



**CONFIDENTIAL B**

# Gauge Master Customized Setting Tool SOP V2.1

2016/04



# Revision History

Revision	Date	Author	Note
1.0	07/21/2015	Filby Horng	1 <sup>st</sup> version for customer
1.1	09/02/2015	Filby Horng	Added flow chart; modified heavy load test method step 6 and 9.
2.0	11/16/2015	Filby Horng	Simplified steps after step 8.
2.1	01/08/2016	Cherry Chiu	Added DLPT step.

# Tool UI

Gauge Master - Customized Setting

## 電池0%定義調整

**瀏覽** 請選擇兩個.h檔案

☐ cust\_battery\_meter.h  
☐ cust\_battery\_meter\_table.h

精準模式 快速模式

溫度(℃)	50℃	25℃	0℃	-10℃
開機電壓(mV)				
最低開機電芯電壓(mV)				

計算

Gauge Master - Customized Setting

## 系統負載影響調整

請選擇兩個.h檔案

**瀏覽**

☒ cust\_battery\_meter.h  
☒ cust\_battery\_meter\_table.h

	HOT	WARM	COOL	COLD
溫度(℃)				
電芯電壓(mV)				
平均電流(mA)				
開機電壓(mV)				

Rsense(mΩ)  
10

Rpcb(mΩ)  
20

Q_MAX_SYS_VOLTAGE(mV)	BATTERY_PSEUDO1(%)	0℃	-10℃				
		低溫開機電壓(mV)			PSEUDO1		

計算

# Test File

- Take XX battery for example:
  - Refer to document “GM1.0 and 2.0 Customized Setting Flow”

Temp (°C)	50°C	25°C	0°C	-10°C
Power-on current I (mA)	363.3	188.2	183.1	263.5

Heavy loading result	HOT	WARM	COOL	COLD
Temp (°C)	40	25	0	-10
Shutdown vol (mV)	3657	3687	3854	4080
Max. average current (mA)	1467.2	1148.9	1238.8	1324.9

# Step 1

- Open the tool. Select accurate mode or rapid mode.

Gauge Master - Customized Setting

電池0%定義調整

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☐ cust\_battery\_meter.h  
☐ cust\_battery\_meter\_table.h

精準模式 快速模式

溫度(°C)	50°C	25°C	0°C	-10°C
開機電壓(mV)				
最低開機電芯電壓(...)				

計算

Gauge Master - Customized Setting

電池0%定義調整

瀏覽 請選擇兩個.h檔案

☐ cust\_battery\_meter.h  
☐ cust\_battery\_meter\_table.h

精準模式 快速模式

開機電壓(mV) 3450 (mV)

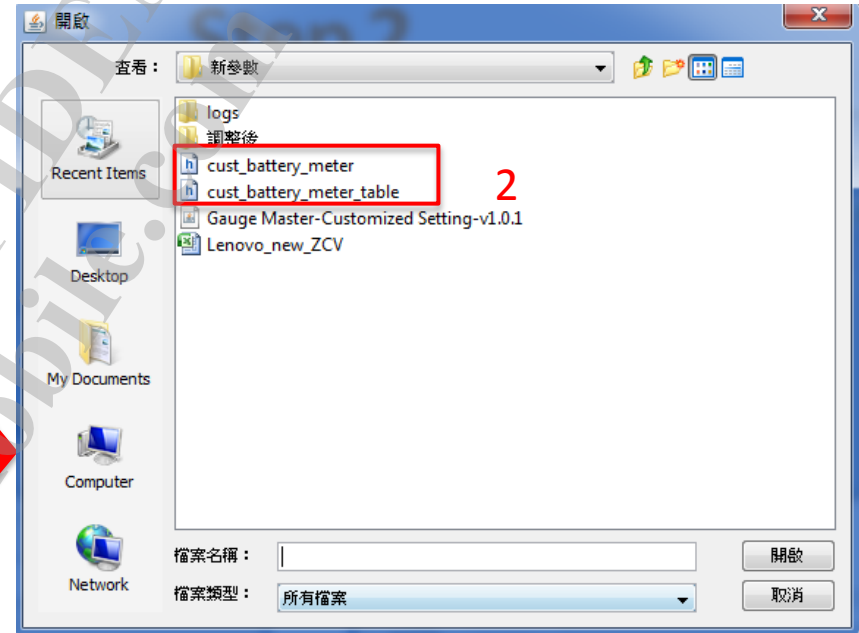
溫度(°C)	50°C	25°C	0°C	-10°C
開機電流(mA)				
最低開機電芯電壓(...)				

計算

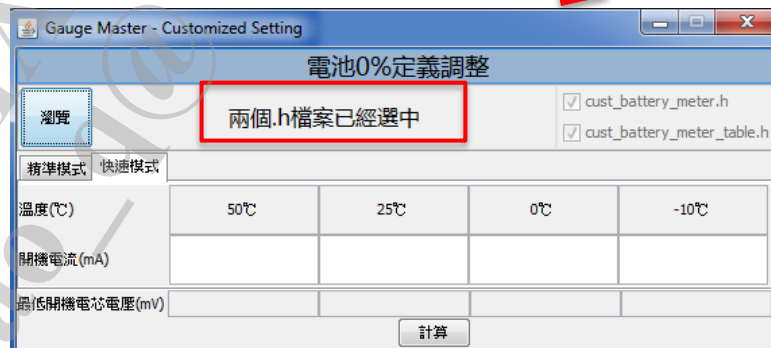
# Step 2

- Select .h files.

1



2



Confirm that two files are selected.

## Step 3-a

- Fill in boot voltage.
  - For MT6797, fill in 3200mV.
  - For other platforms, fill in 3450mV.

The screenshot shows the 'Gauge Master - Customized Setting' window. The title bar is 'Gauge Master - Customized Setting'. The main window has a blue header bar with the text '電池0%定義調整'. Below the header, there is a '瀏覽' button and a red text prompt '請選擇兩個.h檔案'. To the right of the prompt are two checkboxes: 'cust\_battery\_meter.h' and 'cust\_battery\_meter\_table.h'. Below these are two tabs: '精準模式' and '快速模式'. The '精準模式' tab is selected. In this mode, there is a red-bordered input field for '開機電壓(mV)' with the value '3450' and a unit '(mV)' dropdown. Below this is a table with columns for temperature: '50°C', '25°C', '0°C', and '-10°C'. The rows are '開機電流(mA)' and '最低開機電芯電壓(...)'. At the bottom right is a '計算' button.

溫度(°C)	50°C	25°C	0°C	-10°C
開機電流(mA)				
最低開機電芯電壓(...)				

## Step 3-b

- Fill in boot current.
  - For other platforms, refer to [FGADC\_D0] log to fill it in.

Temp (°C)	50°C	25°C	0°C	-10°C
Power-on current (mA)	363.3	188.2	183.1	263.5

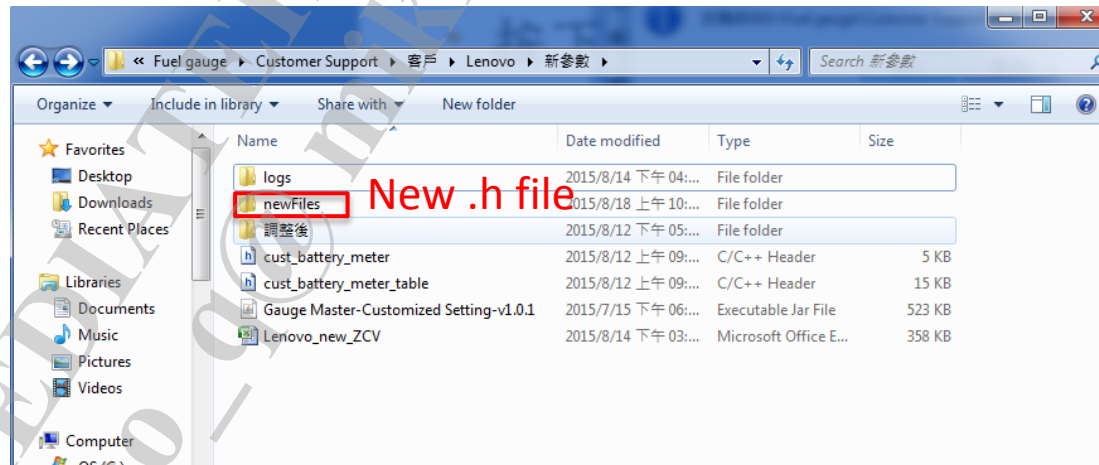
- MTK release Iboot data
  - MT6797 Iboot is 1000(mA).

Temp (°C)	50°C	25°C	0°C	-10°C
Power-on current (mA)	1000	1000	1000	1000



## Step 4

- Click "Calculation".



## Step 5

- Continue to calculate system loading impact.



# Step 6

- Fill in related information. Set HOT temperature to 40°C to avoid system shutdown.

Use the four temperatures in ZCV table.

Heavy loading Result	HOT	WARM	COOL	COLD
Temp (°C)	40	25	0	-10
Shutdown vol (mV)	3657	3687	3854	4080
Max. average current (mA)	1467.2	1148.9	1238.8	1324.9

# Step 6-1

## Heavy Loading Shutdown Voltage

- Check HWOCV and ZCV table for the initial capacity.
  - For MT6795, get HWOCV by meter.
  - For other platforms, get HWOCV by [FGADC\_D0] log.

1. [FGADC\_D0] (HW OCV 4239, HW OCV% 93, SW OCV 4223, SW OCV% 92, RTC% 0, VBAT% 90

Note: For hot temp, refer to 50°C ZCV table.

25°C	OCV	VC	mAh	R	DOD
	4331		0	130	0
Qmax	4308	4251	47	130	1
3362	4289	4233	93	133	3
	4271	4216	140	130	4
	4255	4200	186	133	6
	4239	4168	233	133	7
	4223	4168	279	133	8
	4207	4153	326	133	10
	4192	4137	372	133	11
	4178	4122	419	138	12

Initial capacity=233mAh

# Step 6-2-a

## Heavy Loading Shutdown Voltage

- Check capacity when AvgVbat < power-off voltage

```
[Tue Aug 11 15:10:58.033 2015] [ 8279.756920]<1>. (1) [173:bat_routine_thr][kernel]AvgVbat 3419,bat_vol 3445, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3600
[Tue Aug 11 15:11:08.251 2015] [ 8289.961926]<1>. (3) [173:bat_routine_thr][kernel]AvgVbat 3415,bat_vol 3359, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3487
[Tue Aug 11 15:11:28.265 2015] [ 8309.960288]<2>. (2) [173:bat_routine_thr][kernel]AvgVbat 3411,bat_vol 3413, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 347
[Tue Aug 11 15:11:38.139 2015] [ 8319.878554]<4>. (4) [173:bat_routine_thr][kernel]AvgVbat 3410,bat_vol 3389, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3600
[Tue Aug 11 15:11:58.137 2015] [ 8339.845580]<4>. (4) [173:bat_routine_thr][kernel]AvgVbat 3406,bat_vol 3355, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3600
[Tue Aug 11 15:12:08.137 2015] [ 8349.874910]<4>. (4) [173:bat_routine_thr][kernel]AvgVbat 3405,bat_vol 3408, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3487
[Tue Aug 11 15:12:28.182 2015] [ 8369.894785]<4>. (4) [173:bat_routine_thr][kernel]AvgVbat 3400,bat_vol 3366, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3600
[Tue Aug 11 15:12:48.149 2015] [ 8389.901531]<3>. (2) [173:bat_routine_thr][kernel]AvgVbat 3391,bat_vol 3325, AvgI 0, I 0, VChr 0, AvgT 43, T 44, ZCV 3600
[Tue Aug 11 15:12:58.102 2015] [ 8399.791394]<1>. (2) [173:bat_routine_thr][kernel]AvgVbat 3389,bat_vol 3345, AvgI 0, I 0, VChr 0, AvgT 43, T 45, ZCV 3600

[Tue Aug 11 15:11:28.062 2015] [ 8309.744935]<0>. (4) [360:fuelgauged]MTK_FG: [fgauge_update_dod] fg_dod_1=94, fg_coulomb_act=-28246, fg_dod0=8, C_0mA=3356, C_400mA=
[Tue Aug 11 15:11:38.014 2015] [ 8319.683890]<4>. (1) [360:fuelgauged]MTK_FG: fg_coulomb_act_pre=-28205 fg_coulomb_act=-28290 duration_time=10 fg_coulomb_act_time=20
[Tue Aug 11 15:11:48.123 2015] [ 8329.797044]<3>. (4) [360:fuelgauged]MTK_FG fg_coulomb_act_pre=-28205 fg_coulomb_act=-28333 duration_time=10 fg_coulomb_act_time=30 f
[Tue Aug 11 15:12:38.088 2015] [ 8379.793276]<2>. (1) [360:fuelgauged]MTK_FG: fg_coulomb_act_pre=-28460 fg_coulomb_act=-28545 duration_time=10 fg_coulomb_act_time=20
[Tue Aug 11 15:12:38.166 2015] [ 8379.873544]<1>. (3) [360:fuelgauged]MTK_FG: [fgauge_update_dod] fg_dod_1=95, fg_coulomb_act=-28545, fg_dod0=8, C_0mA=3356, C_400mA=33
[Tue Aug 11 15:12:48.196 2015] [ 8389.916194]<1>. (1) [360:fuelgauged]MTK_FG: fg_coulomb_act_pre=-28460 fg_coulomb_act=-28591 duration_time=10 fg_coulomb_act_time=30
[Tue Aug 11 15:12:48.212 2015] [ 8389.922836]<1>. (2) [360:fuelgauged]MTK_FG: [fgauge_update_dod] fg_dod_1=95, fg_coulomb_act=-28591, fg_dod0=8, C_0mA=3356, C_400mA=3
[Tue Aug 11 15:13:18.054 2015] [ 8419.745761]<2>. (7) [360:fuelgauged]MTK_FG: fg_coulomb_act_pre=-28719 fg_coulomb_act=-28719 duration_time=10 fg_coulomb_act_time=0
```

fg\_coulomb\_act unit 0.1mAh  
→consume capacity=2859.1mAh

# Step 6-2-b

## Heavy Loading Shutdown Voltage

- Confirm the consume capacity when the battery voltage is less than the system shutdown voltage(for MT6797)
- Key word:
  - [DLPT\_POWER\_OFF\_EN] SOC=0 to power off , cnt=

```
[Mon Oct 26 18:37:07.246 2015] [ 1898.891519] <2>.(1)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:17.258 2015] [ 1908.889372] <3>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:27.248 2015] [ 1918.898388] <4>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:37.262 2015] [ 1928.902060] <2>.(4)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:47.257 2015] [ 1938.889476] <3>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:47.257 2015] [ 1938.889483] <3>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] SOC=0 to power off , cnt=1
[Mon Oct 26 18:37:57.525 2015] [ 1948.908132] <4>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] run
[Mon Oct 26 18:37:57.525 2015] [ 1948.908139] <4>.(5)[176.bat_update_thre][DLPT_POWER_OFF_EN] SOC=0 to power off , cnt=2
```

```
[Mon Oct 26 18:36:17.207 2015] [ 1848.892076] <4>.(2)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=81, fg_coulomb_act=6518, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2640, fg_current_avg=12859, qmax_t
[Mon Oct 26 18:36:27.199 2015] [ 1858.894151] <4>.(2)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=81, fg_coulomb_act=6556, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2642, fg_current_avg=12726, qmax_t
[Mon Oct 26 18:36:37.203 2015] [ 1868.885914] <2>.(4)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=81, fg_coulomb_act=6589, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2640, fg_current_avg=12909, qmax_t
[Mon Oct 26 18:36:47.219 2015] [ 1878.903359] <0>.(2)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=81, fg_coulomb_act=6626, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2641, fg_current_avg=12798, qmax_t
[Mon Oct 26 18:36:57.221 2015] [ 1888.888413] <0>.(2)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6664, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2643, fg_current_avg=12694, qmax_t
[Mon Oct 26 18:37:07.205 2015] [ 1898.888678] <2>.(5)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6702, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2645, fg_current_avg=12545, qmax_t
[Mon Oct 26 18:37:17.219 2015] [ 1908.886613] <3>.(4)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6737, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2645, fg_current_avg=12545, qmax_t
[Mon Oct 26 18:37:27.210 2015] [ 1918.893279] <4>.(0)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6775, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2645, fg_current_avg=12540, qmax_t
[Mon Oct 26 18:37:37.219 2015] [ 1928.893584] <2>.(0)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6813, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2643, fg_current_avg=12676, qmax_t
[Mon Oct 26 18:37:47.215 2015] [ 1938.886759] <3>.(4)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6844, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2642, fg_current_avg=12727, qmax_t
[Mon Oct 26 18:37:57.489 2015] [ 1948.894851] <2>.(0)[447.fuelgauged]MTK_FG: [fgauge_update_dod]fg_dod_1=82, fg_coulomb_act=6865, fg_dod0=58, C_0mA=2820, C_400mA=2764, C_FGCurrent=2644, fg_current_avg=12631, qmax_t
```

fg\_coulomb\_act unit 0.1mAh  
→ Consume capacity=686.5mAh

# Step 6-3

## Heavy Loading Shutdown Voltage

- Initial capacity + consume capacity = total capacity 233 mAh + 2859.1 mAh = 3092.1 mAh
- Get power-off voltage OCV by ZCV table.

25°C	OCV	VC	mAh	R	DOD
	3730	3657	2791	128	83
	3722	3649	2837	128	84
	3714	3640	2884	128	86
	3706	3629	2930	128	87
	3695	3625	2977	128	89
	3688	3622	3023	125	90
	3687	3618	3070	130	91
	3685	3612	3116	133	93
	3683	3596	3163	140	94

OCV = 3687mV

Heavy load test result	HOT	WARM	COOL	COLD
Temp (°C)	40	25	0	-10
Power off OCV (mV)	3657	3687	3854	4080
Max. average current (mA)	1467.2	1148.9	1238.8	1324.9



# Step 7

- Fill in shutdown voltage according to different platforms.
  - MT6797 shutdown voltage = **3100mV**

Gauge Master - Customized Setting

系統負載影響調整

請選擇兩個.h檔案

☒ cust\_battery\_meter.h

☒ cust\_battery\_meter\_table.h

	HOT	WARM	COOL	COLD
溫度(°C)	40	25	0	-10
電芯電壓(mV)	3657	3687	3854	4080
平均電流(mA)	1467.2	1148.9	1238.8	1324.9
關機電壓(mV)	3400			

Rsense(mΩ)

10

Rpcb(mΩ)

5

Q\_MAX\_SYS\_VOLTAGE(mV) BATTERY\_PSEUDO1(%)

0°C -10°C

低溫開机电壓(mV)

PSEUDO1

HOT WARM COOL COLD

計算



# Step 8

- Click “Calculation”.

Gauge Master - Customized Setting

系統負載影響調整

請選擇兩個.h檔案

☒ cust\_battery\_meter.h

☒ cust\_battery\_meter\_table.h

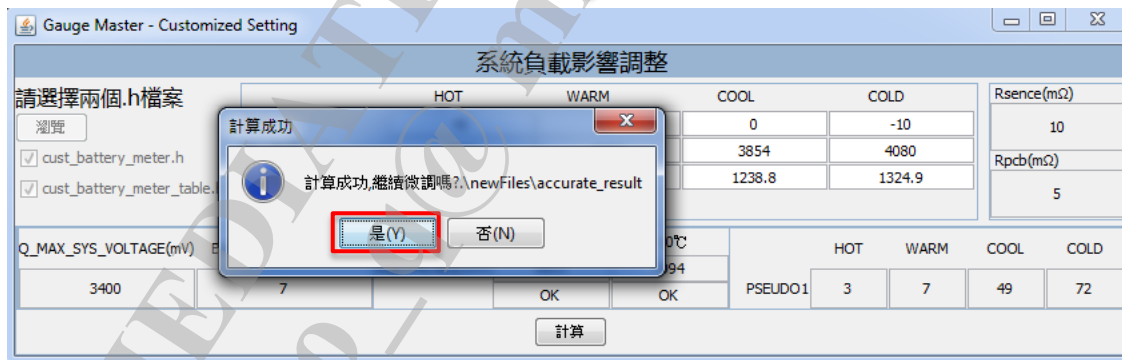
	HOT	WARM	COOL	COLD
溫度(°C)	40	25	0	-10
電芯電壓(mV)	3657	3687	3854	4080
平均電流(mA)	1467.2	1148.9	1238.8	1324.9
開機電壓(mV)	3400			

Rsense(mΩ)	10
Rpcb(mΩ)	5

Q_MAX_SYS_VOLTAGE(mV)	BATTERY PSEUDO1(%)	0°C	-10°C	HOT	WARM	COOL	COLD
		低溫開机电壓(mV)					
				PSEUDO1			

## Step 9

- To tune low temperature 0%, click “Yes”.



# Step 10

- Final .H and tool are in the same path “newFiles”.



# Note

- After adjusting the parameters, a complete charge and discharge test is suggested at each temperature to tune BATTERYPSEUDO1.

Gauge Master - Customized Setting

系統負載影響調整

請選擇兩個.h檔案

☒ cust\_battery\_meter.h

☒ cust\_battery\_meter\_table.h

	HOT	WARM	COOL	COLD
溫度(°C)	40	25	0	-10
電芯電壓(mV)	3657	3687	3854	4080
平均電流(mA)	1467.2	1148.9	1238.8	1324.9
關機電壓(mV)	3400			

Rsense(mΩ)	10
Rpcb(mΩ)	5

Q_MAX_SYS_VOLTAGE(mV)	BATTERYPSEUDO1(%)	0°C	-10°C					
3400	7	3854	4080					
		OK	OK	PSEUDO1	HOT	WARM	COOL	COLD
					3	7	49	72

計算

If BATTERYPSEUDO1(%) > 5, double check and contact ACS for help.

**MEDIATEK**

*everyday genius*