

Build Your Own Data Logger

Module 5: Optimising Your Application

Terminology Starter Guide

Video	5-0
Power consumption (of a device)	<p>The electrical energy per unit time need to operate a device.</p> <p>Although power is measured in units of watts (W) or kilowatts (kW), when we discuss power consumption of a device, we often discuss it in terms of current, ie: millamps or microamps.</p>
Battery life (of a device)	The amount of time the device can operate before the batteries go too low for normal operation.
Battery Capacity	<p>The amount of time the battery can supply the current to the device so it can operate.</p> <p>Usually measured in amp hours (Ah) or millamp hours (mAh).</p>
Low power / Power Down / Sleep / Deep Sleep Mode	<p>Different power states a device can go into.</p> <p>As we go into lower power states, our functionality reduces until finally there's no MCU processing, communications with other chips, or checking of the pin states.</p> <p>This would be the lowest power state and uses the least amount of power of all the modes a device can go into.</p>
Brownout	An intentional or unintentional drop in voltage below the usable voltage threshold.
Blackout	A complete loss of power.

Usable Voltage Threshold / Tolerance	<p>The voltage level under which the MCU will stop functioning properly.</p> <p>We normally want to either avoid going below this threshold or keep the MCU in a reset state until we go above minimum voltage threshold.</p>
Bricking the device	<p>When someone breaks a device and renders it completely useless. It turns it into an expensive brick, i.e. people say they “bricked” it.</p> <p>A ‘bricked device’ cannot be fixed through normal means.</p>
Video	5-1
Watch Dog Timer (WDT), Computer operating properly (COP) Timer	<p>Protect against system bugs, hangs and crashes.</p> <p>A timer circuit that waits for a ‘check in’ event from the device, whilst counting down to zero.</p> <p>If the check in (timer reset) occurs before the watchdog timer reaches zero, the watchdog timer resets to the starting number and starts counting down again.</p> <p>If the check in doesn’t occur before the watchdog timer (WDT) reaches zero, due to some fault condition, such as a hang, the WDT triggers a system reset.</p> <p>Used to recover from system bugs such as stack overflows, memory leaks and race condition bugs.</p>
Logic Bugs	<p>A bug in a program that causes it to operate incorrectly, but not to terminate abnormally (or crash).</p>

	<p>Logic bugs are usually the result of bad math or faulty logic, and relatively easy to diagnose and fix early in the development.</p>
<p>Stack Overflow, Buffer Overflow</p>	<p>A programming error in which an attempt to write data to a particular block of memory fails because there is no space left in the block.</p> <p>A bug that is hard to detect.</p>
<p>Memory Leaks</p>	<p>A memory leak is any portion of an application which uses (RAM) memory without eventually freeing it (for example, after execution)</p> <p>This condition is normally the result of a bug in a program that prevents it from freeing up memory that it no longer needs.</p> <p>Memory leaks are slow to appear, and difficult to reproduce.</p>
<p>Race Conditions</p>	<p>A race condition or race hazard is the behavior of a system where the output is dependent on the sequence or timing of other uncontrollable events. It becomes a bug when events do not happen in the order the programmer intended.</p> <p>For example In computer memory or storage, a race condition may occur if commands to read and write a large amount of data are received at almost the same instant, and the device attempts to overwrite some or all of the old data while that old data is still being read.</p> <p>The result may be one or more of the following: a computer crash, an "illegal operation," notification and shutdown of the program, errors reading the old data, or errors writing the new data.</p>

Chip Registers	A chip register is a configuration location in the chip's memory accessible by the microcontroller. Bits in the register can be thought of as switches that turn on or off specific features of the chip or indicate a specific status of the chip.

Tutorials / Useful Links

SD Card Power Consumption: LOW POWER SHOWDOWN: USD CARD SLEEP AND WRITE CURRENT DRAW	http://bit.ly/microsd-power
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