

# **Universal Serial Bus Mass Storage Class Specification Overview**

**Revision 1.3  
September 5, 2008**

## Change History

Revision	Issue Date	Comments
1.0	October 22, 1998	Initial release
1.1	June 28, 2000	Update
1.2	June 23, 2003	Update list of specs, restrict CBI to full-speed floppies only
1.3	September 5, 2008	Summary of changes from Rev 1.2: Updated related documents & subclass references, added MSC-Lock & IEEE 1667 subclasses, added Vendor Specific subclass & protocol, updated protocol list, added section on Request Codes

USB Device Class Definition for Mass Storage Devices  
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# 1 Introduction

This document gives an overview of the USB Mass Storage Class specifications. How mass storage devices behave on the USB bus is the subject of this and other USB Mass Storage Class specifications. In addition to this Overview specification, several other USB Mass Storage Class specifications are supported by the USB Mass Storage Class Working Group (CWG). The titles of these specifications are:

*USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport*  
*USB Mass Storage Class Bulk-Only (BBB) Transport*  
*USB Mass Storage Class UFI Command Specification*  
*USB Mass Storage Class Bootability Specification*  
*USB Mass Storage Class Compliance Test Specification*  
*USB Lockable Storage Devices Feature Specification (LSD FS)*

The USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport specification is approved for use only with full-speed floppy disk drives. CBI shall not be used in high-speed capable devices, or in devices other than floppy disk drives. CBI shall not be used in devices that implement LSDFS. Usage of CBI for *any* new design is discouraged.

**Note:** The Compliance Test specifications are still under development, and are not yet publicly available.

## 1.1 Specification Relationships

This is a normative document for USB Mass Storage Class devices. If there is a code assignment conflict between this document and another USB document, then the assignments in this document override the other document.

The CBI and Bulk-Only transport protocol specifications are each intended to be stand-alone documents for the USB Mass Storage class, enabling development of a USB Mass Storage compliant device. A device manufacturer *may* choose to implement both CBI and Bulk-Only, but shall follow each specification as applicable.

Booting an operating system from a USB Mass Storage Class device requires no special considerations with regard to Mass Storage Class support. Either CBI or Bulk-Only devices may be bootable. Bootability may, however, require other considerations such as particular types of media formatting, etc. Such considerations are hardware- or operating system dependent, and are beyond the scope of the Mass Storage Class specifications.

## 1.2 Purpose

The purpose of this document is to provide an overview of all the specifications that describe how Mass Storage devices behave on the USB bus. Section 1.1 gives the rules for using the different USB Mass Storage class specifications.

Note that these rules can change. As other companies with different USB Mass Storage Class device projects in mind join the USB Mass Storage Class CWG, other specifications may be developed by the CWG and added to the set of specifications that fully describe how a Mass Storage Class device behaves on the USB bus. If and when that happens, the USB Mass Storage CWG will reconsider the rules specified in section 1.1 of this document.

## 1.3 Terms and Abbreviations

### **May**

A keyword that indicates an option.

### **Shall**

A keyword that indicates a requirement.

## 1.4 Related Documents

USB Mass Storage specifications use the command sets from several existing protocols. The command blocks of these command sets are placed in a USB wrapper which follows USB protocol. The following specifications are referenced by the USB Mass Storage specifications:

- *Reduced Block Commands (RBC), INCITS 330:2000*, available at <http://www.t10.org>
- *Multi-Media Command Set 5 (MMC-5), T10/1675-D* available at <http://www.t10.org/>
- *SCSI Primary Commands – 2 (SPC-2), Revision 3 or later*, available from Global Engineering, (800)-854-7179
- *Standard Protocol for Authentication in Host Attachments of Transient Storage Devices (IEEE 1667)* available at [shop.ieee.org](http://shop.ieee.org).

## 2 Subclass Code

The Interface Descriptor of a USB Mass Storage Class device includes a *bInterfaceSubClass* field. This field denotes the industry-standard command set transported by a Mass Storage Class interface. The value of the *bInterfaceSubClass* field shall be set to one of the Subclass codes as shown in the following table.

Note that the Subclass code values used in the *bInterfaceSubClass* field specify the industry-standard specification that defines transport command sets transported by the interface; these Subclass codes do not specify a type of storage device (such as a CD-ROM or floppy disk drive).

**Table 2.1 – SubClass Codes Mapped to Command Block Specifications**

SubClass Code	Command Block Specification	Comment
00h	SCSI command set not reported	De facto use
01h	Reduced Block Commands (RBC) T10 Project 1240-D	Defined outside of USB
02h	MMC-5 (ATAPI)	Defined outside of USB
03h	Obsolete	Was SFF-8070i
04h	USB Floppy Interface (UFI)	Specifies how to interface Floppy Disk Drives to USB.
05h	Obsolete	Was QIC-157
06h	SCSI transparent command set	Defined outside of USB
07h	Lockable Mass Storage	LSDFS specifies how host has to negotiate access before trying SCSI.
08h	IEEE 1667	Defined outside of USB
09h - FEh	Reserved	Reserved
FFh	Specific to device vendor	De facto use

### 3 Protocol Codes

The Interface Descriptor of a USB Mass Storage Class device includes a *bInterfaceProtocol* field. This field denotes the transport protocol used by this interface.

**Table 3.1 – Mass Storage Transport Protocol**

<i>bInterfaceProtocol</i>	Protocol Implementation	Comment
00h	Control/Bulk/Interrupt protocol (with command completion interrupt)	USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport
01h	Control/Bulk/Interrupt protocol (with no command completion interrupt)	USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport
02h	Obsolete	
03h – 4Fh	Reserved	Reserved
50h	Bulk-Only Transport (BBB)	USB Mass Storage Class Bulk-Only Transport
51h – FEh	Reserved	Reserved
FFh	Specific to device vendor	De facto use

The USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport specification (Protocol codes 0x00 and 0x01) is approved for use only with full-speed floppy disk drives. CBI shall not be used in high-speed capable devices, or in devices other than floppy disk drives. Usage of CBI for *any* new design is discouraged.



## 4 Request Codes

Core USB specifies that a USB control Request addressed to wIndex = bInterfaceNumber of a USB Mass Storage Class device interface includes a *bRequest* field.

The meaning of the bRequest code is specific to the device vendor when the bmRequestType.Type is Vendor, but the meaning of the bRequest code is specific to the interface class when the bmRequestType.Type is Class,

**Table 4.1 – Mass Storage Request Codes**

<i>bRequest</i>	Name	Comment
00h	Accept Device-Specific Command (ADSC)	Assigned in context by USB Mass Storage Class Control/Bulk/Interrupt (CBI) Transport, also aliases core USB request 00h Get Status.
01h – 0Dh	Reserved	Aliases of core USB bRequest codes
0Eh-FBh	Reserved	Reserved
FCh	Get Requests	Assigned by Lockable Storage Devices Feature Specification
FDh	Put Requests	Assigned by Lockable Storage Devices Feature Specification
FEh	Get Max LUN (GML)	Assigned by USB Mass Storage Class Bulk-Only (BBB) Transport
FFh	Bulk-Only Mass Storage Reset (BOMSR)	Assigned by USB Mass Storage Class Bulk-Only (BBB) Transport

The Mass Storage working group chose these bRequest codes with care. The first few codes assigned for the BBB transport do not alias the first few codes assigned for core USB requests because the working group counted down from FFh to choose new codes to recommend to USB-IF.