

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 61 (1993 February 26)

1 - Coordinated Universal Time UTC. Computed values of UTC-UTC(k).

(From 1992 July 1, 0hUTC, to 1993 July 1, 0hUTC, TAI-UTC=27s)

(From 1993 July 1, 0hUTC, until further notice, TAI-UTC=28s)

Date 1992/93 0hUTC	Dec 23	Jan 2	Jan 12	Jan 22
MJD	48979	48989	48999	49009
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	0.88	0.88	1.30	1.84
APL (Laurel)	-0.21	-0.21	-0.20	-0.16
AUS (Canberra)	-0.02	-0.02	-0.01	0.01
BEV (Wien)	3.82	2.78	1.34	0.17
CAO (Cagliari)	-26.34	-26.73	-27.19	-27.58
CH (Bern)	-0.20	-0.23	-0.23	-0.23
CRL (Tokyo)	2.40	2.41	2.44	2.46
CSAO (Lintong)	-0.50	-0.55	-0.51	-0.54
DPT (Pretoria)	-19.06	-18.97	-18.87	-18.83
FTZ (Darmstadt)	-	-	-	-
IEN (Torino)	0.12	0.13	0.15	0.13
IFAG (Wetzell)	3.39	3.31	3.26	3.25
IGMA (Buenos Aires) (1)	-1.64	-1.88	-2.06	-2.21
INPL (Jerusalem)	-0.43	-0.42	-0.43	-0.49
JATC (Lintong)	-1.67	-1.78	-1.92	-2.10
KRIS (Taejon)	-0.29	-0.35	-0.41	-0.44
LDS (Leeds)	0.80	-0.50	-1.92	-3.22
MSL (Lower Hutt)	-3.83	-3.48	-3.53	-3.45
NAOM (Mizusawa)	0.06	-0.09	-0.29	-0.36
NAOT (Tokyo)	-0.64	-0.74	-0.85	-0.96
NIM (Beijing)	7.61	7.69	7.67	7.72
NIST (Boulder)	-0.31	-0.30	-0.28	-0.24
NMC (Sofiya)	-0.30	-1.29	-2.05	-3.03
NPL (Teddington)	0.18	0.23	0.26	0.30
NPLI (New-Delhi)	-7.91	-6.88	-6.86	-6.77
NRC (Ottawa)	0.52	0.67	0.85	1.02
NRLM (Tsukuba)	-11.66	-12.43	-13.23	-14.06
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires) (2)	-71.78	-	-	-
ONRJ (Rio de Janeiro)	-1.64	-1.57	-1.41	-1.22
OP (Paris)	-0.84	-0.68	-0.45	-0.39
ORB (Bruxelles)	0.03	0.32	-0.02	-0.17
PKNM (Warszawa)	0.13	0.18	0.05	-0.01
PTB (Braunschweig)	2.83	2.83	2.83	2.83
RC (Habana)	-3.93	-3.82	-3.78	-3.78
ROA (San Fernando)	3.50	3.43	3.35	3.25
SCL (Wan Chai)	-25.61	-27.20	-28.79	-30.40
SNT (Stockholm)	-0.30	-0.15	-0.14	-0.08
SO (Shanghai) (3)	2.10	2.16	2.07	2.08
SU (Moskva)	0.83	0.73	0.65	0.57
TL (Chung-Li)	0.50	0.41	0.32	0.29
TP (Praha)	-0.92	-0.95	-1.05	-1.02
TUG (Graz)	1.19	1.20	1.21	1.22
USNO (Washington DC)(USNO MC)	-0.02	-0.02	-0.01	0.01
VSL (Delft)	-0.40	-0.35	-0.35	-0.30

2 - International Atomic Time TAI and local atomic time scales TA(k).

The following table gives the computed values of TAI-TA(k).

Date 1992/93 0hUTC	Dec 23	Jan 2	Jan 12	Jan 22
MJD	48979	48989	48999	49009
Laboratory k	TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)	1.25	1.25	1.26	1.31
AUS (Canberra)	-43.82	-43.93	-43.92	-44.07
CH (Bern)	-75.00	-75.12	-75.20	-75.29
CRL (Tokyo)	18.86	19.19	19.54	19.89
CSAO (Lintong)	20.75	20.62	20.58	20.46
F (Paris)	110.23	110.63	111.03	111.42
INPL (Jerusalem)	-113.01	-114.66	-116.34	-118.05
JATC (Lintong)	4.39	4.35	4.42	4.68
KRIS (Taejon)	-0.44	-0.46	-0.53	-0.61
NIM (Beijing)	-9.75	-9.64	-9.66	-9.59
NISA (Boulder) (4)	-45094.26	-45094.64	-45094.99	-45095.33
NIST (Boulder)	-45203.71	-45204.35	-45204.97	-45205.56
NRC (Ottawa)	16.58	16.74	16.92	17.09
PTB (Braunschweig)	-360.57	-360.57	-360.56	-360.57
RC (Habana) (5)	-316.67	-316.90	-317.11	-317.23
SO (Shanghai) (3)	-45.46	-45.38	-45.48	-45.48
SU (Moskva)	2827250.83	2827250.73	2827250.65	2827250.57
USNO (Washington DC) (6)	-34664.55	-34665.23	-34665.90	-34666.56

3 - Notes on sections 1 and 2.

(1) IGMA. Corrected value : UTC-UTC(IGMA) = -1.61 μ s on MJD=48969.

(2) ONBA. Corrected value : UTC-UTC(ONBA) = -70.48 μ s on MJD=48969.

(3) SO . Corrected values :

MJD	UTC-UTC(SO)	TAI-TA(SO)
48959	2.03	-45.49
48969	2.03	-45.51

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

(5) RC . Listed values are TAI-TA(RC) - 18 seconds.

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

4 - UTC - GPS time and TAI - GPS time.

UTC - GPS time = -8s + C0 (until 1993 July 1, 0hUTC)

UTC - GPS time = -9s + C0 (from 1993 July 1, 0hUTC)

TAI - GPS time = 19s + C0.

The GPS data are taken at the Paris Observatory, from Block I satellites, and are usually corrected for the measured ionospheric delays. They are smoothed to obtain daily values of UTC(OP) - GPS time at 0hUTC. UTC - GPS time is derived from them using linear interpolation of UTC - UTC(OP).

The r values are the residuals to the smoothed data for the middle of the 13-minute tracking period. The reference times are given for the first date of the table only. The r values are reported here only to show the quality of the synchronization.

UTC may be derived at any site from observation of any listed satellite, by interpolating C0 to the tracking time. The quality of the access to UTC mainly depends upon local conditions of observation.

		r(ns) Block I				
Date	MJD	C0	PRN 3	PRN11	PRN13	PRN12
1992/93			NAV11	NAV 8	NAV 9	NAV10
0hUTC		(ns)	23h52m	4h44m	10h36m	19h 8m
Dec 23	48979	-17	-7	-2	11	-4
Dec 24	48980	-23	6	10	-5	3
Dec 25	48981	-25	-8	-14	-	-12
Dec 26	48982	-12	9	-	8	2
Dec 27	48983	14	-2	-7	11	2
Dec 28	48984	35	-	0	-	4
Dec 29	48985	41	-2	5	-1	-4
Dec 30	48986	41	2	-7	-	-13
Dec 31	48987	47	11	-	11	-6
Jan 1	48988	55	-7	-3	6	-
Jan 2	48989	59	4	-11	-	-2
Jan 3	48990	69	4	2	0	-9
Jan 4	48991	77	6	-8	-	11
Jan 5	48992	75	-8	-8	11	-
Jan 6	48993	65	-1	-3	-11	-
Jan 7	48994	56	-2	1	3	-
Jan 8	48995	52	3	2	9	-5
Jan 9	48996	47	1	-7	4	-2
Jan 10	48997	38	-7	6	-5	4
Jan 11	48998	28	4	-1	-4	8
Jan 12	48999	15	-10	3	0	-2
Jan 13	49000	-13	7	3	3	2
Jan 14	49001	-37	-1	0	-8	12
Jan 15	49002	-54	-3	-10	-4	-1
Jan 16	49003	-60	-2	1	15	-5
Jan 17	49004	-51	3	-	3	-11
Jan 18	49005	-31	0	3	0	9
Jan 19	49006	-9	-4	-3	8	-1
Jan 20	49007	10	-2	3	-1	-1
Jan 21	49008	29	3	-6	0	3
Jan 22	49009	52	6	-7	-8	8

Section 4 (Cont.)

For Block II satellites, the r values are computed with respect to C0 obtained from Block I only.

		r(ns) Block II							
Date 1992/93 0hUTC	MJD	C0 (ns)	PRN25 NAV25 23h 4m	PRN28 NAV28 2h 4m	PRN17 NAV17 3h 8m	PRN21 NAV21 3h24m	PRN23 NAV23 4h28m	PRN15 NAV15 5h48m	PRN14 NAV14 8h28m
Dec 23	48979	-17	14	-3	84	28	42	5	112
Dec 24	48980	-23	-5	31	16	-21	50	16	12
Dec 25	48981	-25	-71	17	5	-116	-60	-7	30
Dec 26	48982	-12	-64	-15	9	-67	-3	-12	72
Dec 27	48983	14	6	-40	-72	-47	-8	-2	90
Dec 28	48984	35	59	-13	-8	-8	29	-2	7
Dec 29	48985	41	-18	7	-61	-50	-6	2	-56
Dec 30	48986	41	52	94	-53	-84	-6	-6	-56
Dec 31	48987	47	-12	86	-21	10	94	12	97
Jan 1	48988	55	-38	-	-35	44	10	12	3
Jan 2	48989	59	-30	37	26	-45	29	11	-90
Jan 3	48990	69	-	45	0	61	-9	9	10
Jan 4	48991	77	26	75	44	69	-76	13	39
Jan 5	48992	75	-29	-56	-93	32	27	0	-7
Jan 6	48993	65	13	-27	10	-49	108	1	-6
Jan 7	48994	56	-52	42	-13	61	-62	10	13
Jan 8	48995	52	31	-13	48	44	36	8	53
Jan 9	48996	47	-	-	79	-9	-48	4	98
Jan 10	48997	38	-6	29	-33	41	29	9	3
Jan 11	48998	28	-	32	49	-80	-71	10	-65
Jan 12	48999	15	-21	-7	-17	-82	46	-4	-59
Jan 13	49000	-13	-10	-94	-1	-7	-42	1	-14
Jan 14	49001	-37	-43	2	16	-24	-76	2	31
Jan 15	49002	-54	18	-57	-39	30	-4	0	39
Jan 16	49003	-60	2	-	44	25	57	-2	6
Jan 17	49004	-51	-14	-12	55	2	9	1	47
Jan 18	49005	-31	67	-36	-41	-36	-71	4	27
Jan 19	49006	-9	16	-70	-26	83	-16	1	63
Jan 20	49007	10	26	-7	14	14	-31	-4	22
Jan 21	49008	29	6	-47	-7	23	-82	-7	23
Jan 22	49009	52	74	-	41	-2	28	6	-81

Section 4 (Cont.)

		r(ns) Block II								
Date	MJD	C0	PRN18	PRN24	PRN19	PRN16	PRN26	PRN27	PRN 2	PRN20
1992/93			NAV18	NAV24	NAV19	NAV16	NAV26	NAV27	NAV13	NAV20
0hUTC		(ns)	11h24m	11h40m	11h56m	14h 4m	15h40m	15h56m	17h48m	21h 0m
Dec 23	48979	-17	-20	48	0	6	12	-52	6	-1
Dec 24	48980	-23	-69	-38	-20	-4	-37	19	-72	-13
Dec 25	48981	-25	-60	-8	-38	96	7	15	20	-25
Dec 26	48982	-12	-30	-43	-6	-16	66	-57	-18	12
Dec 27	48983	14	-2	71	5	-38	-34	21	-5	-5
Dec 28	48984	35	0	29	11	55	52	41	77	2
Dec 29	48985	41	18	118	-24	-17	-32	-7	24	-5
Dec 30	48986	41	76	-2	9	65	-47	106	-10	10
Dec 31	48987	47	39	65	-	42	-45	-35	46	18
Jan 1	48988	55	-14	-	-2	54	34	-12	-17	-4
Jan 2	48989	59	45	-	-14	41	26	37	34	-13
Jan 3	48990	69	-43	4	-121	65	7	40	148	7
Jan 4	48991	77	-1	47	-56	-58	-14	23	-54	12
Jan 5	48992	75	-38	-12	-11	-68	-106	31	75	11
Jan 6	48993	65	40	90	-26	14	-60	-14	-	5
Jan 7	48994	56	19	92	-20	22	30	3	4	-3
Jan 8	48995	52	53	7	-7	51	13	-24	16	28
Jan 9	48996	47	-18	25	2	-55	-87	-16	41	23
Jan 10	48997	38	-22	-27	-55	-20	32	-22	99	1
Jan 11	48998	28	-50	-39	39	9	-38	-25	-11	6
Jan 12	48999	15	-	6	-63	7	-	44	46	4
Jan 13	49000	-13	-61	-33	-61	-16	6	-5	24	-5
Jan 14	49001	-37	45	95	-10	21	-69	25	-13	-1
Jan 15	49002	-54	-	-	-	5	22	75	55	-3
Jan 16	49003	-60	-52	-107	5	23	-16	50	18	-7
Jan 17	49004	-51	67	59	-112	3	27	-51	-9	6
Jan 18	49005	-31	-69	11	-61	8	-40	38	31	-9
Jan 19	49006	-9	7	-48	4	-4	-41	50	17	2
Jan 20	49007	10	65	7	-	-53	6	5	7	9
Jan 21	49008	29	-71	-29	-37	54	-56	-24	-91	-13
Jan 22	49009	52	-61	-15	-36	-73	-	-19	48	-10

5 - UTC - GLONASS time.

UTC - GLONASS time = C1 (modulo 1s).

From his current observations of both the GPS and GLONASS satellite systems Prof. P. Daly, University of Leeds, establishes and reports GPS time - GLONASS time at ten-day intervals, together with the standard deviation SD of his daily GLONASS data. C1 is then derived using UTC - GPS time of section 4.

Date 1992/93 0hUTC	MJD	C1 (μ s)	SD (μ s)
Dec 23	48979	-12.83	0.05
Jan 2	48989	-12.99	0.05
Jan 12	48999	-13.11	0.05
Jan 22	49009	-13.07	0.05

6 - Duration of the TAI scale interval.

The following table gives the departure D of the duration of the TAI scale interval from the SI second on the rotating geoid as realized by a given primary standard occasionally evaluated or continuously operating as a clock. In the later case the chosen two-month period of observation is also indicated. The last communicated estimate of the inaccuracy of the standard provides the uncertainty s of the D value.

D and s are expressed in units of 10^{-14} second.

Standard	Obs. period	D	s
CRL-Cs1	48949-49009	-2.6	11.0
PTB-CS1	48949-49009	+0.1	3.0
PTB-CS2	48949-49009	-0.3	1.5

The estimate of the duration of the TAI scale interval, computed by the BIPM, from all the available measurements of the TAI frequency, obtained by comparison with primary frequency standards continuously observed or occasionally evaluated (CRL, NIST, NRC, PTB, SU), is:

$$1 + 0 \times 10^{-14} \pm 2 \times 10^{-14}$$

in SI second on the rotating geoid, for the two-month interval 48949-49009 .