

RTC sub second functions and applications. OUT-21-0505

[Overview]

Generally RTC module devices manage time calendar, timer etc. from year to second. Some Epson RTC modules can manage sub second function by using divided frequencies from 32768 Hz. This document describes RTC modules' three concrete applications. (Table1)

Table 1 Functions and Products

Function	Products
FOUT (Clock output)	All most of Epson RTC modules
Sub second time ex.1/100 second	RX-8803SA, RX-8803LC, RX8901CE, RX4901CE, RA8000CE, RA4000CE
Sub second time stamp	RA8000CE, RA4000CE, RX8901CE, RX4901CE

[FOUT function applications]

Figure1 describes RTC module (RA8000CE)'s divider circuit which can provides several divided frequencies from 32768 Hz. FOUT pin has frequency output.

RA8000CE can output 32768 Hz, 1024 Hz or 1 Hz.

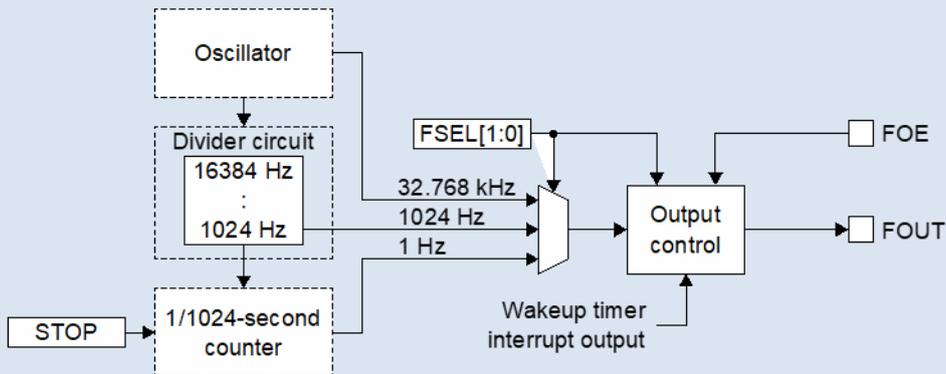


Figure 1 RA8000CE divider circuit

Figure2 shows analog-to-digital convertor (ADC) application. Low speed ADC can be used with low frequency ex.1,024 Hz,32768 Hz. FOUT pin can supply ADC sampling clock. Some other RTC module device can output 4,096 Hz.

Figure3 describes 32768 Hz MCU (Micro Controller Unit) system clock. Therefore the customer has no necessity of 32768 Hz crystal oscillation circuit for MCU device.

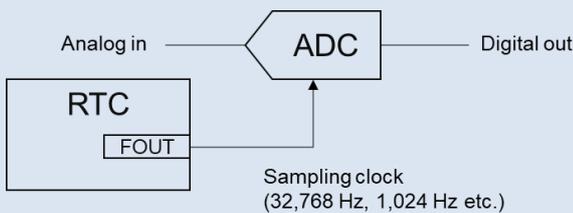


Figure 2 ADC sampling clock

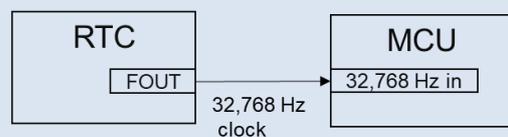


Figure 3 32768 Hz MCU system clock

[Sub second applications]

Generally time stamp is captured to each frame data in video picture applications. This time stamp data is used for proper movie playback, judgement of fame order. But some system cannot capture time stamp data from MPEG (Moving Picture Experts Group), H.264 cause of system limit. In such case, sub second time data will be captured to each frame.

Figure 4 describes RTC module (RX-8803SA/LC) provides time data to video recording. The video camera MCU requires RTC module to send time date for each frame. RTC module sends time date including 1/100 second for each frame.

The video system can playback video picture properly, also judge frame order.

The RX8901CE, RX4901CE, RA8000CE, RA4000CE products have the capability to capture time data resolution down to 1/512 and 1/1024 second.

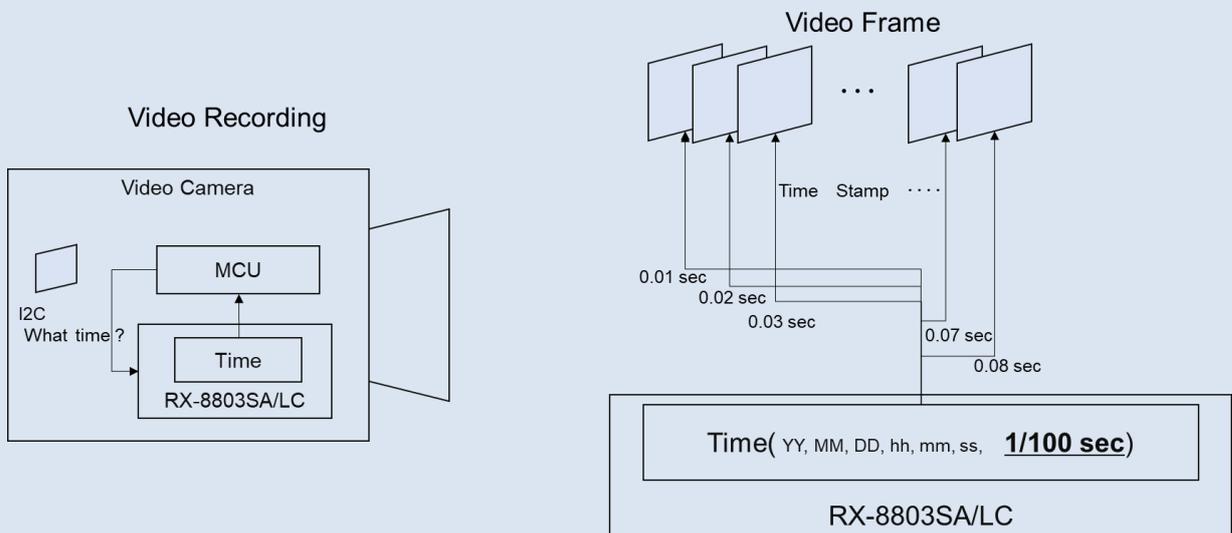


Figure 4 RX-8803SA/LC 1/100 second data for video frame

With the 1/100 second time stamp, the video playback quality may be viewed properly. Also user can judge the frame ordering. See Figure 5.

This 1/100 second (0.01 second period) time stamp can manage network camera application (30 frame/second 0.033 second period), as well as security camera application (5 frame/second 0.2 second period).

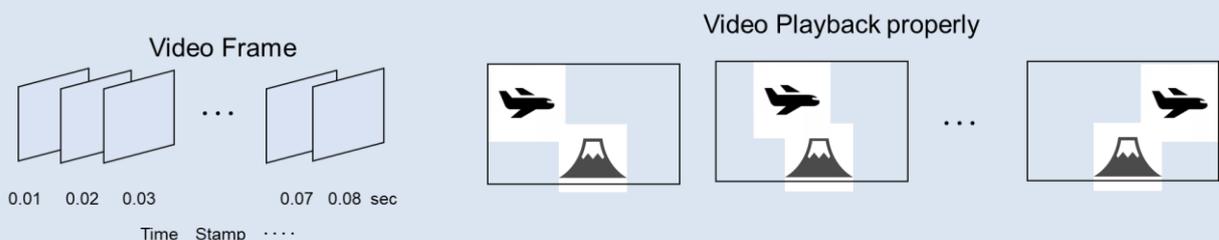


Figure 5 Proper video playback by 1/100 second timestamp

Figure 6, after time synchronizing Camera A, B to GNSS(Global Navigation Satellite System), these cameras record the same skier with 1/100 second time data and Camera A, B obtain frame's timing order. Therefore users can analysis skier's picture frame with two different camera directions.

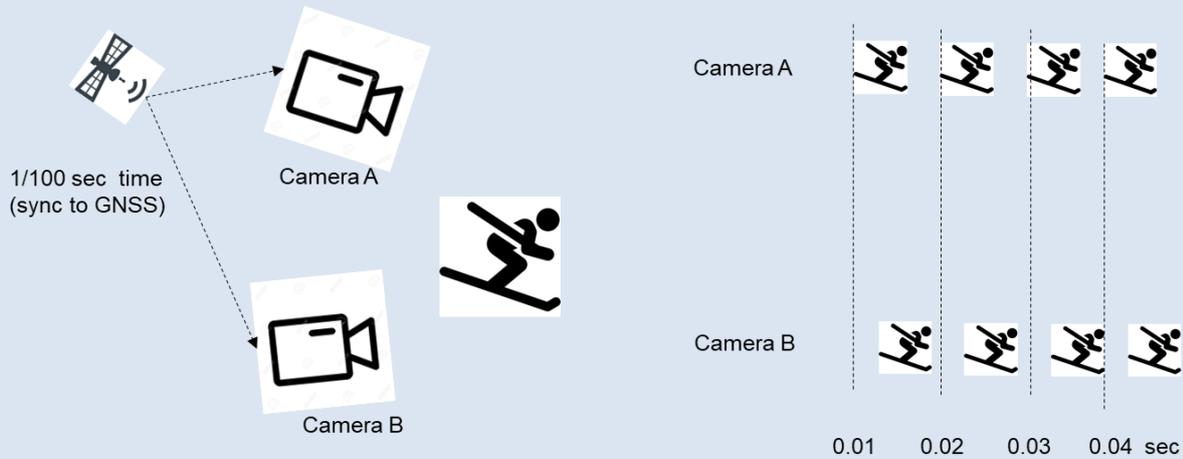


Figure 6 Camera A,B independent 1/100 second time capture

[Sub second time stamp application]

By combination Epson RTC module and MCU, FPGA(Field Programmable Gate Array) system users can manage time stamp operation which records event timings ex. Power outage, system error etc. RX8111CE, RX4111CE can record time from year to second. Also RA8000CE, RA4000CE from year to sub second. Figure 7 shows RA8000 time stamp block diagram. This product can record either BCD(Binary Coded Decimal) or binary format.

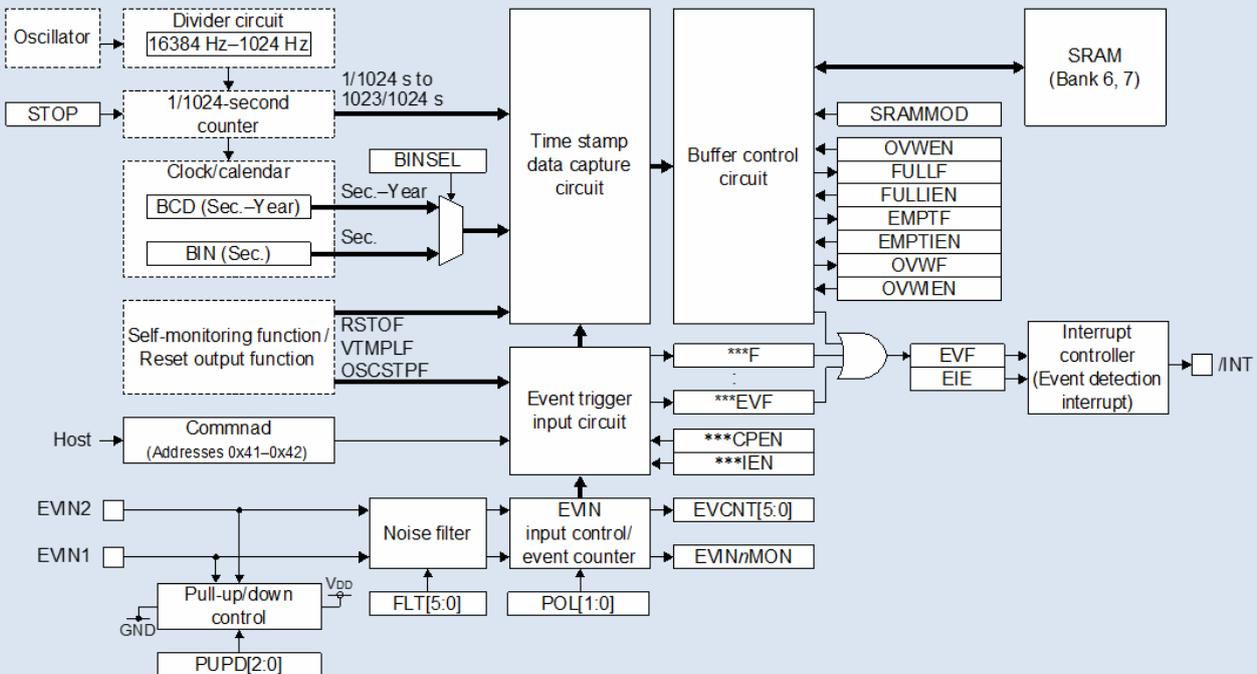


Figure 7 RA8000CE Time stamp block diagram

Many computer systems can manage sub second time stamp by using MCU, FPGA. With the combination MCU, FPGA and RA8000CE the user can do data backup operation by storing time stamp data to RTC module when event occurs. Therefore, user can recognize the time stamp records even during a power outage. User can use binary date in addition to normal BCD format date. See Figure 8.

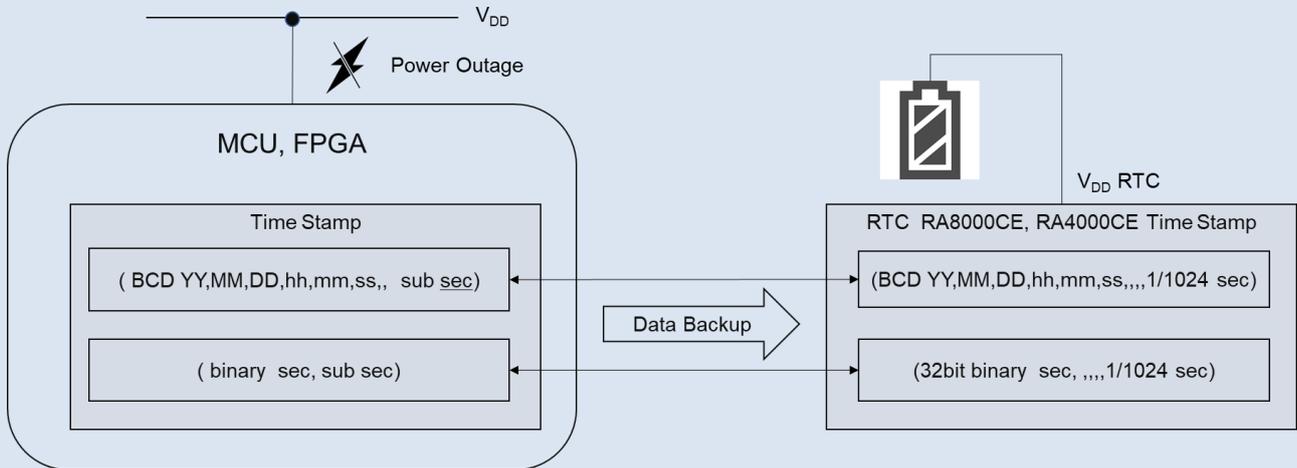


Figure 8 RA8000CE time stamp backup for MCU, FPGA system

For your reference, product information of Epson’s main RTC modules can be found below.

RTC module with sub second time (ex.1/100 second)

[RX-8803SA](#), [RX-8803LC](#), [RX8901CE](#), [RX4901CE](#), [RA8000CE](#), [RA4000CE](#)

RTC module with sub second time stamp

[RX8901CE](#), [RX4901CE](#), [RA8000CE](#), [RA4000CE](#)