ICM7170 Real Time Clock and the New Millennium (Year 2000)

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Introduction

This article describes the mechanism which the Intersil ICM7170 Real Time Clock handles the year 2000 and leap year corrections.

The Gregorian Calendar is used predominantly throughout the world with few exceptions. The Gregorian Calendar provides for leap year every year which is divisible by four except for years divisible by 100 and not divisible by 400. (The next year which will meet this exception, divisible by four and not be a leap year, is the year 2100) Based on this rule, the year 1900 was not a leap but the year 2000 will be. Similarly, the years 2100, 2200, and 2300 will not be leap years but, the year 2400 will be. During leap years there is an extra day (29th day) added to the month of February.

The ICM7170 features internal counters for 1/100 seconds, seconds, minutes, hours (12 hr or 24 hr mode), day-of-week, date, month, and year. The counter value range for each is specified in Table 1 below.

TABLE 1.

COUNTER	VALUE RANGE
1/100 seconds	0-99
seconds	0-59
minutes	0-59
hours (12 hr mode)	1-12
hours (24 hour mode)	0-23
day-of-week	0-6
date	1-31
month	1-12
year	0-99

The “date” counter rollover value is adjusted between 28 and 31, depending on the “month” counter value. For example the “date” counter rollover value is 30 for a “month” counter value of 4 (30 days in April) and 31 for “month” counter value of 12 (31 days in December). In addition, the “date” counter rollover value for February (“month” counter = 2) is further adjusted based on leap year status described below.

The “year” counter is made up of a 7-bit binary counter (2^7 = 128) which “rolls over” or resets back to 00 (000 0000 binary) when incremented from count 99 (110 0011 binary). The two least significant binary bits of the “year” counter are monitored for a value of 00b which would indicate that it is divisible by four. When this “00b” value is detected, an internal signal is generated, indicating a leap year. This signal adjusts the “date” counter rollover value to 29 when the “month” counter value is equal to 2, representing February of a leap year. This leap year correction assures the user correct date counts through the year 2099.

Given the fact the “year” count value is represented by a two digit number (00-99), and not a four digit number, it is up to the user and the end application to correctly interpret this “year” count value. For example, the “year” count = 00 would indicate the year 2000 not the year 1900.

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