol messages.

- Message types: Control, Data, and Extended Messages
- Message Header structure and Power Data Objects (PDOs)
- All Control, Data, and Extended message definitions
- Vendor Defined Message (VDM) structure

Chapter 7: PD Communications Protocol - Message Usage

Message sequences and scenarios organized by Atomic Message Sequences (AMS).

- Reset types, collision avoidance, and error handling
- Message sequences organized by AMS (e.g., Power Role Swap AMS, Get Source Cap AMS)
- Power, Data, and VCONN Role Swap procedures
- Message applicability tables for different port types

Chapter 8: Vendor Defined Messages (VDM)

Vendor Defined Messages and Alternate Mode operations.

- Structured and Unstructured VDM formats and rules
- Discovery process and Alternate Mode entry/exit procedures
- VDM timing requirements and Product Type specific requirements

Chapter 9: State Machine Diagrams

State machine diagrams for USB PD protocol and policy engine implementation.

- Protocol Layer and Policy Engine state machines
- State transitions, timer management, and error recovery
- State machine implementation guidance

Chapter 10: Fast Role Swap (FRS)

Fast Role Swap mechanism for charge-through accessories.

- FRS use cases, initialization, and signaling sequence
- Source and Sink behavior during FRS transitions
- Timing parameters and constraints

Companion Specifications

The following companion specifications are maintained separately:

- PDUSB Status Reporting and Device States
- USB PD R2.0 V1.3
- USB PD R3.2 V1.1 (Previous Revision)

White Papers

The following white papers are maintained separately:

- Alternate BMC Receiver Design Examples

Benefits of the New Structure

- **Significant Size Reduction:** Achieved ~70% reduction in specification size without content loss through elimination of redundancy.
- **AMS-Centric Organization:** Message usage is organized by Atomic Message Sequences (AMS) rather than individual messages, making it easier to understand complete protocol flows.
- **Logical Progression:** Content flows from introduction and terminology through power rules, electrical requirements, communications layers, to implementation details.
- **Separation of Concerns:** Power electrical design (Chapters 3, 4, and 5) is separate from communications design (Chapters 6, 7, and 8).
- **Dedicated Chapters:** Important or complex topics like VDM, electrical requirements, and FRS have dedicated chapters.
- **Implementation Focus:** State machine diagrams consolidated in a single chapter.
- **Improved Navigation:** Related topics are grouped together.