# CE215815 - FM0+ Cyclic Redundancy Check

This example uses the Cyclic Redundancy Check (CRC) peripheral to calculate a checksum and validate the data, using the CCIT CRC16 standard.

## Overview

This code example defines sixty-four 32-bit values to use as input data to the CRC. It validates the data three times: pushing the data as 8-bit, 16-bit, and 32-bit values. The green LED is used to indicate success or failure.

## Requirements

**Tool:** PSoC Creator 4.0

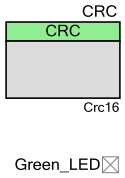
**Programming Language:** C (GCC 4.9.3)

**Associated Parts:** All S6E1C parts

**Related Hardware:** FM0-64L-S6E1C3

## Design

The schematic includes the CRC Component and a GPIO for the LED, renamed for ease of use.




The firmware performs following functions:

1. Initializes the CRC peripheral
2. Pushes the input data to the CRC peripheral as 32-bit, 16-bit, and 8-bit values, and checks the result each time
3. Turns on the green LED if there are no errors (the calculated result matches the checksum)

### Design Considerations

#### CRC32-bit Operation

This code example uses the CCIT CRC16 standard. The peripheral also supports IEEE 802.3 CRC32-bit. To change the standard, modify the **enMode** setting for the peripheral, and change the initial value to 0xFFFFFFFFu (32-bits). In the firmware, change the #define for the checksum, using the macros provided in the *main.c* file.

#### Data Size and Byte Ordering

Regardless of mode you can push the data to the CRC peripheral as 8-, 16-, or 32-bit values. You have choices for how to order the data, and the bits within the data. The code that confirms the CRC checksum must use the same configuration as the code that created the checksum.

#### PDL Installation

The project assumes that you have installed the PDL in the location specified in the **Project Management** panel of the **Tools** > **Options** dialog. If that location is incorrect you will see the build error “The given PDL path is invalid. Unable to find required PDSC file.” To correct this problem in a newly-created project open the **Project** > **Properties** dialog and enter the correct path to the PDL. To avoid the problem in projects you create in the future, make sure you put the correct path in the **Tools** > **Options** dialog.

## Hardware Setup

The CRC Component does not require any hardware setup. Table 1 lists the pin connections required to use this code example on supported FM0+ kits.

Table 1. List of Pins

| Pin | FM0-64L-S6E1C3 |
|---|---|
| Green_LED:GPIO | P3E |

## Components

Table 2 lists the PSoC Creator Components used in this example, as well as the hardware resources used by each.

Table 2. List of PSoC Creator Components

| Component | Version | Hardware Resources |
|---|---|---|
| PDL_CRC | 1.0 | CRC block |
| PDL_GPIO | 1.0 | GPIO pin |

### Parameter Settings

The CRC Component uses default parameter settings, with these exceptions:

Table 3: Component Settings

| Tab | Setting | Value |
|---|---|---|
| None | Name | CRC |
| Basic | U32CrcInitValue | 0xFFFFu |

## Operation

Program the kit, then click the Resume Execution button. If the green LED lights, the CRC checksum matched the calculation in all three cases (8-, 16-, and 32-bit values).

## Related Documents

Table 4 lists relevant application notes, code examples, knowledge base articles, device and Component datasheets.

Table 4. Related Documents

| | |
|---|---|
| **PSoC Creator Component Datasheets** | |
| PDL_CRC | Supports IEEE-802.3 CRC32 and CCITT CRC16 standards (right-click the Component to access) |
| **Device Documentation** | |
| S6E1C | FM0+ S6E1C-Series Ultra Low Power ARM® Cortex®-M0+ Microcontroller (MCU) Family |
| **Development Kit (DVK) Documentation** | |
| FM0-64L-S6E1C3 | ARM® Cortex®-M0+ MCU Starter Kit with USB and Digital Audio Interface |

## Document History

Document Title: CE215815 - FM0+ Cyclic Redundancy Check

Document Number: 002-15815

| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
|---|---|---|---|---|
| ** | 5373366 | YFS | 09/23/16 | New Code Example. |
| *A | 5775156 | YFS | 6/15/17 | Added search keyword so that user can quickly find Code Examples from the component instance popup menu.<br>Updated logo and copyright date. |
| *B | 5987561 | YFS | 12/7/17 | Removing S6E1B support. |

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