

OMTP

COMMON CHARGING AND LOCAL DATA CONNECTIVITY

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1 INTRODUCTION

1.1 *DOCUMENT PURPOSE*

This document recommends using the USB Forum Micro-USB connector for the charging and data connector on compliant Terminals. This recommendation is intended to be referenced by OMTP operators in their Terminal requirements for Terminal vendors. This recommendation also provides a technical guideline for companies producing charging and local data connectivity related platforms and component technologies.

In order to reduce the number of chargers being manufactured, transported and disposed of, the need for a solution that reduces this environmental impact has been identified. This document therefore also defines requirements for a Common Power Supply/Charger and a Common Detachable Cable enabling a complete Common Charging Solution (CLD). The deployment of the CLD shall enable re-use of chargers across multiple terminals, reduce wastage by enabling mobile terminals to be sold with no charger in the box and remove the requirement for every new terminal to be sold with a dedicated charger

1.2 *BUSINESS RATIONALE*

Currently, the typical Terminal portfolio of an operator consists of dozens of Terminals, complemented by a huge number of different peripherals such as chargers, headsets, car kits, data cables, etc. The variety of different chargers and peripherals is driven by the different physical connectors used across the full range of Terminals and vendors. This fragmentation creates unnecessary cost for the whole value chain, limits freedom of selection for the end user, and restricts competition by creating barriers to market entry.

Reaching an industry agreement on standard charging and data connectivity solutions, still leaving room for innovation, shall streamline the whole value chain and provide end users with wider choice when choosing peripherals and enable the use of a common charger across multiple terminals. The user will also be able to use their legacy home entertainment and PC equipment that support USB connectors; and their chargers. This will stimulate a new market opportunity for peripheral vendors, which will benefit the end user and support convergence-related operator business cases such as music delivery.

As an increasingly significant number of terminal sales are replacements, a move to a standardized, high-efficiency common charging solution will enable future handsets to be shipped without a charger, leading to environmental benefits, cost savings for both

manufacturer and operator, reduced wastage of power and raw materials, smaller and lighter packaging and lower shipping costs.

1.3 INTENDED AUDIENCE

These recommendations are intended to be referenced by OMTP operators in their Terminal requirement specifications. They also provide technical guidelines for companies producing the data local connectivity related platforms and component technologies.

1.4 SCOPE

IN SCOPE

All terminal segments from high to low and ultra-low tier phones.

All terminals using a Micro-USB connector for charging and data purposes.

The requirements for a common charging solution that will provide state of the art charging via a high efficiency, low no-load power supply providing a USB Standard-A port which is used with a standard detachable cable to connect to the terminal.

It is understood that either a terminal or a charger may be non-compliant and as such a Compliance table is included in this document to illustrate reasons why this might be the case. For example, a charger may need a captive cable or lower current rating for specific markets.

OUT OF SCOPE

The document is intended as a technical specification and such it does not address or cover areas such as logos, compliance, EMC testing or other broader legal directives such as the R&TTE (Radio and Telecommunications Terminal Equipment) EU directive.

1.5 CONVENTIONS

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in RFC2119 [1].

MUST: This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.

MUST NOT: This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.

SHOULD: This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.

MAY: This word, or the adjective “OPTIONAL”, means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option **MUST** be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option **MUST** be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)

The requirements within this document are uniquely identified using the following format:

CLD-####, where:

CLD is the 3-letter acronym identifying the subject of the requirement (Common Charging Solution).

is a 4 digit number that identifies the requirement (e.g. 0010)

The combined requirement number is to be unique within the document.

2 LOCAL CONNECTIVITY: COMMON CHARGING AND DATA CONNECTORS

This section describes recommended requirements for wired charging and data connectivity. It also describes requirements for a Common Charging Solution.

The goal of these requirements is to deliver a Common Power Supply/Charger for handsets and guarantee an optimal data connectivity experience.

3 USE CASES

3.1 CHARGING USE CASES

The use cases listed below are provided as examples of common usages and do not constitute a complete or exhaustive list of possible use cases.

CHARGING USE CASE 1

User wishes to recharge their Terminal but does not have her/his own charger so uses an alternative common charger.

CHARGING USE CASE 2

User has two Terminals from different manufacturers. She/He wants to bring with her/him only one charger to be used to charge both.

CHARGING USE CASE 3

User wants to buy a new phone. She/he wants to keep the old charger to be used on the new phone avoiding having to buy an additional charger.

CHARGING USE CASE 4

User wants to charge his phone through her/his laptop.

CHARGING USE CASE 5

User should be able to use a single cable to charge their terminal from any USB Standard-A port. This would include Standard-A ports on PCs', cars, airport charging hubs and different nation's chargers

CHARGING USE CASE 6

User should be able to charge their terminal using a common charger supplied with a different manufacturer's device.

CHARGING USE CASE 7

User should be able to charge their terminal whilst using the same connector for data transfer to/from PC.

CHARGING USE CASE 8

User should be able to use the common phone functionalities during charging.

3.2 DATA USE CASES

DATA USE CASE 1

User should be able to use a standard data cable to connect to any compliant mobile Terminal to a PC or entertainment system.

DATA USE CASE 2

User should be able to use a digital headset with a standard data connector to connect with any compliant mobile Terminal. The connector is easy to use in mobile situations and durable enough for daily use.

DATA USE CASE 3

An operator can use a standard data connector to access and modify the Terminal data of any compliant Terminal, including re-flashing the Terminal.

DATA USE CASE 4

The Terminal can be charged using the data connector.

DATA USE CASE 5

User has a data enabled Terminal that can be connected to a computer for use as a modem. The user may use the HSxPA capabilities in their Terminal.

DATA USE CASE 6

The user has a Terminal with high speed UICC interface and he is able to access UICC services and data using a computer.

DATA USE CASE 7

User can stream the following kinds of digital media over the data connector:

- Standard Definition (SDTV) video
- High Definition (HDTV) video
- Digital Audio
- Digital Still Pictures

DATA USE CASE 8

The user has a Terminal and wishes to connect with a car- kit.

DATA USE CASE 9

User has a Terminal and wishes to automatically synchronise audio, video and other data with portable electronic devices and in-home and in-vehicle audio/video systems.

4 CHARGING AND LOCAL DATA CONNECTIVITY REQUIREMENTS

This section defines the requirements that specify a common connector for data and charging use cases listed in Section 3.

In particular, OMTP encourages the adoption of the following requirements based on the Micro-USB connector for charging use cases in all terminal segments from high to low and ultra-low tier phones.

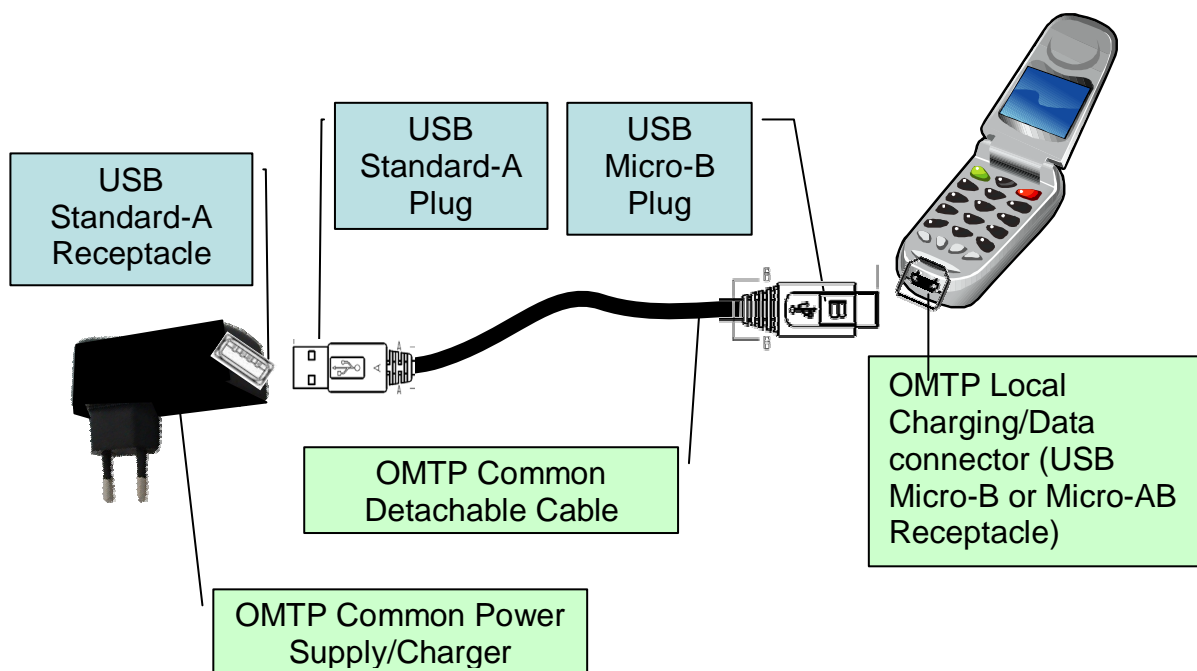


Figure 1 Common Charging Solution Elements

4.1 GENERAL REQUIREMENTS

REQ. ID	REQUIREMENT
CLD-0010	The terminal SHALL support a Micro-USB connector as defined in [2]
CLD-0020	If the Terminal is connected to a dedicated charger as defined in [6], an alert SHOULD be displayed to the user inviting them to unplug the charger (e.g. displaying a message “Battery is full; please unplug the charger from the wall.”) when the battery recharging process has been completed.

4.1.1 COMMON CHARGING SOLUTION

In addition to the Charging and Local Data Connector (CLD), this document specifies a Common Charging Solution (CCS) meeting the charging use cases defined in 3.1.

CCS is based on:

- the use of Micro-USB for Charging and Local Data connectors
- a specification for a Common Power Supply/Charger (CPS)
- a specification of a Common Detachable Cable (CDCable)

Any mobile device complying with this document’s common connector requirements (i.e. which has a Micro-USB receptacle at the terminal end which it is possible to charge the Terminal through) SHALL be considered as a **CLD compliant device**

Any power supply/charger and/or Common Detachable Cable complying with requirements in chapter 4.3 may be considered as a **CLD compliant charger and/or cable**.

Any CLD compliant device that also has a supportive charging solution is to be considered as a CLD compliant device.

Requirements specification for CLD and CCS charger follows.

4.2 CHARGING AND LOCAL DATA CONNECTOR REQUIREMENTS

Wired charging and data connectivity consists of a connector in the mobile Terminal that has mechanical and electrical characteristics.

Electrical characteristics refer to the electrical compatibility in the connectors.

Mechanical characteristics refer to the material, dimensions, and electrical conductors of the connectors.

4.2.1 MECHANICAL

REQ. ID	REQUIREMENT
CLD-0030	The charging and data connector on the Terminal SHALL be implemented in line with the physical characteristics for USB Micro-B or Micro-AB receptacle(s) and USB Micro-A or Micro-B plug as defined in “Universal Serial Bus Micro-USB Cables and Connectors Specification v1.01” Chapter 4 [2].

4.2.2 ELECTRICAL

4.2.2.1 HOST/DEVICE MODE

In conjunction with the above OMTP requirements one of the standard USB modes is specified.

REQ. ID	REQUIREMENT
CLD-0040	<i>Terminal as USB OTG A - device (acting as host or peripheral): Mobile Terminal has Micro-AB receptacle and a Micro-A plug is inserted.</i> If a Micro-A plug is present then the electrical characteristics SHALL be compliant with the relevant specifications in “USB 2.0 OTG Supplement v2.0” Section 5.1 [4].
CLD-0050	<i>Terminal as USB OTG B - device (acting as host or peripheral): Mobile Terminal has a Micro-AB receptacle and a Micro-B plug is inserted.</i> If a Micro-B plug is present then the electrical characteristics SHALL be compliant with the relevant specifications in “USB 2.0 OTG Supplement v2.0” Section 5.2 [4].
CLD-0060	<i>Terminal as USB B - device: Mobile Terminal has a Micro-B receptacle and a Micro-B plug is inserted.</i> If a Micro-B plug is present then the electrical characteristics SHALL be compliant with the relevant specifications in “Universal Serial Bus Specification 2.0” Chapter 7 [5].

4.2.2.2 SPEED CLASSES

In conjunction with the above OMTP requirements one of the standard USB speeds must be specified.

REQ. ID	REQUIREMENT
CLD-0070	<i>USB Full speed (12 Mbit/s)</i> USB 2.0 Full speed “Universal Serial Bus Specification 2.0” Section 7.1 [5].
CLD-0080	<i>USB High speed (480 Mbit/s)</i> USB 2.0 High speed “Universal Serial Bus Specification 2.0” Section 7.1 [5].

4.2.2.3 CHARGING

REQ. ID	REQUIREMENT
CLD-0090	The Terminal SHALL be able to charge its battery using power available from the USB bus in line with the “USB Battery charging specification 1.1” [6] in the following use cases: Use case 1: Terminal is connected to USB host port. Use case 2: Terminal is connected to USB charging host port. Use case 3: Terminal is connected to USB Dedicated Charging port.

4.2.3 GENERAL USB 2.0

REQ. ID	REQUIREMENT
CLD-0100	The Terminal SHALL still be compliant with all the implemented parts of the referenced standards and SHALL implement all parts of the referenced standards required to be compliant with “USB 2.0 adopter’s agreement” [7].

4.3 COMMON POWER SUPPLY/CHARGER AND COMMON DETACHABLE CABLE REQUIREMENTS

In this section requirements for a Common Power Supply/Charger and Common Detachable Charging cable are listed. The Common Power Supply/Charger (in conjunction with a Common Detachable Cable) can be used to charge a compliant Terminal.

REQ. ID	REQUIREMENT
CLD-0110	A Common Power Supply/Charger (CPS) SHALL have a Standard-A receptacle as specified in [6].
CLD-0120	A Common Power Supply/Charger (CPS) SHALL be provided with a Standard-A to Micro-B cable as defined in [5] (named CDCable - Common Detachable Cable)
CLD-0130	A Common Power Supply/Charger (CPS) SHALL comply with all specifications in [6] related to Dedicated Charger.
CLD-0140	A Common Power Supply/Charger (CPS) SHALL be capable of delivering a dedicated charger output current to the terminal of at least 850mA at DC 5.0V
CLD-0150	A Common Power Supply/Charger (CPS) SHALL achieve at least as 4 stars rating (i.e. No-load Power consumption \leq 0.15W) as defined in [8]
CLD-0160	A Common Power Supply/Charger (CPS) SHOULD achieve a minimum four point average charging efficiency in active mode of $[0.095*\ln(P)]+0.529$ where P is the output power, as defined in [9] i.e. 61% at 250mA output, 62% at 500mA, 65% at 750mA or 68% at 900mA

5 FUTURE WORK

To further encourage the adoption in low and ultra-low tier segment, OMTP may liaise with the USB forum to obtain endorsement for charging only Micro-USB connectors capable of charging the handset but without the full capability to enumerate. This profile will address the segment of phone where the cost may be the main consideration

USB 3.0 will also be considered in future versions of this document.

OMTP should consider enhancements to this document by evaluating data use cases 7, 8 and 9 further.

6 APPENDIX (INFORMATIVE): POTENTIAL ISSUES AND CAVEATS WITH PROPRIETARY CABLES

OMTP recognises that in the short term, cables which adapt a common charger Standard-A plug to proprietary charging connectors on the handsets may appear on the market. The user should use only cables certified by the handset manufacturer in order to avoid damage to the terminal. In addition the following technical advice must be considered.

When a Terminal is attached to either a charger or a PC using a certified USB cable, the Terminal detects whether it is attached to a PC or a charger using the data lines in the USB cable. If a proprietary cable does not include the data lines, then the Terminal may be unable to detect whether it is attached to a PC or a charger. If a Terminal cannot distinguish between a PC and a charger, then whenever it detects voltage on the power pin of the USB connector, it must assume it is attached to a charger and be able to draw current. However, according to the USB 2.0 spec, a Terminal with a good battery is only allowed to draw current if it first enumerates. Since the proprietary cable may not include the data lines, the Terminal cannot enumerate. Thus, a Terminal that cannot sense the USB data lines will be non-compliant when attached to a PC. Although PCs are only required to output 500mA, PCs can output more current than this. If a Terminal is attached to a PC through a proprietary cable that does not include the data lines, and tries to draw 900mA from the PC, no damage will occur to the PC. However, the PC may limit current to less than 900mA.

7 DEFINITION OF TERMS

TERM	DESCRIPTION
TERMINAL	Used as an alternative term for a cellular telephone or handset.
COMMON DETACHABLE CABLE	A common detachable cable is a high/full speed cable that is terminated on one end with a Standard-A plug and terminated on the opposite end with a series Micro-B plug as in [4].
CHARGING AND LOCAL DATA CONNECTOR	Single interface on the terminal that supports charging and local data connectivity.
COMMON POWER SUPPLY/CHARGER	High efficiency and low no-load power supply that provides a USB Standard-A receptacle for use with a common detachable cable or in fact any USB Standard-A cable
COMMON CHARGING SOLUTION	Used to describe the component parts of an overall charging system, namely the Common Power Supply/Charger, Common detachable cable and the Charging and Local Data connector
SUPPORTIVE CHARGING	An additional charging interface present on a terminal to be used to support the charging and local data connector

8 ABBREVIATIONS

ABBREVIATION	DESCRIPTION`
HDTV	High Definition Television
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
HSxPA	HSDPA and HSUPA
OMTP	Open Mobile Terminal Platform
OTG	On-the-Go
SDTV	Standard Definition Television
UICC	Universal Integrated Circuit Card
USB	Universal Serial Bus
CLD	Common Charging Solution
CPS	Common Power Supply/Charger
CDCABLE	Common Detachable Cable

9 COMPLIANCE MATRIX

The options below are provided as examples and are not intended to be a comprehensive or exhaustive matrix, they should be considered as purely indicative.

EXAMPLE	COMPLIANT	NON COMPLIANT
Chargers that deliver a dedicated charger output current that is less than specified in CLD-0130		X
Captive Cable Chargers (i.e. a fixed non detachable cable)		X
Proprietary handset connectors		X
Micro-USB connectors	X	
CPS rated as 4 star or better	X	
CPS with an efficiency at or better than recommended in CLD-0150	X	

10 REFERENCED DOCUMENTS

No.	DOCUMENT	AUTHOR	DATE
1	RFC 2119 - Key words for use in RFCs to Indicate Requirement Levels www.ietf.org/rfc/rfc2119.txt	IETF	March 1997
2	Universal Serial Bus Micro-USB Cables and Connectors Specification v 1.01 http://www.usb.org/developers/docs/usb_20_122208.zip	USB Forum	04-Apr-2007
3	USB 2.0 Specification Engineering Change Notice (ECN) #1: Mini-B connector http://www.usb.org/developers/docs/usb_20_122208.zip	USB Forum	20-Oct-2000
4	On-The-Go Supplement to the USB 2.0 Specification v2.0 http://www.usb.org/developers/docs/usb_20_122208.zip	USB Forum	05-Dec-2006
5	Universal Serial Bus Specification 2.0 http://www.usb.org/developers/docs/usb_20_122208.zip	USB Forum	27-Apr-2000
6	Battery charging specification 1.0	USB Forum	08-Mar-2009
	Device Class Specification Adapters Agreement http://www.usb.org/developers/devclass_docs/batt_charging_1_0.zip	USB Forum	As signed
7	USB 2.0 adopters agreement http://www.usb.org/developers/docs/adopters.pdf	USB Forum	As signed
	USB OTG adopters amendment http://www.usb.org/developers/onthego	USB Forum	14-Mar-2007
8	Energy Efficiency Rating for Mobile Device Charger (By Voluntary Agreement EU and Industry IPP Project) http://ec.europa.eu/environment/ipp/mobile.htm	Industry IPP Project	2008

No.	DOCUMENT	AUTHOR	DATE
9	EU Code of Conduct on Efficiency for External Power Supplies - Version 3 http://re.jrc.ec.europa.eu/energyefficiency/pdf/CoC%20PowerSupply%20Version3-28112007.pdf	EU CoC	2007

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