R32C/100 Series

Oscillator Stop Detection Interrupt

R01AN0515EJ0100
Rev. 1.00
June 30, 2011

Abstract

This document describes a method to use oscillator stop detection in the R32C/100 Series.

Products

MCUs: R32C/116 Group
R32C/117 Group
R32C/118 Group

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Contents

1. Specifications

The oscillator stop detection function detects when the main clock is stopped by an external source. This application note describes a method for turning on an error warning LED when the main clock stops and an oscillator stop detection interrupt is generated.

Table 1.1 lists the Peripheral Function and Its Application. Figure 1.1 shows an Operation Example.

Table 1.1 Peripheral Function and Its Application

Peripheral Function	Application
Oscillator stop detection	Detects when the main clock stops

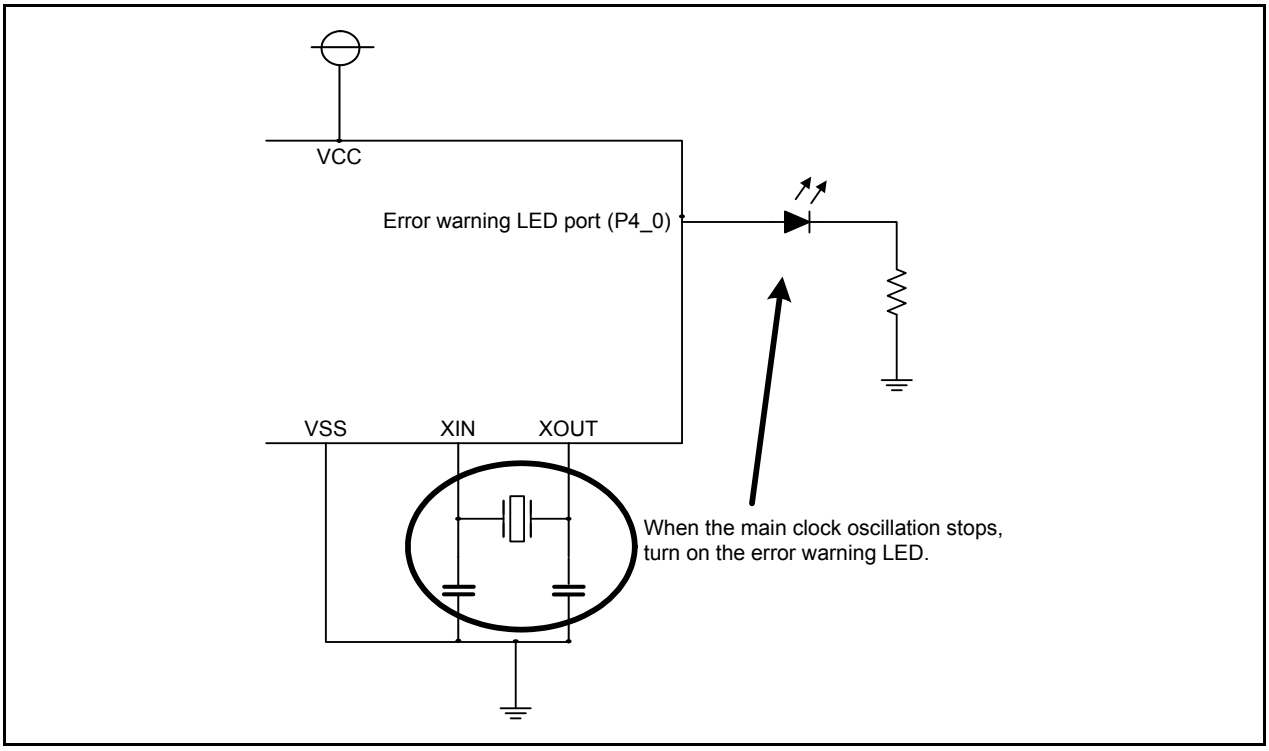

Figure 1.1 Operation Example

2. Operation Confirmation Conditions

The sample code accompanying this application note has been run and confirmed under the conditions below.

Table 2.1 Operation Confirmation Conditions

Item	Contents
MCU used	R5F64189DFD (R32C/118 Group)
Operating frequencies	• Main clock: 16 MHz • PLL clock: 100 MHz • Base clock: 50 MHz • CPU clock: 50 MHz • Peripheral bus clock: 25 MHz • Peripheral function clock source: 25 MHz
Operating voltage	5 V
Integrated development environment	Renesas Electronics Corporation High-performance Embedded Workshop Version 4.07
C compiler	Renesas Electronics Corporation R32C/100 Series C Compiler V.1.02 Release 01
	Compile options -D__STACKSIZE__=0X300 -D__ISTACKSIZE__=0X300 -DVECTOR_ADR=0x0FFFFFBDC -c -finfo -dir "$(CONFIGDIR)" (Default setting is used in the integrated development environment.)
Sample code version	Version 1.00

3. Reference Application Note

The application note associated with this application note is listed below. Refer to this application note for additional information.

- R32C/100 Series Configuring PLL Mode (REJ05B1221-0100)

4. Hardware

4.1 Pin Used

Table 4.1 lists the Pin Used and Its Function.

Table 4.1 Pin Used and Its Function

Pin Name	I/O	Function
P4_0	Output	This pin connects to the error warning LED.

5. Software

5.1 Operation Overview

When the main clock is stopped, an oscillator stop detection interrupt is generated. In the oscillator stop detection interrupt handling, after setting the base clock divided by 4 and the peripheral function clock source divided by 8, confirm that the CM23 bit in the CM2 register is 1 (main clock oscillator stopped) three times before turning on the error warning LED.

Figure 5.1 shows the Timing Diagram.

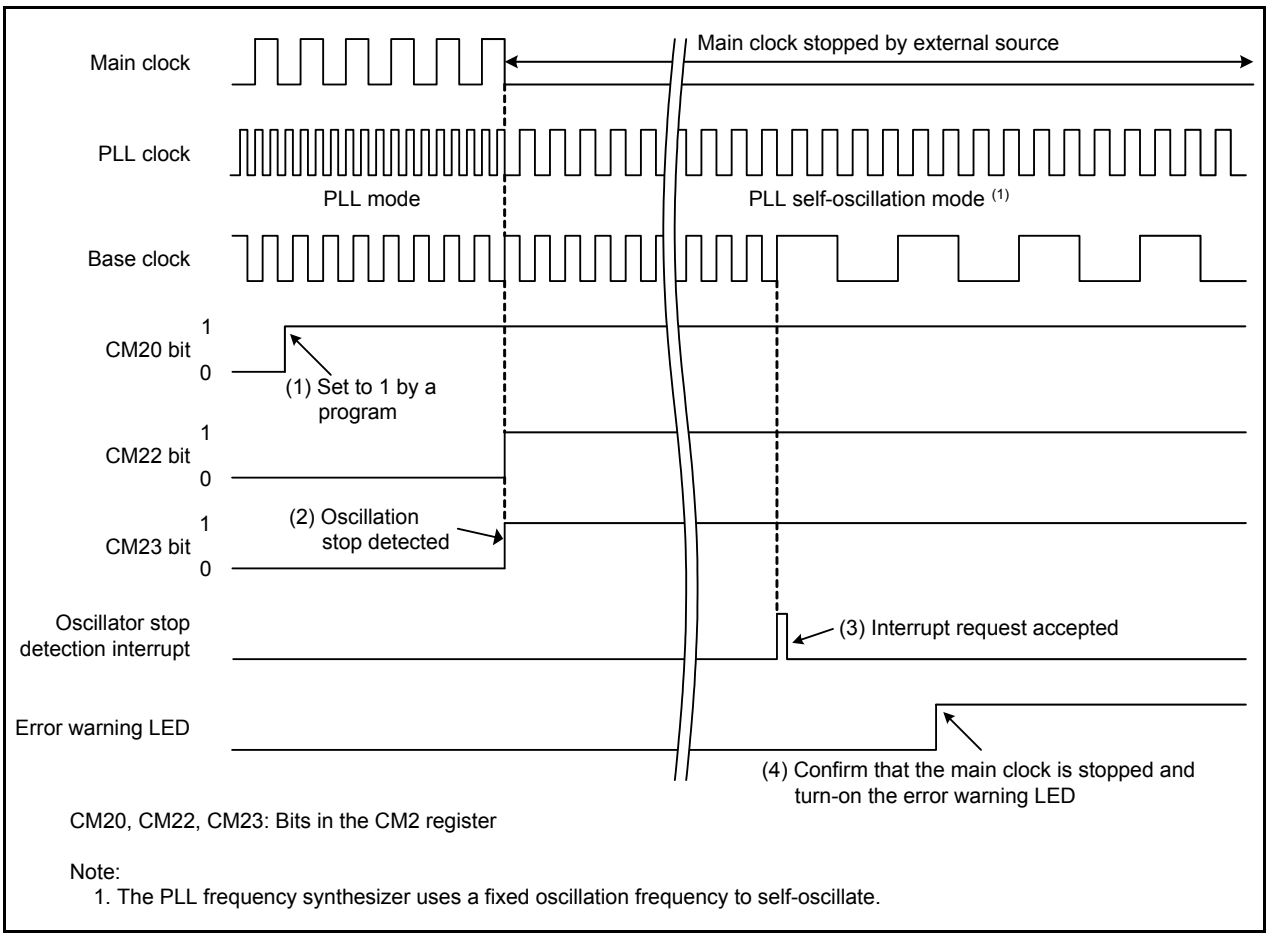

Figure 5.1 Timing Diagram

5.2 Variable

Table 5.1 lists the static Variable.

Table 5.1 static Variable

Type	Variable Name	Contents	Function Used
unsigned char	stop_cnt	Main clock stop counter	_wdt_int

5.3 Flowcharts

5.3.1 Main Processing

Figure 5.2 shows the Main Processing.

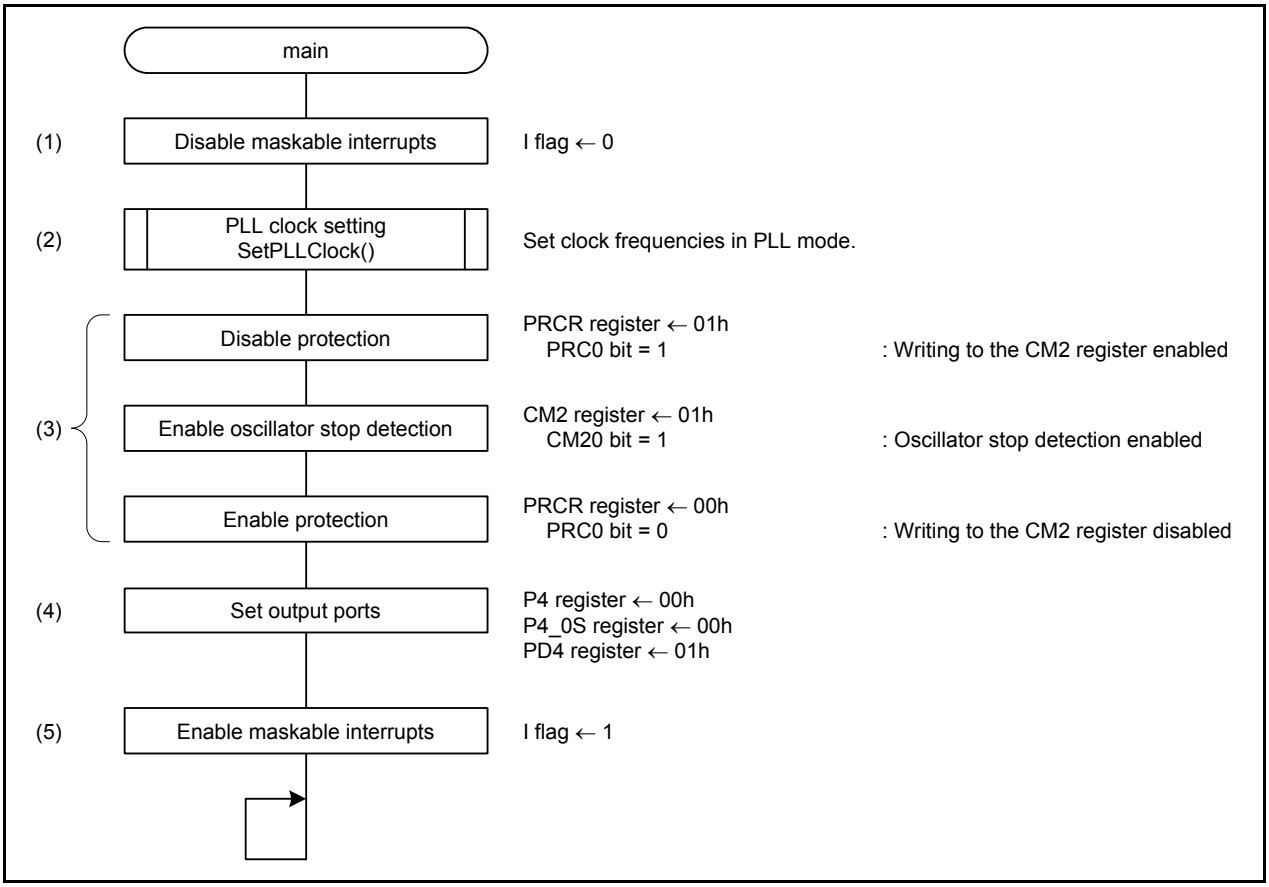

Figure 5.2 Main Processing

5.3.2 Oscillator Stop Detection Interrupt Handling

Figure 5.3 shows the Oscillator Stop Detection Interrupt Handling.

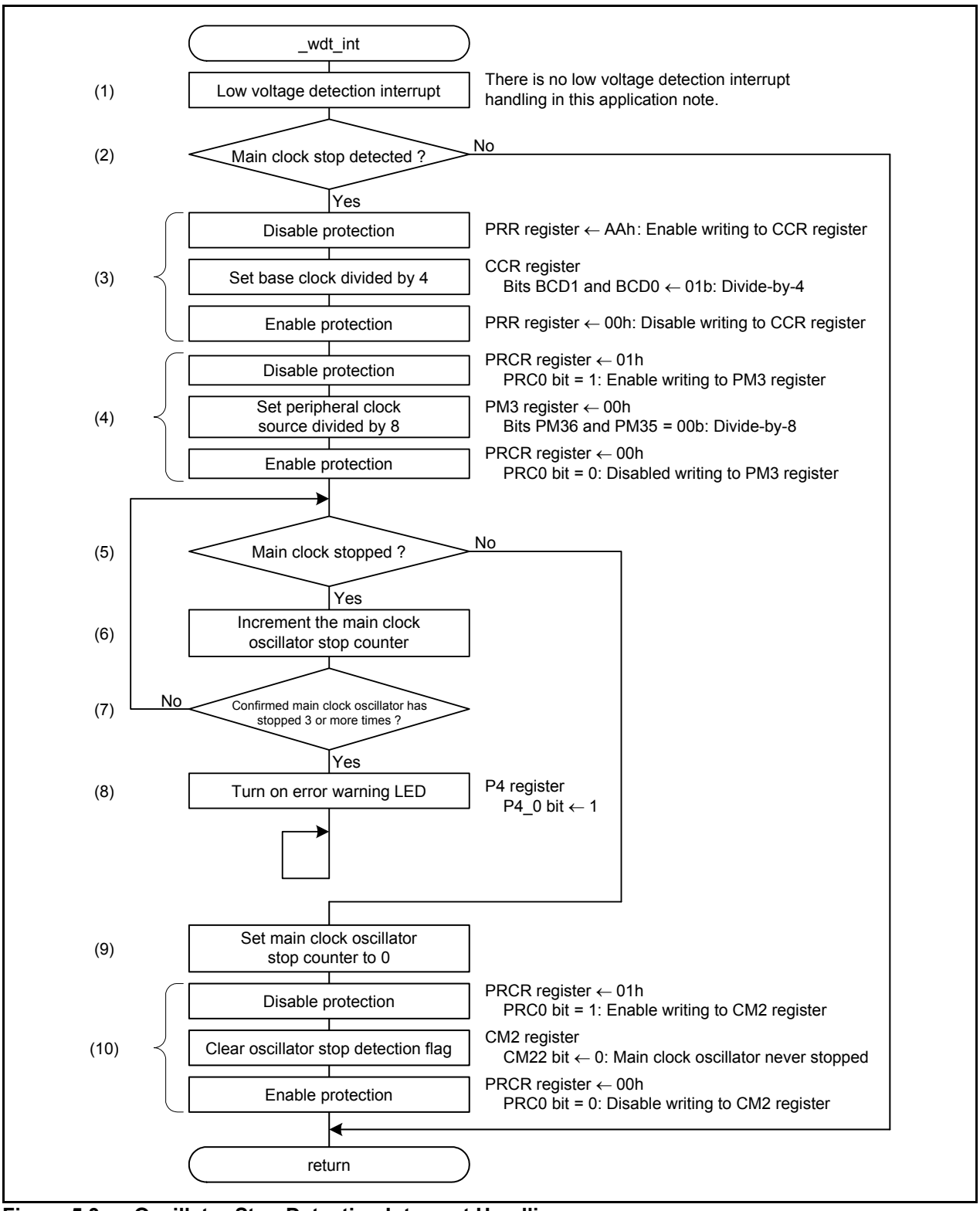

Figure 5.3 Oscillator Stop Detection Interrupt Handling

6. Sample Code

Sample code can be downloaded from the Renesas Electronics website.

7. Reference Documents

R32C/116 Group User's Manual: Hardware Rev.1.10
R32C/117 Group User's Manual: Hardware Rev.1.10
R32C/118 Group User's Manual: Hardware Rev.1.10
The latest versions can be downloaded from the Renesas Electronics website.

Technical Update/Technical News
The latest information can be downloaded from the Renesas Electronics website.

C Compiler Manual
R32C/100 Series C Compiler Package V.1.02
C Compiler User's Manual Rev.2.00
The latest version can be downloaded from the Renesas Electronics website.

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Revision History	R32C/100 Series Oscillator Stop Detection Interrupt

Rev.	Date	Description	
		Page	Summary
1.00	June 30, 2011	—	First edition issued

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins

   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.

   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.

   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

   — The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

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