

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 23 (1990 January 2)

1 - COORDINATED UNIVERSAL TIME UTC. Computed values of UTC-UTC(k)

(From 1988 January 1, 0h UTC, to 1990 January 1, 0h UTC, TAI-UTC = 24s)
 (From 1990 January 1, 0h UTC, until further notice, TAI-UTC = 25s)

Date 1989 (0h UTC)	OCT 30	NOV 9	NOV 19	NOV 29
MJD	47829	47839	47849	47859
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	-9.43	-8.37	-7.76	-6.91
APL (Laurel)	-0.12	-0.07	-0.02	-0.02
ASMW (Berlin)	-0.14	-0.22	-0.07	0.26
AUS (Canberra)	-0.79	-0.77	-0.75	-0.75
BEV (Wien)	-	-	-	-
CAO (Cagliari)	10.10	-	-	12.25
CH (Berne)	-0.74	-0.80	-0.85	-0.92
CRL (Tokyo)	-0.93	-0.91	-0.88	-0.87
CSAO (Shaanxi)	-1.85	-2.14	-2.26	-2.41
DPT (Pretoria)	-15.89	-16.18	-16.49	-16.74
FTZ (Darmstadt)	16.54	16.54	16.46	16.48
IEN (Torino)	0.13	0.06	-0.01	-0.09
IFAG (Wetzell)	-0.31	-0.20	0.12	0.34
INPL (Jerusalem)	139.13	140.49	141.83	143.19
JATC (Xian)	-7.87	-8.40	-8.99	-9.43
KSRI (Taejon)	-8.99	-8.87	-8.87	-8.67
NAOM (Mizusawa)	-35.02	-35.11	-35.18	-35.19
NIM (Beijing)	-	-	-	-
NIST (Boulder)	-0.07	-0.04	0.03	0.06
NPL (Teddington)	-1.69	-1.83	-1.97	-2.06
NPLI (New-Delhi)	-16.81	-17.41	-17.93	-18.45
NRC (Ottawa)	-15.59	-15.68	-15.75	-15.81
NRLM (Tsukuba)	-45.04	-43.58	-42.09	-40.69
OMH (Budapest)	-9.89	-10.04	-10.28	-10.07
ONRJ (Rio de Janeiro)	11.63	11.51	11.34	11.27
OP (Paris)	-0.07	-0.01	0.01	-0.01
ORB (Bruxelles)	3.20	3.38	3.54	3.72
PEL (Lower Hutt)	-	-	-	-
PKNM (Warsaw)	-0.06	-0.22	-0.33	-0.34
PTB (Braunschweig)	3.84	3.82	3.83	3.84
RC (Havana) (1)	-	-	-2.66	-2.56
ROA (San Fernando)	9.25	9.33	9.45	9.54
SO (Shanghai)	3.20	3.34	3.50	3.54
STA (Stockholm)	0.21	0.29	0.35	0.41
SU (Moscow) (2)	12.18	12.06	11.94	11.75
TAO (Tokyo)	-4.41	-4.49	-4.53	-4.60
TL (Taiwan)	1.87	1.70	1.61	1.42
TP (Praha) (3)	0.20	1.44	1.50	1.87
TUG (Graz)	3.05	3.27	3.49	3.75
USNO (Washington) (USNO MC)	-0.79	-0.77	-0.75	-0.75
VSL (Delft)	2.01	2.01	2.08	2.08
YUZM (Beograd)	21.07	21.52	21.31	20.79
ZIPE (Potsdam)	-0.29	-0.32	-0.26	-0.11

2 - INTERNATIONAL ATOMIC TIME TAI AND LOCAL ATOMIC TIME SCALES TA(k)

Computed values of TAI-TA(k)

Date 1989 (0h UTC)	OCT 30	NOV 9	NOV 19	NOV 29
MJD	47829	47839	47849	47859
Laboratory k	TAI-TA(k)	(Unit = 1 microsecond)		
APL (Laurel)	-1.46	-1.41	-1.36	-1.36
AUS (Canberra)	-24.33	-24.49	-24.73	-24.98
CH (Berne)	-61.06	-61.29	-61.52	-61.77
CRL (Tokyo)	-2.19	-2.15	-2.12	-2.11
CSAO (Shaanxi)	37.13	36.76	36.54	36.29
DDR (Berlin)	-28.74	-28.76	-28.66	-28.47
F (Paris)	74.69	74.99	75.31	75.61
JATC (Xian)	-1.41	-1.37	-1.34	-1.48
NIM (Beijing)	-	-	-	-
NISA (Boulder) (4)	-45060.35	-45060.58	-45060.77	-45061.00
NIST (Boulder)	-45132.51	-45132.96	-45133.41	-45133.91
NRC (Ottawa)	15.48	15.39	15.32	15.26
PTB (Braunschweig)	-359.56	-359.58	-359.57	-359.56
RC (Havana) (1)	-	-	-6000256.13	-6000256.82
SO (Shanghai)	-44.25	-44.17	-44.03	-44.02
SU (Moscow) (2)	2827262.18	2827262.06	2827261.94	2827261.75
USNO (Washington) (5)	-34588.29	-34588.85	-34589.45	-34589.95

3 - NOTES ON SECTIONS 1 AND 2

(1) RC . Comite Estatal de Normalizacion, Habana, Cuba.

MJD	UTC-UTC(RC)	TAI-TA(RC)
47749	-2.15	-6000247.62
47759	-2.20	-6000248.48
47769	-2.22	-6000249.29
47779	-2.30	-6000250.18

(2) SU .

MJD	UTC-UTC(SU)	TAI-TA(SU)
47769	12.92	2827262.92
47779	12.80	2827262.80
47789	12.68	2827262.68
47799	12.56	2827262.56
47809	12.43	2827262.43
47819	12.31	2827262.31

From 47769 to 47859 interpolated values using the clock transportations reported in section 5.

(3) TP . The apparent time step on MJD = 47839 results from a recalibration of the TV link between TP and PTB.

(4) TA(NISA) designates the scale AT1 of NIST.

(5) TA(USNO) designates the scale A1(MEAN) of USNO.

4 - UTC-GPS TIME and TAI-GPS TIME

UTC-GPS TIME = -5 seconds + Co ; TAI-GPS TIME = 19 seconds + Co.

Co is obtained from measurements made at Paris Observatory, usually corrected for the measured ionospheric delay, and from linear interpolation of UTC-UTC(OP).

DC is the synchronization offset between satellites, as measured at Paris Observatory at the instant T of the tracking. T is given for the middle of the tracking period of 13 minutes, for the first tabular date and must be decremented by 4 minutes per day (8 minutes when moving from 0h.. to 23h..).

For most of the applications it is sufficient to derive UTC from the observations of any of the listed satellites, at any time, by interpolating Co. However, in case of large values of DC, one might obtain better values of UTC by using, instead of Co, $C=Co+DC$.

Date 1989	MJD	Co (ns) 0hUTC	DC(ns)							
			PRN11 NAV 8 16h 0m	PRN14 NAV14 18h24m	PRN 6 NAV 3 22h 8m	PRN 9 NAV 6 23h28m	PRN12 NAV10 2h28m	PRN13 NAV 9 3h32m	PRN 3 NAV11 4h52m	
OCT 30	47829	-686	13	-	0	-4	-10	-1	-5	
OCT 31	47830	-685	3	-	-3	5	-9	-8	-10	
NOV 1	47831	-683	7	-	-9	1	8	2	2	
NOV 2	47832	-686	1	-	-4	-1	3	3	-1	
NOV 3	47833	-689	6	-	3	3	-4	-4	-6	
NOV 4	47834	-684	8	-	-7	-3	-13	-4	-1	
NOV 5	47835	-671	12	-1	-4	-6	-5	10	4	
NOV 6	47836	-658	14	-9	1	0	18	-8	-1	
NOV 7	47837	-647	6	-22	-6	-2	-1	-8	-5	
NOV 8	47838	-635	13	-26	-4	-2	0	4	5	
NOV 9	47839	-623	10	4	-4	-4	-11	-7	-3	
NOV 10	47840	-615	6	1	-2	3	4	-10	1	
NOV 11	47841	-610	1	-17	-2	-1	-10	8	4	
NOV 12	47842	-611	3	-	-5	1	0	0	2	
NOV 13	47843	-612	2	-	-1	3	-13	2	1	
NOV 14	47844	-607	7	-	-5	-6	12	-10	7	
NOV 15	47845	-596	14	-	-1	4	-7	-5	-1	
NOV 16	47846	-586	-1	-	-	-	-15	2	3	
NOV 17	47847	-582	-2	-	-4	2	-3	5	2	
NOV 18	47848	-579	-3	-	-3	-6	5	5	4	
NOV 19	47849	-574	0	8	-5	-3	5	-1	3	
NOV 20	47850	-569	4	5	-2	4	-7	-8	0	
NOV 21	47851	-560	7	-3	-7	-6	-5	2	12	
NOV 22	47852	-554	10	16	-9	-7	-5	15	11	
NOV 23	47853	-545	6	3	-13	-2	-9	-5	4	
NOV 24	47854	-530	5	5	-12	-5	0	-5	14	
NOV 25	47855	-510	9	26	-3	-4	-3	-6	-1	
NOV 26	47856	-491	-2	-	-8	-1	8	2	7	
NOV 27	47857	-478	1	-	-5	-3	-10	8	9	
NOV 28	47858	-464	9	-	-3	4	-7	-12	4	
NOV 29	47859	-447	2	-	-5	-4	-8	1	8	

5 - MEASUREMENT OF UTC(j)-UTC(k)

Date 1989	MJD	Time comparisons (Unit : 1 microsecond)	uncert.	source	meth. (1)
OCT 23	47822.53	UTC(TP) - UTC(CH) =	-1.48	0.1 TP telex	CT
OCT 26	47825.58	UTC(TP) - UTC(PTB) =	2.91	0.1 TP telex	CT
OCT 27	47826.47	UTC(TP) - UTC(ZIPE) =	-1.53	0.05 TP telex	CT
OCT 27	47826.51	UTC(TP) - UTC(ASMW) =	-0.99	0.05 TP telex	CT
NOV 15	47845.00	UTC(SU) - UTC(ASMW) =	-12.12	0.01 SU telex	CT
NOV 30	47860.06	UTC(SU) - UTC(PKNM) =	-12.00	0.05 SU telex	CT
DEC 13	47873.44	UTC(SU) - UTC(OMH) =	-20.991	0.03 SU telex	CT

(1) method : CT clock transportation.

6 - DURATION OF THE TAI SCALE INTERVAL : 1 second + D

D and its standard deviation s are expressed in $1 \cdot 10^{-14}$ second.

The following data are given :

- for continuously operating primary standards (primary clocks), the average of D for the two previous months, with the last available estimate of the inaccuracy of the standard;
- for occasional measurements, the value D for the measurement interval, as computed by BIPM (the BIPM uncertainty may be larger than the reported uncertainty on account of the time comparisons);
- the BIPM evaluation from all available measurements (from CRL, NIST, NRC, PTB, SU), with the uncertainty based on those of individual measurements, as reported.

Standards,	Interval(MJD)	D	s
NRC-CsV	47799-47859	+29.6	10.0
PTB-CS1	47799-47859	+1.6	3.0
PTB-CS2	47799-47859	+3.5	1.5
BIPM estimate	47799-47859	+3	2

7 - INFORMATION

- (a) Time Signal ZUO. The emission of time signals by ZUO station on frequencies 2.5 and 5.0 MHz have ceased on 1989 November 17.
- (b) UTC(NRC). There will be a one-time step change of -15 microseconds added to UTC(NRC) on 1990 January 1, 0h UTC. After this date, UTC(NRC) will be steered toward UTC by small adjustments of rate.