CEENBOT Control Board LED's & Beeper Codes

The CEENBoT control board is equipped with two 5mm bicolor LED's (Left & Right), one 3mm red LED (Attn.) and one set tone beeper. These audio visual devices are used to give feedback to the user on what the controller is doing.

Powering CEENBoT ON & OFF:
Press the PWR button and the Attn. LED should light up until the button is released. After releasing the button the Attn. LED should turn OFF, the Left & Right LED's should glow orange and you should hear two short beeps. Press the PWR button again and the Right & Left LED's should turn OFF and you should hear 1 long beep. For either operation the PWR button must be pressed for at least 25ms to be recognized.

Low Battery Warnings:
When the battery voltage drops below 6.60V the Attn. LED will come on steady to indicate the low battery. When the battery voltage drops below 6.00V all the LED's will turn OFF and six short beeps will be emitted. If the PWR button is pressed when the CEENBoT is OFF and battery is below 6.00V the CEENBoT will only emit six short beeps then turn OFF.

Special Case Low battery Warning:
While the motors are running the CEENBoT does not perform the same battery tests as it does when the motors are not running. This is because the battery voltage frequently drops below 6.00V when the motors are running which would cause false low battery warnings and shutdowns. To solve this problem a special case low battery detection algorithm had to be designed which will test the CEENBoT battery voltage while the motors are running. This test does not let the battery voltage drop below 5.00V which is the minimum safe operating voltage for the 5.00V logic used to control the CEENBoT. If this happens the CEENBoT will disable the motors turn the Left LED red and emit the 6 short beeps. If the CEENBoT is turned back ON after this event it is likely that there will be no low battery warning and measuring the battery voltage with a meter might show the voltage above 7.20V. If this happens the battery is low and needs to be charged.

High Battery Warning:
When the battery voltage is above 9.60V the Right LED and Attn LED will turn OFF and the Left LED will blink red quickly. One short tone will be emitted every time the LED blinks. This will happen 100 times then the CEENBoT will shut off.

Motor Driving Indicators:
Below is a table of the LED color indicators for the Left & Right LED's for given motor commands.

Free-spin	**Forward**	**Reverse**	**Brakes**
ORANGE	GREEN	RED	Blinking Red-Green

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Charging Indicators:
(See CEENBoT Modes with Attached Battery Charger document for more information)
The CEENBoT is equipped with a smart charger than runs a four stage NiMh charging algorithm. The Left LED will indicate these four different stages. When the charger is attached the beeper emits one long, two short beeps to indicate the charger is attached.

Stage 1:
The Left LED will blink green at 1Hz for 30 seconds. Attn. LED will blink quickly.

Stage 2:
The Left LED will blink Red at 1Hz for 4 minutes. Attn. LED will turn ON and OFF with the charger.

Stage 3a:
The Left LED will blink red 5.50Hz until the battery voltage reaches 9.60V. Attn. LED will blink quickly.

Stage 3b:
The Left LED will blink red at 17Hz until the battery voltage drops below 9.60V. Attn. LED will blink quickly.

Stage 4:
The Left LED will blink green at 6Hz until the user removes the charger. Attn. LED will turn ON and OFF with the charger.

When the charger is removed the beeper emits one short, two long beeps to indicate the charger has been removed.

ON with Power Mode (ONwPWR):
(See CEENBoT Modes with Attached Battery Charger document for more information)
This mode allows the user to attach a charger to the CEENBoT while the CEENBoT is in its normal operating mode. When the user holds the PWR button while attaching the charger the Left LED will blink green quickly until the button is released.

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