

APGAR Timer Power Consumption.

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Assumptions:

- 1 The timer will never be turned OFF – there will always be some LCD activity.
- 2 The timer will be used twice a day, 365 days a year.
- 3 The sounder will operate at the 1, 5 and 10 minute points. Each operation will be for 5 seconds at a 50/50 duty cycle.
- 4 The LCD will be updated every second, 365 days a year.
- 5 The battery will be monitored once every hour with 5 ADC cycles per sample.

Power Consumption Calculation:

Number of hours in a year:	24 x 365	8760
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ST7LITE15

CPU (Estimated):

Active Halt mode	200uA
Run (Slow) mode	200uA
Consumption:	200uA x 8760

1752 mAh (1)

LVD/AVD	245uA
	245uA x 8760

2146 mAh (2)

RC Oscillator (Not used)

0 mAh

PLL (Not used)

0 mAh

12-bit Timer AT2	50uA $50\mu\text{A} \times 2(\text{Use}) \times (3(\text{Times}) \times 5 (\text{Seconds}) / 3600(\text{Hours}) \times 365) / 2(\text{Duty})$	0.076 mAh	(3)
SPI (Not used)		0 mAh	
ADC	1.2mA $1.2\text{mA} \times 5(\text{Samples}) \times 0.5\text{mS}(\text{Conversion time}) / 3600(\text{Hours}) \times 8760$	0.0073 mAh (4)	
Flash Memory No Read/Write	100uA $100\mu\text{A} \times 8760$	876 mAh	(5)
Read	2.6mA $2.6\text{mA} \times (256 / 32768)(\text{Instructions}) \times 8760$	178 mAh	(6)
Ports (Leakage)	1uA $1\mu\text{A} \times 15(\text{Pins}) \times 8760$	131 mAh	(7)
<u>PCF8576D LCD Driver</u>			
Supply	20uA $20\mu\text{A} \times 8760$	175 mAh	(8)
LCD Supply	60uA $60\mu\text{A} \times 8760$	526 mAh	(9)
<u>Sounder</u>	2.5mA $2.5\text{mA} \times 2(\text{Use}) \times (3(\text{Times}) \times 5 (\text{Seconds}) / 3600(\text{Hours}) \times 365) / 2(\text{Duty})$	3.8 mAh	(10)
<u>I2C interface</u>	$2(\text{Lines}) \times 3\text{V} / 2700 \text{ Ohms} \times 1 / 1000(\text{duration}) / 3600(\text{Hours}) \times 8760$	0.00 mAh	(11)

<u>Battery Potential Divider</u>	10uA 10uA x 8760	88 mAh	(12)
<u>LTC1877 Regulator (1/5mA Load)</u>	100uA 100uA x 8760	<u>876 mAh</u>	(13)
Total (1 – 13):		6752 mAh	

Battery capacity required: 6752 mAh

“AA” Battery capacities by manufacturer:

Varta 4106	2600 mAh
Duracell MN1500	2700 mAh
Energizer Ultra Alkaline	2850 mAh

<u>Number of batteries required:</u>	6752 / 2600	3 batteries
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