Subject: Issue 118
From: Van Snyder

1 Introduction

Unresolved issue 118 concerns whether it would be clearer and simpler not to require minimum lengths for the character arguments of the DATE_AND_TIME intrinsic procedure. The description gets a little turgid, if we don't want to change the existing functionality, but here are edits that accomplish it.

Also, note 13.9 is wrong.

2 Edits

Edits refer to 99-007r2. Page and line numbers are displayed in the margin. Absent other instructions, a page and line number or line number range implies all of the indicated text is to be replaced by immediately following text, while a page and line number followed by + indicates that immediately following text is to be inserted after the indicated line. Remarks for the editor are noted in the margin, or appear between [and] in the text.

[Editor: If 99-238 passed, change "procedure SYSTEM_CLOCK" therein to "procedures DATE_AND_TIME and SYSTEM_CLOCK".]	xv:3
[Editor: Delete.]	319:2-10
[Editor: Delete ", and shall be ... value".]	319:11-12
[Editor: Replace "The leftmost 8 characters are" by "DATE(1:min(8,len(DATE)) is".]	319:13
[Editor: Replace "they are assigned blanks" by "blanks are assigned".]	319:16
[Editor: Delete ", and shall be ... value".]	319:17-18
[Editor: Replace "The leftmost 10 characters are" by "TIME(1:min(10,len(TIME)) is".]	319:19
[Editor: Replace "they are assigned blanks" by "blanks are assigned".]	319:22
[Editor: Delete ", and shall be ... value".]	319:23-24
[Editor: Replace "The leftmost 5 characters are" by "ZONE(1:min(5,len(ZONE)) is".]	319:19
[Editor: Replace "they are assigned blanks" by "blanks are assigned".]	319:28-29
[Editor: Remove "(and is also known as Greenwich Mean Time)" or change it to ("and is within 0.9 second of Greenwich Mean Time, which is now referred to as UT1)."]	320:9

3 Discussion for J3

GMT is not the same as UTC. Even though the standard doesn't give accuracy specifications for DATE_AND_TIME, the differences are enough that they could be significant in some calculations, on platforms with good clocks – e.g. for GPS. The reference to GMT should be removed, or carefully qualified.

At `http://tycho.usno.navy.mil/history.html`, The U.S. Naval Observatory (USNO) says

that GMT is the same as Universal Time (UT). UT, however, comes in three flavors – UT0, UT1 and UT2. UT0 is based on the *mean solar day.* UT1 and UT2 take into account polar motion and seasonal variations, respectively. `http://tycho.usno.navy.mil/systime.html` says that UT1 and UTC are slightly different (by up to 0.9 seconds). (USNO doesn't mention UT2).

`http://astro-2.msfc.nasa.gov/Academy/Rocket_Sci/clocks/time-gmt.html` remarks that GMT is measured from noon and UTC from midnight.

According to `http://sts.sunyit.edu/timetech/gmt-utc.html` there are slight differences – millisecond variations and an occasional leap-second – between GMT and UTC. They don't define either one.

An internal JPL web says UTC is the same as "*Greenwich Civil Time*, which is an approximation to UT2," but doesn't mention GMT. Both the JPL source and the USNO source say that TAI – UTC is an integral number of seconds, that increases by one second approximately once per year (TAI is *International Atomic Time*).

`http://greenwich2000.com/time/info/utc.htm` says that UTC "Replaced Greenwich Mean Time (GMT) as the World standard for time in 1986. It [UTC] is based on atomic measurements rather than the earth's rotation."

`http://www.wharton.co.uk/tech006.htm` says "Coordinated Universal Time (UTC) is almost identical to GMT. However whereas GMT is based on the rotation of the earth, UTC is derived from the comparison of a number of atomic time scales from laboratories around the world. The definition of a second was also originally based on the earth's rotation, but in 1967 began to use atomic time. A second is currently defined as 'the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom' [at mean sea level]. UTC officially replaced GMT as the world standard time in 1986.

"The time measurement obtained through reference to the earth's rotation still has relevance and is of particular importance in some fields of navigation. Rather than GMT it is referred to as UT1. The rate of rotation has slowed in recent years and in order to ensure that the gap between UTC and UT1 remains at less than 0.9 seconds, the leap second was introduced."