

Battery Charging Status over Bluetooth Classic (HFP) and Bluetooth Low Energy (GATT BAS)

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In-vehicle wireless Bluetooth connections of phones and devices to the vehicles has become commonplace, with clear benefits for facilitating handsfree telephony and to allow wireless transmission of music, audio, spoken navigation prompts, etc to the vehicle display and/or speakers.

With this increased in-vehicle usage, the need to maintain adequate charge levels for these devices is a priority for drivers. While driving, users can typically charge their phones and devices via a wired (USB, AC, auxiliary power point) connection, or a wireless charger located in the vehicle.

The only way for drivers to understand if these devices are charging, and to understand the charge rate while connected to one of these charge connections is thru manual/visual interaction with the device itself.

This interaction can lead to driver distraction issues and driver inconvenience.

The proposed change would be to modify the existing GPP TS 27.007 standard (*3rd Generation Partnership Project Technical Specification Group Core Network and Terminals AT command set for User Equipment*) command +CBCHG to provide more relevant information as seen in the table below:

Parameter Name Spec name	Values	Mandatory/ Optional	Description
Charging State charge_status	On Off	M	What is the current state of Charging, is it on or off
Time To Fully Charged full_charge_time	x Min.	O	How long until the device thinks it will be fully charged at the current charging rate
Charging Speed charging_speed	Fast Slow	O	Is the device in Fast charging mode or slow charging mode
Charging Mode charging_mode	AC USB Wireless	O	How is the device being charged
Charing Current charge_current	X mA	O	How many milliamps is the device being charged at

The newly modified 3GPP command +CBCHG could be sent over Bluetooth HFP protocol from the Phone to the vehicle display since the phone can fetch this information from its battery charging module.

This information can then readily be displayed within vehicle displays and or read back to the driver using a voice assistant negating any driver need to physically interact with their phone or device while driving to understand charge status.

An additional benefit of using this command is that drivers could now readily use in-vehicle displays to diagnose if a phone is not correctly connected to a charger and can easily take corrective actions (e.g. move the phone slightly on a wireless charge pad, reconnect the phone to a different USB port), before the phone surprisingly runs out of charge, even though the user thought it was connected.

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