

## THE NBS TIME SCALE AND ITS RELATION TO OTHER TIME SCALES

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An atomic time scale (NBS-A) using the time pulses of WWV and based on the United States Frequency Standard (USFS) has been established.\* The hyperfine structure separation in cesium was assumed to be 9,192,631,770.00 . . . c/s. NBS atomic time was assigned to WWV time pulses beginning in October, 1957, and was made to agree with the U.S. Naval Observatory A.1 time on January 1, 1958. Since then, the two scales have diverged at an average rate of about  $1 \times 10^{-10}$  sec/sec.

More recently atomic clocks with a precision exceeding  $1 \mu\text{s}$  per day have been placed in operation at Boulder based on the USFS.\*\* On April 24, 1963, the absolute time differences between clocks at Boulder, the U.S. Naval Observatory and the Loran-C master station at Cape Fear, North Carolina, were determined to an accuracy of  $\pm 5 \mu\text{s}$  by carrying a portable clock between these various stations.\*\*\* This experiment yielded experimental values for the composite propagation and receiver delays between stations. The Loran-C time pulses are now used to continuously compare A.1 time and NBS-A time.

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\* J. Newman, L. Fey, and W. R. Atkinson, *Proc. IEEE*, 51 (1963) 498.

\*\* J. A. Barnes, D. H. Andrews and D. W. Allen, *IEEE Trans. Instr. & Meas.*, 13 (1964).

\*\*\* J. A. Barnes, and L. Fey, *Proc. IEEE*, 51 (1963) 1665.