RENESAS TECHNICAL UPDATE

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Product Category	MPU & MCU		Document No.	TN-RX*-A€Î FA/E/////////Rev.	1.00
Title	Notes on Realtime Clock Initialization after Power-on in the RX63N Group and the RX631 Group		Information Category	Technical Notification	
Applicable Product	RX63N Group, RX631 Group	Lot No.	Reference Document	RX63N Group, RX631 Group User's Manual: Hardware Rev.1.60 (R01UH0041EJ0160)	
		All			

1. Notes

Due to the realtime clock (RTC) specifications, registers in the RTC module are not reset by MCU reset signals, including the RES# pin reset and watchdog timer reset. The register values are retained after a reset.

Since register values in the RTC module are undefined after power-on, an appropriate initialization procedure is required.

Table 1.1 lists notes on initialization of the RTC described in the user's manual.

Table 1.1   Notes on RTC Initialization

Item	Value after reset	Notes
General	—	• The peripheral module clock (PCLK) frequency must be equal to or higher than the count source frequency. • Oscillation of the sub-clock is controlled with both bits SOSCCR.SOSTP and RCR3.RTCEN. • When using the sub-clock as the RTC count source, control the sub-clock with the RCR3.RTCEN bit. • Before oscillating the sub-clock, make sure to also set the RCR3.RTCDV[2:0] bits. • The sub-clock starts oscillating immediately after power-on. Even when stopping the oscillation, the sub-clock starts oscillating again after a reset. • When using the main clock as the RTC count source, the main clock oscillation frequency cannot be above 16.777216 MHz. • Oscillation of the main clock is controlled with both bits MOSCCR.MOSTP and MOFCR.MOFXIN.
MOFCR.MOFXIN bit	0	• After modifying this bit, make sure that the value has been updated and then execute the next process. • When setting this bit to 1, the main clock does not stop oscillating even in software standby mode.
RCR2.RESET bit	0	• Once 1 is written to this bit, make sure that this bit has been modified to 0 and then execute the next instruction. • When a count source is not supplied, an RTC software reset cannot be used.
RCR3.RTCEN bit	Undefined	• After modifying this bit, make sure that the value has been updated and then execute the next process. • When the RCR4.RCKSEL bit is 1, oscillation of the sub-clock cannot be controlled with this bit. • When setting this bit to 1, the sub-clock does not stop oscillating even in software standby mode.
RCR3.RTCDV[2:0] bits	Undefined	• During oscillation of the sub-clock, do not modify these bits. • After modifying these bits, make sure that the value has been updated and then execute the next process.
RCR4.RCKSEL bit	Undefined	• Set this bit only once after power-on.

2.   RTC Initialization Procedure

After power-on, perform the following procedure to initialize the RTC.
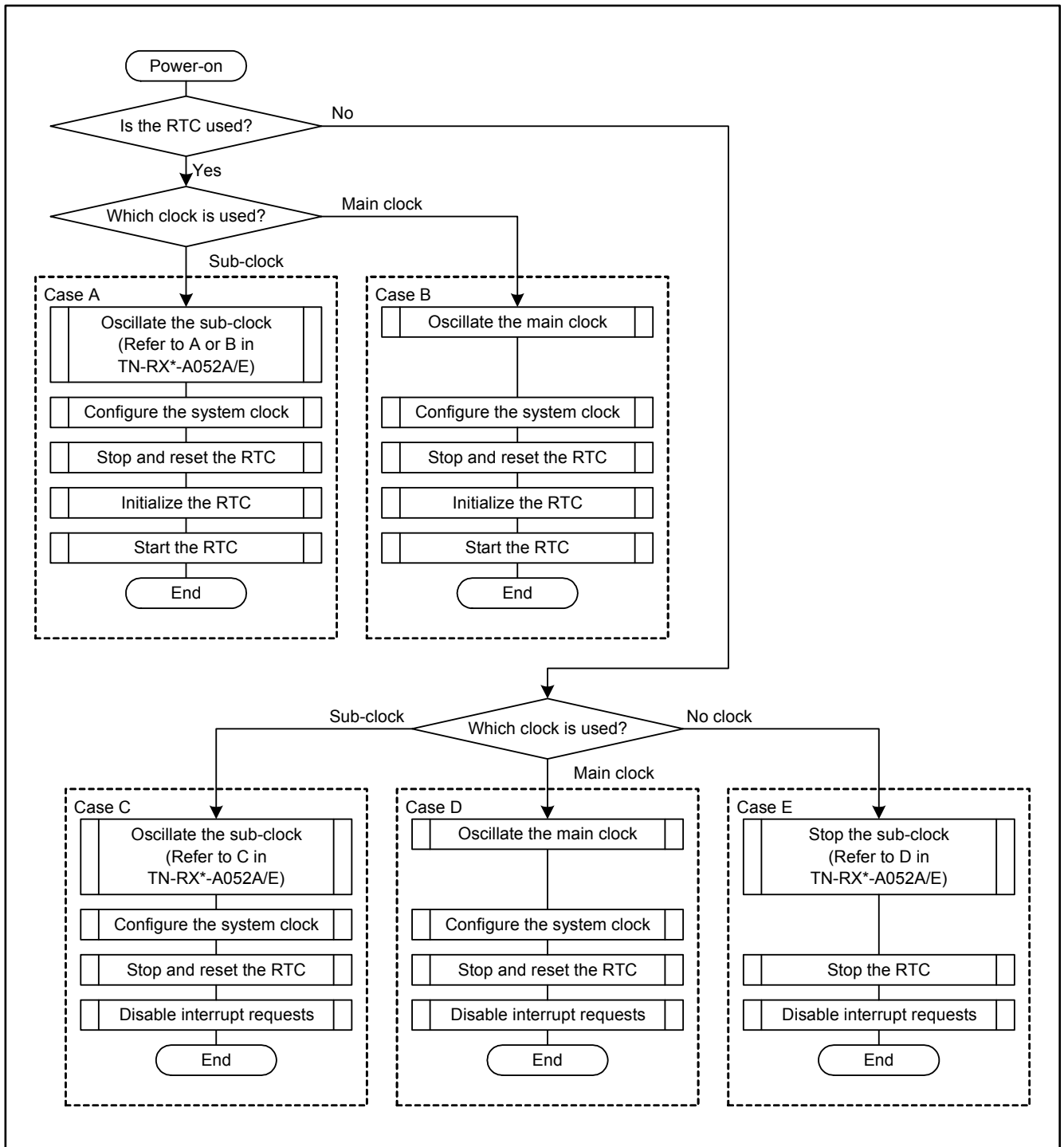

Figure 2.1   RTC Initialization Flowchart

A. When operating the RTC with the sub-clock

The following is the procedure to operate the RTC using the sub-clock as a count source.

(1) Oscillate the sub-clock

For the sub-clock settings, refer to A. "When using the sub-clock as a count source of the RTC" in Technical Update "Notes on Sub-clock Initialization in the RX630 Group, RX63N Group, and RX631 Group" (TN-RX*-A052A/E). When using the sub-clock only as the RTC count source, it is also possible to use the procedure described in B. "When using the sub-clock only as an RTC count source".

(2) Configure the system clock

After a reset, the LOCO clock is selected as a system clock. Since the LOCO clock frequency is higher than the sub-clock frequency, the system clock does not need to be changed. If the system clock needs to be changed, configure the system clock while making sure that the PCLK frequency is not lower than sub-clock frequency.

(3) Stop and reset the RTC

Registers in the RTC are undefined after power-on. Before using the RTC, perform an RTC software reset to initialize these registers.

(4) Initialize the RTC

Set each RTC-associated register and then set the time and alarm. For details, refer to the user's manual.

(5) Start the RTC

Set the RTC to start.

Figure 2.2 shows a flowchart of the procedure described above.

Note 1. The value depends on the sub-clock settings.
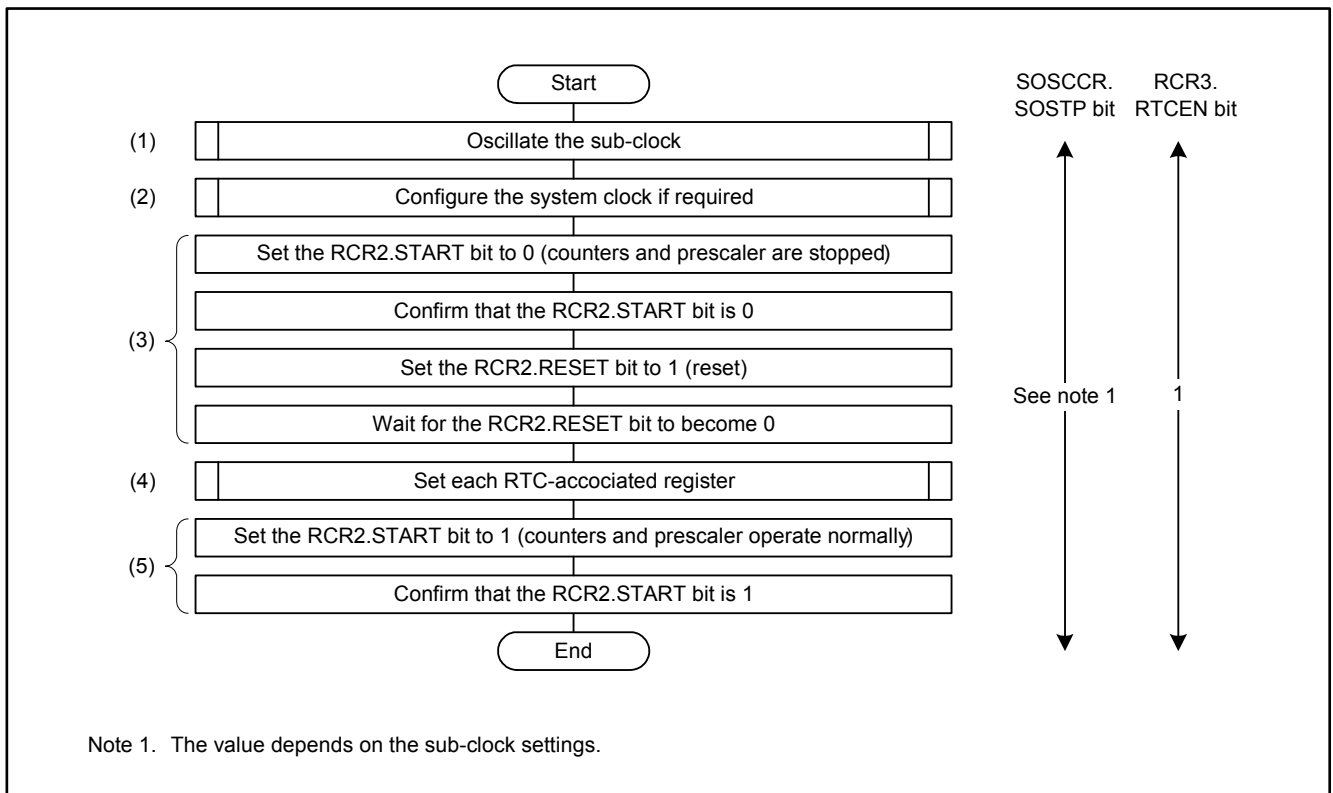
Figure 2.2   Initialization Flowchart When Operating the RTC with the Sub-clock

B.   When operating the RTC with the main clock

The following is the procedure to operate the RTC with the main clock as a count source.

(1)   Oscillate the main clock

Refer to the user's manual to set the main clock oscillation, and then wait until oscillation stabilizes. The MOFCR.MOFXIN bit must be set to 1 (the main clock oscillator is forcedly oscillated) so as not to stop the main clock in software standby mode.

(2)   Configure the system clock

After a reset, the LOCO clock is selected as a system clock. Since the LOCO clock frequency is lower than the main clock frequency, the system clock must be changed.

(3)   Stop and reset the RTC

Registers in the RTC are undefined after power-on. Before using the RTC, perform an RTC software reset to initialize these registers.

(4)   Initialize the RTC

Set each RTC-associated register and then set the time and alarm. For details, refer to the user's manual.

(5)   Start the RTC

Set the RTC to start.

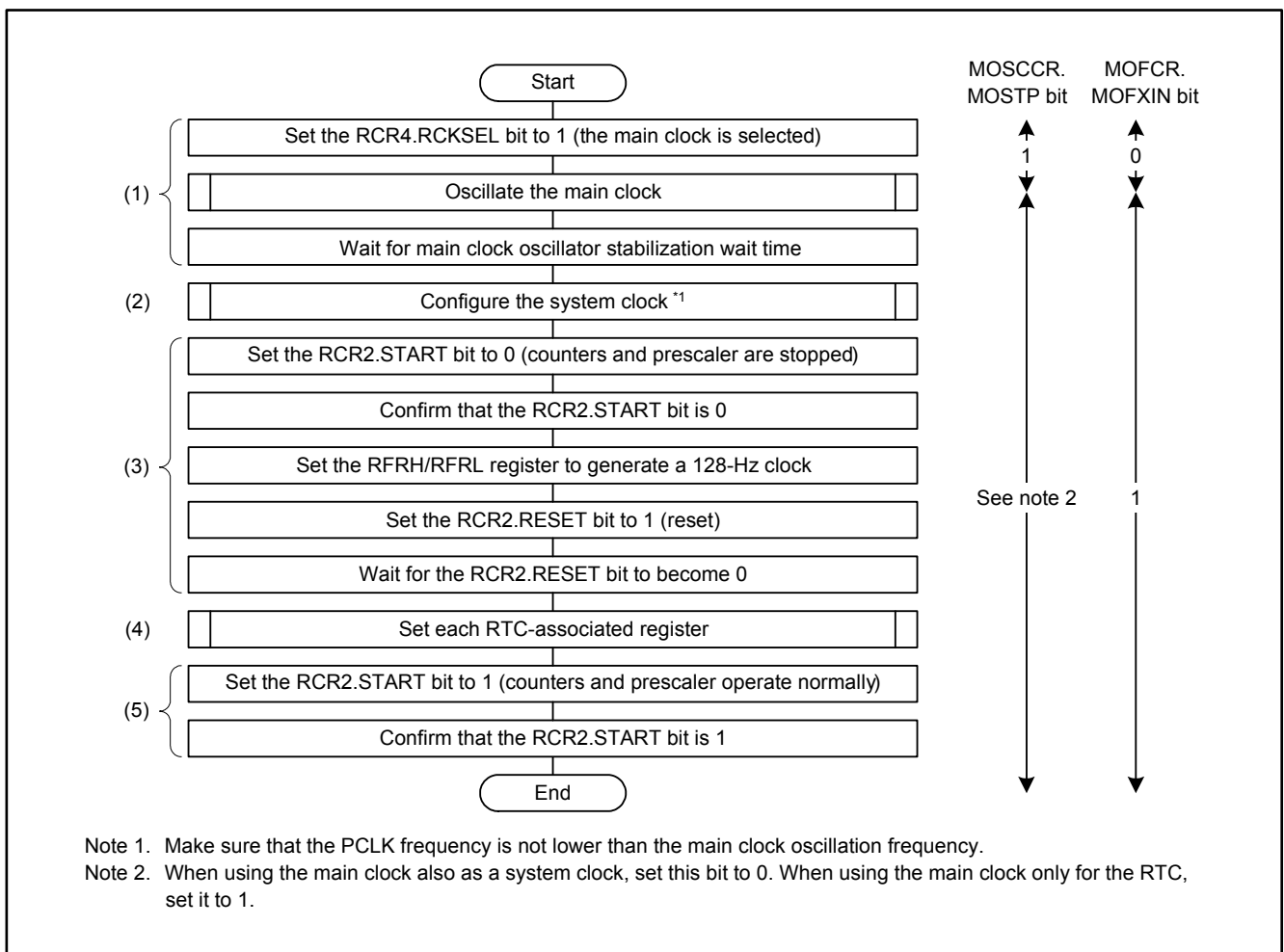Figure 2.3 shows a flowchart of the procedure described above.


```
                                        Start
                                                                        MOSCCR.      MOFCR.
                                                                        MOSTP bit    MOFXIN bit
          Set the RCR4.RCKSEL bit to 1 (the main clock is selected)
                                                                            1            0
  (1)            Oscillate the main clock

          Wait for main clock oscillator stabilization wait time

  (2)            Configure the system clock *1

          Set the RCR2.START bit to 0 (counters and prescaler are stopped)

          Confirm that the RCR2.START bit is 0

  (3)     Set the RFRH/RFRL register to generate a 128-Hz clock         See note 2      1

          Set the RCR2.RESET bit to 1 (reset)

          Wait for the RCR2.RESET bit to become 0

  (4)            Set each RTC-associated register

          Set the RCR2.START bit to 1 (counters and prescaler operate normally)
  (5)
          Confirm that the RCR2.START bit is 1

                                        End
```

Note 1. Make sure that the PCLK frequency is not lower than the main clock oscillation frequency.
Note 2. When using the main clock also as a system clock, set this bit to 0. When using the main clock only for the RTC, set it to 1.

Figure 2.3   Initialization Flowchart when Operating the RTC with the Main Clock

C. When not using the RTC (when the sub-clock can be used as a count source)

The following is the procedure to stop the RTC using the sub-clock as a count source.

(1) Oscillate the sub-clock

Oscillate the sub-clock according to the procedure described in C. "When using the sub-clock only as a system clock" of Technical Update "Notes on Sub-clock Initialization in the RX630 Group, RX63N Group, and RX631 Group" (TN-RX*-A052A/E).

(2) Configure the system clock

After a reset, the LOCO clock is selected as a system clock. Since the LOCO clock frequency is higher than the sub-clock frequency, the system clock does not need to be changed. If the system clock needs to be changed, configure the system clock while making sure that the PCLK frequency is not lower than the sub-clock frequency.
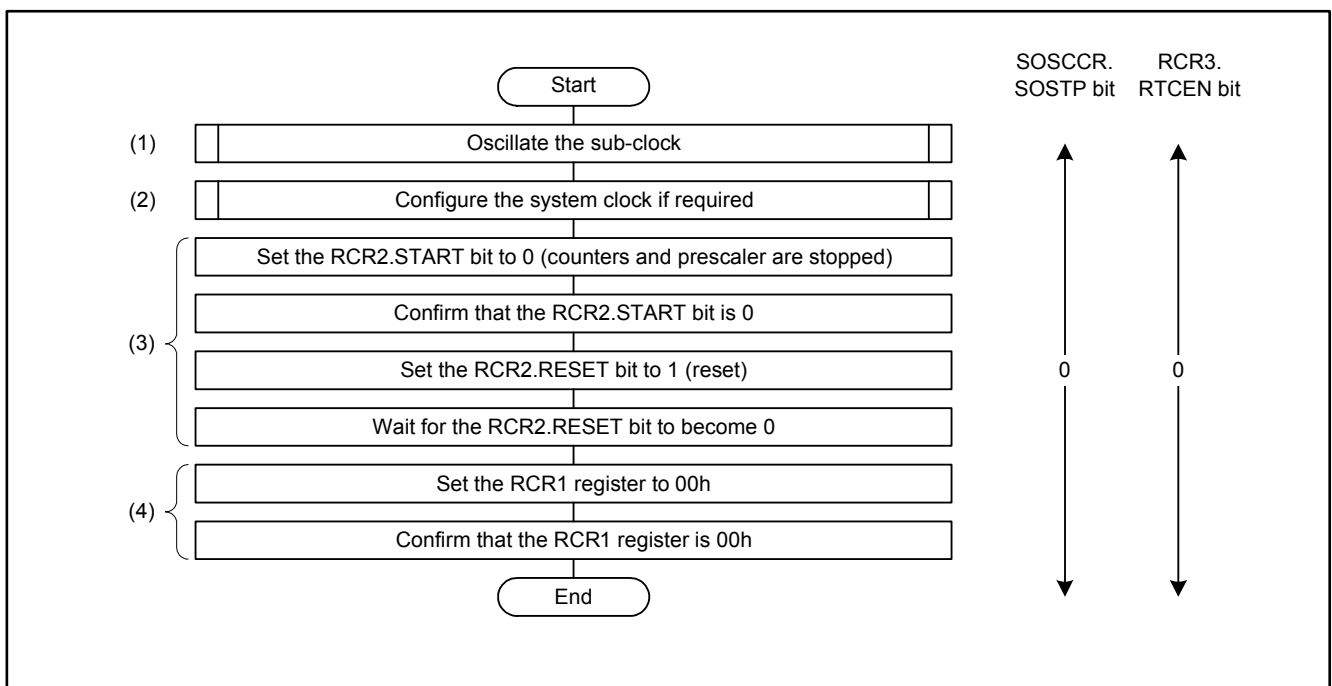
(3) Stop and reset the RTC

Registers in the RTC are undefined after power-on. Perform an RTC software reset to initialize these registers.

(4) Disable RTC interrupt requests

Initialize the RCR1 register as it was not initialized in step (3) above.

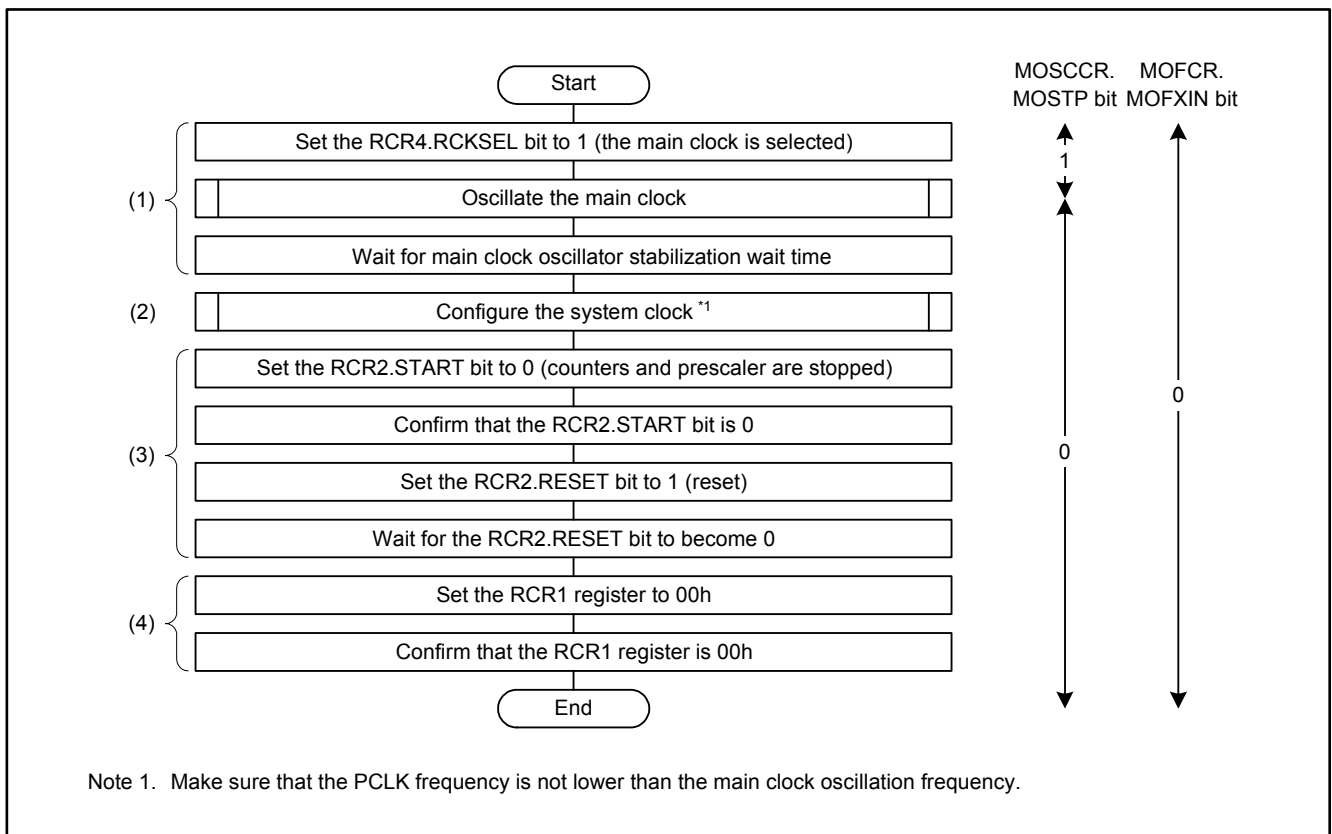Figure 2.4 shows a flowchart of the procedure described above.

Figure 2.4   Initialization Flowchart When Not Using the RTC (When the Sub-clock Can Be Used)

D. When not using the RTC (when the main clock can be used as a count source)

The following is the procedure to stop the RTC using the main clock as a count source.

(1) Oscillate the main clock

Refer to the user's manual to set the main clock oscillation, and then wait until oscillation stabilizes.

(2) Configure the system clock

After a reset, the LOCO clock is selected as the system clock. Since the LOCO clock frequency is lower than the main clock frequency, the system clock must be changed.

(3) Stop and reset the RTC

Registers in the RTC are undefined after power-on. Perform an RTC software reset to initialize these registers.

(4) Disable RTC interrupt requests

Initialize the RCR1 register as it was not initialized in step (3) above.

Figure 2.5 shows a flowchart of the procedure described above.

Note 1. Make sure that the PCLK frequency is not lower than the main clock oscillation frequency.

Figure 2.5   Initialization Flowchart When Not Using the RTC (When the Main Clock Can Be Used)

E. When not using the RTC (when neither the main clock nor sub-clock can be used)

When neither the main clock nor sub-clock can be used, an RTC software reset cannot be used. Perform the following procedure to stop the RTC.

(1) Stop the sub-clock

Even when there is no crystal for the sub-clock, the SOSCCR.SOSTP bit is 0 (sub-clock oscillator is operating) and the RCR3.RTCEN bit is undefined after power-on. It is required to set these bits to stop the oscillation. For details, refer to the procedure described in D. "When not using the sub-clock" of Technical Update "Notes on Sub-clock Initialization in the RX630 Group, RX63N Group, and RX631 Group" (TN-RX*-A052A/E).

(2) Stop the RTC

The RCR2.START bit value is undefined after power-on. Set this bit to 0 (counters and prescaler are stopped) to stop the RTC.

(3) Disable RTC interrupt requests

Since a count source is not supplied, an RTC software reset cannot be used. Even if writing a value to the RCR1 register, the register value is not updated. Interrupt requests are disabled by the ICU.
Since time capture events cannot be disabled, make sure to set pins RTCIC0 to RTCIC2 not to be in the high-impedance state.

Figure 2.6 shows a flowchart of the procedure described above.

Note 1. Since a count source is not supplied, the RCR2 register value is not updated. Do not confirm a written value.
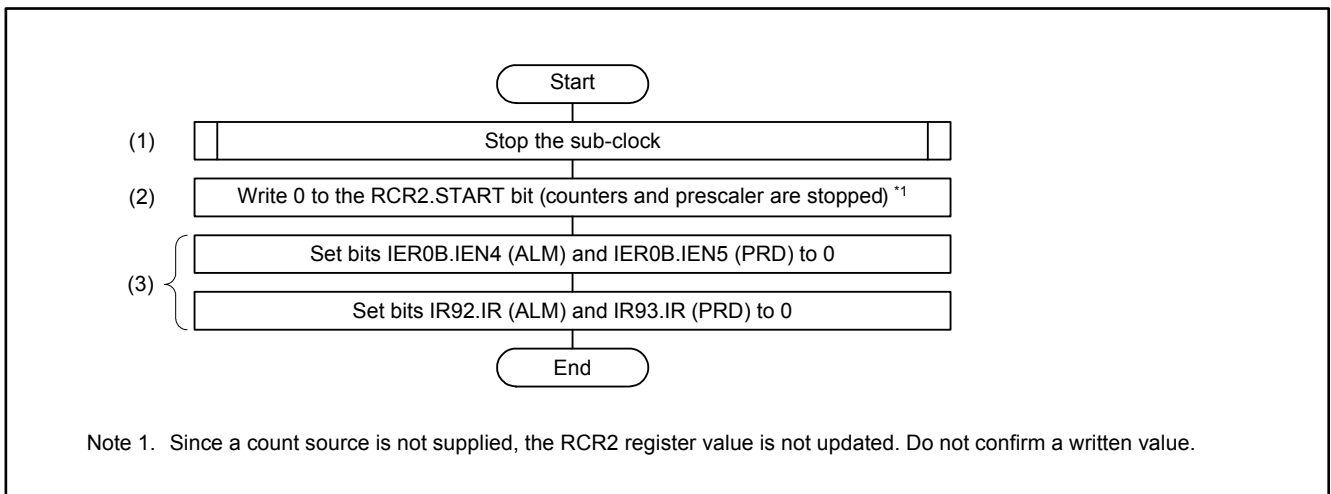
**Figure 2.6   Initialization Flowchart When Not Using the RTC
(When Neither the Main Clock nor the Sub-clock Can Be Used)**