TIME STANDARDS

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GMT	**Greenwich Mean Time**. The original (1884 - 1972) world standard time zone at 0 meridian (0 degrees longitude) which, by definition, passes through Greenwich, England. See http://time.greenwich2000.com/
ZULU	Military time designation of world time (UTC) at 0 meridian.
UT	**Universal Time**. Defined by the Earth's rotation and determined by astronomical observations. See http://tycho.usno.navy.mil/systime.html
UT0	Precise solar local time on the 0 meridian.
UT1	UT0 corrected for Chandler wobble or "polar wandering". In 1972, GMT was officially replaced by UT1, which is now official world time.
UT2	UT1 corrected for seasonal variations in the Earth's orbital rate.
TAI	**Universal Atomic Time**. The average time of a large, worldwide collection of atomic clocks. See http://www.quid.fr/WEB/TEMPS/Q007040.HTM
UTC	**Universal Time, Coordinated.** Corrected TAI. Whenever UTC and UT1 approach a one second difference, UTC is advanced or retarded by one leap second. Since 6 January 1980, UTC has been retarded 13 times. UTC has never been advanced by a leap second. See http://tycho.usno.navy.mil/leapsec.html
GPS Time	**Global Positioning System** Time. Maintained by the US Naval Observatory to within 90 nanoseconds of UTC. GPS Time = UTC + Leap Seconds since January 6, 1980. See http://tycho.usno.navy.mil/systime.html
IRIG Time	**Inter Range Instrumentation Group** standards for distribution of UTC throughout US military test ranges. Used for time tagging data, and for display. IRIG Time = UTC. See http://jcs.mil/RCC/manuals/200/
IRIG-A	78-bit digital code modulated on a 10 kHz sine wave. Frame Repetition Rate = 10 Hz. Resolution = 1 ms (dc level shift) or 0.1 ms (modulated 10 kHz carrier).
IRIG-B	74-bit time code modulated on a 1 kHz sine wave. Frame Repetition Rate = 1 Hz. Resolution = 10 ms (dc level shift) or 1 ms (modulated 1 kHz carrier).
IRIG-G	74-bit time code modulated on a 100 kHz carrier. Frame Repetition Rate = 100 Hz. Resolution = 0.1 ms (dc level shift) or 0.01 ms (modulated 100 kHz carrier).
IRIG-H	32-bit time code modulated on a 100 Hz or 1 kHz carrier. Frame Repetition Rate = 1 Minute Resolution = 1 second (dc level shift) or 10 ms (modulated 100 Hz carrier) or 1 ms (modulated 1 kHz carrier).

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COMMENTS ADDED
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1. OFFICIAL WORLD TIME is UT1 and is based on solar time.

2. UNIVERSAL COORDINATED TIME (UTC) is electronically generated from atomic clocks and tends to run a teensy bit faster than actual solar time. Therefore once every two years or so UTC will read 12 Noon plus one second when the Sun overhead shows exactly 12 Noon. When this happens, UTC is electronically retarded one second (the UTC clock hands are pushed back one second) to make it agree with the position of the Sun. Being electronically generated, it is easy to distribute UTC by radio and by wire, and nothing **humans** do requires higher absolute time accuracy than one second.

3. Essentially, GPS time is UTC but without the leap seconds. Any system that uses GPS time to time-tag events will show those events as 13 seconds later in time than any events simultaneously time-tagged using UTC. For example, if GPS time says an event happened at 13 seconds after 12 Noon, the same or a simultaneous event timed by UTC would indicate the event occurred at exactly 12 Noon.

4. Some electronic systems may require higher accuracy between time-tagged events. An understanding of how the various time standards are related will allow for reconciling any offsets in time measurement. This will include the time delays experienced in relaying time-tagged data from the place where the data is tagged to the place where the data is used. Typically these delays will be of a few milliseconds, most of which (for Earth-bound systems) is the time it takes for the hardware and software to process this digital data.

5. For Earth-bound systems the propagation delay (one second every 186,000 miles) in radio, wire, or fiber-optic transmission will generally be less than the delays encountered in the various modems and other data processing equipment. Signals in space will be subject to the speed-of-light delay of one second every 186,000 miles the signal travels, in addition to the hardware delays mentioned above.

6. Very fast moving missiles frequently time-tag data and GPS position, and radio the data to a ground control facility. In these cases we will know where the missile **used to be** a few milliseconds ago. We can never know where the missile is **now**!