# OMTP

## COMMON CHARGING AND LOCAL DATA CONNECTIVITY

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# CONTENTS

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# 1 INTRODUCTION

## 1.1 DOCUMENT PURPOSE

This document recommends using the USB (Universal Serial Bus) Forum Micro-USB connector for charging and as the data connector on compliant Terminals. This document is intended to be referenced by OMTP operators in their Terminal requirements for Terminal vendors. This document 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 (CPS)_and a Common USB Std-A to Micro-B detachable cable enabling a complete Common Charging Solution (CCS). The deployment of the CCS 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 range of Terminals on offer from operators. 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 local data connector (CLD) 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 existing compatible chargers. This document 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 standardised, high-efficiency common charging solution should enable future handsets to be shipped without

a charger, leading to environmental benefits, cost savings for both manufacturer and operator, reducing wasted power and raw materials and allowing for 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 local data connectivity related platforms and component technologies.

## 1.4 SCOPE

### IN SCOPE

All terminals which support USB data connectivity as defined in "Universal Serial Bus Specification" Revision 2.0 [5] and later engineering change notices issued by the USB-IF on this Revision.

### 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.

### NOTES

Some terminals or supplied chargers may be non-compliant for local market reasons; these are considered as out of scope since they are not CCS compliant.

However, it is strongly recommended that all possible components of such charging solutions are made compliant to ensure as wide compatibility as possible.

For example, a terminal may require an alternative connector to Micro-USB but it will still be advantageous for the power supply to be compliant with all CPS requirements as it can then charge CCS compliant devices.

Alternatively, as a cost benefit or for specific market requirements, a supplied charger may require a captive cable or lower current rating, in this instance the handset should still be designed to meet all CLD requirements."

## 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:

CCS-####, where:

CCS 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 requirements recommended for wired charging and data connectivity. It also describes requirements for a CCS.

The goal of these requirements is to deliver a CPS 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 are not exhaustive.

### CHARGING USE CASE 1

A user wishes to recharge a Terminal but does not have the Terminal manufacturer supplied charger and so uses an alternative common charger.

### CHARGING USE CASE 2

A user has two Terminals from different manufacturers. The user wants to carry only one charger to charge both Terminals.

### CHARGING USE CASE 3

A user purchases a new Terminal and will keep the existing charger to use with the new Terminal, therefore avoiding having to purchase an additional charger.

### CHARGING USE CASE 4

A user wants to charge a Terminal from a laptop computer.

### CHARGING USE CASE 5

A user uses a single cable (Std-A to Micro-B) to charge a Terminal from any USB Standard-A port. This includes Standard-A ports on PC's, in vehicles, airport charging hubs and regionally specific chargers.

### CHARGING USE CASE 6

A user charges a terminal using a common charger supplied with a different manufacturer's device.

### CHARGING USE CASE 7

A user charges a terminal whilst using the same connector (Micro-B or Micro-AB receptacle) for data transfer to/from PC.

### CHARGING USE CASE 8

A user uses the phone functionalities during charging.

## 3.2 DATA USE CASES

### DATA USE CASE 1

User should be able to use a standard data cable (Std-A to Micro-B) to connect 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 (Micro-A plug) 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 cable (Std-A to Micro-B) 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 (Micro-B or Micro-AB receptacle).

### 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 of the Terminal using a standard data cable.

### DATA USE CASE 6

The user has a Terminal with high speed UICC interface, UICC services and data can be accessed with a standard data cable 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 Terminal is connected to a car- kit.

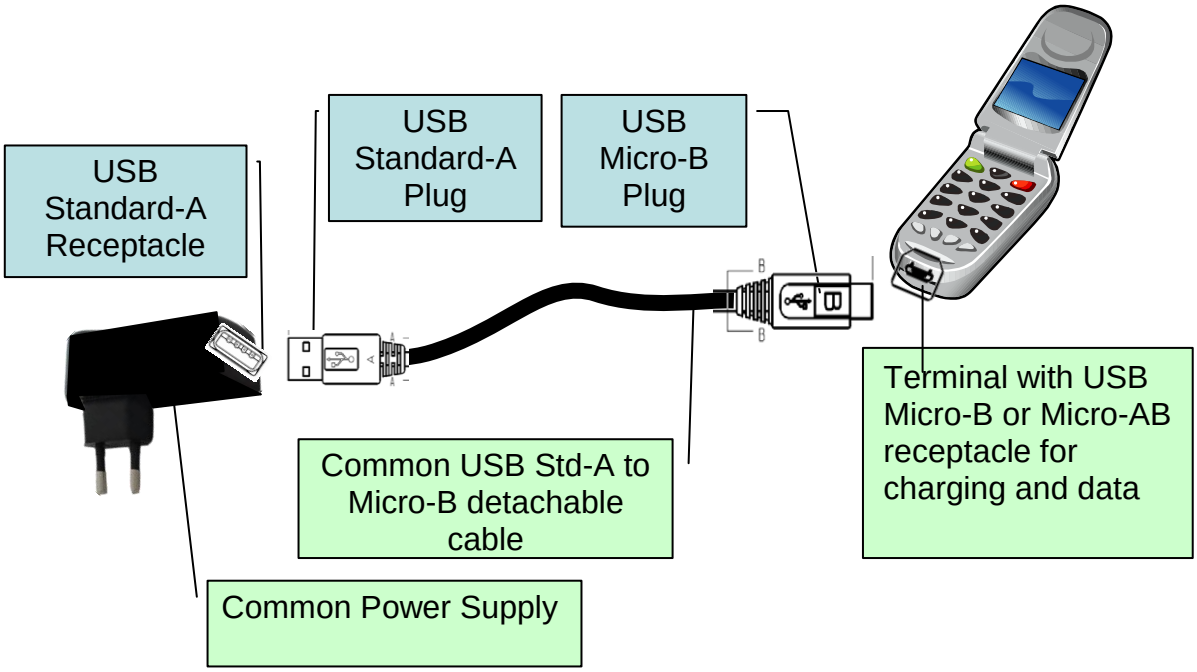
### *DATA USE CASE 9*

User has a Terminal and can automatically synchronise audio, video and other data with portable electronic devices and in-home and in-vehicle audio/video systems using a standard data cable.

# 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 Terminals.




## *4.1 GENERAL REQUIREMENTS*

| REQ. ID | REQUIREMENT |
|---|---|
| **CCS-0010** | The Terminal SHALL support either a Micro-B or Micro-AB receptacle as defined in [2]. |

| REQ. ID | REQUIREMENT |
|---|---|
| **CCS-0020** | When the Terminal is attached to a USB Charger 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(CLD),
- a specification for a Common Power Supply (CPS),
- a specification of a Common USB Std-A to Micro-B detachable cable

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

Any power supply/charger and/or Common USB Std-A to Micro-B detachable cable complying with requirements in chapter 4.3 may be considered as a **CCS compliant charger and/or cable.**

Any CLD-compliant device which features an additional supportive charging input is still considered to be CLD-compliant.

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 electrical and mechanical 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 local data connector (CLD) 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]. |
| **CLD-0035** | The charging and local data connector (CLD) on the Terminal SHOULD always be implemented so that the upper face of the Micro-USB plug (the face marked with the USB icon) is facing towards the user when looking at the main screen of the Terminal. |

### 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** | *Terminal as USB OTG (On-the-Go) A - device (acting as host or peripheral): Mobile Terminal has Micro-AB receptacle and a Micro-A plug is inserted.*<br>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** | *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.*<br>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]. |

| REQ. ID | REQUIREMENT |
|---|---|
| **CLD-0060** | *Terminal as USB B - device: Mobile Terminal has a Micro-B receptacle and a Micro-B plug is inserted.*<br>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 at least one of the standard USB speeds must be supported by the terminal.

| REQ. ID | REQUIREMENT |
|---|---|
| **CLD-0070** | *USB Full speed (12 Mbit/s)*<br>USB 2.0 Full speed as defined in "Universal Serial Bus Specification 2.0" Section 7.1 [5]. |
| **CLD-0080** | *USB High speed (480 Mbit/s)*<br>USB 2.0 High speed as defined in "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:<br>Use case 1: Terminal is connected to USB Standard Downstream Port.<br>Use case 2: Terminal is connected to USB Charging Downstream Port.<br>Use case 3: Terminal is connected to USB Dedicated Charging port. |
| **CLD-0091** | Under normal charging conditions it SHOULD take no more than 1 hour to achieve at least 80 % per 1000mAh stated battery capacity |

| | |
|---|---|
| **CLD-0092** | The terminal SHOULD use a high-efficiency internal charging circuit which does not produce significant waste heat when lowering the input voltage, for example a switch mode design instead of a linear mode design. |

### *4.2.3 GENERAL USB 2.0*

| REQ. ID | REQUIREMENT |
|---|---|
| **CLD-0100** | The Terminal SHALL 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” [7a] and [7b]. |

## 4.3 COMMON POWER SUPPLY AND COMMON USB STD-A TO MICRO-B DETACHABLE CABLE REQUIREMENTS

In this section requirements for a Common Power Supply and Common USB Std-A to Micro-B detachable cable are listed. The Common Power Supply (in conjunction with a Common USB Std-A to Micro-B detachable cable) can be used to charge a compliant Terminal.

| REQ. ID | REQUIREMENT |
|---|---|
| **CPS-0110** | A Common Power Supply (CPS) SHALL have a Standard-A receptacle as specified in [6]. |
| **CPS-0111** | A Common Power Supply (CPS) Standard-A receptacle SHALL meet the Ruggedized Standard-A requirements as specified in [10]. |
| **CPS-0120** | A Common Power Supply (CPS) SHALL be provided with a USB Std-A to Micro-B detachable cable as defined in [5]. |
| **CPS-0130** | A Common Power Supply (CPS) SHALL implement all USB Standard-A receptacles provided in accordance with specifications for 'Dedicated Charging Port' in [6]. |
| **CPS-0140** | A Common Power Supply (CPS) SHALL be capable of delivering a dedicated charger output current to the terminal of at least 850mA at DC 5.0V (±5%) This is equivalent to the value in USB-IF BC1.1 [6] known as Dedicated Charging Port Output Current ($I_{DCHG}$). |
| **CPS-0150** | A Common Power Supply (CPS) SHALL achieve at least a 4 star rating (i.e. No-load Power consumption ≤ 0.15W ) as defined in [8]. |
| **CPS-0151** | A Common Power Supply (CPS) SHOULD achieve at least a 5 star rating (i.e. No-load Power consumption ≤ 0.03W ) as defined in [8]. |
| **CPS-0160** | A Common Power Supply (CPS) SHALL meet Energy-Efficiency Criteria for AC-AC and AC-DC External Power Supplies in Active Mode limit as defined in ENERGY STAR® Program Requirements for Single Voltage External AC-DC and AC-AC Power Supplies Eligibility Criteria (Version 2.0) [11]. |

| REQ. ID | REQUIREMENT |
|---|---|
| **CPS-0170** | A Common Power Supply (CPS) SHALL meet all performance and functionality specifications with mains electricity supply in the range 90-264 Vac and 47-63 Hz. A wider input voltage range may be specified for CPS intended for certain markets or geographic regions. |
| **CPS-0171** | A Common Power Supply (CPS) SHALL comply with all requirements for each USB-A receptacle it provides. |
| **CPS-0180** | For Common Mode Noise considerations a Common Power Supply (CPS) SHALL have a maximum AC voltage frequency component of 95 Vp-p. The measurement method and test conditions SHALL be declared. |
| **CPS-0190** | For Common Mode Noise considerations a Common Power Supply (CPS) SHALL have a maximum switching frequency component of 1.0 Vp-p. The measurement method and test conditions SHALL be declared. |

# 5 FUTURE WORK

To further encourage the adoption in low and ultra-low tier Terminal sales 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.

## *5.1 SOLAR CELL BASED POWER SUPPLY*

As alternative energy sources are becoming more commonplace and continuing the drive for environment benefits envisaged from following these requirements; a solar cell based power source could be used to complement or even replace the Common Power Supply/Charger (CPS) in a Common Charging Solution (CCS).

The requirements [8] for energy efficiency and no-load power consumption should still be adhered to where possible but given the clean energy nature of Solar Cell it is understood that this may not be the case and therefore will not affect any compliancy.

In the instance a Solar Cell based power supply is used it should either:

1) Present a USB Standard-A receptacle.,
2) Have an integrated connector cable that terminates in a Micro-USB B connector.

The provision for solar cell-based power supplies is made without any form of study into the environmental impact of the production of such cells as this is outside the scope of this work.

# 6 APPENDIX (INFORMATIVE):

## *6.1 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 additional term for a cellular telephone or handset. |
| **COMMON USB STD-A TO MICRO-B DETACHABLE CABLE** | A common USB Std-A to Micro-B 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 (CLD)** | Single interface on the terminal that supports charging and local data connectivity. |
| **COMMON POWER SUPPLY (CPS)** | High efficiency and low no-load power supply that provides a USB Standard-A receptacle for use with a common USB Std-A to Micro-B detachable cable or in fact any USB Standard-A cable. |
| **COMMON CHARGING SOLUTION (CCS)** | Used to describe the component parts of an overall charging system, namely the Common Power Supply (CPS), Common USB Std-A to Micro-B detachable cable and the Charging and Local Data connector (CLD). |
| **SUPPORTIVE CHARGING** | An additional charging interface present on a terminal to be used to support the charging and local data connector (CLD). |

# 8 ABBREVIATIONS

| ABBREVIATION | DESCRIPTION |
|---|---|
| **CCS** | Common Charging Solution |
| **CLD** | Charging and Local Data connector |
| **CPS** | Common Power Supply |
| **HDTV** | High Definition Television |
| **HSDPA** | High Speed Downlink Packet Access |
| **HSUPA** | High Speed Uplink Packet Access |
| **HSxPA** | HSDPA and HSUPA |
| $I_{DCHG}$ | Dedicated Charging Port Output Current |
| **OMTP** | Open Mobile Terminal Platform |
| **OTG** | On-the-Go |
| **R&TTE** | Radio and Telecommunications Terminal Equipment |
| **SDTV** | Standard Definition Television |
| **UICC** | Universal Integrated Circuit Card |
| **USB** | Universal Serial Bus |

# 9 REFERENCED DOCUMENTS

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| 3 | USB 2.0 Specification Engineering Change Notice (ECN) #1: Mini-B connector.<br>http://www.usb.org/developers/docs/usb_20_122909-2.zip | USB-IF | 20-Oct-2000 |
| 4 | On-The-Go and Embedded Host Supplement to the USB 2.0 Specification v2.0.<br>http://www.usb.org/developers/docs/usb_20_122909-2.zip | USB-IF | 08-May-2009 |
| 5 | Universal Serial Bus Specification 2.0.<br>http://www.usb.org/developers/docs/usb_20_122909-2.zip | USB-IF | 27-Apr-2000 |
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| 10 | USB-IF USB Cable and Connectors Class Document 2.0 | USB-IF | Aug 2007 |
| 11 | ENERGY STAR® Program Requirements for Single Voltage External Ac-Dc and Ac-Ac Power Supplies<br>http://www.energystar.gov/ia/partners/product_specs/program_reqs/eps_prog_req.pdf | ENERGY STAR ® | 22 April 2008 |

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