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Table 8 - Offsets and step adjustments of UTC, until 1975 Dec. 31

Date (at 0h UT)	Offsets	Steps
1961 Jan. 1	-150×10^{-10}	
Aug. 1	"	+0.050 s
1962 Jan. 1	-130×10^{-10}	
1963 Nov. 1	"	-0.100 s
1964 Jan. 1	-150×10^{-10}	
April 1	"	-0.100 s
Sept. 1	"	-0.100 s
1965 Jan. 1	"	-0.100 s
March 1	"	-0.100 s
July 1	"	-0.100 s
Sept. 1	"	-0.100 s
1966 Jan. 1	-300×10^{-10}	
1968 Feb. 1	"	+0.100 s
1972 Jan. 1	0	-0.107 7580 s
July 1	"	-1 s
1973 Jan. 1	"	-1 s
1974 Jan. 1	"	-1 s
1975 Jan. 1	"	-1 s

Table 9 - Relationship between TAI and UTC, until 1975 Dec. 31

Limits of validity (at 0 h UT)		TAI-UTC
1961 Jan. 1	1961 Aug. 1	1.422 818 0 s + (MJD - 37 300) × 0.001 296 s
Aug. 1	1962 Jan. 1	1.372 818 0 s + "
1962 Jan. 1	1963 Nov. 1	1.845 858 0 s + (MJD - 37 665) × 0.001 123 2 s
1963 Nov. 1	1964 Jan. 1	1.945 858 0 s + "
1964 Jan. 1	April 1	3.240 130 0 s + (MJD - 38 761) × 0.001 296 s
April 1	Sept. 1	3.340 130 0 s + " "
Sept. 1	1965 Jan. 1	3.440 130 0 s + " "
1965 Jan. 1	March 1	3.540 130 0 s + " "
March 1	July 1	3.640 130 0 s + " "
July 1	Sept. 1	3.740 130 0 s + " "
Sept. 1	1966 Jan. 1	3.840 130 0 s + " "
1966 Jan. 1	1968 Feb. 1	4.313 170 0 s + (MJD - 39 126) × 0.002 592 s
1968 Feb. 1	1972 Jan. 1	4.213 170 0 s + " "
1972 Jan. 1	July 1	10.000 000 0 s
July 1	1973 Jan. 1	11.000 000 0 s
1973 Jan. 1	1974 Jan. 1	12.000 000 0 s
1974 Jan. 1	1975 Jan. 1	13.000 000 0 s
1975 Jan. 1		14.000 000 0 s

Table 10 - Atomic time, collaborating laboratories.

ABBREVIATION	LABORATORIES
ASMW	Amt für Standardisierung, Messwesen und Warenprüfung, Berlin, Deutsche Demokratische Republik.
DHI	Deutsches Hydrographisches Institut, Hamburg, Bundesrepublik Deutschland.
DNM	Division of National Mapping, Canberra, Australia.
F	Commission Nationale de l'Heure, Paris, France.
FOA	Research Institute of National Defence, Stockholm, Sweden.
IEN	Istituto Elettrotecnico Nazionale, Torino, Italia.
IGMA	Instituto Geographico Militar, Buenos Aires, Argentina.
ILOM	International Latitude Observatory, Mizusawa, Japan.
NBS	National Bureau of Standards, Boulder, USA.
NIS	National Institute for Standards, Cairo, Egypt, Arab Rep.
NPL	National Physical Laboratory, Teddington, U.K.
NPRL	National Physical Research Laboratory, Pretoria, South Africa.
NRC	National Research Council of Canada, Ottawa, Canada.
OMSF	Instituto y Observatorio de Marina, San Fernando, España.
ON	Observatoire de Neuchâtel, Neuchâtel, Suisse.
ONBA	Observatorio Naval, Buenos Aires, Argentina.
ONRJ	Observatorio National, Rio de Janeiro, Brazil.
OP	Observatoire de Paris, Paris, France.
ORB	Observatoire Royal de Belgique, Bruxelles, Belgique.
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Bundesrepublik Deutschland.
PTCH	Direction générale des PTT, Berne, Suisse.
RGO	Royal Greenwich Observatory, Herstmonceux, U.K.
RRL	Radio Research Laboratories, Tokyo, Japan.
TAO	Tokyo Astronomical Observatory, Tokyo, Japan.
TCL	Telecommunication Laboratories, Taiwan, Rep. of China.
TP (1)	{ Ústav Radiotechniky a Electroniky, Praha, Československo. Astronomický Ústav, Praha, Československo.
URSS	Laboratoire d'état de l'étalon de temps et de fréquence, URSS.
USNO	U.S. Naval Observatory, Washington, USA.
VSL	Van Swinden Laboratorium, Den Haag, Nederland.
ZIPE	Zentralinstitut Physik der Erde, Potsdam, Deutsche Demokratische Republik.

(1) Both laboratories cooperate in the derivation of UTC(TP).

Table 11 - Laboratories keeping an independent local atomic time

Laboratory (i)	Equipment in atomic standards (1)	Information on AT(i) - UTC(i): Interval of validity (in MJD at 0h UT)	AT(i) - UTC(i) in s
F (2)	8 HP Cs 2 HP4Cs	year 1974	AT(F) - UTC(OP) is published in Bulletin H by OP
NBS	8 HP Cs 2 lab. primary st (3)	42 048 - 42 413	13.045 121 378 $-(99.36 \times 10^{-9})$(MJD-42 047)
NRC	3 HP Cs 1 HP4 Cs 2 Lab. primary st. (4)	year 1974	13 seconds exactly
ON	1 E Cs 2 HP Cs 1 HP4 Cs	year 1974	13 seconds exactly
PTB	7 HP Cs 1 lab. primary st. (5)	year 1974	published in PTB Time Service Bull.
RGO	5 HP Cs 1 HP4 Cs	42 048 - 42 229	12.999 973 30 $-(40 \times 10^{-9})$(MJD-42 048)
		42 229 - 42 413	12.999 966 06 $-(30 \times 10^{-9})$(MJD-42 229) (6)
USNO	12 HP Cs 14 HP4 Cs 1 Hydrogen Maser	year 1974	A1(USNO, MEAN) - UTC(USNO MC) : provisional values in USNO series 7 ; final values in(USNO) series 11. (7)

Table 11 - (cont.)

Notes

(1) E Cs = Ebauches S.A. cesium standard,
HP Cs = Hewlett-Packard cesium standard 5060A or 5061A,
HP4Cs = Hewlett-Packard cesium standard, option 4.

(2) The standards are located as follows (at the end of 1974)

Centre National d'Etudes Spatiales	1 HP
Centre National d'Etudes des Télécommunications	1 HP, 1 HP4
Centre d'Etudes et de Recherches Géodynamiques et Astronomiques	1 HP
Observatoire de Paris	4 HP, 1 HP4
Observatoire de Besançon	1 HP

They are intercompared by the TV method and linked to the foreign laboratories through OP (see Table 12).

(3) The laboratory primary standards control AT(NBS) via an NBS accuracy algorithm.

(4) The HP Cs standards are calibrated twice a week against Cs III, one of the two laboratory standards (2.1 m) with a 2 σ precision of about 1×10^{-12}. The other laboratory standard, still undergoing development during 1974, was used for a more accurate determination of the frequency of AT(NRC).

(5) AT(PTB) results from a reading of the 7 HP Cs St. considering the comparisons with the primary freq. st. CS1 of PTB. Precautions are taken in order to ensure the best uniformity of the scale. The AT(PTB) second is about 1×10^{-12}s shorter than the CS1 second. UTC(PTB) + 1 h = MEZ(PTB) is called the Official Time Scale (in Central European Time) which is disseminated, e.g., by the LF transmitter DCF77.

(6) AT(RGO) is designated by GA2.
In 1973 AT(RGO) - UTC(RGO) = 12 s exactly.
On 1974 January 1, 0h UT, in order to achieve a close agreement with UTC(BIH), a time step of + 26.7 μs was applied to UTC(RGO) and a rate correction began to be used.

(7) AT(USNO) is designated by A1(USNO, MEAN).

Table 12 - Equipment and links of the collaborating laboratories

Laboratory (i)	Equipment	Source of UTC(i)	LORAN-C receptions	VLF and LF receptions	Television link with
DHI	1 HP Cs	Cs	7970-W	DCF77	PTB, TP, ZIPE
DNM	3 HP Cs	1 Cs		GBR, NLK, NWC	other lab. in Australia
FOA	2 HP Cs 1 HP4 Cs	mean of 3 Cs	7970-W	GBR, NAA, OMEGA/ND	other lab. in Sweden
IEN	4 HP Cs	1 Cs	7970-W 7990-M 7990-Z	GBR, NAA, MSF60, OMEGA/N, /T, /ND	other lab. in Italy
IGMA	1 E Cs	Cs		NAA, NLK	ONBA
ILOM	3 HP Cs	Cs	9970-M	NLK	RRL
NBS	see Table 11	All the Cs	9930-Z	NAA, NLK, WWVB	NRC, USNO
NPL	5 HP Cs 1 Lab. Cs 2 H Masers	1 Cs	7970-W	GBR, MSF60	transmitting station in Rugby
NPRL	1 HP Cs	Cs		GBR, NAA	
NRC	see Table 11	All the Cs	9930-Y		NBS, USNO
OMSF	2 E Cs 1 HP4 Cs	All the Cs	7990-Z	NAA	
ON	see Table 11	All the Cs	7970-W 7990-Z		
ONBA	2 E Cs	2 Cs		NAA, OMEGA/T	
ONRJ	2 HP Cs	All the Cs		GBR, NAA	other lab. in Brasil
OP	4 HP Cs 1 HP4 Cs	1 Cs	7970-W 7990-Z		other lab. in France

Table 12 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C receptions (2)	VLF and LF receptions (3)	Television link with
ORB	2 HP Cs	1 Cs	7970-W		
PTB	see Table 11		7970-W	GBR, NAA	DHI, TP
PTCH	1 E Cs	Cs	7970-W		
RGO	see Table 11	selection of the Cs	7970-M 7970-W 7990-Z	GBR, MSF60	
RRL	HP Cs 2 H masers	1 Cs	9970-M	NLK	TAO, ILOM
TAO	3 HP Cs	1 Cs	9970-M	NLK, NWC	ILOM, RRL
TCL	2 HP Cs	all the Cs	9970-M 5970	NDT, NWC	
TP	1 HP Cs	Cs		DCF77, GBR, NAA	DHI, PTB, ZIPE
URSS	H masers			GBR, NAA, OMA50, RBW	
USNO	see Table 11	Cs	(4)	(4)	NRC
VSL	1 HP Cs	Cs	7970-W	DCF77	other lab. in Holland
ZIPE	1 HP Cs	Cs	7970-W	DCF77, GBR, NAA, OMA50, OMEGA/N	ASMW, DHI, TP

Table 12 - (cont.)

Notes

(1) E Cs = Ebauches S.A. cesium standard
HP Cs = Hewlett-Packard cesium standard 5060 A of 5061 A
HP4 Cs = Hewlett-Packard cesium standard, option 4.

(2) LORAN-C stations :

9930-Y	East Coast Chain, Nantucket
9930-Z	" " " Dana
7990-M	Mediterranean chain, Simeri Crichi
7990-Z	" " Estartit
7970-M	Norwegian Sea chain, Ejde
7970-W	" " " Sylt
9970-M	Northwest Pacific chain, Iwo Jima
5970	Southeast Asia

(3) OMEGA stations

/N Aldra, Norway
/ND Lamoure, North Dakota, USA
/T Trinidad, West Indies

(4) The daily phase values Series 4 of the USNO give the values of UTC(USNO MC) - transmitting station for :

the LORAN-C chains

the LORAN-D West Coast, U.S.A.,

the OMEGA stations ND, T,

the VLF stations GBR, NAA, NBA, NLK.

TABLE 13 - TIME COMPARISONS BETWEEN LABORATORIES BY CLOCK TRANSPORTATION IN 1974 (FOR ABBREVIATIONS, SEE P. B 24).

UNLESS OTHERWISE STATED, THE TRANSPORTATION WAS CARRIED OUT BY THE FIRST MENTIONED LABORATORY

DATE 1974		MJD	TIME COMPARISONS (UNIT : 1 MICROSECOND)		ERROR	SOURCE
FEB	5	42083.8	UTC(ONBA) - UTC(ONRJ) =	2021.9	0.1	ONRJ LETTER
FEB	19	42097.4	UTC(ONBA) - UTC(ONRJ) =	2018.6	0.1	ONRJ LETTER
MAR	13	42119.2	UTC(USNO) - UTC(RRL) =	-4.6	0.2	USNO DPV 373 (1)
MAR	13	42119.2	UTC(USNO) - UTC(TAO) =	19.0	0.2	USNO DPV 373
MAR	14	42120.2	UTC(USNO) - UTC(TCL) =	37.4	0.2	USNO DPV 373
APR	9	42146.4	UTC(AGMC) - UTC(NPRL) =	219.8	1.0	NPRL LETTER (2)
MAY	16	42183.3	UTC(USNO) - UTC(OMSF) =	-1.0	0.1	USNO DPV 382
MAY	17	42184.0	UTC(ILOM) - UTC(RRL) =	22.7	0.2	ILOM LETTER
MAY	21	42188.8	UTC(USNO) - UTC(ARO) =	-24.3	0.2	USNO DPV 384 (3)
MAY	22	42189.0	UTC(USNO) - UTC(NRC) =	-0.6	0.2	USNO DPV 384
MAY	22	42189.3	UTC(USNO) - UTC(OP) =	1.7	0.1	USNO DPV 382
MAY	24	42191.6	UTC(USNO) - UTC(NBS) =	-2.8	0.2	USNO DPV 384
JUL	5	42233.6	UTC(NBS) - UTC(OP) =	5.2		NBS LETTER
JUL	19	42247.1	UTC(NBS) - UTC(OP) =	5.4		NBS LETTER
AUG	15	42274.3	UTC(USNO) - UTC(IEN) =	-11.7	0.2	USNO DPV 397
AUG	19	42278.2	UTC(USNO) - UTC(DHI) =	-1.4	0.2	USNO DPV 397
AUG	20	42279.3	UTC(USNO) - UTC(RGO) =	-4.5	0.2	USNO DPV 397
AUG	21	42280.4	UTC(USNO) - UTC(NPL) =	-39.8	0.2	USNO DPV 397
OCT	17	42337.4	UTC(USNO) - UTC(OP) =	4.4	0.1	USNO DPV 405
OCT	18	42338.1	UTC(USNO) - UTC(RRL) =	-1.0	0.2	USNO DPV 405
OCT	18	42338.1	UTC(USNO) - UTC(TAO) =	15.7	0.2	USNO DPV 405
OCT	18	42338.8	UTC(USNO) - UTC(OMSF) =	-0.3	0.1	USNO DPV 405
OCT	24	42344.5	UTC(USNO) - UTC(ON) =	16.2	0.1	USNO DPV 405 (4)
OCT	29	42349.3	UTC(USNO) - UTC(ORB) =	-13.8	0.1	USNO DPV 405
OCT	30	42350.3	UTC(USNO) - UTC(VSL) =	56.2	0.1	USNO DPV 405
NOV	6	42357.4	UTC(USNO) - UTC(NPRL) =	209.3	0.1	NPRL LETTER (5)
DEC	2	42383.0	UTC(ONBA) - UTC(IGMA) =	2505.4	0.1	IGMA LETTER
DEC	11	42392.6	UTC(ONBA) - UTC(IGMA) =	1976.6	0.1	IGMA LETTER
DEC	18	42399.2	UTC(ONBA) - UTC(IGMA) =	2506.2	0.1	IGMA LETTER

(1) UTC(USNO) IS WRITTEN INSTEAD OF UTC(USNO MC)
DPV:DAILY PHASE VALUES,SERIES 4,PUBLISHED BY USNO

(2) AGMC:U.S. AEROSPACE GUIDANCE AND METROLOGY CENTER

(3) ARO:ALGONQUIN RADIO OBSERVATORY,LAKE TRAVERSE,ONTARIO,CANADA

(4) CORRECTION SENT BY ON

(5) COMPARISON CARRIED OUT BY GODDARD SPACE FLIGHT CENTER

TABLE 14 - INDEPENDENT ATOMIC TIMES

AT(I) DENOTES THE ATOMIC TIME OF THE LABORATORY I

UNIT IS ONE MICROSECOND

DATE 1974	MJD	TAI - AT(I) (1)						
		F	NBS (2)	NRC	ON	PTB	RGO	USNO
JAN 2	42049	-61.2	-45125.8	-0.7	19.1	-364.5	25.2	-34399.1
JAN 12	42059	-61.2	-45124.5	-0.4	19.3	-364.4	25.6	-34399.3
JAN 22	42069	-61.3	-45123.4	-0.2	19.5	-364.2	26.0	-34399.3
FEB 1	42079	-61.4	-45122.2	-0.4	19.6	-364.2	26.2	-34399.4
FEB 11	42089	-61.6	-45121.2	-0.2	19.6	-364.1	26.5	-34399.3
FEB 21	42099	-61.7	-45120.1	-0.3	19.7	-363.9	27.0	-34399.2
MAR 3	42109	-61.8	-45118.7	-0.3	19.9	-363.7	27.3	-34399.2
MAR 13	42119	-61.9	-45117.5	-0.3	20.2	-363.4	27.8	-34399.3
MAR 23	42129	-62.2	-45116.2	0.1	20.1	-363.5	28.0	-34399.2
APR 2	42139	-62.2	-45114.9	0.3	20.2	-363.4	28.4	-34399.3
APR 12	42149	-62.3	-45113.8	-0.1	20.3	-363.3	28.8	-34399.4
APR 22	42159	-62.7	-45112.6	-0.7	20.5	-363.3	29.1	-34399.3
MAY 2	42169	-62.9	-45111.4	-0.6	20.5	-363.3	29.4	-34399.4
MAY 12	42179	-63.3	-45110.0	-0.5	20.4	-363.3	29.6	-34399.2
MAY 22	42189	-63.7	-45108.7	-0.1	20.3	-363.3	29.7	-34399.1
JUN 1	42199	-63.9	-45107.9	0.4	20.3	-363.2	30.0	-34399.1
JUN 11	42209	-64.0	-45107.1	0.9	20.3	-363.2	30.3	-34399.0
JUN 21	42219	-64.2	-45106.1	1.1	20.2	-363.2	30.6	-34398.9
JUL 1	42229	-64.4	-45105.0	1.2	20.1	-363.2	30.8	-34398.9
JUL 11	42239	-64.7	-45104.0	1.3	19.9	-363.2	31.0	-34398.8
JUL 21	42249	-65.0	-45103.0	1.4	19.7	-363.2	31.3	-34398.7
JUL 31	42259	-65.2	-45102.0	1.6	19.5	-363.2	31.6	-34398.6
AUG 10	42269	-65.5	-45101.1	1.6	19.2	-363.2	31.8	-34398.5
AUG 20	42279	-65.8	-45100.1	1.4	18.9	-363.3	32.1	-34398.4
AUG 30	42289	-65.9	-45099.2	1.3	18.6	-363.3	32.4	-34398.3
SEP 9	42299	-66.0	-45098.2	1.3	18.3	-363.4	32.6	-34398.1
SEP 19	42309	-66.3	-45097.3	1.1	17.9	-363.5	32.8	-34397.9
SEP 29	42319	-66.5	-45096.4	0.9	17.8	-363.5	33.0	-34397.8
OCT 9	42329	-66.6	-45095.4	0.9	17.8	-363.4	33.3	-34397.8
OCT 19	42339	-66.8	-45094.6	0.5	17.7	-363.4	33.6	-34397.6
OCT 29	42349	-67.0	-45093.6	0.8	17.7	-363.4	33.8	-34397.5
NOV 8	42359	-67.4	-45092.6	1.0	17.6	-363.4	34.0	-34397.3
NOV 18	42369	-67.8	-45091.6	1.3	17.4	-363.4	34.4	-34397.1
NOV 28	42379	-68.2	-45090.8	1.7	17.4	-363.3	34.7	-34396.9
DEC 8	42389	-68.6	-45089.9	1.7	17.3	-363.2	35.0	-34396.7
DEC 18	42399	-69.0	-45088.8	1.7	17.2	-363.1	35.4	-34396.6
DEC 28	42409	-69.4	-45087.8	2.2	17.2	-363.0	35.8	-34396.4

(1) Adjustment of the origins, see p. A-13

(2) NBS Intentional changes were applied to the rate of AT(NBS).
The corresponding changes in relative frequency are (new - old) :
1973 Feb. 1, 0h TAI, -4.5×10^{-13}
1973 May 1, " " , + 0.5 "
1974 Jan. 1, " " , + 0.5 "
1975 Jan. 1, " " , + 4.6 "

TABLE 15 - UNIVERSAL TIME (COORDINATED)

UTC(I) DENOTES THE APPROXIMATION TO UTC KEPT BY THE LABORATORY I

UNIT IS ONE MICROSECOND

DATE 1974		MJD	UTC - UTC(I)(1)						
			ASMW	DHI (2)	DNM (3)	FOA	IEN	ILOM (4)	NBS
JAN	2	42049	-9.6	-3.7	98.2	41.8	-7.2	-19.1	-4.6
JAN	12	42059	-10.1	-3.3	99.4	41.5	-7.7	-20.0	-4.3
JAN	22	42069	-10.1	-3.0	100.9	41.0	-8.2	-21.3	-4.3
FEB	1	42079	-10.4	-2.6	102.1	40.4	-8.4	-21.7	-4.0
FEB	11	42089	-10.0	-2.0	104.0	39.7	-9.0	-22.0	-4.0
FEB	21	42099	-10.1		105.8	39.0	-9.2	-22.3	-3.9
MAR	3	42109	-9.9		107.4	38.5	-9.5	-22.9	-3.5
MAR	13	42119	-9.6		108.8	38.2	-9.9	-23.3	-3.3
MAR	23	42129	-9.8		110.9	37.3	-10.0	-23.6	-2.9
APR	2	42139	-9.9		112.3	36.3	-9.9	-24.4	-2.7
APR	12	42149	-9.6	-1.9	113.8	36.4	-9.9	-25.2	-2.6
APR	22	42159	-10.1	-1.4	115.4	37.5	-10.3	-25.8	-2.4
MAY	2	42169	-10.2	-1.3	117.1	38.5	-10.5	-26.3	-2.1
MAY	12	42179	-10.5	-1.2	118.7	39.5	-11.0	-26.8	-1.7
MAY	22	42189	-10.6	-0.6	120.4	40.1	-10.9	-27.3	-1.5
JUN	1	42199	-10.7	-1.1	0.2	40.3	-10.8	-27.8	-1.6
JUN	11	42209	-10.5	-1.1	-1.2	40.3	-10.8	-28.2	-1.8
JUN	21	42219	-10.7	-1.0	-2.6	40.2	-10.7	-28.4	-1.8
JUL	1	42229	-10.7	-0.9	-3.8	40.3	-10.5	-28.8	-1.7
JUL	11	42239	-10.9	-0.8	-4.9	40.5	-10.9	-29.0	-1.7
JUL	21	42249	-11.0	-0.9	-6.1	40.5	-11.3	-29.2	-1.7
JUL	31	42259	-11.1	-0.8	-7.0	40.4	-11.5	-29.5	-1.7
AUG	10	42269	-11.5	-0.6	-8.2	40.4	-11.1	-29.9	-1.8
AUG	20	42279	-11.7	0.1	1.2	40.3	-11.0	-30.2	-1.8
AUG	30	42289	-11.8	0.5	0.7	40.5	-10.6	-30.3	-1.8
SEP	9	42299	-11.8	1.0	0.0	40.1	-10.3	-30.1	-1.8
SEP	19	42309	-12.1	1.3	-1.2	39.2	-9.6	-30.4	-2.0
SEP	29	42319	-12.1	1.8	-2.4	38.3	-9.8	-30.7	-2.0
OCT	9	42329	-12.8	2.3	-3.7	37.4	-9.7	-31.0	-2.0
OCT	19	42339	-12.5	2.4	-5.2	36.7	-9.4	-31.1	-2.2
OCT	29	42349	-11.7	2.6	-6.3	36.0	-9.6	-30.7	-2.2
NOV	8	42359	-12.0	2.5	-7.1	35.3	-9.8	-31.3	-2.2
NOV	18	42369	-11.1	2.5	-7.6	34.8	-9.8	-31.7	-2.3
NOV	28	42379	-11.1	2.5	-8.5	34.5	-9.7	-32.0	-2.4
DEC	8	42389	-11.2	2.4	-9.1	34.1	-10.1	-32.6	-2.5
DEC	18	42399	-11.7	2.4	-9.6	33.4	-10.5	-33.1	-2.4
DEC	28	42409	-11.4	2.5	-10.2	32.8	-10.9	-33.4	-2.4

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1974	MJD	UTC - UTC(I)(1) NPL	NRC	OMSF (5)	ON	OP	ORB (6)	PTB
JAN 2	42049	-33.3	-0.7	-1.5	19.1	-2.0	-48.8	0.1
JAN 12	42059	-33.5	-0.4	-1.2	19.3	-1.6	-48.3	0.2
JAN 22	42069	-33.9	-0.2	-1.2	19.5	-1.3	-46.6	0.3
FEB 1	42079	-34.2	-0.4	-0.8	19.6	-0.9	-45.4	0.3
FEB 11	42089	-34.4	-0.2	-0.7	19.6	-0.7	-44.0	0.3
FEB 21	42099	-34.9	-0.3	-0.5	19.7	-0.4	-43.0	0.3
MAR 3	42109	-35.2	-0.3	-0.5	19.9	0.0	-41.9	0.4
MAR 13	42119	-35.5	-0.3	-0.4	20.2	0.4	-40.3	0.6
MAR 23	42129	-35.9	0.1	-0.4	20.1	0.5	-39.0	0.4
APR 2	42139	-36.1	0.3	-0.3	20.2	0.9	-37.7	0.4
APR 12	42149	-36.1	-0.1	-0.2	20.3	1.3	-36.2	0.5
APR 22	42159	-36.3	-0.7	-0.3	20.5	1.4	-34.6	0.4
MAY 2	42169	-36.4	-0.6	-0.2	20.5	1.7	-33.5	0.3
MAY 12	42179	-36.8	-0.5	-0.2	20.4	1.9	-32.3	0.2
MAY 22	42189	-37.1	-0.1	-0.3	20.3	2.1	-31.7	0.0
JUN 1	42199	-37.3	0.4	0.0	20.3	2.4	-30.6	0.0
JUN 11	42209	-37.4	0.9	0.4	20.3	2.8	-28.8	-0.0
JUN 21	42219	-37.6	1.1	0.7	20.2	3.1	-27.3	-0.2
JUL 1	42229	-37.8	1.2	0.5	20.1	3.4	-26.2	-0.3
JUL 11	42239	-37.9	1.3	0.3	19.9	3.7	-25.1	-0.4
JUL 21	42249	-38.2	1.4	0.2	19.7	3.9	-23.9	-0.5
JUL 31	42259	-38.2	1.6	0.5	19.5	4.1	-22.8	-0.6
AUG 10	42269	-38.3	1.6	0.4	19.2	4.4	-21.3	-0.6
AUG 20	42279	-38.3	1.4	0.2	18.9	4.7	-20.0	-0.9
AUG 30	42289	-38.5	1.3	0.4	18.6	5.0	-19.3	-1.0
SEP 9	42299	-38.8	1.3	0.5	18.3	5.3	-17.8	-1.1
SEP 19	42309	-38.9	1.1	0.3	17.9	5.5	-16.0	-1.2
SEP 29	42319	-39.2	0.9	0.6	17.8	5.8	-14.7	-1.2
OCT 9	42329	-39.4	0.9	1.3	17.8	6.1	-13.6	-1.2
OCT 19	42339	-39.5	0.5	2.4	17.7	6.3	-12.7	-1.2
OCT 29	42349	-39.8	0.8	3.5	17.7	6.4	-11.6	-1.1
NOV 8	42359	-40.0	1.0	4.0	17.6	6.2	-10.6	-1.1
NOV 18	42369	-40.1	1.3	4.7	17.4	5.9	-9.6	-1.1
NOV 28	42379	-40.4	1.7	5.7	17.4	5.8	-8.5	-1.0
DEC 8	42389	-40.6	1.7	6.2	17.3	5.6	-7.3	-0.9
DEC 18	42399	-40.7	1.7	7.0	17.2	5.4	-6.2	-0.8
DEC 28	42409	-40.8	2.2	7.7	17.2	5.2	-4.7	-0.8

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1974	MJD	UTC - UTC(I) [1] PTCH (7)	RGO (8)	RRL (4)	TAO (4)	TCL (4)	TP	USNO
JAN 2	42049	-2.6	-1.5	-8.2	17.4	33.7	-19.3	0.5
JAN 12	42059	-3.4	-1.6	-7.9	17.6	33.8	-20.0	0.4
JAN 22	42069	-4.6	-1.5	-8.3	16.9	33.6	-20.0	0.3
FEB 1	42079	-5.8	-1.7	-7.8	17.0	34.1	-20.5	0.2
FEB 11	42089	-5.4	-1.8	-7.3	17.2	34.5	-21.1	0.3
FEB 21	42099	-5.9	-1.8	-6.4	17.6	35.4	-21.5	0.4
MAR 3	42109	-9.4	-1.8	-6.1	17.7	35.9	-21.6	0.3
MAR 13	42119	-10.5	-1.7	-5.8	17.9	36.2	-22.5	0.3
MAR 23	42129	-11.8	-1.9	-5.4	18.2	36.3	-22.9	0.5
APR 2	42139	-10.5	-2.0	-5.3	18.0	36.3	-23.7	0.4
APR 12	42149	-11.2	-2.0	-5.4	17.8	36.2	-24.6	0.2
APR 22	42159	-12.5	-2.0	-5.2	17.6	36.3	-25.0	0.2
MAY 2	42169	-12.7	-2.1	-4.9	17.5	37.0	-25.4	0.3
MAY 12	42179	-12.3	-2.3	-4.6	17.5	37.5	-25.6	0.4
MAY 22	42189	-12.3	-2.6	-4.3	17.5	38.2	-26.5	0.5
JUN 1	42199	-11.7	-2.8	-4.2	17.3	38.7	-27.4	0.6
JUN 11	42209	-11.7	-2.8	-4.2	17.0	38.8	-28.2	0.5
JUN 21	42219	-11.8	-2.9	-3.9	16.9	39.4	-29.6	0.6
JUL 1	42229	-11.8	-3.1	-3.7	16.8	40.6	-1.3	0.8
JUL 11	42239	-12.4	-3.2	-3.3	16.6	41.6	-1.1	0.9
JUL 21	42249	-13.4	-3.2	-3.0	16.6	42.7	-1.0	0.9
JUL 31	42259	-14.9	-3.3	-2.7	16.4	43.6	-0.6	1.1
AUG 10	42269	-16.5	-3.3	-2.8	15.9	43.7	-0.7	1.1
AUG 20	42279	-17.6	-3.4	-2.5	15.9	44.5	-0.8	1.2
AUG 30	42289	-18.5	-3.4	-2.3	15.9	45.8	-0.7	1.4
SEP 9	42299	-18.3	-3.5	-1.8	16.0	46.6	-0.5	1.6
SEP 19	42309	-18.0	-3.6	-1.6	15.8	47.8	-0.5	1.7
SEP 29	42319	-16.7	-3.6	-1.6	15.7	48.4	-0.1	1.8
OCT 9	42329	-15.2	-3.6	-1.4	15.7	49.0	-0.2	1.9
OCT 19	42339	-13.7	-3.7	-1.0	15.8	51.6	-0.5	2.0
OCT 29	42349	-12.1	-3.7	-0.2	16.7	54.5	-0.4	2.2
NOV 8	42359	-10.4	-3.8	0.0	16.9	56.7	-0.6	2.3
NOV 18	42369	-8.7	-3.8	0.2	17.2	58.7	-0.6	2.6
NOV 28	42379	-6.8	-3.7	0.2	17.4	57.9	-0.7	2.6
DEC 8	42389	-5.1	-3.7	0.2	17.5	59.5	-0.8	2.8
DEC 18	42399	-3.1	-3.6	0.3	18.0	61.3	-0.6	3.1
DEC 28	42409	-0.7	-3.6	0.4	18.3	62.4	-1.1	3.3

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1974		MJD	UTC - UTC(I) (1) VSL	ZIPE (9)
JAN	2	42049	7.9	0.1
JAN	12	42059	8.6	0.5
JAN	22	42069	9.3	0.9
FEB	1	42079	10.1	1.3
FEB	11	42089	10.7	1.7
FEB	21	42099	11.1	1.8
MAR	3	42109	12.0	1.5
MAR	13	42119	13.0	1.9
MAR	23	42129	13.5	1.7
APR	2	42139	14.0	1.7
APR	12	42149	15.8	1.6
APR	22	42159	17.9	1.3
MAY	2	42169	21.2	1.0
MAY	12	42179	23.1	0.8
MAY	22	42189	25.0	0.6
JUN	1	42199	27.0	0.6
JUN	11	42209	29.2	1.3
JUN	21	42219	31.4	2.0
JUL	1	42229	33.4	-0.5
JUL	11	42239	35.4	-0.5
JUL	21	42249	37.5	-0.4
JUL	31	42259	39.5	-0.4
AUG	10	42269	41.8	-0.6
AUG	20	42279	43.9	-0.6
AUG	30	42289	46.2	-1.0
SEP	9	42299	48.3	-1.1
SEP	19	42309	50.5	-1.1
SEP	29	42319	52.5	-1.7
OCT	9	42329	54.4	-2.2
OCT	19	42339	56.3	-2.1
OCT	29	42349	58.2	-1.5
NOV	8	42359	60.2	-1.5
NOV	18	42369	62.6	-0.9
NOV	28	42379	64.6	-0.4
DEC	8	42389	66.2	-1.0
DEC	18	42399	67.9	-1.4
DEC	28	42409	69.4	-1.2

NOTES

(1) Adjustment of the origins, see p. A-13.

(2) DHI Crystal clock from MJD=42 097 to MJD = 42 148.5.

(3) DNM Changes of master clock on MJD=42 196 and MJD=42 278.

(4) ILOM, RRL, TAO, TCL Uncertainty of ± 5 μs due to the lack of permanent synchronization of the Northwest Pacific LORAN-C chain with UTC(USNO).

(5) OMSF UTC(OMSF) : time step on 1974 Jan. 1, 0h UTC.

(6) ORB UTC(ORB) : time step of -159.185 μs on 1974 Jan. 2, 0h UTC.

(7) PTCH The origin of UTC-UTC(PTCH) is not known ; UTC-UTC(PTCH) = 0 was arbitrarily fixed on 1972 Nov. 18.

(8) RGO UTC(RGO) : time step of + 26.7 μs on 1974 Jan. 1, 0h UTC.

(9) ZIPE UTC(ZIPE) : time step of + 2.7 μs on 1974 July 1, 0h UTC.

TABLE 16 - UNIVERSAL TIME (COORDINATED)(FROM VLF MEASUREMENTS)

UTC(I) DENOTES THE APPROXIMATION TO UTC KEPT BY THE LABORATORY I

UNIT IS ONE MICROSECOND

DATE 1974	MJD	UTC - UTC(I) IGMA (1)	NPRL (2)	URSS (3)
JAN 2	42049	443	144	8
JAN 12	42059	449	171	8
JAN 22	42069	460	201	5
FEB 1	42079	464	209	7
FEB 11	42089	462	216	7
FEB 21	42099	466	221	11
MAR 3	42109	462	218	15
MAR 13	42119	463	216	18
MAR 23	42129	465	217	22
APR 2	42139	467	217	22
APR 12	42149	466	222	29
APR 22	42159	465	222	33
MAY 2	42169	462	226	37
MAY 12	42179	461	225	41
MAY 22	42189	460	225	47
JUN 1	42199	459	227	52
JUN 11	42209	459	227	56
JUN 21	42219	463	229	60
JUL 1	42229	462	229	65
JUL 11	42239	460	230	70
JUL 21	42249	460	228	73
JUL 31	42259	460	229	77
AUG 10	42269	458	227	81
AUG 20	42279	458	224	85
AUG 30	42289	457	224	85
SEP 9	42299	456	222	85
SEP 19	42309	455	219	85
SEP 29	42319	454	217	85
OCT 9	42329	454	214	85
OCT 19	42339	453	214	87
OCT 29	42349	455	211	87
NOV 8	42359	456	212	87
NOV 18	42369	455	205	89
NOV 28	42379	457	203	87
DEC 8	42389	457	200	84
DEC 18	42399	456	190	80
DEC 28	42409	458	175	90

(1) IGMA Origin given by a clock transportation on 1973 March 1.
(2) NPRL Origin given by a clock transportation on 1974 April 9.
(3) URSS Arbitrary origin UTC-UTC(URSS) = 0 for MJD = 41 549.

Table 17 - Comparisons between the clock transportations and the BIH results

The table gives the differences between the clock transportation results and those derived from the data of Table 15 (before rounding-off) for some pairs of laboratories.

Time comparisons		Date	MJD	Difference in μs clock tr.-BIH
UTC-(USNO) -	UTC(DHI)	1974 Aug. 19	42 278.2	-0.2
	UTC(IEN)	1974 Aug. 15	42 274.3	+0.5
	UTC(NBS)	1974 May 24	42 191.6	-0.8
	UTC(NPL)	1974 Aug. 21	42 280.4	-0.2
	UTC(NRC)	1974 May 22	42 189.0	0.0
	UTC(OMSF)	1974 May 16	42 183.3	-0.4
		Oct. 18	42 338.8	-0.7
	UTC(ON)	1974 Oct. 24	42 344.5	+0.6
	UTC(OP)	1974 May 22	42 189.3	+0.1
		Oct. 17	42 337.4	+0.1
	UTC(ORB)	1974 Oct. 29	42 349,3	0.0
	UTC(RGO)	1974 Aug. 20	42 279.3	+0.1
	UTC(RRL)	1974 Mar. 13	42 119.2	+1.5
		Oct. 18	42 338.1	+2.0
	UTC(TAO)	1974 Mar. 13	42 119.2	+1.4
		Oct. 18	42 338.1	+1.9
	UTC(TCL)	1974 Mar. 14	42 120.2	+1.5
	UTC(VSL)	1974 Oct. 30	42 350.3	-0.1
UTC(OP) -	UTC(NBS)	1974 Jul. 5	42 233.6	0.0
		Jul. 19	42 247.1	+0.1
	UTC(OMSF)	1974 May 16	42 183.3	-0.5
		Oct. 18	42 338.8	-0.9
UTC(RGO) -	UTC(DHI)	1974 Aug. 19	42 278.2	-0.3
	UTC(IEN)	1974 Aug. 15	42 274.3	+0.5
	UTC(NPL)	1974 Aug. 21	42 280.4	-0.3
UTC(RRL) -	UTC(TAO)	1974 Mar. 13	42 119.2	-0.1
		Oct. 18	42 338.1	-0.1

TABLE 18 - INTERNATIONAL ATOMIC TIME , BI-MONTHLY RATES OF TAI-CLOCK FOR 1974

THE RATES ARE AVERAGED OVER INTERVALS OF TWO MONTHS ENDING AT THE GIVEN DATES

UNIT IS NS/DAY , 0.0 DENOTES THAT THE CLOCK WAS NOT USED

LAB.	CLOCK	42099	42159	42219	42289	42349	42409
F	12 134	-190.01	-199.85	-236.23	-265.12	-290.70	0.0
F	12 158	105.47	105.45	105.64	0.0	0.0	86.53
F	12 195	-180.99	-168.25	-166.26	-143.36	-149.96	-175.54
F	12 206	-205.75	0.0	0.0	0.0	0.0	0.0
F	12 207	0.0	95.14	72.20	39.70	37.10	12.23
F	12 347	172.96	173.73	160.23	161.38	177.01	153.48
F	12 439	67.70	52.45	0.0	-72.68	-72.99	-80.88
F	12 475	146.90	149.32	156.30	0.0	0.0	146.59
F	12 594	70.08	68.25	66.28	65.38	63.37	52.78
F	14 753	0.0	0.0	0.0	179.99	211.08	207.38
F	99 2	21.49	-24.86	-98.51	0.0	0.0	0.0
FOA	11 55	-3.80	81.04	196.08	168.95	170.20	188.33
FOA	11 200	-107.70	-156.14	-5.88	-25.03	-288.81	-231.13
FOA	14 900	0.0	0.0	0.0	-139.36	-116.94	-109.15
IEN	12 303	0.0	-14.41	-6.01	-148.14	15.48	-70.26
IEN	12 469	0.0	47.21	44.39	11.56	17.44	-19.31
IEN	12 609	0.0	82.16	63.36	0.0	0.0	23.01
IEN	12 893	0.0	0.0	0.0	0.0	-95.71	-109.80
NBS	11 121	0.0	0.0	0.0	0.0	0.0	-162.21
NBS	11 137	0.0	-79.45	-54.47	6.44	-9.14	-17.18
NBS	11 167	-27.86	-18.45	-34.89	-31.69	-30.03	-31.23
NBS	11 169	-112.68	-88.02	-126.61	-80.98	-97.39	-120.01
NBS	12 323	-45.32	-42.06	-55.12	-78.28	-99.48	-81.49
NBS	12 324	168.76	0.0	0.0	0.0	0.0	374.06
NBS	12 352	184.39	187.80	161.38	153.08	139.36	133.88
NBS	12 601	31.74	40.06	30.94	27.34	28.84	33.28
NPL	11 134	304.33	0.0	0.0	0.0	0.0	0.0
NPL	11 334	-32.06	-32.41	-19.66	-3.04	-38.35	-41.30
NPL	12 316	-84.35	-88.80	-96.24	-99.11	-110.79	-113.91
NPL	12 418	-27.80	-22.59	-23.42	-11.91	-20.38	-18.32
NPL	12 832	0.0	11.18	9.98	7.43	-14.06	12.99
NRC	11 217	0.0	46.70	59.93	58.13	59.92	73.86
NRC	12 122	-20.67	8.87	-17.05	-22.96	0.0	-214.84
NRC	12 267	50.20	33.35	44.77	54.87	36.65	47.38
NRC	14 911	0.0	0.0	0.0	0.0	-176.20	0.0
OMSF	12 896	0.0	0.0	0.0	0.0	0.0	42.97
OMSF	13 16	0.0	0.0	-63.88	4.74	0.0	0.0
OMSF	13 17	356.88	283.37	273.23	297.54	0.0	0.0
ON	11 173	-101.54	-101.43	-59.54	31.54	75.38	45.44
ON	12 285	37.42	37.51	26.87	9.37	27.14	26.55
ON	13 14	14.90	6.59	-10.72	-60.01	-73.15	-63.07
ON	14 863	0.0	0.0	53.43	33.19	77.53	55.64
ORB	12 510	0.0	139.57	117.63	119.06	127.33	113.55
PTB	11 274	0.0	0.0	0.0	0.0	0.0	235.70
PTB	12 144	69.43	0.0	0.0	0.0	0.0	0.0

TABLE 18 - (CONT.)

LAB.	CLOCK	42099	42159	42219	42289	42349	42409
PTB	12 320	388.28	0.0	0.0	245.29	237.51	240.00
PTB	12 389	133.55	135.85	127.60	112.82	121.76	126.00
PTB	12 394	-66.49	-71.99	-84.65	-86.11	-102.48	-91.62
PTB	12 395	-98.99	-97.00	-105.77	-109.62	-97.04	-90.61
PTB	12 462	-182.67	-177.76	-177.92	-170.35	-169.68	-163.12
PTCH	13 23	-71.11	-83.78	16.87	-106.68	112.10	186.07
RGO	11 123	0.0	0.0	0.0	0.0	-171.46	0.0
RGO	11 199	92.10	92.77	101.21	111.01	121.26	124.32
RGO	12 202	-41.54	-72.28	-81.16	-66.24	-82.38	-86.42
RGO	12 348	1.62	-8.66	-24.96	-9.33	-43.69	-36.50
RGO	12 484	406.54	409.60	410.44	413.99	402.22	399.16
TP	12 335	44.85	23.24	10.43	11.31	4.31	-7.90
USNO	11 276	-391.95	-450.91	-423.99	-443.39	-463.19	-488.32
USNO	11 282	0.0	0.0	322.81	0.0	0.0	0.0
USNO	12 147	152.44	158.28	167.05	187.25	210.18	196.84
USNO	12 345	148.88	0.0	0.0	0.0	0.0	0.0
USNO	12 346	324.33	320.03	342.37	335.12	340.82	335.28
USNO	12 405	-62.87	-75.34	-92.00	0.0	0.0	0.0
USNO	12 444	-118.34	-111.00	-128.26	-148.24	-133.55	-121.22
USNO	12 497	266.23	244.99	263.66	285.82	0.0	0.0
USNO	12 532	2.76	5.65	21.91	30.02	38.18	44.36
USNO	12 546	-307.62	-303.02	-309.50	-325.19	-320.78	-305.66
USNO	12 549	-50.43	-56.27	-48.87	-48.02	-44.34	-45.39
USNO	12 573	26.79	22.03	73.38	0.0	0.0	0.0
USNO	12 577	-215.34	0.0	0.0	0.0	0.0	0.0
USNO	12 583	0.0	-692.75	0.0	0.0	0.0	0.0
USNO	12 591	72.24	66.40	74.44	55.70	54.42	63.62
USNO	12 592	327.16	333.71	327.70	307.81	296.12	316.11
USNO	14 431	-36.78	-46.02	0.0	0.0	0.0	0.0
USNO	14 571	137.59	141.06	144.36	144.29	145.54	146.21
USNO	14 651	124.42	109.35	101.61	93.19	82.68	62.92
USNO	14 653	-43.65	-38.93	-29.52	-23.64	-9.74	2.90
USNO	14 654	-151.07	-150.32	-132.56	-120.98	-108.45	-98.83
USNO	14 656	156.66	149.36	162.11	172.50	183.91	167.25
USNO	14 660	-44.70	-44.13	-24.93	4.44	2.96	-7.31
USNO	14 783	0.0	0.0	0.0	-40.04	-37.17	-40.41
USNO	14 834	0.0	35.05	45.04	50.58	48.85	43.72
USNO	14 837	0.0	-15.71	-13.56	-12.50	-6.73	1.54
USNO	14 862	0.0	0.0	-114.61	0.0	0.0	0.0
USNO	14 873	0.0	0.0	76.39	0.0	0.0	0.0
USNO	14 875	0.0	0.0	-12.05	17.16	0.0	0.0
VSL	12 503	65.31	103.85	215.09	211.01	200.67	188.34

NOTE - THE CLOCKS ARE DESIGNATED BY THEIR MODEL (2 DIGITS) AND SERIAL NO. THE CODES FOR THE MODELS ARE
11 HEWLETT-PACKARD 5060A 12 HEWLETT-PACKARD 5061A
13 EBAUCHES OSCILLATOM. 14 HEWLETT-PACKARD 5061A , OPTION 4
99 PROTOTYPE (HEWLETT-PACKARD TUBE)

TABLE 19 - INTERNATIONAL ATOMIC TIME , WEIGHTS OF THE CLOCKS FOR 1974

THE WEIGHTS ARE GIVEN FOR INTERVALS OF TWO MONTHS ENDING AT THE GIVEN DATES

*** DENOTES THAT THE CLOCK WAS NOT USED

LAB.	CLOCK	42099	42159	42219	42289	42349	42409
F	12 134	18	20	10	6	5	***
F	12 158	100	100	100	***	***	0
F	12 195	0	78	100	31	39	46
F	12 206	23	***	***	***	***	***
F	12 207	***	0	23	10	11	9
F	12 347	95	100	90	100	86	71
F	12 439	8	16	***	0	100	100
F	12 475	12	10	10	***	***	0
F	12 594	60	78	100	100	100	96
F	14 753	***	***	***	0	13	25
F	99 2	1	1	0	***	***	***
FOA	11 55	15	0	0	1	1	2
FOA	11 200	14	8	0	3	0	1
FOA	14 900	***	***	***	0	25	29
IEN	12 303	***	0	100	0	0	0
IEN	12 469	***	0	100	19	24	12
IEN	12 609	***	0	35	***	***	0
IEN	12 893	***	***	***	***	0	63
NBS	11 121	***	***	***	***	***	0
NBS	11 137	***	0	21	0	5	7
NBS	11 167	55	54	85	89	100	100
NBS	11 169	5	5	11	26	36	30
NBS	12 323	31	27	27	42	18	19
NBS	12 324	100	***	***	***	***	0
NBS	12 352	47	47	48	52	29	20
NBS	12 601	100	100	99	100	100	100
NPL	11 134	59	***	***	***	***	***
NPL	11 334	54	67	68	45	49	49
NPL	12 316	27	29	87	100	94	72
NPL	12 418	100	100	100	92	100	100
NPL	12 832	***	0	100	100	58	65
NRC	11 217	***	0	75	100	100	89
NRC	12 122	2	1	1	2	***	0
NRC	12 267	63	27	34	67	74	96
NRC	14 911	***	***	***	***	0	***
OMSF	12 896	***	***	***	***	***	0
OMSF	13 16	***	***	0	0	***	***
OMSF	13 17	3	0	5	6	***	***
ON	11 173	12	38	18	0	2	2
ON	12 285	100	100	96	84	82	94
ON	13 14	36	35	62	12	6	7
ON	14 863	***	***	0	34	15	25
ORB	12 510	***	0	26	50	80	84
PTB	11 274	***	***	***	***	***	0
PTB	12 144	83	***	***	***	***	***

TABLE 19 - (CONT.)

LAB.	CLOCK	42099	42159	42219	42289	42349	42409
PTB	12 320	16	***	***	0	100	100
PTB	12 389	100	100	100	90	99	100
PTB	12 394	44	39	33	57	59	58
PTB	12 395	100	100	99	100	92	100
PTB	12 462	100	100	100	100	100	100
PTCH	13 23	0	2	0	0	0	0
RGO	11 123	***	***	***	***	0	***
RGO	11 199	100	100	100	95	54	51
RGO	12 202	51	45	43	52	44	36
RGO	12 348	100	99	53	80	33	32
RGO	12 484	92	100	100	100	94	100
TP	12 335	16	15	13	15	36	30
USNO	11 276	11	2	7	8	10	9
USNO	11 282	***	***	0	***	***	***
USNO	12 147	88	100	100	66	22	19
USNO	12 345	7	***	***	***	***	***
USNO	12 346	56	60	74	87	100	100
USNO	12 405	21	23	26	***	***	***
USNO	12 444	100	100	82	65	59	58
USNO	12 497	96	44	42	38	***	***
USNO	12 532	72	78	85	76	50	34
USNO	12 546	0	100	100	88	100	87
USNO	12 549	77	85	100	100	100	100
USNO	12 573	17	17	17	***	***	***
USNO	12 577	24	***	***	***	***	***
USNO	12 583	***	0	***	***	***	***
USNO	12 591	72	93	100	82	93	98
USNO	12 592	69	69	70	80	35	49
USNO	14 431	1	1	***	***	***	***
USNO	14 571	93	100	100	100	100	100
USNO	14 651	38	22	14	12	15	22
USNO	14 653	46	49	43	51	55	32
USNO	14 654	66	94	65	49	34	21
USNO	14 656	33	47	50	76	62	67
USNO	14 660	96	100	59	16	15	20
USNO	14 783	***	***	***	0	100	100
USNO	14 834	***	0	98	100	100	100
USNO	14 837	***	0	100	100	100	100
USNO	14 862	***	***	0	***	***	***
USNO	14 873	***	***	0	***	***	***
USNO	14 875	***	***	0	14	***	***
VSL	12 503	99	11	0	1	2	2

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13 EBAUCHES OSCILLATOM. 14 HEWLETT-PACKARD 5061A , OPTION 4
99 PROTOTYPE (HEWLETT-PACKARD TUBE)

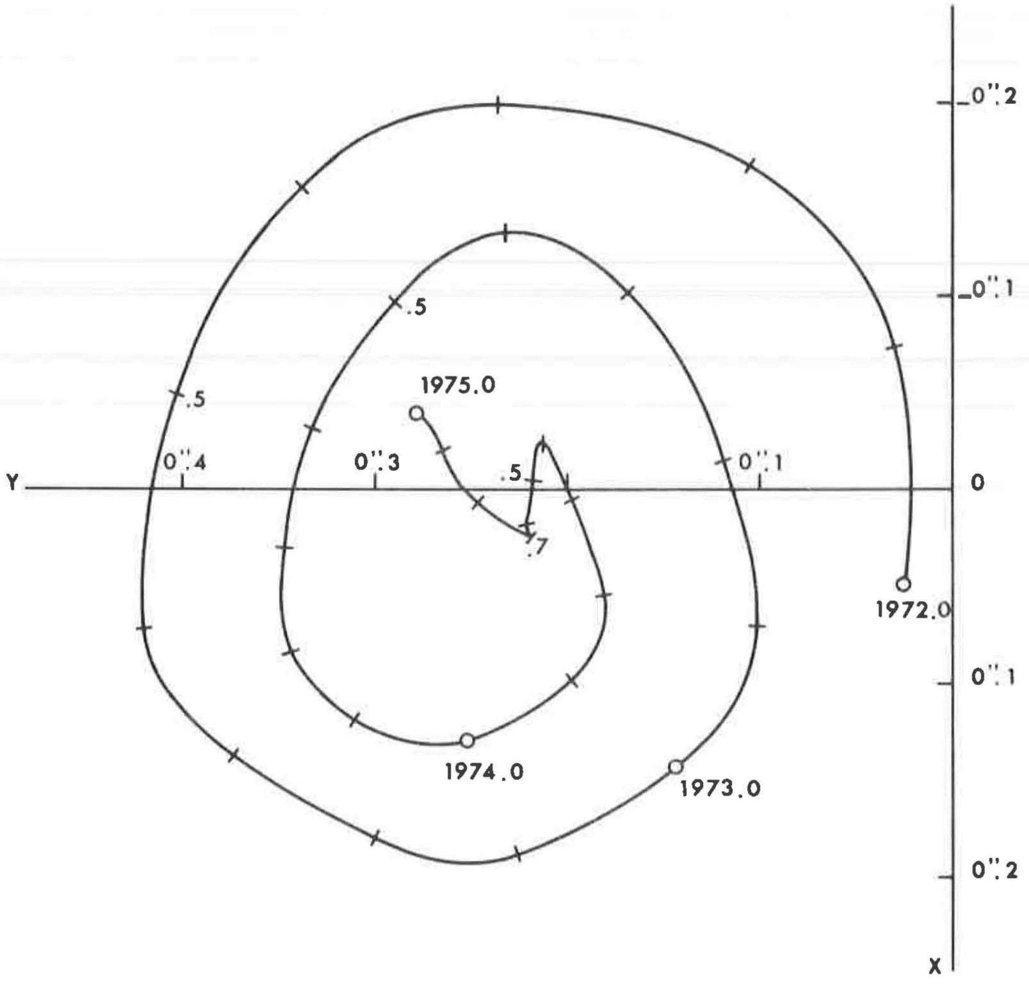


Fig. 1 - Path of the pole from 1972.0 to 1975.0
Smoothed values of Tables 6C, obtained by Vondrak's method, with the coefficient of smoothing which equalizes the internal and external deviations in x and y.

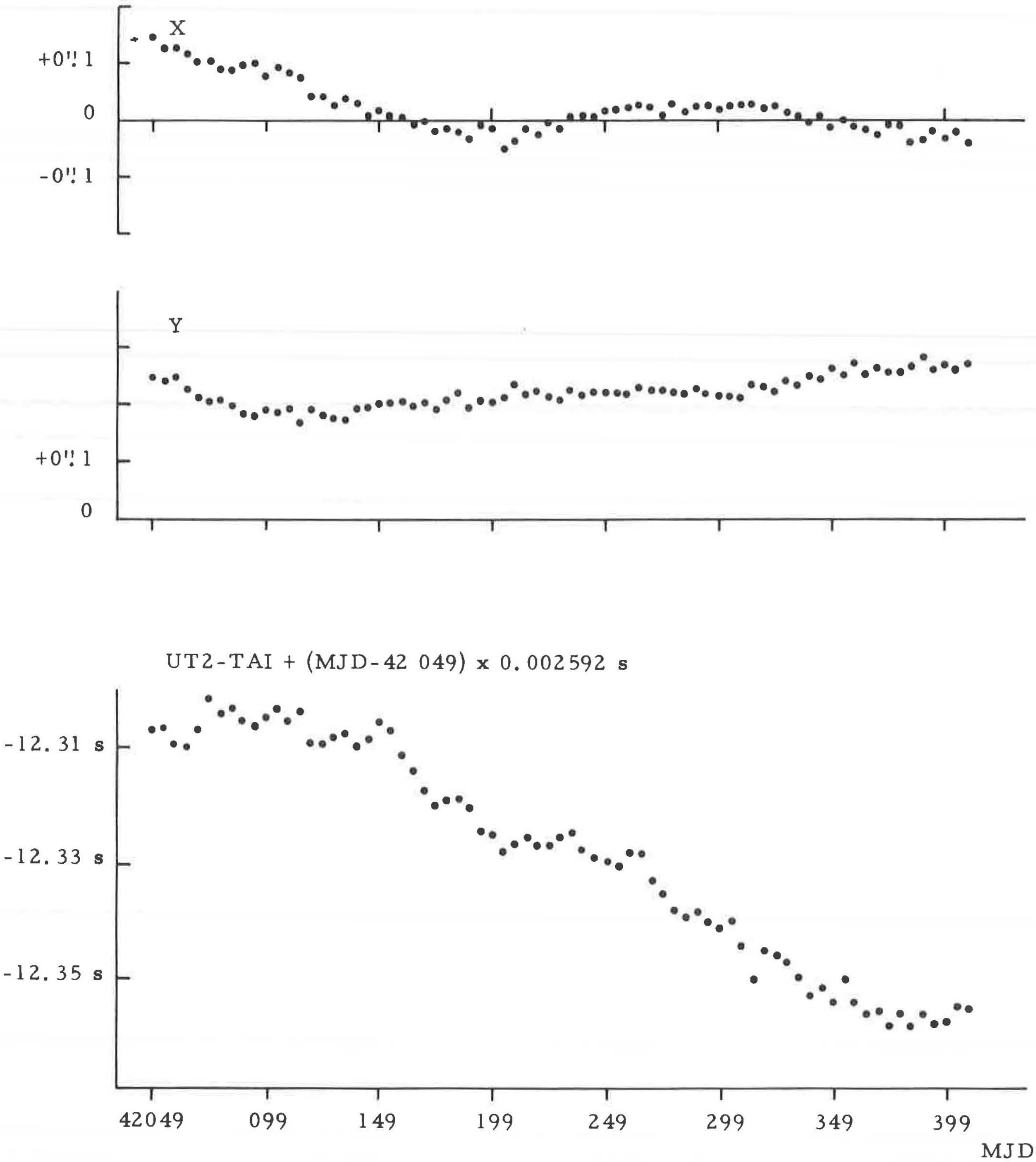


Fig. 2 - Raw data of x, y, UT2-TAI(table 6C for 1974), for every 5 days.

PART C

TIME SIGNALS

The time signals, unless otherwise stated, follow the UTC system described thereafter.

The Part C is based on the information received until April 1975.

INTERNATIONAL RADIO CONSULTATIVE COMMITTEE RECOMMENDATION 460 (GENEVA, 1974)*

STANDARD-FREQUENCY AND TIME-SIGNALS EMISSIONS

(Question 1/7)

(1970-1974)

The C.C.I.R.,

CONSIDERING

a) that the Administrative Radio Conference, Geneva, 1959, allocated the frequencies 20 kHz ± 0.05 kHz, 2.5 MHz ± 5 kHz (2.5 MHz ± 2 kHz in Region 1), 5 MHz ± 5 kHz, 10 MHz ± 5 kHz, 15 MHz ± 10 kHz, 20 MHz ± 10 kHz to the standard frequency and time signal service and 25 MHz ± 10 kHz, requesting the C.C.I.R. to study the question of establishing and operating a world-wide standard-frequency and time-signal service ;

b) that additional standard frequencies and time signals are emitted in other frequency bands ;

c) the provisions of Article 44, Section IV, of the Radio Regulations ;

d) the continuing need for close cooperation between Study Group 7 and Intergovernmental Maritime Consultative Organization (I.M.C.O.), International Civil Aviation Organization (I.C.A.O.), the General Conference on Weights and Measures (C.G.P.M.) and the International Time Bureau (B.I.H.) and the concerned unions of International Council of Scientific Unions (I.C.S.U.) ;

e) the desirability of maintaining world-wide co-ordination of standard-frequency and time-signal emissions ;

f) the need to disseminate standard-frequencies and time signals in conformity with the second as defined by the 13th General Conference of Weights and Measures (1967) ;

g) the continuing need to make Universal Time (UT) immediately available to an accuracy of one-tenth of a second ;

UNANIMOUSLY RECOMMENDS :

1. that all standard-frequency and time-signal emissions conform as closely as possible to Coordinated Universal Time (UTC) (see Annex I) ; that the time signals should not deviate from UTC by more than one millisecond ; that the standard frequencies should not deviate by more than 1 part in 10^{10}, and that the time signals emitted from each transmitting station should bear a known relation to the phase of the carrier ;

* In the text of the Recommendation, "coordinated universal time" should read "Universal Time (Coordinated)" in accordance with the recommendations by the Comité International des Poids et Mesures, october 1974.

2. that all standard frequency and time signal emissions should contain information on the difference between UT1 and UTC (see Annex II) ;
3. that this document be transmitted by the Director, C.C.I.R. to all Administrations Members of the I.T.U., to I.M.C.O., I.C.A.O., the C.G.P.M., the B.I.H., International Union of Geodesy and Geophysics (I.U.G.G.), International Union of Radio Science (U.R.S.I.) and International Astronomical Union (I.A.U.) ;
4. that the standard-frequency and time-signal emissions should conform to items 1 and 2 above, from 1 January 1975*.

ANNEX I

TIME SCALES

A. Universal Time (UT).

In applications in which an imprecision of a few hundredths of a second cannot be tolerated, it is necessary to specify the form of UT which should be used :

UTO is the mean solar time of the prime meridian obtained from direct astronomical observation ;

UT1 is UTO corrected for the effects of small movements of the Earth relative to the axis of rotation (polar variation) ;

UT2 is UT1 corrected for the effects of a small seasonal fluctuation in the rate of rotation of the Earth ;

UT1 is used in this document, since it corresponds directly with the angular position of the Earth around its axis of diurnal rotation. GMT may be regarded as the general equivalent of UT.

B. International Atomic Time (TAI)

The international reference scale of atomic time (TAI), based on the second (SI), as realized at sea-level, is formed by the Bureau International de l'Heure (B.I.H.) on the basis of clock data supplied by cooperating establishments. It is in the form of a continuous scale, e.g. in days, hours, minutes and seconds from the origin 1 January 1958 (adopted by the C.G.P.M. 1971).

C. Coordinated Universal Time (UTC)

UTC is the time-scale maintained by the B.I.H. which forms the basis of a coordinated dissemation of standard frequencies and time signals. It corresponds exactly in rate with (TAI) but differs from it by an integral number of seconds.

The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap seconds) to ensure approximate agreement with UT1.

D. DUT1

The value of the predicted difference UT1-UTC, as disseminated with the time signals is denoted DUT1, thus DUT1 ≈ UT1 - UTC. DUT1 may be regarded as a correction to be added to UTC to obtain a better approximation to UT1.

* Until 1 January 1975 Report 517 is valid ; after this date the Report should be considered as cancelled.

OPERATIONAL RULES

The values of DUT1 are given by B.I.H. in integral multiples of 0.1 s.

The following operational rules apply :

1. Tolerances

1.1 The magnitude of DUT1 should not exceed 0.8 s.

1.2 The departure of UTC from UT1 should nos exceed ± 0.9 s*.

1.3 The deviation of (UTC plus DUT1) from UT1 should not exceed ± 0.1 s.

2. Leap seconds

2.1 A positive or negative leap second, should be the last second of a UTC month, but first preference should be given to the end of December and June, and second preference be given to the end of March and September.

2.2 A positive leap second begins at $23^h59^m60^s$ and ends at $0^h0^m0^s$ of the first day of the following month. In the case of a negative leap second, $23^h59^m58^s$ will be followed one second later by $0^h0^m0^s$ of the first day fo the following month (See Annex III).

2.3 The BI.H. should decide upon and announce the introduction of a leap second, such an announcement to be made at least eight weeks in advance.

3. Value of DUT1

3.1 The B.I.H. is requested to decide upon the value of DUT1 and its date of introduction and to circulate this information one month in advance**.

3.2 Administrations and organisations should use the B.I.H. value of DUT1 for standard-frequency and time-signal emissions, and are requested to circulate the information as widely as possible in periodicals, bulletins, etc.

3.3 Where DUT1 is disseminated by code, the code should be in accordance with the following principles (except see item 3.5) :
- the magnitude of DUT1 is specified by the number of emphasized seconds markers and the sign of DUT1 is specified by the position of the emphasized seconds markers with respect to the minute marker. The absence of emphasized markers indicates DUT1 = 0 ;
- the coded information should be emitted after each indentified minute.

Full details of the code aregiven in Annex II.

3.4 Alternatively, DUT1 may be given by voice or in Morse code.

3.5 DUT1 information primarily designed for, and used with, automatic decoding equipment may follow a different code but should be emitted after each identified minute.

3.6 In addition, UT1 -UTC may be given to the same or higher precision by other means, for example, in morse code or voice, by messages associated with maritime bulletins, weather forecasts, etc. ; announcements of forthcoming leap seconds may also be made by these methods.

3.7 The B.I.H. is requested to continue to publish in arrears definitive values of the differences UT1 -UTC, UT2 - UTC.

* The difference between the maximum value of DUT1 and the maximum departure of UTC from UT1 represents the allowable deviation of (UTC + DUT1) from UT1 and is a safeguard for the B.I.H. against unpredictable changes in the rate of rotation of the Earth.

** In exceptional cases of sudden change in the rate of rotation of the Earth, the B.I.H. may issue a correction not later than two weeks in advance of the date of its introduction.

ANNEX II

CODE FOR THE TRANSMISSION OF DUT1

A positive value of DUT1 is indicated by emphasizing a number (n) of consecutive seconds markers following the minute marker from seconds marker one to seconds marker (n) inclusive ; (n) being an integer from 1 to 8 inclusive.

$$DUT1 = (n \times 0.1)s$$

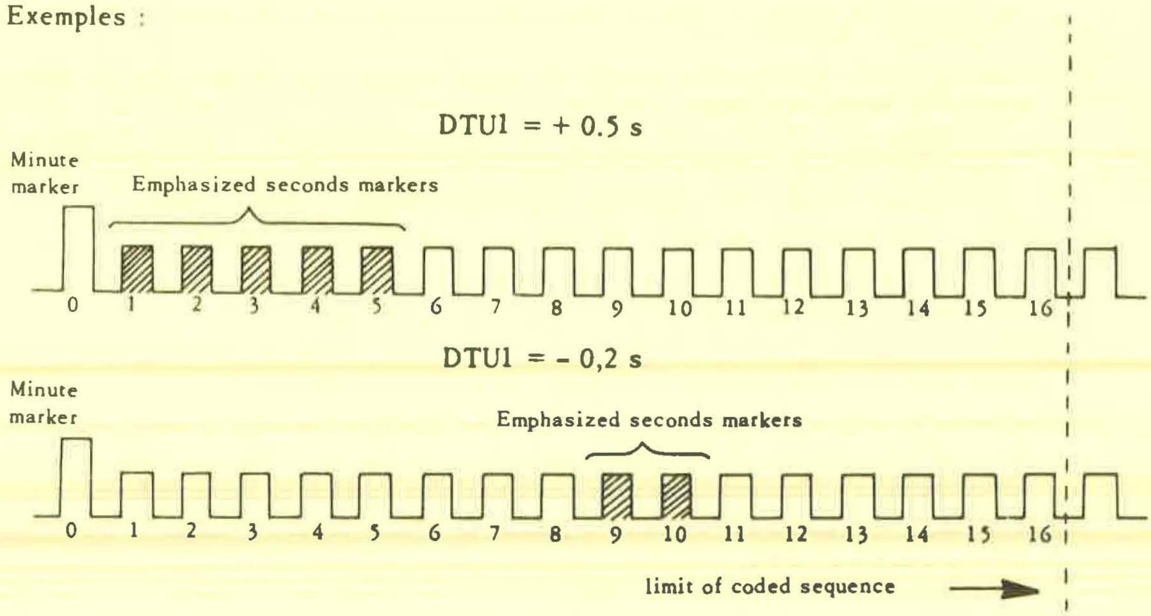
A negative value of DUT1 is indicated by emphasizing a number (m) of consecutive seconds markers following the minute marker from seconds marker nine to seconds marker (8 + m) inclusive ; (m) being an integer from 1 to 8 inclusive.

$$DUT1 = -(m \times 0.1)\ s$$

A zero value of DUT1 is indicated by the absence of emphasized seconds markers.

The appropriate seconds markers may be emphasized for exemple by lengthening, doubling, splitting, or tone modulation of the normal seconds markers.

Exemples :

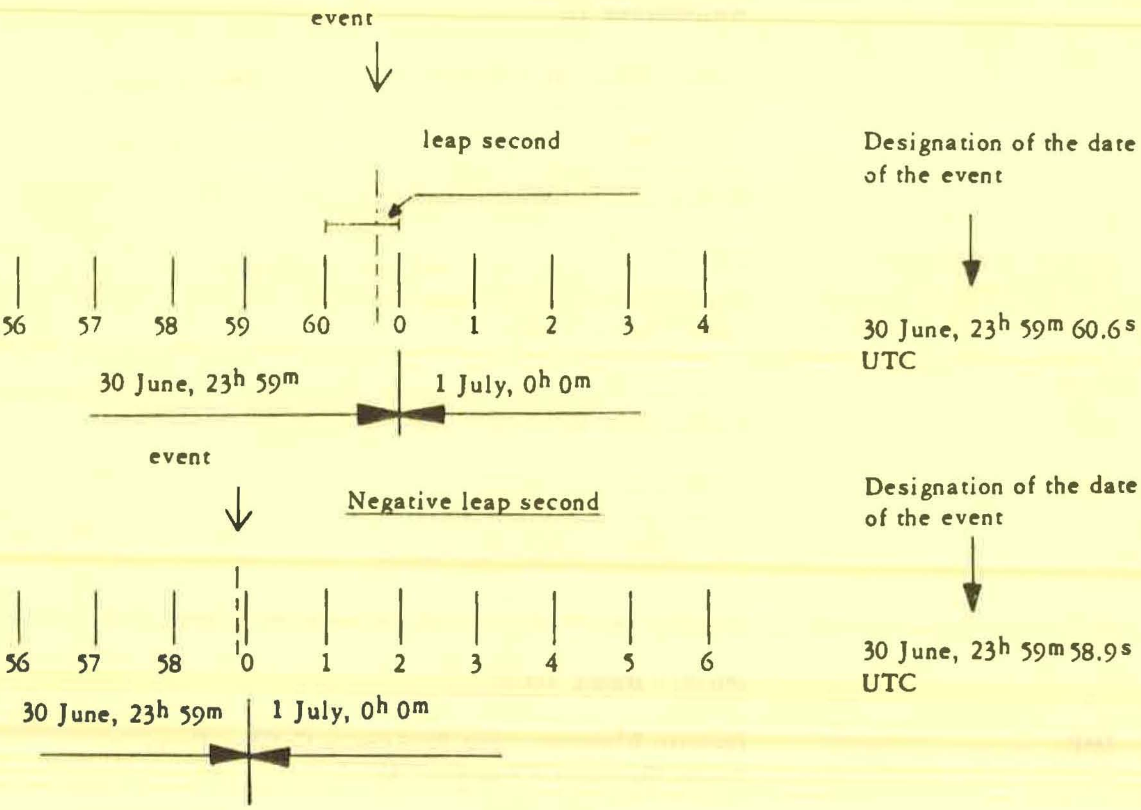


ANNEX III

DATING OF EVENTS IN THE VICINITY OF A LEAP SECOND

The dating of events in the vicinity of a leap second shall be effected in the manner indicated in the following figures :

Positive leap second



AUTHORITIES RESPONSIBLE FOR THE TIME SIGNAL EMISSIONS

Signal	Authority
CHU	National Research Council, Time and Frequency Section Physics Division (M-36) **Ottawa K1A 0S1**, Ontario, Canada, Attn : Dr. C.C. Costain
DAM, DAN, DAO	Deutsches Hydrographisches Institut **2 Hamburg 4**, Federal Republic of Germany.
DCF77	Physikalisch-Technische Bundesanstalt, Laboratorium 1.22 **33 Braunschweig** Bundesallee 100, Federal Republic of Germany.
DGI, DIZ	Amt für Standardisierung, Messwesen und Warenprüfung Fachabteilung Elektrizität Arbeitsgebiet Zeit und Frequenznormale DDR **1026 Berlin** Wallstrasse 16
FFH	Centre National d'Etudes des Télécommunications Groupement Etudes spatiales et Transmissions Département Dispositifs et Ensembles fonctionnels 38, rue du Général Leclerc **92131 Issy-les-Moulineaux**, France.
FTA91, FTH42 FTK77, FTN87	Observatoire de Paris, Service de l'Heure, 61, avenue de l'Observatoire, **75014 Paris**, France.
GBR MSF	National Physical Laboratory, Electrical Science Division **Teddington**, Middlesex, United Kingdom.
HBG	Service horaire HBG Observatoire Cantonal, CH - **2000 Neuchâtel**, Suisse.
IAM	Istituto Superiore Poste e Telecomunicazioni Viale di Trastevere, 189 00100 - **Roma**, Italy
IBF	Istituto Elettrotecnico Nazionale Galileo Ferraris Corso Massimo d'Azeglio, 42 10125 - **Torino**, Italy
JJY	Frequency Standard Division The Radio Research Laboratories Ministry of Posts and Telecommunications Midori-cho, Koganei, **Tokyo 184**, Japon

Signal	Authority
LOL	Director Observatorio Naval Av. Costanera Sur, 2099 **Buenos Aires**, Republica Argentina.
LQB9, LQC20	Servicio internacional de la Hora Sección Conservación de la Hora Gral. Savio 865 Villa Maipú **San Martin**, Pcia. de Buenos Aires Republica Argentina.
NBA, NDT, NPG, NPM, NPN, NSS, NWC	Superintendant U.S. Naval Observatory **Washington**, D.C. 20390 U.S.A.
OLB5, OMA	1° - Time information : Astronomický Ústav ČSAV, Budečská 6, 120 23 **Praha 2**, Vinohrady, Czechoslovakia. 2° - Standard frequency information : Ústav radiotechniky a elektroniky ČSAV, Lumumbova 1, 180 88 **Praha 8**, Kobylisy, Czechoslovakia.
PPE, PPR	Serviço da Hora Observatorio Nacional Rua General Bruce, 586 **2000 Rio de Janeiro**. GB.ZC. -08, Brasil.
RAT, RCH, RES RID, RIM, RKM RWM	Comité d'Etat des Normes Conseil des Ministres de l'URSS **Moscou 117049**, USSR, Leninski prosp., 9.
VNG	Time and Frequency Standards Section A.P.O. Research Laboratories 59 Little Collins Street **Melbourne**, VIC. 3000, Australia
WWV, WWVH WWVB	Time and Frequency Services Section Time and Frequency Division National Bureau of Standards **Boulder**, Colorado 80302, U.S.A.
YVTO	Direccion de Hidrografia y Navegacion Observatorio Cagigal Apartado Postal N° 6745 **Caracas**, Venezuela
ZUO	National Physical Research Laboratory P.O. Box 395 **Pretoria** South Africa

Time-Signals emitted in the UTC system

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
CHU	Ottawa Canada +45° 18' +75° 45'	3330 7335 14670	continuous	Second pulses of 300 cycles of a 1 kHz modulation. Minute pulses are 0.5 s long. A bilingual (Fr.-Eng.) announcement of time is made each minute. DUT1 : CCIR code by split pulses
DAM	Elmshorn Germany, F.R. +53° 46' - 9° 40'	8638.5 16980.4 4265 8638.5 6475.5 12763.5	} 11 h 55 m to 12 h 6 m } 23 h 55 m to 24 h 6 m from 21 Sept. to 20 March } 23 h 55 m to 24 h 6 m from 21 March to 20 Sept.	New international system, then second pulses from minutes 0.5 to 6.0 (minute pulses prolonged). A1 type. DUT1 : CCIR code by doubling, after minute pulses 1 to 5
DAN	Osterloog Germany, F.R. +53° 38' - 7° 12'	2614	11 h 55 m to 12 h 6 m 23 h 55 m to 24 h 6 m	As DAM (see above)
DAO	Kiel Germany, F.R. +54° 26' -10° 8'	2775	11 h 55 m to 12 h 6 m 23 h 55 m to 24 h 6 m	As DAM (see above)
DCF77	Mainflingen Germany, F.R. +50° 1' - 9° 0'	77.5	continuous, except second Tuesday of every month from 4 h to 8 h	The second marks are reduction to 1/4 of the carrier's amplitude of 0.1 s duration ; the reference point is the beginning of the pulse modulation. The second 59 marker is omitted Time code in BCD (year, month, day, hour, minute, day of the week) by lengthening second marks from marks N° 20 to N° 58 every minute. DUT1 : CCIR code by lengthening to 0.2 s
DGI	Oranienburg Germ.Dem.Rep. +52° 48' -13° 24'	185	5 h 59 m 30 s to 6 h 00 m 11 h 59 m 30 s to 12 h 00 m 17 h 59 m 30 s to 18 h 00 m	A2 type second pulses of 0.1 s duration for seconds 30-40, 45-50, 55-60. The last pulse is prolonged.
DIZ (1) see p. C-15	Nauen Germ.Dem.Rep. +52° 39' -12° 55'	4525	continuous except from 8 h 15 m to 9 h 45 m for maintenance if necessary	A1 type second pulses of 0.1 s duration. Minute pulses prolonged to 0.5 s. DUT1 : CCIR code by double pulse.
FFH	Ste Assise France +48° 33' - 2° 34'	2500	continuous from 8 h to 16 h 25	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses prolonged to 0.5 s. DTU1 : CCIR code by lengthening to 0.1 s.
FTA91	Saint-André-de-Corcy France +45° 55' - 4° 55'	91.15	at 8 h, 9 h, 9 h 30 m, 13 h, 20 h, 21 h, 22 h 30 m.	A1 type second pulses during the 5 minutes preceding the indicated times. Minute pulses are prolonged. DTU1 : in Morse code
FTH42 FTK77 FTN87	Pontoise France +49° 4' - 2° 7'	7428 10775 13873	at 9 h and 21 h at 8 h and 20 h at 9 h 30 m, 13 h, 22 h 30 m	A1 type second pulses during the 5 minutes preceding the indicated times. Minute pulses are prolonged. DUT1 : in Morse code.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
GBR	Rugby United Kingdom +52° 22' + 1° 11'	16	at 3 h, 9 h, 15 h, 21 h	A1 type second pulses during the 5 minutes preceding the indicated times. DUT1 : CCIR code by double pulse
HBG	Prangins Switzerland +46° 24' - 6° 15'	75	continuous	Interruption of the carrier at the beginning of each second, during 100 ms. The minutes are identified by a double pulse, the hours by a triple pulse. No transmission of DUT1
IAM	Rome Italy +41° 52' -12° 27'	5000	10 m every 15 m from 7 h 30 m to 8 h 30 m and from 13 h to 14 h except Sat. afternoon and Sun. Advanced by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses of 20 cycles (Announcements 5 m before the emission of time signals).
IBF	Torino Italy +45° 2' - 7° 42'	5000	During 15 m preceding 7 h, 9 h, 10 h, 11 h, 12 h, 13 h, 14 h, 15 h, 16 h, 17 h, 18 h. Advanced by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. These pulses are repeated 7 times at the minute. Voice announcements at the beginning and end of each emission. Time announcement by Morse Code every ten minutes beginning at 0 h 0 m.. DUT1 : CCIR code by double pulse.
JG2AS	Chiba Japan + 35° 38' -140° 4'	40	from 23 h 30 m to 8 h (exc. Sun.) and from 8 h to 23 h 30 on Monday. Interruptions during communications.	A1 type second pulses of 0.5 sec. duration. Second 59 is omitted. No DUT1 code.
JJY	Koganei Japan +35° 42' - 139° 31'	2500 5000 10000 15000	continuous, except interruptions between minutes 25 and 34.	Second pulses of 8 cycles of 1600 Hz modulation. Minute pulses are preceded by a 600 Hz modulation. DUT1 : CCIR code by lengthening
LOL1	Buenos-Aires Argentina -34° 37' + 58° 21'	5000 10000 15000	11 h to 12 h, 14 h to 15 h, 17 h to 18 h, 20 h to 21 h 23 h to 24 h	Second pulses of 5 cycles of 1000 Hz modulation. Second 59 is omitted. Announcement of hours and minutes every 5 minutes, followed by 3 m of 1000 Hz and 440 Hz modulation. DUT1 : CCIR code by lengthening
LOL2 LOL3	Buenos-Aires Argentina -34° 37' +58° 21'	8030 17180	1 h, 13 h, 21 h	A1 second pulses during the 5 minutes preceding the indicated times. Minute pulses are prolonged. DUT1 : CCIR code by double pulse
LQB9 LQC20	Planta Gral Pacheco - 34° 26' + 58° 37'	8167.5 17551.5	22 h 5 m, 23 h 50 m 10 h 5 m, 11 h 50 m	A1 second pulses during the 5 minutes preceding the indicated times. Second 59 is omitted, second 60 is prolonged. After the emission, OK is transmitted if the emission is correct, NV if not correct DUT1 : CCIR code by omission of second markers.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
MSF	Rugby United Kingdom + 52° 22' + 1° 11'	60	continuous except for an interruption for maintenance from 10 h 0 m to 14 h 0 m on the first Tuesday in each month	Interruptions of the carrier of 100 ms for the second pulses, of 500 ms for the minute pulses. The signal is given by the the beginning of the interruption. DUT1 : CCIR code by double pulse
MSF	Rugby United Kingdom + 52° 22' + 1° 11'	2500 5000 10000	between minutes 0 and 5, 10 and 15, 20 and 25, 30 and 35, 40 and 45, 50 and 55	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses are prolonged. DUT1 : CCIR code by double pulse
NBA (2)	Summit Canal Zone + 9° 3' + 79° 39'	24	Every even hour except 24 h and during Monday maintenance (12 h to 18 h)	Experimental FSK second pulses on 24 kHz. See (2), p. C-15. DUT1 : by Morse Code, each minute between seconds 56 and 59
NDT	Yosami Japan + 32° 58' - 137° 1'	17.4	to be determined	To be determined
NPG	Dixon, CA. USA + 38° 23' + 121° 46'	3268 6428.5 9277.5 12966	6 h, 12 h, 18 h, 24 h	CW second pulses during 5 minutes preceding the indicated times on the American Code time format DUT1 : by Morse Code, each minute between seconds 56 and 59
NPM	Lualualei, HI USA + 21° 25' + 158° 9'	4525 9050 13655 16457.5 22593	TIME SIGNALS SUSPENDED INDEFINITELY.	
NPN	Barragada Guam + 13° 28' - 144° 50'	4955 8150 13380 21760	TIME SIGNALS SUSPENDED INDEFINITELY.	
NSS (2)	Annapolis, MD USA + 38° 59' + 76° 27'	21.4		Experimental FSK second pulses on 21.4 kHz when transmissions resume. See (2) p. C-15.
		88 8090 12135	5 h, 11 h, 17 h, 23 h (on Tuesday 17 h the frequency 134.9 kHz replaces 88 kHz)	CW second pulses during 5 minutes preceding the indicated times on the American Code time format.
		20225 25590	17 h, 23 h	DUT1 : by Morse Code, each minute between seconds 56 and 59

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
NWC (2)	Exmouth Australia - 21° 48' -114° 9'	22.3	Keyed from 28 to 30 minutes after every other even hour beginning 0 h UT	Experimental FSK second pulses during the indicated times on the American Code time format. DUT1 : by Morse Code, between seconds 56 and 58. See (2) p.C-15
OLB5	Poděbrady Czechoslovakia + 50° 9' - 15° 8'	3170	continuous except from 6 h to 12 h on the first Wednesday of every month	A1 type, second pulses No transmission of DUT1
OMA (3)	Poděbrady Czechoslovakia + 50° 9' - 15° 8'	50	continuous except from 6 h to 12 h on the first Wednesday of every month	Interruption of the carrier of 100 ms at the beginning of every second, of 500 ms at the beginning of every minute. The precise time is given by the beginning of the interruption (3).
	Liblice Czechoslovakia + 50° 4' - 14° 53'	2500	between minutes 5 and 15 25 and 30, 35 and 40, 50 and 60 of every hour except from 5 h to 11 h on the first Wednesday of every month	Pulses of 5 cycles of 1 kHz modulation (prolonged for the minutes). The first pulse of the 5th minute is prolonged to 500 cycles. No transmission of DUT1.
PPE	Rio de Janeiro Brasil - 22° 54' + 43° 13'	8721	0 h 30 m, 11 h 30 m, 13 h 30 m, 19 h 30 m, 20 h 30 m, 23 h 30 m	Second ticks, of A1 type, during the five minutes preceding the indicated hours. The minute ticks are longer DUT1 : CCIR Code by double pulse.
PPR	Rio de Janeiro Brasil - 22° 59' + 43° 11'	435 8634 13105 17194.4	01 h 30 m, 14 h 30 m, 21 h 30 m	Second ticks, of A1 type, during the five minutes preceding the indicated hours. The minute ticks are longer
RAT (4) see p.C-16	Moscow USSR + 55° 19' - 38° 41'	2500	between minutes 30 and 35, 41 and 45, 50 and 60 from 17 h 50 m to 24 h	Second pulses* at the beginning of the minute are prolonged to 0.5 s.
		5000	between minutes 30 and 35, 41 and 45, 50 and 60 from 1 h 30 m to 6 h and from 12 h 30 m to 17 h	DUT1 + dUT1 by Morse Code each hour between minutes 11 and 12.
RBU (4)	Moscow USSR + 55° 19' - 38° 41'	$66\frac{2}{3}$	between minutes 0 and 5 from 0 h to 12 h 5 m, from 14 h to 18 h 5 m and from 20 h to 22 h 5 m	A1 type. Second pulses . The pulses at beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 6 and 7.

* The information about the value and the sign of the DUT1 + dUT1 difference is transmitted after each minute signal by the marking of the corresponding second signals by additional impulses. In addition, it is transmitted in Morse Code as indicated.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
RCH (4) see p. C-16	Tashkent USSR + 41° 19' - 69° 15'	2500	between minutes 15 and 20, 25 and 30, 35 and 40, 45 and 50 from 0 h to 3 h 50 m from 5 h 35 m to 9 h 30 m from 10 h 15 m to 13 h 30 m from 14 h 15 m to 24 h	Second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 51 and 52.
RID (4)	Irkutsk USSR + 52° 46' - 103° 39'	5004 10004	between minutes 5 and 10, 15 and 20, 25 and 30, 51 and 60 from 0 h to 1 h 10 m from 13 h 51 m to 24 h between minutes 5 and 10, 15 and 20, 25 and 30, 51 and 60 from 1 h 51 m to 13 h 10 m	Second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 31 and 32.
RIM (4)	Tashkent USSR + 41° 19' - 69° 15'	5000 10000	between minutes 15 and 20, 25 and 30, 35 and 40, 45 and 50 from 0 h to 1 h 30 m from 2 h 15 m to 3 h 50 m from 18 h 15 m to 24 h between minutes 15 and 20, 25 and 30, 35 and 40, 45 and 50 from 5 h 35 m to 9 h 30 m from 10 h 15 m to 13 h 30 m from 14 h 15 m to 17 h 30 m	Second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 51 and 52.
RKM (4)	Irkutsk USSR + 52° 46' - 103° 39'	10004 15004	between minutes 5 and 10, 15 and 20, 25 and 30, 51 and 60 from 0 h to 1 h 10 m, from 13 h 51 m to 24 h between minutes 5 and 10, 15 and 20, 25 and 30, 51 and 60 from 1 h 51 to 13 h 10 m	Second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 31 and 32.

* The information about the value and the sign of the DUT1 + dUT1 difference is transmitted after each minute signal by the marking of the corresponding second signals by additional impulses. It addition, in is transmitted in Morse Code as indicated.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
RTA (4) see p. C-16	Novossibirsk USSR + 55° 04' - 82° 58'	4996	between minutes 5 and 10, 15 and 20, 25 and 29, 35 and 39 from 0 h to 2 h 39 m from 18 h 5 m to 24 h	Second pulses*. The pulses at the beginning of the minute are prolonged. DUT1 + dUT1 : by Morse Code each hour between minutes 45 and 46.
		14996	between minutes 5 and 10, 15 and 20, 25 and 29, 35 and 39 from 3 h 5 m to 4 h 39 m from 6 h 5 m to 17 h 29 m	
RWM (4)	Moscow USSR + 55° 19' - 38° 41'	10000	between minutes 30 and 35, 41 and 45, 50 and 60 from 1 h 30 m to 3 h from 17 h 50 m to 24 h	Second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s. DUT1 + dUT1 : by Morse Code each hour between minutes 11 and 12.
		15000	between minutes 30 and 35, 41 and 45, 50 and 60 from 3 h 50 m to 17 h	
		9996	between minutes 30 and 35 41 and 45, 50 and 60 from 14 h 30, to 24 h	
RTZ (4)	Irkutsk USSR + 52° 18' - 104° 18'	50	between minutes 0 and 5 from 1 h to 23 h 5 m	A1 type second pulses*. The pulses at the beginning of the minute are prolonged to 0.5 s DUT1 + dUT1 : by Morse Code each hour between minutes 6 and 7.
VNG	Lyndhurst Australia - 38° 3' -145° 16'	4500 7500 12000	9 h 45 m to 21 h 30 m continuous except 22 h 30 m to 22 h 45 m 21 h 45 m to 9 h 30 m	Seconds markers of 50 cycles of 1 kHz modulation ; 5 cycles only for seconds markers 55 to 58 ; seconds marker 59 is omitted ; 500 cycles for minute markers. During the 5th, 10th, 15th, etc... minutes, 5 cycles for seconds markers 50 to 58. Identification by voice announcement during 15th, 30th, 45th and 60th minutes. DUT1 : CCIR code by 45 cycles of 900 Hz modulation immediately following the normal seconds markers.

* The information about the value and the sign of the DUT1 + dUT1 difference is transmitted after each minute signal by the marking of the corresponding second signals by additional impulses. It addition, in is transmitted in Morse Code as indicated.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
WWV	Fort-Collins USA + 40° 41' +105° 2'	2500 5000 10000 15000 20000 25000	continuous	Pulses of 5 cycles of 1 kHz modulation. 59th and 29th second pulse omitted. Hour is identified by 0.8 second long, 1500 Hz tone. Beginning of each minute identified by 0.8 second long, 1000 Hz tone. DUT1 : CCIR code by double pulse. BCD Time code given on 100 Hz subcarrier, includes DUT1 correction
WWVB	Fort Collins USA + 40° 40' +105° 3'	60	continuous	Second pulses given by reduction of the amplitude of the carrier. Coded announcement of the date and time and of the correction to obtain UT1. No CCIR code.
WWVH	Kauai USA + 21° 59' +159° 46'	2500 5000 10000 15000 20000	continuous	Pulses of 6 cycles of 1200 Hz modulation. 59th and 29th seconds pulse omitted. Hour identified by 0.8 second long 1500 Hz tone. Beginning of each minute identified by 0.8 second long, 1200 Hz tone. DUT1 : CCIR code by double pulse. BCD Time code given on 100 Hz subcarrier, includes DUT1 correction.
YVTO	Caracas Venezuela + 10° 30' + 66° 56'	6100	continuous	Second pulses of 1 kHz modulation with 0.1 s duration. The minute is identified by a 800 Hz tone and a 0.5 s duration Second 30 is omitted Between seconds 52 and 57 of each minute, voice announcement of hour, minute and second.
ZUO	Olifantsfontein South Africa – 25° 58' – 28° 14'	2500 5000 100000	18 h to 4 h continuous continuous	Pulses of 5 cycles of 1 kHz modulation. Second 0 is prolonged. DUT1 : CCIR code by lengthening

OTHER TIME SIGNALS

BPV, XSG, Shanghaï, China, P.R.
Latitude : + 31° 12', longitude : -121° 26'.
Characteristics and schedule not known.
For some emissions, see the time of emission, p. C-18 and C-19.

Notes on the characteristics of time signals

(1) DUT1 information in CCIR code

dUT1 information. This additional information specifies more precisely the difference UT1 - UTC down to multiples of 0.02 s, the total value of the correction being DUT1+dUT1.

A positive value of dUT1 is indicated by doupling a number (p) of consecutive seconds markers from seconds marker 21 to seconds marker (20+p) inclusive ; (p) being an integer from 1 to 5 inclusive

$$dUT1 = p \cdot 0.02 \text{ s}.$$

A negative value of dUT1 is indicated by doupling a number (q) of consecutive seconds markers following the minute marker from seconds marker 31 to seconds marker (30+q) inclusive ; (q) being an integer from 1 to 5 inclusive

$$dUT1 = -(q \cdot 0.02) \text{ s}$$

The seconds marker 28 following the minute marker is doubled as parity bit, if the value of (p) or (q) is an even number, or if dUT1 = 0.

Time- information. During the last 20 seconds of each minute in a BCD-code an information about the value "minute" and "hour" in the UTC time scale of the following minute marker is given.

(2) NBA, NSS, NWC - Several U.S. Naval VLF stations transmit time signals on an experimental FSK format (NWC, NBA, NSS).

Both frequencies, MARK (assigned frequency) and SPACE (plus 50 Hz), are phase stabilized.

50 baud frequency shift keying will be employed with bit lengths of 20 ms.

Transition between frequencies will require approximately 2 ms.

The time of the halfway point of the transition will be maintained within $\pm 10\,\mu s$ of the station clock.

This point will also be identical with the phase coincident point between the two carriers.

The zero crossing of the positive slope of the assigned carrier cycle will be controlled in time to $\pm 1\,\mu s$ of the station clock.

The one second pulses for the American Code will consist of 300 ms of 20 ms reversals followed by 700 ms of steady signal of the assigned carrier cycle + 50 Hz (SPACE). The beginning of the second will occur at the half transition point at the start of the reversals (SPACE ⟶ MARK).

(3) OMA, 50 kHz.

a. Owing to the reconstruction of the transmitter site in Liblice the OMA signal 50 kHz is being radiated with reduced power (approx. 50 W) from an auxilliary transmitter in Poděbrady (50° 9', - 15° 8'), as from September 23, 1974. Resumption of the transmission from Liblice is not expected before the end of 1975.

b. Time of the day (seconds, minutes and units of hours) transmission was started by the station OMA 50 kHz from July 1974 on an experimental basis. In the segment 0.55 s – 0.95 s of each second the time in BCD is encoded in the transmission through reversals of the carrier phase. Phase 0° corresponds to logical zero and phase 180° corresponds to logical one. The duration of 1 bit is 20 ms.

The users interested in continuous phase only have the possibility to suppress the coding by by simple doubling of the carrier frequency Sequential modification permitting to include the full date, MJD and DUT 1 in the coded transmission is envisaged, possibly for the end of 1975.

(4) The radiostations of the USSR emit UT1 information in accordance with the CCIR code Furthermore they give an additional information dUT1 specifying more precisely the difference UT1-UTC down to multiples of 0.02 s, the total value of the correction being DUT1+dUT1. Positive values of dUT1 are transmitted by the marking of p second markers within the range between the 20th and 25th second so that dUT1 = +0.02 s × p. Negative values of DUT1 are transmitted by the marking of q second markers within the range between the 35th and the 40th second, so that dUT1 = -0.02 s × q.

ACCURACY OF THE CARRIER FREQUENCY

The carriers of the following time signals are standard frequencies.

Station	Relative accuracy of the carrier frequency in 10^{-10}
CHU	0.05
DCF77	0.02
FFH	0.2
GBR	0.2
HBG	0.02
IAM	0.5
IBF	0.1
JJY, JG2AS	0.2
LOL1	0.2
MSF (60 kHz)	0.2
MSF (h.f.)	0.2
NBA (V.L.F.), NDT	0.03
NSS (V.L.F.), NWC	0.03
OMA (all frequencies)	0.5
VNG	1
WWV	0.1
WWVB	0.1
WWVH	0.1
ZUO	0.1

TIME OF EMISSION OF THE TIME SIGNALS IN 1974.

Unless otherwise stated, the values of UTC-signal are valid for the whole year 1974.

Signal	UTC-Signal (unit : 0.0001 s)	Remarks
BPV (10 MHz, 15 MHz)	-210	
CHU	0	
DAM, DAN, DAO	0*	
DCF77	0	
DGI	0	
DIZ	0	Irregularities on 1974 March 15, until 6h 6m UT.
FFH	0	
FTA91	0	
FTH42, FTK77, FTN87	0	
GBR	0	
HBG	0	
IAM	0	
IBF	0	
JJY	0	
LOL (all emissions)	0	
LQB9	- 4	
LQC20	- 9	
MSF	0	
NSS(h f)	0	
OLB5	+ 8	
OMA	0	
PPE	0	
RWM (and other t.s. from USSR)	0	
VNG	0	
WWV, WWVB, WWVH	0	
ZUO	0	

*DAN Jan. 22, 12h, +19 ; Jan. 24, 0h, +15 ; Jan. 24, 12h, +52.

DAO Jan. 23, 00h, - 22 ; Jan. 23, 12h, - 15 ; Jan. 24, 0h, - 22.
Jan. 24, 12h, - 51.

TIME OF EMISSION OF BPV ON 9351 kHz, 13h UT.

The missing data can be interpolated, except when a step adjustment occurs (marked by —— in the following table).

UTC - BPV (9351 kHz)
(unit : 0.0001s)

Date	1974 Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	-6964	-6160	-	-4428	-3515	-2566	-1754	-1184	- 585	+ 246	+1126	+2054
2	6930	6131	-5347	4392	3490	2531	1705	1171	554	272	1160	2087
3	6894	-	5312	4350	3462	2508	1704	1129	528	300	1194	2122
4	6863	6082	5288	4328	3433	-	1666	1133	509	324	1225	2155
5	6832	6053	5258	4300	3399	2455	1640	1103	484	351	1256	2180
6	6796	6030	5229	4268	3378	2428	1614	1082	463	378	1284	2213
7	6765	6008	5196	4232	3347	2401	1601	1072	451	411	1317	2248
8	6736	5980	5173	4201	3318	2374	-	1060	421	430	1350	2274
9	6706	5951	5142	4172	3283	2345	1549	1039	398	468	1379	2306
10	6672	5921	5104	4136	3260	2323	-	1022	369	492	1413	2336
11	6670	5896	5078	4107	3233	2299	1509	1004	311	525	1448	2368
12	6634	5866	5049	4075	3206	2279	1482	985	287	549	1478	2398
13	6610	5840	5018	4044	3176	2241	1464	967	258	578	1504	2428
14	6586	5809	4984	4012	3146	2218	1442	956	233	605	1534	2455
15	6555	5786	4956	3974	3117	2198	1425	942	205	635	1562	2490
16	6527	5759	4927	3946	3081	2172	1399	924	-	658	1590	2523
17	6495	5729	4883	3914	3053	2145	1372	903	156	686	1618	2551
18	6467	5694	4862	3878	3023	2125	1367	-	124	703	1646	2581
19	6437	5672	4834	3851	2993	2102	1329	869	-	729	1677	2612
20	-	5640	4808	3816	2960	2076	1324	851	74	756	1706	2640
21	6375	5611	4766	3811	2874	2022	1330	834	50	784	1741	2672
22	6355	5584	4737	3780	2846	1995	1305	810	- 12	810	1768	2707
23	6324	5555	4707	-	2820	1966	1286	791	+ 12	836	1795	2742
24	6305	5525	4678	3725	2790	1945	1265	764	43	866	1829	2770
25	6277	5495	4643	3702	2763	1917	1242	748	-	907	1859	2807
26	6252	5467	4600	3666	2736	1884	1221	724	99	933	1898	2840
27	6228	5442	-	3640	-	1863	1197	710	128	972	1922	2872
28	6197	5411	4545	3610	2679	1833	1176	693	157	1002	-	2906
29	6175		4511	3574	2636	-	1154	654	186	1030	1988	2939
30	6151		4482	3542	2613	-	1132	651	220	1061	2022	2970
31	6124		-		2582		1114	633		1092		3004

Dépôt légal : 2ème trimestre 1975
Imprimeur : Observatoire de Paris
Le Gérant : R. Michard