

Customer Training Workshop

Traveo™ II Real-Time Clock

Q4 2020



Target Products

› Target product list for this training material:

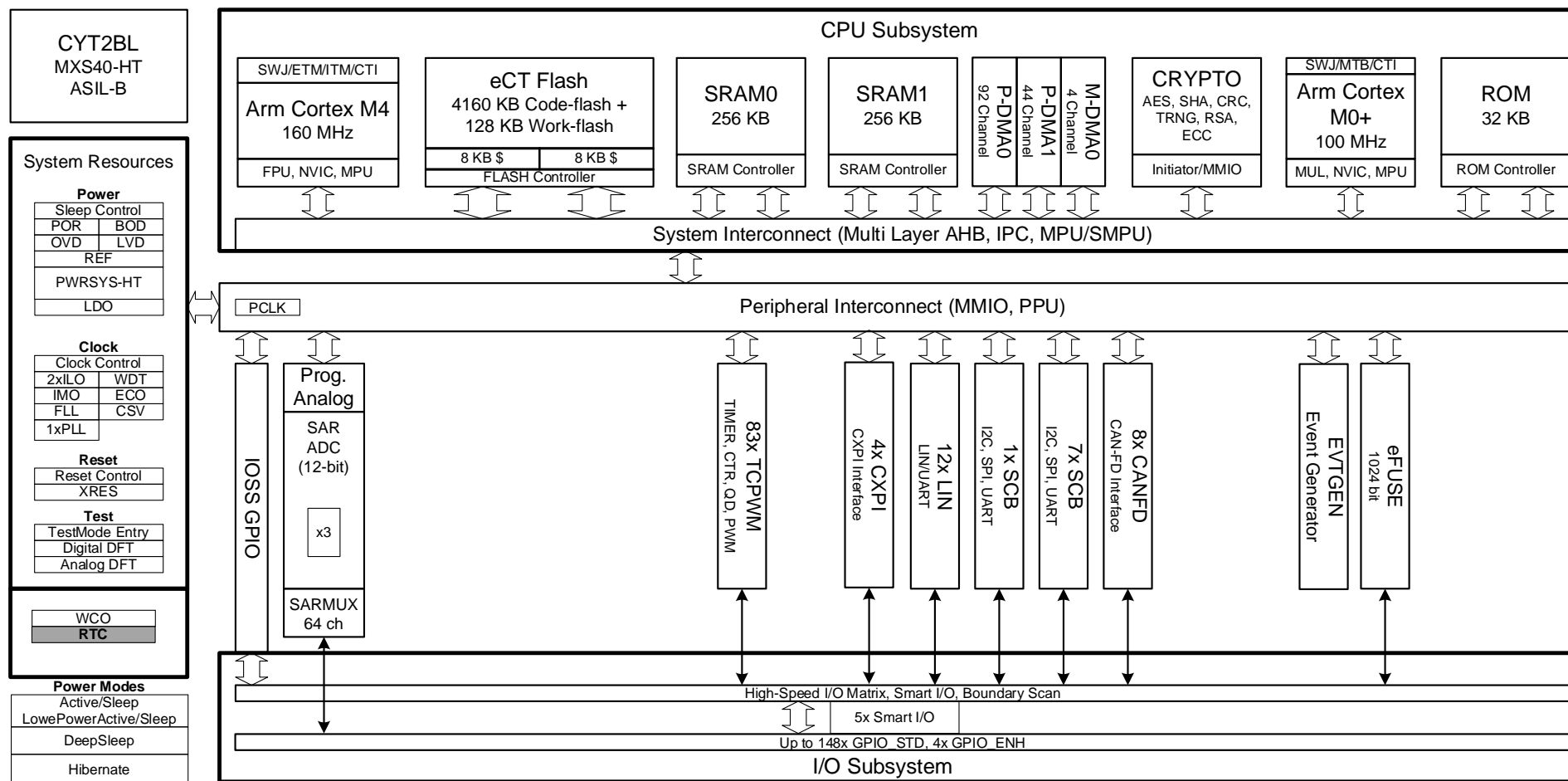
Family Category	Series	Code Flash Memory Size
Traveo™ II Automotive Body Controller Entry	CYT2B6	Up to 576 KB
Traveo II Automotive Body Controller Entry	CYT2B7	Up to 1088 KB
Traveo II Automotive Body Controller Entry	CYT2B9	Up to 2112 KB
Traveo II Automotive Body Controller Entry	CYT2BL	Up to 4160 KB
Traveo II Automotive Body Controller High	CYT3BB/ CYT4BB	Up to 4160 KB
Traveo II Automotive Body Controller High	CYT4BF	Up to 8384 KB
Traveo II Automotive Cluster	CYT3DL	Up to 4160 KB
Traveo II Automotive Cluster	CYT4DN	Up to 6336 KB

Introduction to Traveo II Body Controller Entry

> The real-time clock (RTC) is a part of the System Resources block

Hint Bar

Review TRM chapter 21 for additional details

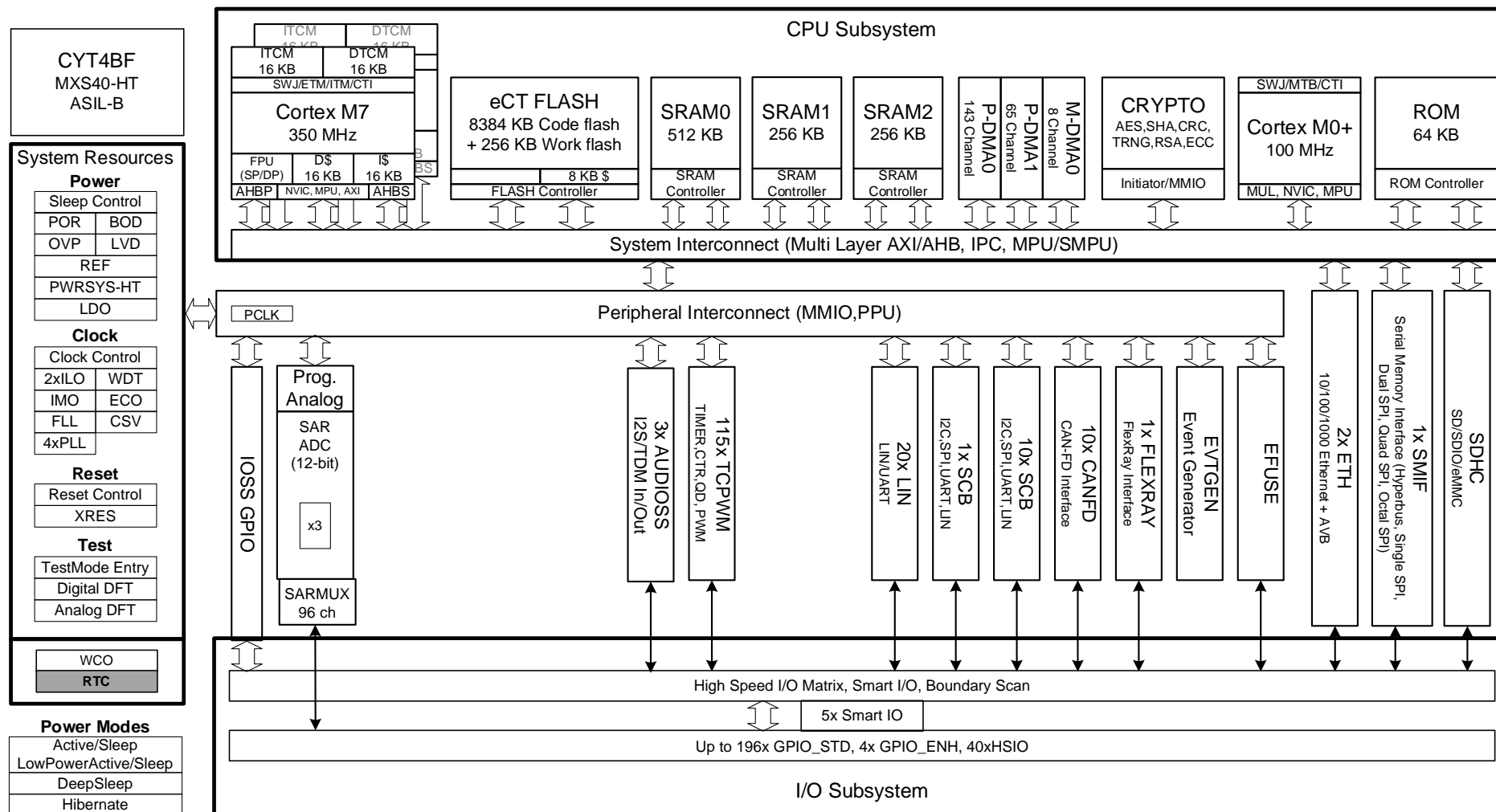


Introduction to Traveo II Body Controller High

> The real-time clock (RTC) is a part of the System Resources block

Hint Bar

Review TRM chapter 21 for additional details

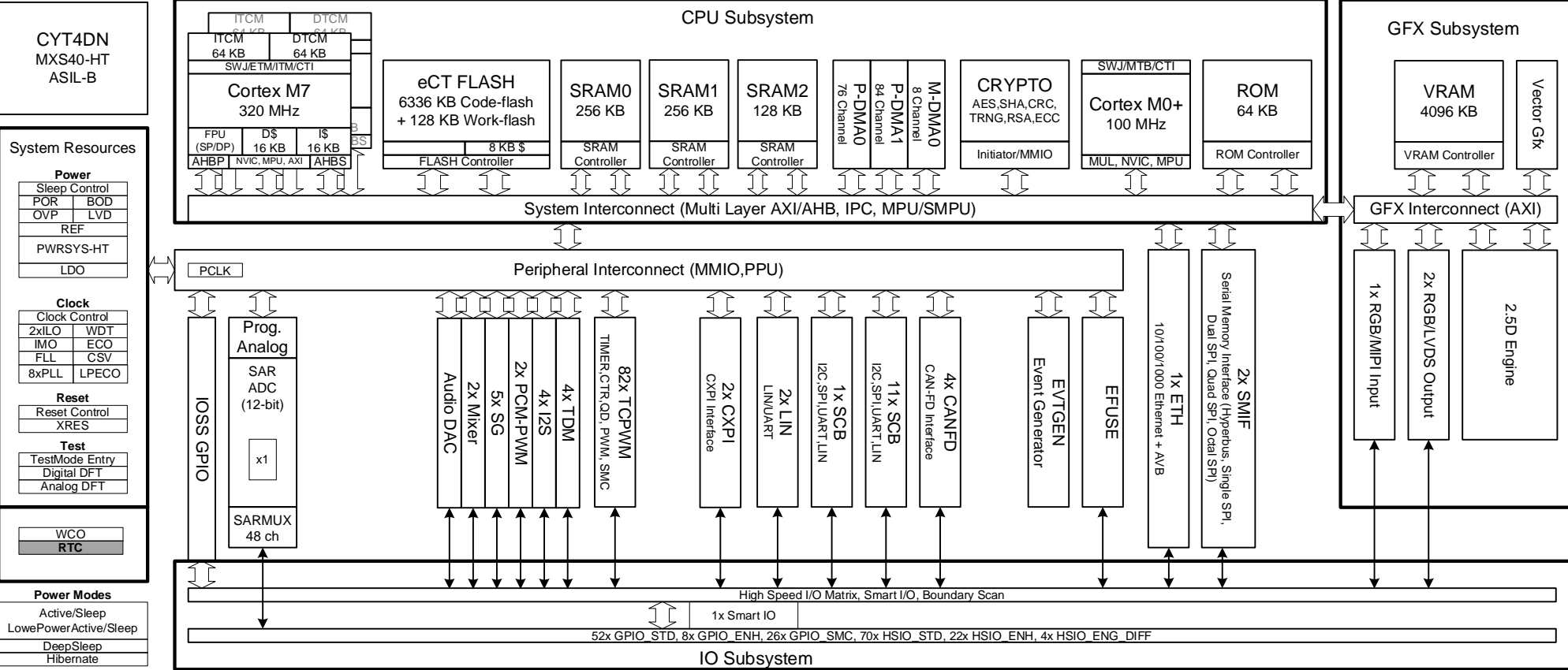


Introduction to Traveo II Cluster

> The real-time clock (RTC) is a part of the System Resources block

Hint Bar

Review TRM chapter 21 for additional details



Real-Time Clock Overview

- › The Real-Time Clock system is an “always-on” function
- › Features
 - Fully-featured RTC
 - Year, month, date, day-of-week, hour, minute, second fields (all fields integer)
 - Supports both 12-hour and 24-hour formats
 - Automatic leap-year correction
 - Configurable alarm function
 - Alarm on month, date, day-of-week, hour, minute, second fields
 - Two independent alarms
 - Calibration for 32768-Hz WCO and 4 MHz to 8 MHz LPECO
 - Calibration waveform output
 - Supports 512 Hz, 1 Hz, and 2 Hz
 - Backup registers¹

Hint Bar

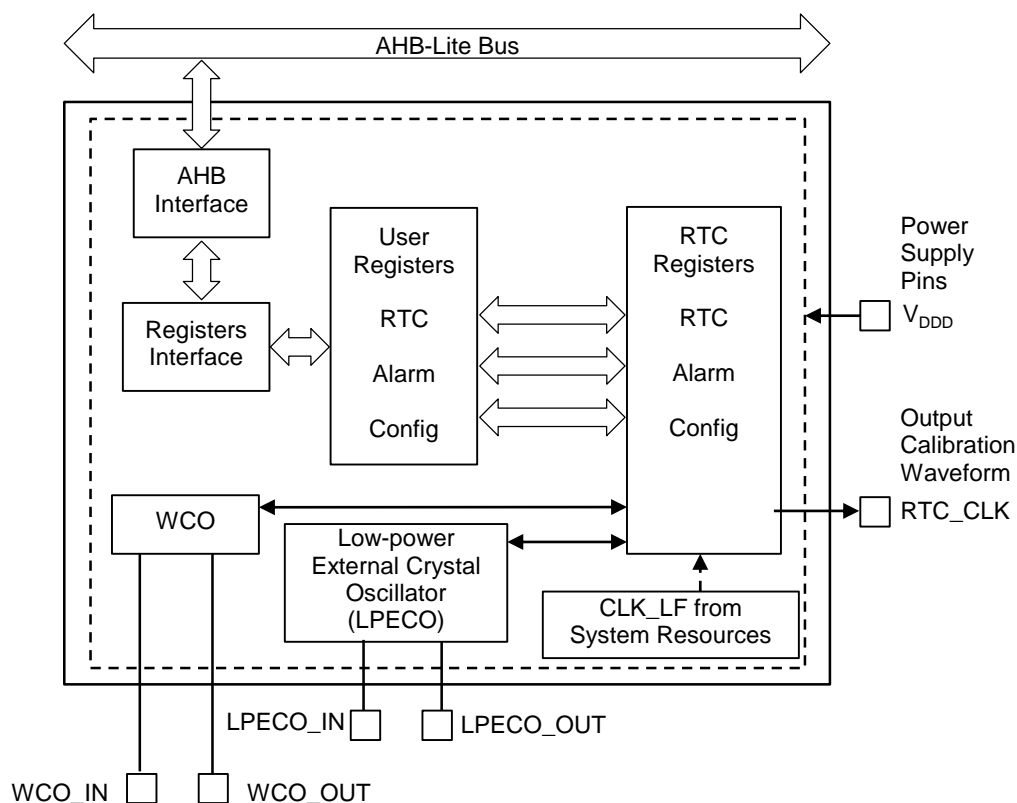
Review TRM chapter 21 for additional details.

Review TRM chapter 18 for calibration details

¹ Traveo II features four 32-bit backup registers that can be used to store important information/flags. This includes information that needs to be retained when the device enters Hibernate mode.

Real-time Clock Block Diagram

- > The RTC block consists of:
 - Input clock
 - Count field
 - Alarm (Interrupt)
 - Output (Calibration)
 - Registers (Read/Write)

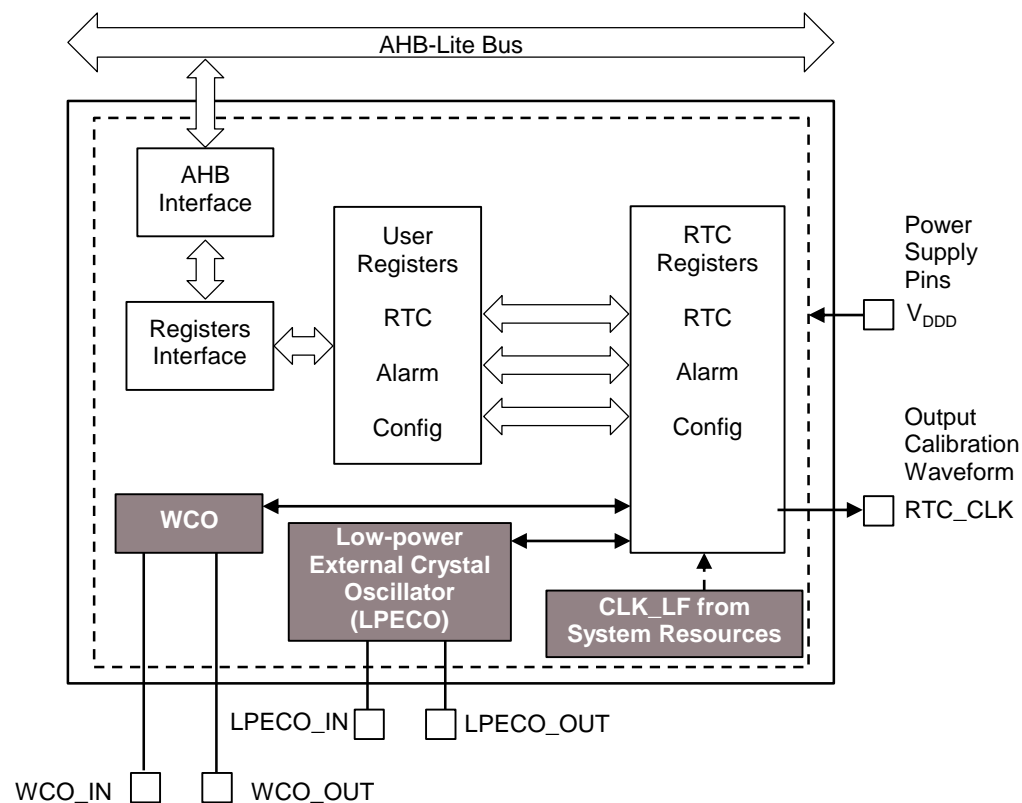


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Review TRM chapter 21 for additional details.

RTC Input Clock Sources

- > Watch-crystal oscillator (WCO)
 - 32.768-kHz external crystal oscillator (default)
 - Using external clock (32.768-kHz)
- > Low-power External Crystal Oscillator (LPECO)
 - 4-8 MHz crystal oscillator that can be fractionally divided to 32.768 kHz
- > Low-frequency clock (CLK_LF)
 - Can select ILO0 or ILO1¹



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Review TRM chapter 21 for additional details

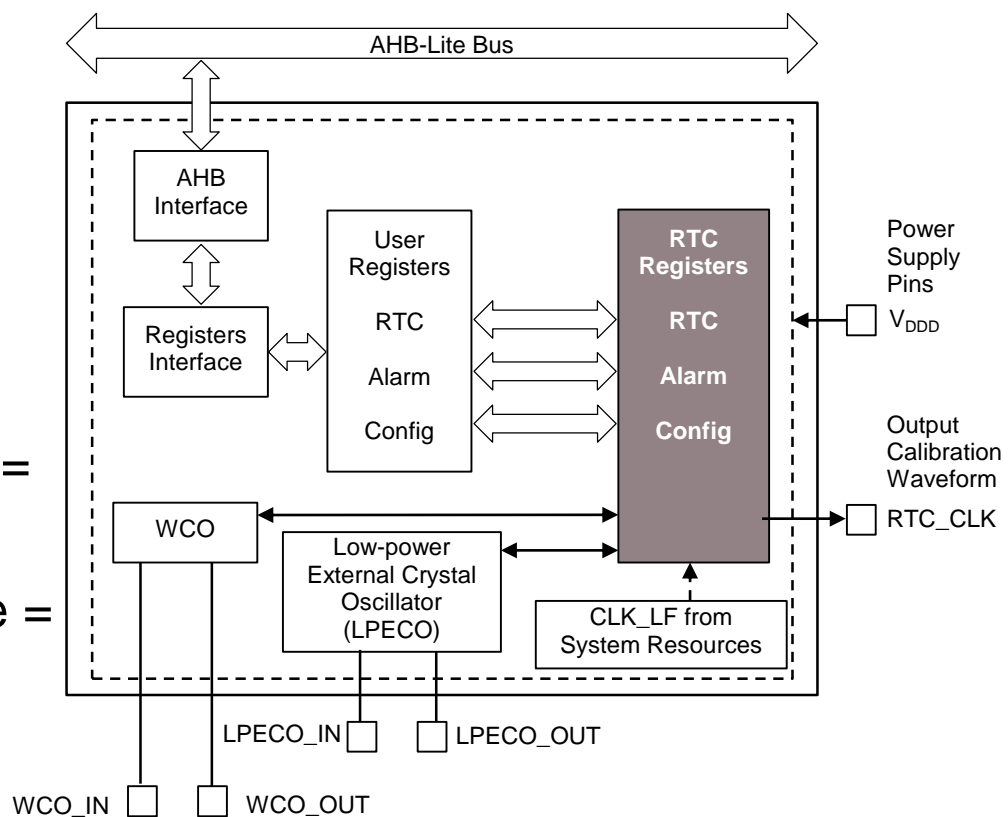
Review TRM chapter 18 for clocking system details.

¹ Refer to the datasheet for ILO0 and ILO1 accuracy details

Count Field

The RTC count fields consist of seven integer fields and one control bit

- > **RTC_SEC**
Calendar seconds, value range = 0-59
- > **RTC_MIN**
Calendar minutes, value range = 0-59
- > **RTC_HOUR**
Calendar hours, value depends on 12 or 24-hour format
- > **CTRL_12HR**
Select the 12 or 24-hour mode
- > **RTC_DAY**
Calendar day of the week, value range = 1-7, user defines meaning of values
- > **RTC_DATE**
Calendar day of the month, value range = 1-31, automatic leap year correction until 2400
- > **RTC_MON**
Calendar month, value range = 1-12
- > **RTC_YEAR**
Calendar year, value range = 0-99



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Review TRM chapter 21 for additional details.

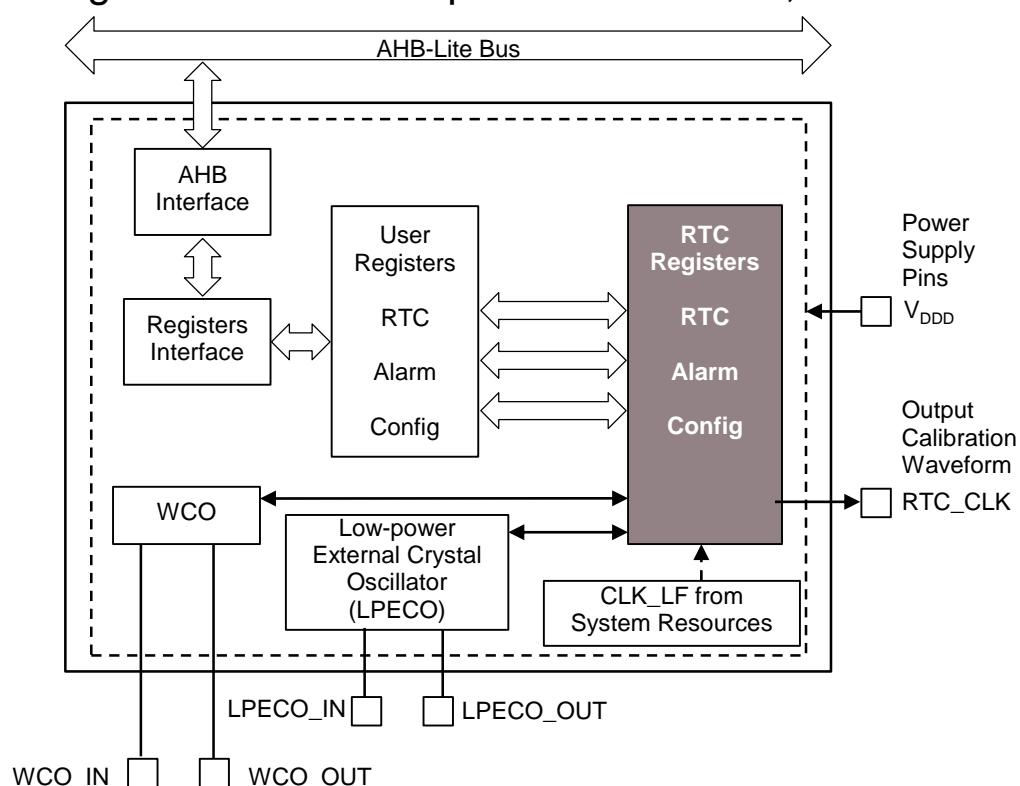
Alarm (Interrupt)

› Traveo II features two independent alarms. It can generate an interrupt for each alarm¹, which consists of six fields

- **ALM_SEC**
Alarm seconds, value range = 0–59
- **ALM_MIN**
Alarm minutes, value range = 0–59
- **ALM_HOUR**
Alarm hours, value depends on 12 or 24-hour format
- **ALM_DAY**
Calendar day of the week, value range = 1–7, user defines meaning of values
- **ALM_DATE**
Alarm day of the month, value range = 1–31, leap year corrected
- **ALM_MON**
Alarm month, value range = 1–12

› Use Cases

- Alarm1: October, 8, AM10:15 (BACKUP_ALM1_DATE.ALM_MON=10, BACKUP_ALM1_DATE.ALM_DATE=8, BACKUP_ALM1_TIME.ALM_HOUR=10, BACKUP_ALM1_TIME.ALM_MIN=15)
- Alarm2: November, 15, AM11:30 (BACKUP_ALM2_DATE.ALM_MON=11, BACKUP_ALM2_DATE.ALM_DATE=15, BACKUP_ALM2_TIME.ALM_HOUR=11, BACKUP_ALM2_TIME.ALM_MIN=30)



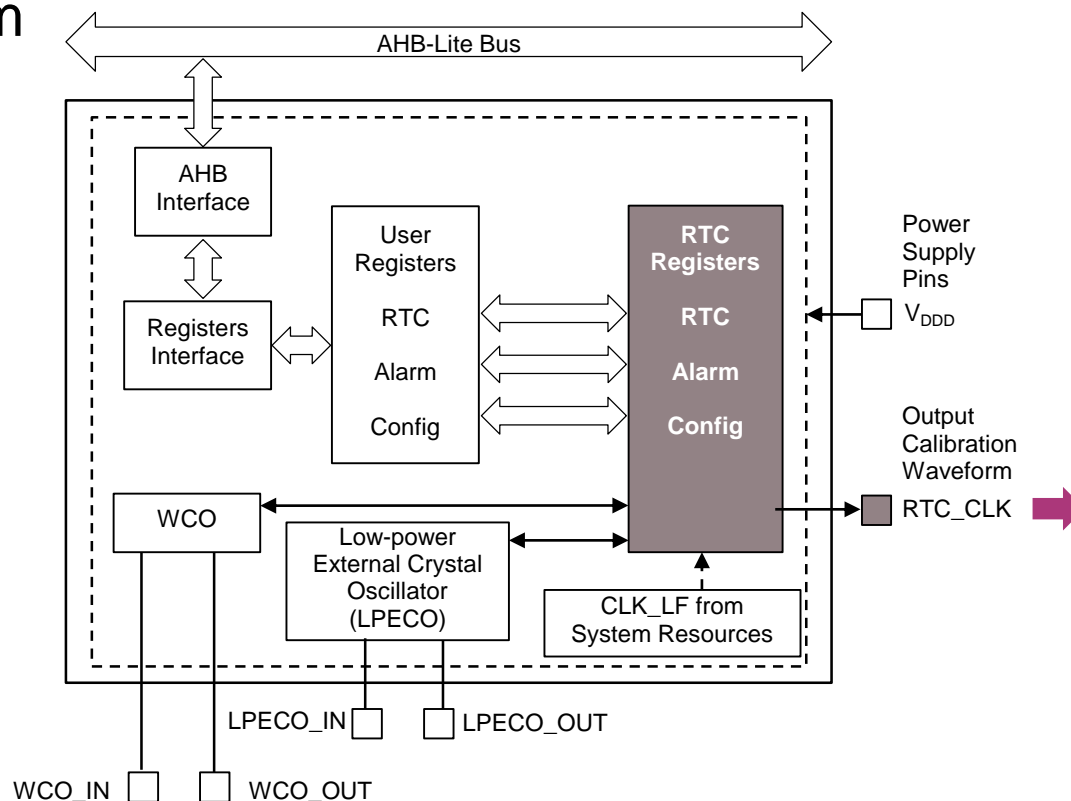
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Review TRM section 21.8 for additional details

¹ This alarm can be used as a wakeup source from Hibernate mode

Output (Calibration)

- > RTC has a calibration waveform output that supports 512 Hz, 1 Hz, and 2 Hz
- > Calibration procedure
 - ① Measure the frequency of the RTC_CLK pin output
 - ② Calculate the gap between ① and the expected value
 - ③ Feedback ② to register¹



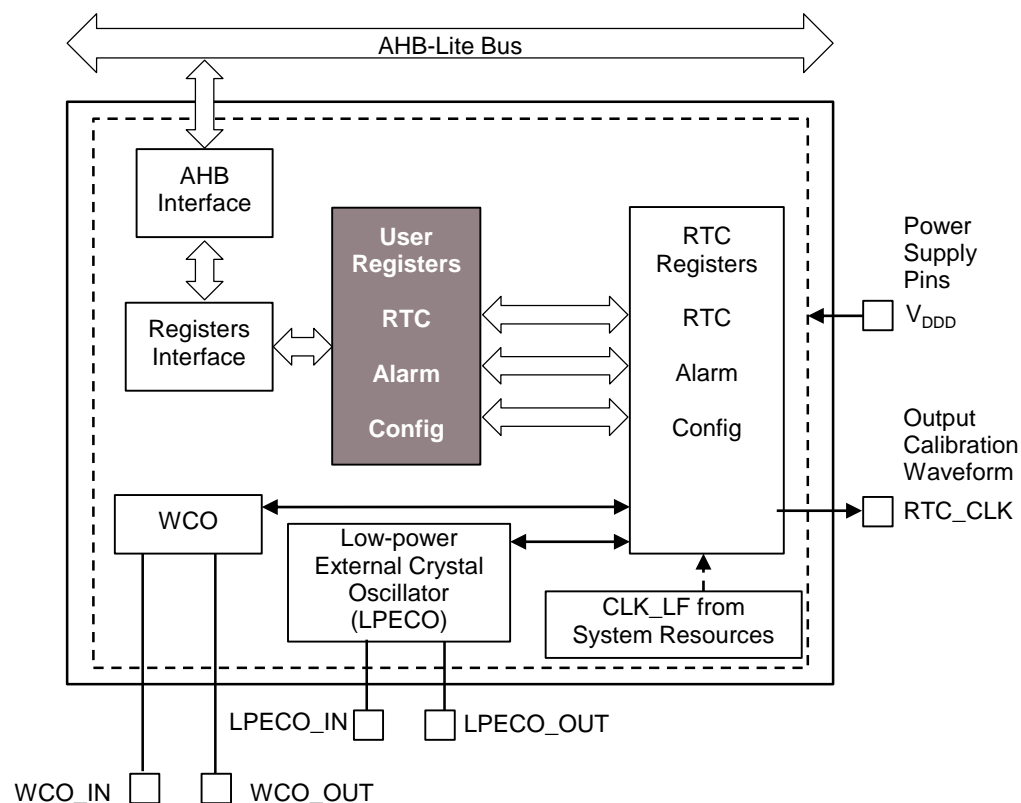
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Review the specific device datasheet for additional details

¹ The Register TRM will give you additional details on BACKUP_CAL_CTL.

Register (Read Access)

- > Software sets the BACKUP_RTC_RW.READ bit¹
- > When this bit is set, the RTC registers will be copied to the user registers and frozen
- > The software can safely read the RTC value
- > The read transaction is completed by clearing the BACKUP_RTC_RW.READ bit



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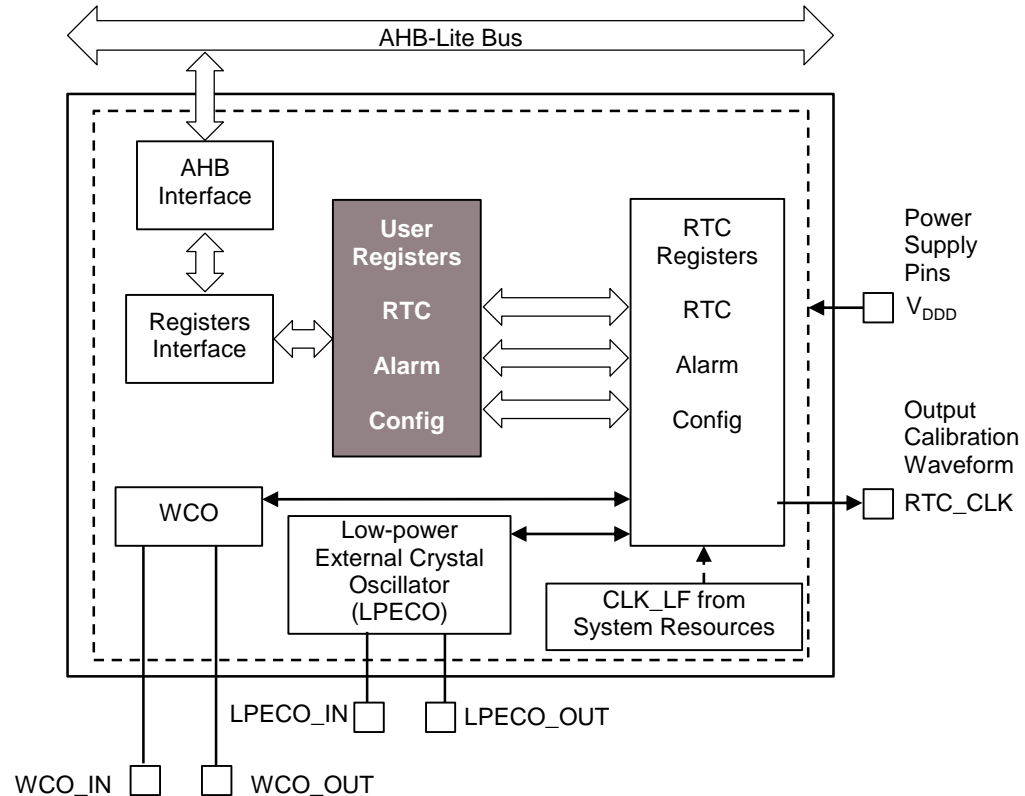
Review TRM section 21.6.1 and the Register TRM for additional details

¹ The READ bit is described in the Register TRM (BACKUP_RTC_RW). It cannot be set in the following cases:

- The RTC is still busy with a previous operation.
- The BACKUP_RTC_RW.WRITE bit is set.

Register (Write Access)

- > Software sets the `BACKUP_RTC_RW.WRITE` bit¹
- > When the `BACKUP_RTC_RW.WRITE` bit is set, data can be written into the RTC user registers
- > After the `BACKUP_RTC_RW.WRITE` bit is cleared, the hardware will copy all the new data to the RTC registers



Hint Bar

Review TRM section 21.6.2 and the Register TRM for additional details

¹ The WRITE bit is described in the Register TRM (`BACKUP_RTC_RW`). It cannot be set in the following cases:

- The RTC is still busy with a previous operation.
- The `BACKUP_RTC_RW.READ` bit is set.



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Revision History

Revision	ECN	Submission Date	Description of Change
**	6140813	04/25/2018	Initial release
*A	6354961	10/18/2018	Added slides 2, 4, 5, and note descriptions in all slides. Updated slides 3, 9, 10, and 11.
*B	6599849	06/13/2019	Updated slides 2, 3, 4, 9 and 10. Added slide 5.
*C	7062498	01/08/2021	Updated slides 2 to 13.