Questions and Answers Concerning MCP79XXX Serial RTCCs

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An RTCC is a device that is able to maintain the date and time in a system by using an external crystal. Microchip provides application notes that show how to make use of the various features of these devices. This technical brief intends to resolve several of the commonly-asked questions regarding developing and using Microchip MCP79XXX stand-alone serial interface Real-Time Clock/Calendar devices.

Q The registers can be read from and written to but the time does not increment. Why?

A The oscillator must be started by setting the ST bit in the RTCSEC register if a crystal is being used, or by setting the EXTOSC bit in the Control register, if an external clock source is used. Also, refer to the following documents: AN1365 – *"Recommended usage of Microchip Serial RTCC Devices"* (DS00001365) and AN1519 – *"Recommended crystals for Stand-Alone RTCCs*" (DS00001519).

Q How do I measure the oscillation frequency?

A A standard oscilloscope probe has too much loading and will attenuate the oscillator signals. It can sometimes be used for a short period of time (1-2 seconds) before causing the oscillator to stop. For longer measurements, it is recommended that a high-impedance probe with low capacitance be used. Configuring the device for 32 kHz output works too, though the peak-to-peak voltage cannot be measured. See sections **Output Configurations** and **Square Wave Output Mode** in the data sheet.

Q Does the MCP794XX support both alarms enabled at the same time?

A Yes, check section **Dual Alarm Operation** in the data sheet.

Q I'm using battery backup for my RTCC, but why can't I read the registers?

A The communication bus (I^{2}C™/SPI) is disabled when the device operates on battery backup.

Q I use battery backup, but the registers are reset every time there is a power loss. What should I do?

A The VBATEN bit in the RTCWKDAY register must be set before shutting down the main power supply.

Q I set the VBATEN bit in the RTCWKDAY register, but I still lose date and time when switching from V$_{CC}$ to battery backup.

A V$_{CC}$ may be falling too fast. It must fall slower than the fall time (T$_{FVCC}$) specified in the AC Characteristics table of the MCP79XXX data sheets. A capacitor on the V$_{CC}$ pin, big enough to slow down the voltage drop, might be needed. Also, care must be taken when writing the RTCWKDAY register, especially in bulk data transfers, so as to not clear VBATEN.

Q I'm using MCP7941X which has 1 kb EEPROM. Why can't I access all of the 1024 bytes?

A The size of the EEPROM is not 1 kilobyte, but 1 kilobit, which means that it has only 128 bytes of EEPROM memory.

Q I'm having trouble with setting Time/Date registers. The values read are wrong or impossible for a calendar. What should I do?

A The oscillator should be stopped by clearing the ST bit in the RTCSEC register if a crystal is used, or by clearing the EXTOSC bit in the Control register if an external clock source is used; wait for it to stop (the OSCRUN bit in the RTCWKDAY register should change to 0) and then update the registers and start the oscillator again.

Q I'm using MCP79XX RTCC, but after several hours the time is lagging/ahead. What should I do?

A It is recommended to use the right crystal with the right pair of capacitors to have the least amount of error in the base frequency. See AN1519 – *"Recommended Crystals for Stand-Alone RTCCs"* (DS00001519) for a list of recommended crystals. Then, the temperature of the environment needs to be taken into account; with greater variation from +25°C, the crystal will oscillate slower. See AN1413 – *"Temperature Compensation of a Tuning Fork Crystal Based on MCP79410"* (DS01413) for more details. Also, the time in the RTCC needs to be compared to a more reliable source, such as GPS or NTP.

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Q The crystal recommended in the data sheet is obsolete. Can you recommend another crystal that works with Microchip RTCCs?

A For a list of recommended crystals, refer to application note AN1519 – *"Recommended Crystals for Stand-Alone RTCCs"* (DS00001519).

Q Will a battery drain if I set the VBATEN bit and still power my device from V_{CC}?

A No. The VBATEN bit enables the device to automatically switch to backup power when V_{CC} falls below V_{TRIP}, but does not increase current consumption from V_{BAT} when operating from V_{CC}. However, the user must still take into account the self-discharge effects of the battery.

Q If the ST bit in the RTCSEC register is set, but the oscillator stops for whatever reason, will the OSCRUN bit be cleared?

A Yes, the OSCRUN bit is set by hardware after 32 oscillator cycles are detected, and is automatically cleared if no cycles are detected after oscillator timeout period (T_{OSF}). See the T_{OSF} parameter in the data sheet.

Q What is the procedure to restart the oscillator if it stopped because of an unknown/external perturbation?

A If the ST bit in the RTCSEC register is still set, just remove the external perturbation that interferes with the crystal and it will begin to oscillate automatically.

Q Do I have to use pull-up resistors from SDA and SCL lines to the battery line?

A No. the I^2C interface is disabled when V_{CC} is below V_{TRIP}.

APPENDIX A: REVISION HISTORY

Revision A (August 2014)

Original release of this document.

NOTES:

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