



Preliminary

CANTUS

- RTC -

32bits EISC Microprocessor *CANTUS*

Ver 1.0
October 8, 2009

Advanced Digital Chips Inc.

History

2009-10-08 Created Preliminary Specification

CANTUS Evaluation Board Application Note : #0007 RTC

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1 Summary

이 문서는 CANTUS SDK의 RTC(Real Time Clock)에 대한 Application Note이다.

RTC Project는 CANTUS의 RTC를 이용하여 현재 시간을 읽어 Debug용 UART Channel 7번을 통해 출력하는 예제이다.

- UART에 대한 내용은 AN_0002_UART를 참조하라.

2 Register Set

2.1 Register Set Flow Chart

CANTUS의 RTC를 사용하기 위해선 다음과 같은 순서로 Register를 설정한다.

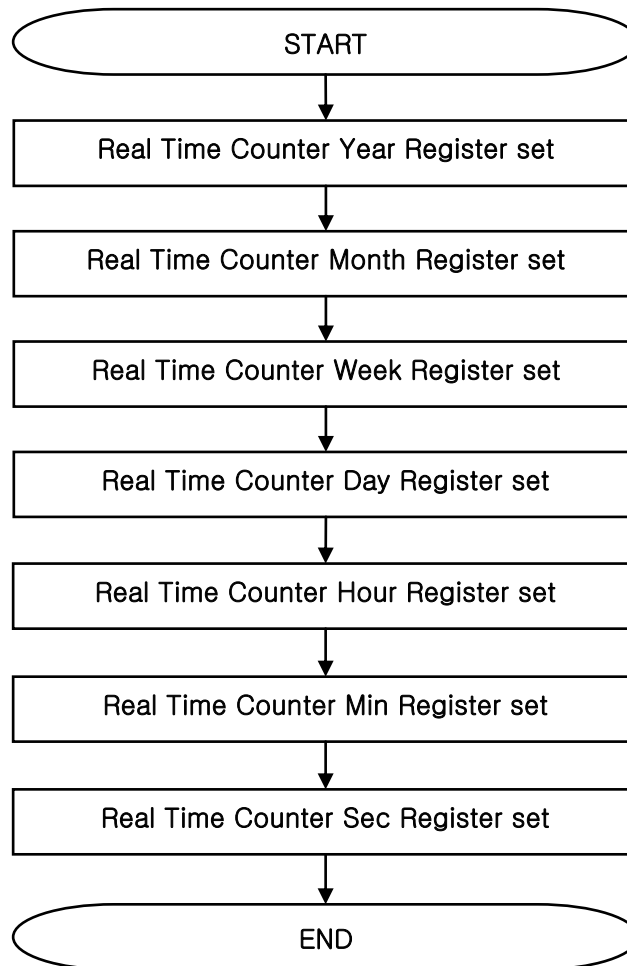


그림 2-1 Register Set Flow Chart

2.2 Real Time Counter Year Register

㉞ 2-1 Real Time Counter Year Register (RTCYEAR)

Address : 0x8002_381C

Bit	R/W	Description	Default Value
31 : 7	R	Reserved	-
6 : 0	R/W	Year (0~99)	0x04

2.3 Real Time Counter Month Register

㉞ 2-2 Real Time Counter Month Register (RTCMONTH)

Address : 0x8002_3818

Bit	R/W	Description	Default Value
31 : 4	R	Reserved	-
3 : 0	R/W	Month (1~12)	0x1

2.4 Real Time Counter Week Register

㉞ 2-3 Real Time Counter Week Register (RTCWEEK)

Address : 0x8002_3814

Bit	R/W	Description	Default Value
31 : 3	R	Reserved	-
2 : 0	R/W	Week (0~6)	0x4

2.5 Real Time Counter Day Register

㉞ 2-4 Real Time Counter Day Register (RTCDAAY)

Address : 0x8002_3810

Bit	R/W	Description	Default Value
31 : 5	R	Reserved	-
4 : 0	R/W	Day (1~31)	0x01

2.6 Real Time Counter Hour Register

㉞ 2-5 Real Time Counter Hour Register (RTCHOUR)

Address : 0x8002_380C

Bit	R/W	Description	Default Value
31 : 5	R	Reserved	-
4 : 0	R/W	Hour (0~23)	0x00

2.7 Real Time Counter Min Register

표 2-6 Real Time Counter Min Register (RTCMIN)

Address : 0x8002_3808

Bit	R/W	Description	Default Value
31 : 6	R	Reserved	-
5 : 0	R/W	Min (0~59)	0x00

2.8 Real Time Counter Sec Register

표 2-7 Real Time Counter Sec Register (RTCSEC)

Address : 0x8002_3804

Bit	R/W	Description	Default Value
31 : 7	R	Reserved	-
6	R	RTC Time Counter Register Update 0 : Update 1 : Not Yet Update Update bit가 발생하여야 RTC 설정이 전달된 것이다.	0
5 : 0	R/W	Sec (0~59)	0x00

*** RTCSEC Register를 Write 해야 Time Counter Register가 Update 된다.

*** RTCSEC Register를 Time Counter Register 중 가장 마지막에 다루어야 한다.



RTC는 주기적인 Interrupt 요청과 설정한 시간에 Alarm Interrupt를 요청할 수 있다. 이 Interrupt를 사용하기 위해선 아래 2.9 와 2.10 의 설정 외에도 Interrupt Set과 Interrupt Enable이 필요하다.

2.9 Real Time Counter Control Register

표 2-8 Real Time Counter Control Register (RTCCTRL)

Address : 0x8002_3800

Bit	R/W	Description	Default Value
31 : 6	R	Reserved	-
5	R	RTC Control Register Update 0 : Update 1 : Not Yet Update Update bit가 발생하여야 RTC 설정이 전달된 것이다.	0
4	R/W	Test Mode 0 : Normal Mode 1 : RTC Test Mode(Fast)	0
3 : 0	R/W	RTC Interrupt Select 0000 : No Interrupt 0001 : Alarm Interrupt 0010 : 0.25 Sec 0011 : 0.5 Sec 0100 : 2 Sec 0101 : 4 Sec 0110 : 8 Sec 0111 : 16 Sec 1000 : 2 Min 1001 : 4 Min 1010 : 8 Min 1011 : 16 Min 1100 : 2 Hour 1101 : 4 Hour 1110 : 2 Day 1111 : 4 Day	0000

*** RTC Interrupt Select Register를 설정하고 Interrupt를 발생시키기 위해서는 Power Management Control Register 중에서 Wake Up Control Register의 RTC Interrupt Enable bit를 활성화 시켜야 한다.

2.10 Real Time Alarm Register

표 2-9 Real Time Alarm Register (RTCALM)

Address : 0x8002_3820

Bit	R/W	Description	Default Value
31 : 24	R	Reserved	-
23 : 21	R	Reserved	-
20 : 16	W	Hour(0~23)	0x00
15 : 14	R	Reserved	-
13 : 8	W	Min(0~59)	0x00
7 : 6	R	Reserved	-
5 : 0	W	Sec(0~59)	0x00

3 Function Set

3.1 Function Set Flow Chart

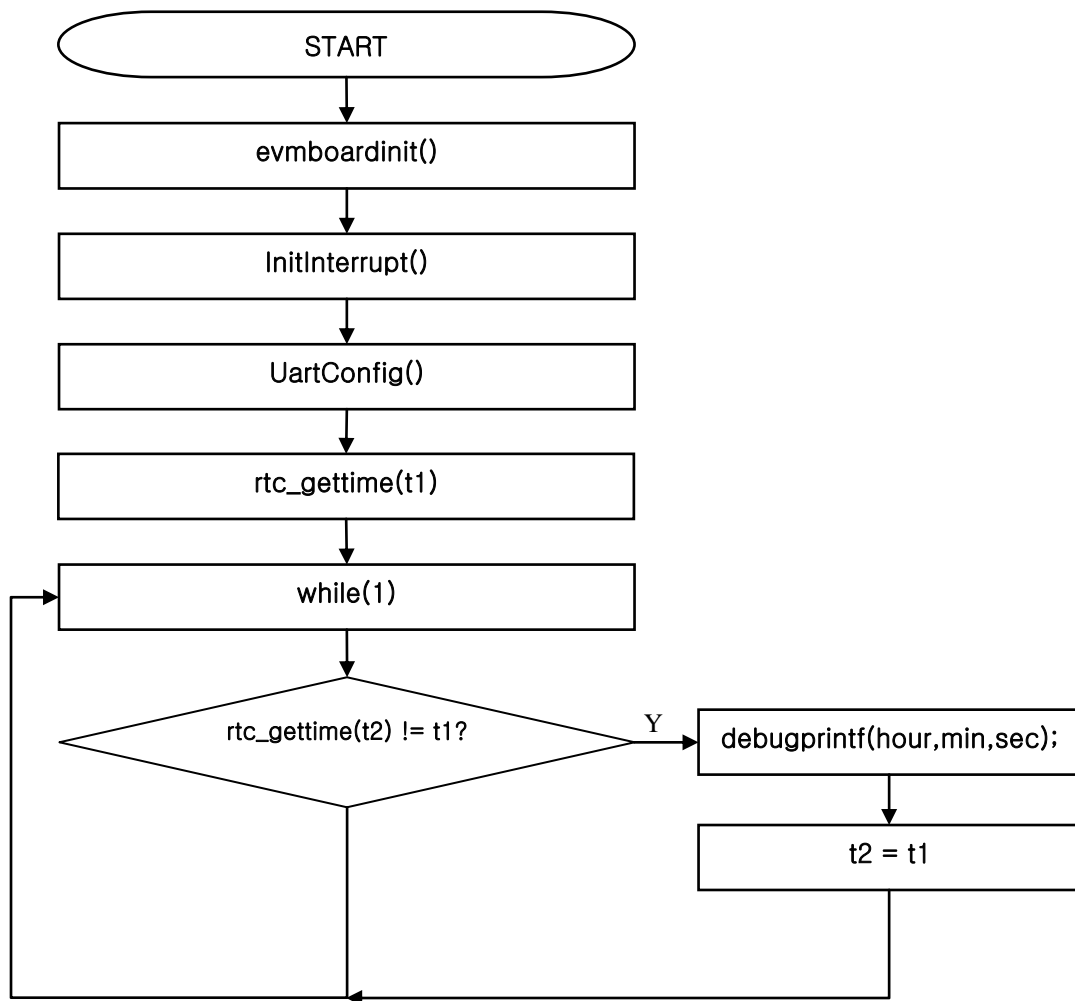


그림 3-1 Function Set Flow Chart

3.1.1 rtc_gettime()

```
void rtc_gettime(rtcTime* tm);
```

- rtcTime* tm : RTC값이 저장될 구조체

```
void rtc_gettime(rtcTime* ptm)
{
    int val;
    val = *R_RTCSEC;
    ptm->sec = val & 0x7f;

    val = *R_RTCMIN;
    ptm->min = val & 0x7f;

    val = *R_RTCHOUR;
    ptm->hour = val & 0x7f;

    val = *R_RTCDAY;
    ptm->day = val & 0x3f;

    val = *R_RTCWEEK;
    ptm->week = val&0x3;

    val = *R_RTCMON;
    ptm->mon = val & 0x1f;

    val = *R_RTCYEAR;
    ptm->year = (val & 0x1f)+RTC_BASE_YEAR;
}
```

Rtc_gettime() 함수는 다음 RTC의 Register에서 값을 읽어 구조체에 저장한다.

- Real Time Counter Sec Register
- Real Time Counter Min Register
- Real Time Counter Hour Register
- Real Time Counter Day Register
- Real Time Counter Week Register
- Real Time Counter Month Register
- Real Time Counter Year Register

3.1.2 rtc_settime()

```
void rtc_settime(rtcTime* tm);
```

- rtcTime* tm : RTC에 저장할 구조체

```
void rtc_settime(rtcTime* ptm)
{
    *R_RTCSEC = ptm->sec;
    *R_RTCMIN = ptm->min;
    *R_RTCHOUR = ptm->hour;
    *R_RTCDAY = ptm->day;
    *R_RTCWEEK = ptm->week;
    *R_RTCMON = ptm->mon;
    *R_RTCYEAR = ptm->year-RTC_BASE_YEAR;
}
```

rtc_settime() 함수는 구조체를 읽어 다음 RTC의 Register에 저장한다.

- Real Time Counter Sec Register
- Real Time Counter Min Register
- Real Time Counter Hour Register
- Real Time Counter Day Register
- Real Time Counter Week Register
- Real Time Counter Month Register
- Real Time Counter Year Register

- rtcTime 구조체는 다음과 같이 정의 되어있다.
/include/canntus/rtc.h

```
typedef struct
{
    int sec;
    int min;
    int hour;
    int day;
    int week; // 0:Sun,1:Mon,...
    int mon; // 1: Jan, 2:Feb,...
    int year;
}rtcTime;
```

3.2 rtc.c

/Cantuslib/rtc.c

rtc.c 는 RTC를 사용하기 위한 정의 및 함수로 구성되어 있다. 사용자는 RTC의 Register들을 직접 사용하지 않아도 rtc.c에서 정의된 함수를 사용하여 RTC를 설정하여 사용할 수 있다.

4 Point This Note

- CANTUS의 RTC는 주기적인 interrupt를 발생할 수 있다.
- CANTUS의 RTC는 Alarm interrupt를 발생할 수 있다.
- CANTUS의 RTC에 대한 자세한 내용은 CANTUS Datasheet의 19 Real Timer Clock을 참고하라.