# AN923
# APPLICATION NOTE

# TIMEKEEPER Rolling into the Year 2000 (21st Century, Y2K)

The members of the TIMEKEEPER family, from STMicroelectronics, are listed in Table 1. Each contains, in a single-package footprint, non-volatile RAM (NVRAM) and a real time clock (RTC), offering dedicated time-keeping and alarm functions.

**Table 1. Family of TIMEKEEPER Devices**

| | |
|---|---|
| M41T56 | Low cost RTC that is compatible with Serial $I^2C$ bus applications |
| M48T86 | RTC primarily utilized for its Timekeeping functions with little additional memory |
| M48T559 | RTC with 64 Kbit memory that supports Address, Data Multiplexed I/O pins |
| M48T02/12, M48T08/18, M48T58/59, M48T35, M48T37 | RTCs with 16 Kbit to 256 Kbit of additional asynchronous SRAM non-volatile memory |
| M48T201 | TIMEKEEPER controller |

## CENTURY ROLLOVER

The date and time information is distributed over several internal registers, with two BCD digits in each register. Fabricated in ST's SRAM technology, the individual registers can be user-accessed like a conventional bank of SRAM (read accesses to read the time, write accesses to set a new time).

The year is divided into two fields: the Century field, and the Years field (each one 8 bits wide, holding two BCD digits). TIMEKEEPER devices that were designed in 1997, and after, have a register for each of these fields; those that were designed before 1997, though, do not have the Century register.

At the turn of the century, all TIMEKEEPERS will increment the Years register from 99 to 00 (from 1001,1001 to 0000,0000). Those that have a Century register, will, at the same moment, increment it from 19 to 20 (from 0001,1001 to 0010,0000).

The Century register, where present, is positioned 14 address locations before the most significant byte address, using the device's 16-byte register map definition. For a 32K x 8 device, for example, the Century register is at address location 7FF1h.

For TIMEKEEPER devices that do not have a Century register, but which utilize the 16-byte register map definition, it is recommended that the user sets up the same location (location 7FF1h for a 32K x 8 device, for example) for storing the Century information. This byte, of course, is not updated automatically by the clock, but has to be updated manually by the user's software. It is recommended that the user stores the BCD value 19 (0001,1001) in the location now, and on 1st January 2000, at 12:00:01 AM, updates it to the BCD value 20 (0010,0000).

TIMEKEEPER devices that do not have a Century register, and that do not utilize the 16-byte register map definition, can still adopt the same methodology. Any address location that is convenient to the application can be used for storing the Century information.

Note: All TIMEKEEPERS automatically allow for 31, 30, 29 and 28 day months (correctly adjusting for leap-years until the year 2100).

If you have any questions or suggestions concerning the matters raised in this document, please send them to the following electronic mail addresses:

*apps.nvram@st.com* (for application support)

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Please remember to include your name, company, location, telephone number and fax number.