

What Is Compute through Power Loss?



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With the Launch of new MSP430 FRAM MCUS and the latest MSP430 FRAM LaunchPad, you may have missed our recently launched [MSP-FRAM-UTILITIES](#) page. The truth is, this is likely the most exciting release in terms of both innovation and usability since our power-profiling [EnergyTrace Technology](#) that released nearly one year ago. Given the mix of [MSP430FRx FRAM microcontrollers](#) released this past year, we thought it would be fitting to start a library that could leverage some of the unique memory advantages offered across this family of microcontrollers:

- Unified memory block for use as program or data storage
- 10e15 write endurance
- Faster write speeds
- Lower energy consumption
- Increased security

Compute Through Power Loss (CTPL) is a software utility that enables a system to save the CPU and several peripheral states in non-volatile memory before entering a low-power mode or losing power. This library features a number of APIs to monitor for events such as power-failure and to react to those events in an intelligent way. This is only possible on FRAM microcontrollers which are capable of writing at 8MHz with zero wait-states. This ultra-fast non-volatile write speed combines with 10e15 endurance to enable exciting capabilities. Since our memory protection unit is used to ensure safe operation, this is currently available exclusively on MSP430FR5x/6x microcontrollers. Let's look at the new possibilities:

1. The expanded use of low-power modes (LPMs) x.5 - reduces complexity and time associated with starting up from a low-power mode where system state is not traditionally retained.

```

... // Check if a wakeup from LPMx.5 was detected and use a dedicated dev
... // previous program execution in that case.
... if (SYSRSTIV == SYSRSTIV_LPM5WU) {
... mode = APP_ULP_ADC;
... select = SEL_ADC_LPM35_MODE;
... setClock = 1; ... // After exiting from LPM3.5, set up date and tim
... SystemInitFromLPM35 ();
... }
... else { ... // Start up normally
... SystemInit(); ... // Initialize board

... // Display TI Logo
... LCD_drawPicture(1);
... TAI_sleep(8192); ... // 2s
... // Display Wolverine Slash
... LCD_drawPicture(2);
... TAI_sleep(8192); ... // 2s
... // Write "Wolverine User Experience" on LCD
... LCD_introWrite();
... TAI_sleep(8192); ... // 2s
... }
    
```

```

// Enter shutdown
ctpl_enterShutdown(CTPL_SHUTDOWN_TIMEOUT_64_MS);
    
```

Intelligent system state restoration after power failure - shuts down gracefully on power failure and reduces current consumption and time on wake-up.

System counter
implementation
on startup



Context save
on power
failure



Application
resume on
power restore



This new software library can be leveraged across applications! Explore the TI Design ([TIDM-FRAM-CTPL](#)) to learn more and get started with this utility API and the [MSP-EXP430FR6989](#) LaunchPad!

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