

# TEST REPORT

(Power out issue in game card made by Embedx)



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**R&D CENTER**

## 1. Overview

1-1. The picture of issued and tested card



1-2. Phenomenon

Embedx's sample cards which have been in cold storage and built with Rocket batteries are going dead after 2 months.

## 2. Conclusion

The stand-by (sleep) current of the cards are 1.2 microamperes (Average). From this, if the cards never work by someone, they will have to be survived for 15 months.

We guess there are some problems with circuit board. Somehow, the cards were abnormally and automatically operated sometimes. So, it seems likely that the batteries were going dead faster than expected. According to our opinion, it seems there is a problem at the switch part for play (operating).

### 3. Test result

#### 3-1. The voltage of the embedded batteries in cards

- We checked the batteries voltage after separation from issued cards. The result is as follows.

Card No.	#1	#2	#3	#4
Open circuit voltage (V)	1.960	1.912	1.903	0.954

- After a few hours, the voltages were somewhat increased. It means there was certain load outside of batteries.

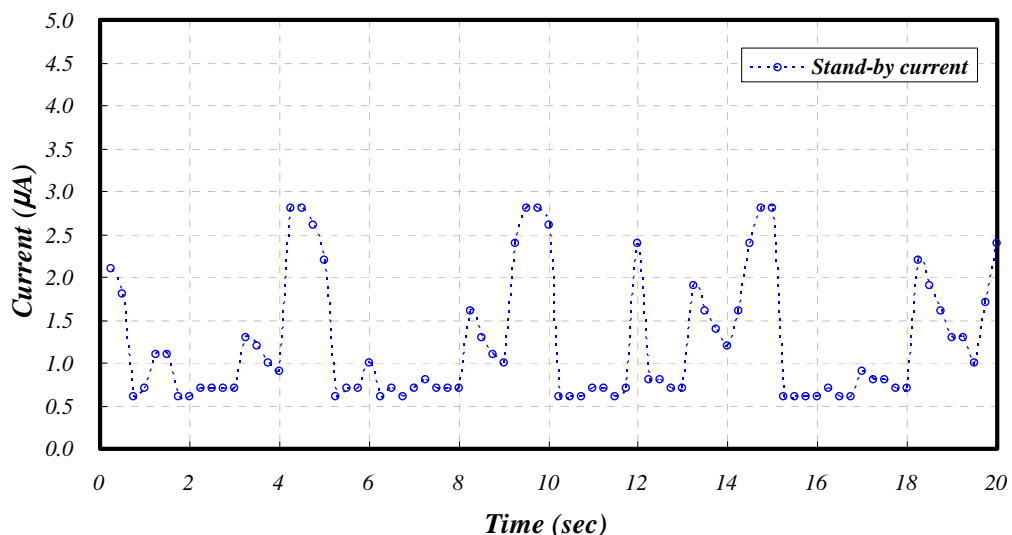
- We disassembled the batteries. They were thoroughly discharged. (Over-discharged)

#### 3-2. Stand-by and operating current of the cards

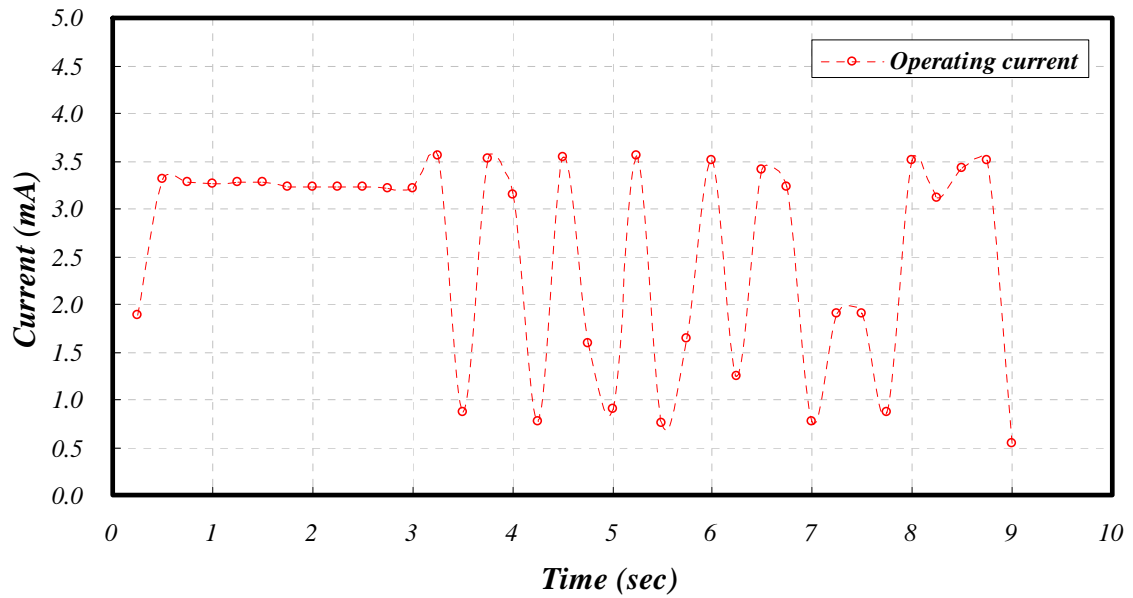
- We equipped the card with new fresh battery and checked the stand-by current and operating current. The result is as follows.

Card No.	#1	#2	#3	#4
Stand-by current ( $\mu$ A)	0.7 ~ 3.0	0.6 ~ 2.8	0.6 ~ 2.8	0.6 ~ 2.9

- Average stand-by current: 1.2 microamperes

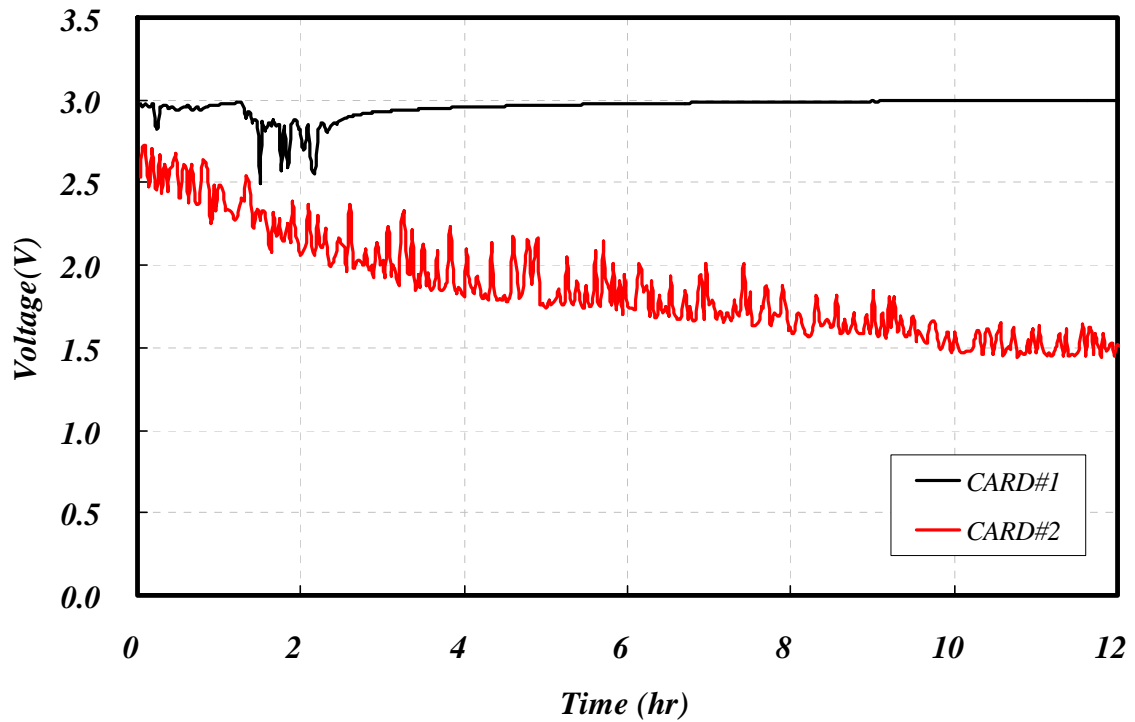


- Average operating current: 2.6 milliamperes



### 3-3. Observation of the battery voltage

- The cards are fitted with new fresh batteries. And then we observed the voltage of the stand-by state. The result is as follows.

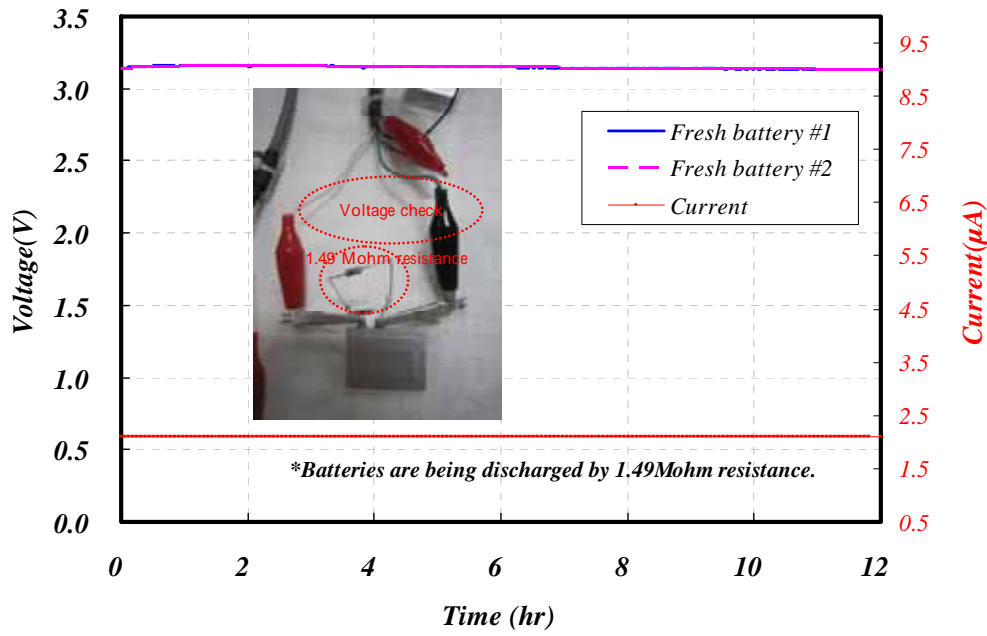


- The battery was well connected with card circuit board and we did not push the play button, but the LEDs in cards were operated sometimes.  
(Card#2 was operated (LED on) frequently than card#1)



<Test card>

- If the cards do not operated (if the cards are in a state of stand-by), the battery will keep Min. 3.1V for 12hrs. See the below graph. We connected 1.49 Mohm resistance to battery. (At this point, the value of current will be about 2.1 microamperes.)



Please see the attached video file. Operation state of the card kept changed.

The card is in operating state when I leave the card on the floor, but the card is in stand-by state when I pick up the card. It is a strange phenomenon.